

# AAS

## Asian & Asian American Studies

### AAS 500: Intellectual History of East Asia

This course examines the major intellectual traditions of East Asia with an idea that intellectual movements not only reflect but also influence historical developments. It is designed to help students enhance their understanding of East Asian thoughts, history, and culture. Topics will cover the intellectual movements in China, Japan, and Korea from ancient times to the early 20th century.

*3 credits, Letter graded (A, A-, B+, etc.)*

### AAS 501: Proseminar: Topics & Methods in Contemporary Asian and Asian American Studies

This course introduces students to qualitative and quantitative research methods commonly used in social sciences and humanities, including narrative research, phenomenological research, ethnographic research, case study research, correlational research, and survey research. Students are expected to identify a topic of interest of their own choosing within Contemporary Asian and Asian American Studies and develop a pilot research project. The instructor plays the role of a facilitator by leading methodological as well as thematic discussions on research topics initiated by students. This course takes the formats of lectures, workshops, student presentations, peer critique, and one-on-one instructor-student conferences.

*3 credits, Letter graded (A, A-, B+, etc.)*

### AAS 505: The Pacific, Travel and Empire

This cultural studies course examines the cultures of travel (i.e. fiction, memoirs, photography, and filmmaking) in narratives by and about the Pacific, South and Southeast Asia. We will study "empire" by analyzing narratives about the former colonies of Spain, France, Britain and the United States. As we discuss the metaphors or tropes of empire, we will also examine the concept of empire as a historical and contemporary formation, or what an empire meant in the 19th century and what it means today in the early 21st century. The course begins with the premise that travel narratives and modern visual culture illuminate the relationship between the violence and romance of travel. The course includes modern travel narratives (i.e. novels by Asian Americans) that focus on the lives of those who are forced to travel or migrate

due to civil war, poverty and/or economic instability.

*3 credits, Letter graded (A, A-, B+, etc.)*

### AAS 534: English in Asia

Study of the expanding roles of English in South Asia, East Asia, and Southeast Asia. With more non-native speakers than native speakers, and more in Asia than elsewhere, English has acquired new identities. We will study functions of English in colonial and post-colonial times; how it competes with, and complements local languages in business, advertising, media, education, research, administration, judiciary, creative literature, call centers, and on the Internet; the evolution of dynamic new Asian Englishes, such as Indian English, and their social and cultural contexts; controversies regarding English medium education and its impact on local languages, relevance of native English standards, and implications for theory, description, and method in diverse disciplines, such as, business communication, cultural studies, English, lexicography, speech recognition, journalism, media studies, sociolinguistics, teaching English as a second language, and Asian Studies.

*3 credits, Letter graded (A, A-, B+, etc.)*

### AAS 540: Inter-Asia Cultural Studies

This course is an examination of the critical theory on Inter-Asia cultures and phenomena. Emphasis is placed on the role of culture within the writing, documentation, and evidencing of history. Attention may be focused on a particular era, group, institution, type of object, or event.

*3 credits, Letter graded (A, A-, B+, etc.)*

### AAS 545: Learning of Asian Languages

This course will analyze the cognitive processes involved in the acquisition of Asian languages as second or foreign languages. We will start with discussion of first language acquisition and compare it with second language acquisition (SLA). Methodologies such as contrastive analysis and error analysis, and concepts such as interlanguage, native and non-native competence, bilingual competence, acceptability, correctness, standard language will be critically examined. We will also consider the variables that affect SLA, including age, context, exposure, attitude, cognition, attention and motivation. Special attention will be given to the applicability of current research paradigms and findings to the acquisition of languages such as Chinese, Japanese, Korean, and Hindi, both in terms of their structural characteristics and in their socio-cultural context.

*3 credits, Letter graded (A, A-, B+, etc.)*

### AAS 547: Directed Reading in Contemporary Asian and Asian American Studies

This course provides an opportunity for graduate students in Contemporary Asian and Asian American Studies to pursue readings in an area of their interest as part of their graduate program studies. Independent readings in graduate topics in Contemporary Asian and Asian American studies. May be repeated. Prerequisites: Approval by Director of Graduate Studies

*1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### AAS 555: Heritage Languages of Asian Americans

English has long been the dominant language used in the United States, while the languages of numerous indigenous and immigrant communities have declined and many have died. At the same time, the United States' extensive global role, the rising geopolitical rise of Asian powers, such as China, India, Japan, South Korean, and others has highlighted the need to foster greater Asian language and cultural skills among Americans. In that context, maintaining the existing diversity of languages spoken among American immigrant populations becomes as important and effective as teaching the languages to new populations. There is an increasing recognition that the advantages of such multilingualism are not only cultural, but also cognitive, diplomatic, security, commercial, social, and political as well. Retaining knowledge of the home language is found to promote the minority individuals' psychological well-being, facilitate communication and bonding across generations, and ease the process of adjusting to life away from the home country, while promoting a pluralistic outlook and providing globally valuable job skills. Still, the brunt of the actual effort to foster multilingualism has been left to individual families despite the known fact that parental effort at maintenance alone are not enough to prevent an eventual shift to English. This new course is a critical examination of the nature and extent of available support (institutional, social, family, and other) for maintaining this valuable resource of Asian immigrants languages. Students learn through in-depth readings, class lectures and discussions, and directed research in language communities of their choice.

*3 credits, Letter graded (A, A-, B+, etc.)*

### AAS 560: Empire, Memory and Narratives of Asian America

Asian American literary scholars have focused on the tropes of immigration and settlement as major paradigms for mapping the landscape of Asian American writing. The late 1990s, however, witnessed the emergence of novels, memoirs, narrative and experimental films that departed from current notions of Asian American literature and films. A distinct cohort of writers and filmmakers, who are first-generation immigrants, created cultural forms that focus on the *heimat* or the homeland, narrating history, the legacies of war, violence, personal and national memory. The seminar considers how these fictional and non-fictional narratives engage with new aesthetic and political questions regarding Asian American writing, filmmaking and the limits and the possibilities of memory in the digital age.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AAS 565: Food, Labor and Asian America**

"An authentic taste of Asia" is a marketing phrase haunted by the violent histories of Orientalism, Western expansion and wars in Asia. In truth, the success and popularity of some Asian food is more than the celebration of the immigrant work ethic. Behind the popularity are geopolitical and labor issues. The consumption of beef and poultry in the U.S., for example, is intimately connected to the exploitation of immigrants from the global south. Undocumented immigrants and refugees from Southeast Asia, East Africa and the Americas perform the dirty task of slaughtering millions of animals: chickens, turkeys, pigs, ducks, sheep, lamb, calves. In 2009 alone, 33,300,000 cattle were killed for their meat in the United States. Immigrant laborers of American industrial slaughterhouses carry out dirty and dangerous work, killing and dismembering animals even as the laborers themselves live in crowded, unsanitary quarters. Similarly, the cooks of America's kitchens are immigrants from Asia and other parts of the world. This new MA course focuses on the emerging field known as "food studies," in particular the politics and histories of Asian food and its popularity in the United States. If the old adage is "we are what we eat," what does it mean that Asian food in the U.S. is intimately connected to the histories of wars in Asia, undocumented labor, and the exploitation of immigrant food workers?

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AAS 570: Intercultural Communication**

Through combination of theory and research from discourse linguistics and linguistic anthropology, this course examines (i) how culture shapes ways of speaking; (ii) how

language constructs identities, dispositions, role relations; and (iii) what challenges people from different cultures may face when they communicate with each other. The following analytical perspectives will be presented: speech act theory, ethnography of communication, linguistic politeness, and sequential organization of turn taking.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AAS 571: Islamic Thought in Asia**

Islam is commonly considered a Middle-Eastern religion, but most of the Middle East lies within the Asian continent, and the vast majority of Muslims over the centuries have been non-Arabic speakers, living across south and central Asia into India, China, and Indonesia. We will survey the importance of Islam as today's largest Asian religion (numerically speaking) and look at some of the distinctive features of its local variants. We will pay special attention to the manner in which teachings were presented in the languages besides Arabic that became Islam's vehicles, in particular Chinese, which witnessed a remarkable synthesis of the Islamic and Confucian worldviews.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AAS 572: Topics in Asian Philosophy I**

This course presents in-depth student of specific topic in an Asian philosophical tradition. Students are expected to demonstrate knowledge through mastery of native terms and concepts from that tradition. May be repeated as the topics changes.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AAS 573: Orientalism**

Edward Said's *Orientalism*, written in 1978, was a polemical attack on the discipline of Orientalism and the representations of the "orient" in western thought. Almost thirty years later, the debate still rages: are all western scholars' writings about Asia complicit in imperialism? Is there such a thing as objective scholarship, or are power and knowledge so deeply intertwined that all intellectual activity is inherently political? Taking our start from Said's ideas, we will look at authors who extended Said's critique to the fields of South Asian and East Asian Studies, and also examine some of Said's most outspoken critics. In investigating these issues, students will learn about some of the major figures in the history of Asian students. We will conclude the semester by exploring the possibilities for "post-orientalist" approaches to the study of Asian cultures and religions, and by examining the pervasiveness of orientalist themes in popular culture.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AAS 575: Multilingualism & Communication in Asia**

Survey of multilingualism as a cognitive phenomenon and communication strategy with special reference to traditionally multilingual societies. Structural, sociolinguistic, cultural, and cognitive models are evaluated for their adequacy in representing multilingualism in Western and especially non-Western (Asian and African cultures). Topics include concepts of multilingualism, typology of multilingualism; functional distribution of languages in education, media, social media, and business; diglossia, code-switching and code-mixing, psycholinguistic and neurolinguistic models of multiple language representation and processing in the brain; synchronic and diachronic dimensions of language contact and interaction in the individual and society: accents, interference, transfer on various linguistic levels; borrowing, linguistic convergence, emergence of pidgins, creoles, mixed languages, styles, and non-native varieties; multilingualism as a pragmatic and stylistic literary device speech acts and multilingual creativity; socio-political dimensions of multilingualism: multilingualism and identity; accommodation and assimilation; language maintenance and shift; language rivalry and conflict; spread of languages of wider communication and minority languages' anxiety about hegemony and endangerment; cross-cultural case studies of pluralistic models of synergistic co-existence.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AAS 578: Chinese Sociolinguistics**

Narrative readings in Chinese selected from Chinese newspapers and magazines, including news reports and narrations on lifestyles, people, and landscapes. Students are expected to improve their skills in the analysis and writing of narrative readings. This course is designed for students who already have advanced level proficiency in Chinese, who can read and write everyday vernacular Chinese, but who have not been exposed to more formal language and literary forms.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AAS 585: Translation Studies of Asian Languages**

Inquiry into issues in the translation of Asian languages into/from English. This course introduces the recent theories and concepts of translation studies and applies them to the analysis of a variety of Asian texts as source texts or target texts. Students are expected to gain insights into the lexical, grammatical,

cognitive, pragmatic, and socio-cultural characteristics of Asian languages as well as social and political issues that surround translation of Asian texts. Texts to be analyzed include, but are not limited to, literary works, newspaper articles, advertisements, brochures, and business letters. Advanced skills in one of the Asian languages are required.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AAS 587: Supervised Research in Contemporary Asian and Asian American Studies**

This course provides thesis credit for students in the graduate program, Contemporary Asian and Asian American Studies. Thesis credit. Independent graduate research under the supervision of a faculty member. May be repeated to a limit of 6 credits. Prerequisites: Approval of Director of Graduate Studies  
*1-6 credits, Letter graded (A, A-, B+, etc.) May be repeated 6 times FOR credit.*

## **ACC**

### **Accounting**

#### **ACC 529: Managerial Accounting and Decision Making**

This course covers cost accounting concepts and theories and the implementation of an accounting system as a source of information for decision making, planning, control, and the evaluation of organizational performance by management. Other topics include cost-volume-profit analysis, overhead rates, budgeting and statement of cash flows.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 542: Accounting for the Small Business Entrepreneur**

This course is designed to introduce the student to accounting and other financial concepts that the small business entrepreneur needs to know in order to be successful. The course will reinforce accounting concepts already introduced in the Financial Accounting course with an emphasis on the small business. Other business/financial concerns such as bank reconciliations, payroll preparation, payroll and sales tax compliance, maintenance of installment debt, and utilization of sales and purchase discounts will be reviewed. Since most small business entrepreneurs need to either do their own bookkeeping or at least be intimately involved in the process this course requires the student to become familiar with two different accounting software packages (Quickbook and Peachtree). Prerequisite: Enrolled in Accounting MBA or MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 543: Corporate Governance**

This course aims to enable students to understand legal arrangement and social economic theories that are necessary for analyzing core issues of modern corporate governance. The role of accounting in corporate governance is emphasized. Prerequisite: Enrolled in Accounting MBA or MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 544: Financial Statement Analysis**

Financial statement analysis is central to fundamental analysis of business. This course is about the analysis of financial statements for making investment decisions. It integrates key elements from accounting, finance, and business strategy and applies them to financial decision-making. The course will be taught using a combination of lectures, case analyses, class discussions, and student presentations. Prerequisite: Enrolled in Accounting MBA or MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 545: Entity Taxation**

Introduces fundamental income taxation concepts for business entities. Coverage includes the formation, operation, reorganization and dissolution of C and S corporations. Topics associated with partnerships and LLCs entities are also reviewed. Students will be exposed to other areas of our Federal tax system, including U.S. multi-national, gift, estate, and fiduciary income tax topics. State nexus and financial accounting for income taxes concepts are also introduced. Prerequisite: Enrolled in Accounting MBA or MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 546: Information Security & Current Emerging Technologies in Accounting**

#### **ACC 560: Information Security and Current Technologies in Accounting**

This course teaches students concepts on information security and protection of information assets. Also, it discusses important topics on IT governance and management including but not limited to IT risk management, IT controls, access controls and cyber security. Additionally, it covers emerging technologies and software applications commonly used in today's accounting profession. Prerequisite: Enrolled in Accounting MBA or MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 562: Analysis and Design of Accounting Systems**

A managerial approach to the concepts, issues and techniques used to successfully manage and maintain an "Accounting Information System." Topics will include business processes such as the revenue and expenditure cycles; business transactions including replenishment procedures and customer loyalty programs; general ledger output and compliance requirements as well as interfaces to OLAP environments. Prerequisite: Enrolled in Accounting MBA or MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 580: Contemporary Issues in Accounting**

The focus of this course is on contemporary issues facing the accounting profession. It serves as an academic culmination that draws upon other courses in the accounting curriculum. In exploring contemporary issues, students will more deeply consider the theoretical underpinnings and practical application of accounting principles generally accepted in the United States (GAAP); auditing procedures and auditing standards generally accepted in the United States (GAAS); federal taxation guidelines; and the profession's ethical, professional and legal responsibilities. Pedagogy includes extensive use of newsworthy accounting issues and the Financial Accounting Standards Codification, American Institute of Certified Public Accountants Auditing Standards, and the IRS Tax Code, Regulation, and Guidelines. Course is team taught by three accounting instructors. Prerequisite: Enrolled in Accounting MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 590: Advanced Auditing and Assurance**

This course builds on the foundation from an undergraduate Auditing and Assurance course, using case studies to motivate and develop a thorough understanding of how audit standards (GAAS), processes, and techniques facilitate the auditor's role of validating that financial statements are presented fairly and in accordance with Generally Accepted Accounting Principles (GAAP). Students will learn through case studies, classroom discussions, and projects. The course will also cover contemporary issues in auditing. Prerequisite: Enrolled in Accounting MBA or MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 591: Internal Auditing**

This course is designed to introduce the student to the goal of internal auditor, i.e., to understand, audit and report on an entity's financial, compliance and operational control systems. The course will discuss how the internal auditor accomplishes this goal through professional standards and the best industry practices. This course will present information that will enable the student to understand how the internal audit process improves ethical behavior and operational efficiencies within the business environment. These sessions include discussions about the history of the internal audit function. Other topics discussed will be application in the banking industry, the Enron fraud and the resulting Sarbanes-Oxley legislation and application to local government environments. Finally, there will be discussion about the audit committee and how it relates to the internal audit. Prerequisite: Enrolled in Accounting MBA or MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 594: Governmental and Not for Profit Accounting and Reporting**

This course is designed to introduce the student to generally accepted accounting practices (GAAP) for both governmental and not-for-profit entities. The different accounting rules for each type of entity will be explored and compared to typical corporate accounting practices. The course will examine standards and issued by the two rule making bodies, i.e. the Financial Accounting Standards Board (FASB) and the Governmental Accounting Standards Board (GASB) and how they affect the accounting and financial reporting for the two types of entities. These sessions will include explanation of typical accounting transactions and the resulting financial statements. There will also be discussions about current financial events affecting both environments. Prerequisite: Enrolled in Accounting MBA or MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 596: Financial Accounting Theory**

This course explores the historical development and refinement of the conceptual framework of accounting theory as it relates to financial reporting. The implications of the convergence of International Accounting Standards, and Generally Accepted Accounting Principles (GAAP) in a global environment are discussed. Current accounting practices are analyzed and evaluated in the context of the conceptual framework of GAAP along with the discussion of research methodologies. Prerequisite: Enrolled in Accounting MBA or MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 597: Advanced Accounting**

This course provides the students with an in-depth, up-to-date coverage of accounting for consolidations, governmental, not-for-profit entities, and other key advanced topics. The course links theory and practice with constant emphasis on the logic of procedures.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ACC 598: Forensic Analytics in Accounting**

The aim of this course is to explore and master the professional skills necessary to detect, investigate and prevent fraud. Students will learn how and why fraudulent activities are committed, and how allegations of fraud should be investigated and resolved. The use of technology to proactively detect fraud will be discussed. The following areas such as financial investigations, financial statement fraud, tax fraud, business valuation, resolution and litigation services will be covered.

Prerequisite: Enrolled in Accounting MBA or MS program

*3 credits, Letter graded (A, A-, B+, etc.)*

## **AFH**

### **Africana Studies/Humanities**

#### **AFH 520: The Caribbean and the Literary Imagination**

An examination of the literary representation of the Caribbean through an extensive study of selected fictional and theoretical writings. This seminar will include an examination of the representations of the Caribbean by African American as well as Caribbean writers.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **AFH 524: Contemporary African Diasporic Literature and Film**

Contemporary African American Diasporic Literature and Film offers a comparative analysis of twentieth and twenty-first century African Diasporic writers and filmmakers and their explorations of race, class, and gender. To establish the shifting nature of African Diasporic intellectual thought, we shall consider how each successive generation of writers and filmmakers builds upon discussions of racial identity, black sexuality, and social mobility. To demonstrate how discussions of race have evolved over time texts will be read in conjunction with each other. So for example, Fanon's seminal text *Black Skin White Masks*, a text that seeks to explain the racialization of society, the double consciousness of black people, and the superiority complex of white people will be read against Paul Gilroy's *Against Race*, a text

arguing for the deconstruction and recognition of race as a cultural construct. Other topics for discussion focus on how "newer" writers delve into questions of sexuality from a fresh perspective. Comparing Morrison's *Sula* with Cheryl West's play *Before it Hits Home*, for example, demonstrates that writers are now exploring questions of sexuality in more provocative ways. West's uncovering of the "downlow" life-style lived by Black men, and the health concerns related and the dangers of sexually transmitted diseases such as HIV/AIDS. Permission from advisor required.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **AFH 528: Contemporary Black Literature and Cultural Criticism**

This course introduces students to some of the major contemporary literary and cultural theorists from the twentieth and twenty-first centuries (Fanon, Baker, Christian, Gilroy, Mercer, Morrison, Gates, Patterson, CLR James, etc). Earlier scholars from the nineteenth century such as Anna Julia Cooper or Du Bois will also be referenced. Through an examination of major literary and cultural movements such as Negritude, the Caribbean Artists Movement, The Black Arts Movement, and the Post- Black Artists Movement, students will gain insight into how black scholars both critique and contribute to the artistic, political, and social discourse of the day. An application of Postcolonial, Feminist/Womanist, and Cultural Criticism will aid the students in their reading of the critical materials.

*Offered*

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **AFH 564: Seminar in Francophone Literature**

Close examination of the literature written in French of the Francophone world outside of France, with special emphasis on the literature of the Caribbean and Africa. This course will pose and explore questions such as: What is Francophone literature and what are the implications of a literature considered as "Francophone"? What are the functions of writing in French in a "postcolonial" context? Permission of advisor required.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **AFH 585: Independent Studies**

Specialized in-depth exploration of topics related to Africana Studies core themes based on a contractual relationship between individual student and faculty. Student must gain permission of selected faculty to enroll in their section of this course. The course can be

taken only twice in fulfillment of requirements for the M.A.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AFH 599: Thesis**

This course is intended to prepare students in developing a sustained and mature (nuanced) argument for their M.A. thesis. The class is for credit with flexible attendance requirements. The student must have an AFS faculty sponsor (thesis director) who will be responsible for assigning a course grade. The class is available beginning in the second term of a student's enrollment in the M.A. program and in the summer upon approval of the Director of Graduate Studies.

*6 credits, Letter graded (A, A-, B+, etc.)*

## **AFS**

### **Africana Studies/Social and Behavioral Sciences**

#### **AFS 500: Foundations in Africana Studies, I**

Core course required of all students pursuing a master's degree in Africana Studies. The two-semester foundations sequence will introduce students to the theoretical issues and historiography of the African Diaspora. The parameters of African Diaspora studies and will cover the historical, literary, socio-political, cultural, and economic themes of the black experience. The course will provide critical examination of the global experience and promote an understanding of the Black Diaspora. Students will read the works of scholars who shaped the broad intellectual world. The required readings will emphasize the canons of Diaspora literature, including works by and about W.E.B. Du Bois, George Padmore, C.L.R. James, Marcus Garvey, and others.

*Permission of advisor required.*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **AFS 501: Foundations in Africana Studies, II**

Core course required of all students pursuing a Master's degree in Africana Studies. The two-semester foundations courses will introduce students to the theoretical issues and historiography of the African Diaspora. The parameters of African Diaspora studies will cover the historical, literary, socio-political, cultural, and economic themes of the black experience. The course will provide critical examination of the global experience and promote an understanding of the Black Diaspora focusing on scholarly works by Paul

Gilroy, Chinua Achebe, Henry Louis Gates, Angela Davis, Walter Rodney, and others.

*Permission of advisor required.*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **AFS 502: Research Methods in Africana Studies**

This course introduces students to basic concepts of research methodology, specifically as they pertain to studies of the African diaspora. Students will be exposed to a variety of critical approaches across such disciplines as history, literature, political science, and sociology in the context of Africana studies. Students will examine the ways in which theoretical, ideological, and philosophical assumptions about race, class, and gender shape the kinds of research questions we ask and the types of instruments we use to investigate and evaluate the experiences and contributions of people from the African diaspora. Permission of advisor required.

*Fall, 0-3 credits, Letter graded (A, A-, B+, etc.)*

#### **AFS 504: Racialized Oppressions and the Idea of Humanity**

When one reads accounts of slavery, genocide, the systematic denial of rights to a group because of a racial identity, the question always arises whether the oppressors view the racialized other as fully human? This course will explore this question and what it means to view an individual or group as "fully human." How have philosophical understandings of the moral importance and the moral meaning of "humanity" served to exacerbate, moderate or fight against racial oppression? How does racial and gender oppression compare in this respect? Is there a comparison to be made between racial oppression and the treatment accorded to disabled people with respect to the understanding of what it is to be human? Does shifting the ground from a biologically-based concept such as "humanity" to a philosophical concept of "personhood" serve to justify or serve as a tool against these identity-based oppressions? Does shifting the ground justify the analogy of racism with the abuse of animals, as in the idea of "speciesism"? We will explore as many of these questions as interest dictates and time permits. Permission from advisor required.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **AFS 507: African Music**

This is a selective introduction to African music, and the music of the African Diaspora. We will read from major scholars in the field of African music studies such as Simha Arom, Christopher Waterman, Gerhard Kubik,

Michele Kisliuk, Ruth Stone, Kofi Agawu, and others. Students will get a broad overview of the music of the major regional subdivisions of Africa (for instance North Africa, Central Africa, South Africa, etc.), as well as a historical perspective on the musicological issues that have been central to Africanist musicology and ethno musicology. There will be regular reading, listening, and short writing assignments, occasional quizzes, a book review, and a final research project of 16-18 pp. For the book review, students will write about a monograph on African Music such as John Miller Chernoff's *African Rhythm and African Sensibility* or Paul Berliner's *The Soul of Mbira*. Students will present their research to class towards the end of the term. Permission from course instructor required.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **AFS 530: Slavery and the Atlantic World**

This course will examine the experiences of people of African descent as participants in a coerced migration that created the African Diaspora. The transatlantic slave trade led to an enduring image of black men and women as transported commodities. Therefore, it has had the greatest impact on the construction of the African Diaspora giving rise to new communities of people across the globe.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **AFS 533: Race, Gender, and Globalization**

This seminar explores current issues and debates relating to the racialized and gendered effects of globalization. Topics include an overview of the sociology of globalization and theories of globalism/the global system, transnational classes and a transnational state, global culture and ideology, transnational migrations and the new global labor market, globalization and race/ethnicity, women and globalization, local-global linkages, and resistance to globalization.

*Offered*

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **AFS 536: Africa and Globalization**

This seminar will discuss the interconnection between this enduring crisis of the modern African state and the impact of globalization, especially after the collapse of communism in Eastern Europe. We will critically explore the implications of these complex regional and global political and economic forces for emerging African social formation, the viability of African states and societies, new migration patterns, transnationalism, and

diasporic connections especially since the decolonization process in the 1950's.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AFS 540: The Black Power Movement**

This course examines the Black Power Movement. Stokely Carmichael's call for "Black Power!" broke through the commotion of everyday politics during 1966's Meredith March Against Fear. Soon after, and for the next decade, Black Power galvanized African American politics, engendering radical movements for social, political, and cultural transformation that impacted blacks in the United States and beyond. An emerging historiography traces the roots of Black Power in the postwar black freedom movement, finding cultural and political touchstones for future Black Power activism among civil rights renegade, trade unionists, and black nationalists. We will examine works produced during the Black Power era and new scholarship to analyze the Black Power Movement's legacy in the politics and culture of African Americans. Permission of advisor is required. This course is offered as both HIS 540 and AFS 540.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AFS 541: Music and Race: Black Music (Cross Cultural Study of Music)**

This seminar will examine how certain widely held conceptualizations about race (and in some instances ethnicity) are articulated, reinforced, or challenged in music making and consumption, on the one hand, and in scholarship about music on the other. Writings on race and music have tended to be about "black" culture(s). In this course we will critique this focus and the construct of black music in great detail. The course requires extensive readings on these topics; listening to musical examples (in-depth knowledge of music theory is not necessary); vigorous class discussion and written reaction papers; a final research paper and class presentation. Students may choose to explore other aspects of music and race besides black music in their final papers (for example, how Orientalism has been constituted in music and musical criticism and scholarship). Permission of advisor required.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AFS 542: Caribbean Transnational Identity in the US**

This course seeks to examine the strategies some immigrants from the Caribbean utilize to live their lives simultaneously in the US and the country of origin. To do so, it sheds light on the ways in which the US construction of

race and ethnicity influences the immigrants' search for an identity in the United States.

*Prerequisite: Enrollment in the Graduate Certificate Program*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AFS 550: Women of Color in The Modern World: Shifting Identities and Feminist Visions**

This course explores the various ways in which gender, race, and class, along with other aspects of identity, shape the lives and experiences of women of color in the United States and globally. It presents the ongoing debates concerning the interconnections of gender, race, and shifting identities. It will examine the relationships between the construction of personal identities, identity statuses, cultural and ideological meaning systems, and the search for alternative images. Permission from advisor required.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AFS 555: Sociology of Gender and Development**

The 1960's marked a transition in global economic relations from one characterized by colonial extraction and exploitation, to sustainable development emphasizing economic growth and the alleviation of poverty. It was quickly discovered, however, that the effects of development were beneficial for some but devastating for others, especially poor women. The discovery led many scholars and practitioners, especially those who embrace feminist ideologies, to demand that development agencies and policies be sensitive to gender issues. This seminar will focus on gender and development, in theory and practice, in the global South. It will promote students'

*understanding of the central role that gender plays in the success and assessment of development strategies.*

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AFS 560: Sexualities: African and Caribbean Perspectives**

This seminar is designed to introduce students to the complexities of human sexuality from a perspective that places subaltern individuals at the center of the analysis. It locates these individuals, and their sexual practices, in the Tropics (particularly in Africa and the Caribbean) first in those man-made communities where sexuality was one of the (unspoken) exigencies of the slave and colonial economies, and later in the modern era where these economies have given way to neo-colonies.

*Offered*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AFS 570: The Black Radical Tradition**

This course examines the black radical tradition from slavery to the present, paying particular attention of twentieth-century social movements and the intersection between trade unionism, black nationalism, internationalism, and Marxism. Black radicalism has a long history in the United States and beyond. At its core, this tradition has housed diverse, at times conflicting, ideological strains, personalities, and organizations ranging from black feminists, Marxists, socialists, liberals, trade unionists, artists, and intellectuals. In the process this tradition has run afoul of more mainstream expressions of Black protest (although in certain eras, such as during the Black Power Movement, it has represented the mainstream), and black radicals are often marginalized as wild-eye dreamers, naive to the ways of the world.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AFS 585: Independent Studies**

Specialized in-depth exploration of topics related to Africana Studies core themes based on a contractual relationship between individual student and faculty. Student must gain permission of selected faculty to enroll in their section of this course. The course can be taken only twice in fulfillment of requirements for the M.A.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **AFS 599: Thesis**

This course is intended to prepare students in developing a sustained and mature (nuanced) argument for their M.A. thesis. The class is for credit with flexible attendance requirements. The student must have an AFS faculty sponsor (thesis director) who will be responsible for assigning a course grade. The class is available beginning in the second term of a student's enrollment in the M.A. program and in the summer upon approval of the Director of Graduate Studies. Fall and Spring

*3-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **AFS 616: Twentieth Century African Political History**

This seminar is an extensive exploration of African political history in the twentieth-century. It examines the major themes that have shaped the formation and the decline of the modern African state since the imposition of colonial rule in the late nineteenth century. Drawing from monographs and journal articles

on twentieth century African social and political history, and the recent scholarship on state/society relations, the seminar will explore the interactions between state institutions and structures of society in colonial and post-colonial Africa. The seminar is broadly structured around key themes which are presented in chronological order. These themes are divided into three major sections. The first section which deals with the colonial period will examine the following themes: partition and conquest; African resistance to early colonialism; the historical processes of state formation in Africa; the colonial economy; and the interaction between the world religion (Christianity and Islam) and colonial rule. The second section on the postcolonial era examines the following themes: the historical processes of state formation in Africa; communal identities and social change since decolonization; the patriarchal society and the crisis of the state; and the new debates on democratization and civil society in the post-Cold War era. The final section examines the international politics of African states from both theoretically and historical perspectives. The relevant themes here include the impact of the major powers on African subregions in the Cold War and post-containment eras; the impact of multilateral agencies on African political, economic and social developments; regional organizations and African states. The structure of the course is intended to be coherent but flexible, so that we can identify some basic trends in the reading assignments and construct consistent themes on the interplay of political transformation in the twentieth century. Permission of advisor is required.

3 credits, Letter graded (A, A-, B+, etc.)

## AMS

### Applied Mathematics and Statistics

#### AMS 500: Responsible Conduct of Research and Scholarship (RCRS)

This course is designed to introduce students to the major issues in the ethics of science and research. Using a combination of readings-written and web-based-videos, and case discussion, students will investigate the moral values intrinsic to science and the professional and social values with which scientists must comply. Each class will begin with an introductory lecture or video followed by discipline-based, small group discussions with the participation of an AMS faculty member.

S/U grading

May be repeated for credit.

#### AMS 501: Differential Equations and Boundary Value Problems I

Examples of initial and boundary value problems in which differential equations arise. Existence and uniqueness of solutions, systems of linear differential equations, and the fundamental solution matrix. Power series solutions. Sturm-Liouville theory and eigenfunction expansion. Green's functions. Spring

3 credits, Letter graded (A, A-, B+, etc.)

#### AMS 502: Differential Equations and Boundary Value Problems II

Analytic solution techniques for, and properties of solutions of, partial differential equations, with concentration on second order PDEs. Techniques covered include: method of characteristics, separation of variables, eigenfunction expansions, spherical means. Green's functions and fundamental solutions, and Fourier transforms. Solution properties include: energy conservation, dispersion, dissipation, existence and uniqueness, maximum and mean value principles.

3 credits, Letter graded (A, A-, B+, etc.)

#### AMS 503: Applications of Complex Analysis

A study of those concepts and techniques in complex function theory that are of interest for their applications. Pertinent material is selected from the following topics: harmonic functions, calculus of residues, conformal mapping, and the argument principle. Application is made to problems in heat conduction, potential theory, fluid dynamics, and feedback systems.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

#### AMS 504: Foundations of Applied Mathematics

An introductory course for the purpose of developing certain concepts and techniques that are fundamental in modern approaches to the solution of applied problems. An appropriate selection of topics is based on the concepts of metric spaces, compactness, sequences and convergence, continuity, differentiation and integration, function sequences, contraction mapping theorem. Strong emphasis on proofs.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

#### AMS 505: Applied Linear Algebra

Review of matrix operations. Elementary matrices and reduction of general matrices by elementary operations, canonical forms, and inverses. Applications to physical problems. Offered as AMS 505 or HPH 695.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

#### AMS 507: Introduction to Probability

The topics include sample spaces, axioms of probability, conditional probability and independence, discrete and continuous random variables, jointly distributed random variables, characteristics of random variables, law of large numbers and central limit theorem, Markov chains. Note: Offered as AMS 507 or CET 551 or HPH 696.

3 credits, Letter graded (A, A-, B+, etc.)

#### AMS 510: Analytical Methods for Applied Mathematics and Statistics

Review of techniques of multivariate calculus, convergence and limits, matrix analysis, vector space basics, and Lagrange multipliers.

*Prerequisite: A course in linear algebra and in multivariate calculus*

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

#### AMS 511: Foundations of Quantitative Finance

Introduction to capital markets, securities pricing and modern portfolio theory, including the organization and operation of securities market, the Efficient Market Hypothesis and its implications, the Capital Asset Pricing Model, the Arbitrage Pricing Theory and more general factor models. Common stocks and their valuation, statistical analysis, and portfolio selection in a single-period, mean-variance context will be explored along with its solution as a quadratic program. Fixed income securities and their valuation, statistical analysis, and portfolio selection. Discussion of the development and use of financial derivatives. Introduction to risk neutral pricing, stochastic calculus and the Black-Scholes Formula. Whenever practical examples will use real market data. Numerical exercises and projects in a high-level programming environment will also be assigned.

3 credits, Letter graded (A, A-, B+, etc.)

#### AMS 512: Capital Markets and Portfolio Theory

Development of capital markets and portfolio theory in both continuous time and multi-period settings. Utility theory and its application to the determination of optimal consumption and investment policies. Asymptotic growth under conditions of uncertainty. Applications to problems in strategic asset allocation over finite horizons and to problems in public finance. Whenever practical, examples will use real market data. Numerical exercises and projects in a high-level programming environment will also be assigned.

3 credits, Letter graded (A, A-, B+, etc.)

**AMS 513: Financial Derivatives and Stochastic Calculus**

Further development of derivative pricing theory including the use of equivalent martingale measures, the Girsanov Theorem, the Radon-Nikodym Derivative, and a deeper, more general understanding of the Arbitrage Theorem. Numerical approaches to solving stochastic PDE's will be further developed. Applications involving interest rate sensitive securities and more complex options will be introduced. Whenever practical examples will use real market data. Numerical exercises and projects in a high-level programming environment will also be assigned. Prerequisite: AMS 511. 3 Credits

*3 credits, Letter graded (A, A-, B+, etc.)*

**AMS 514: Computational Finance**

Review of foundations: stochastic calculus, martingales, pricing, and arbitrage. Basic principles of Monte Carlo and the efficiency and effectiveness of simulation estimators. Generation of pseudo- and quasi-random numbers with sampling methods and distributions. Variance reduction techniques such as control variates, antithetic variates, stratified and Latin hypercube sampling, and importance sampling. Discretization methods including first and second order methods, trees, jumps, and barrier crossings. Applications in pricing American options, interest rate sensitive derivatives, mortgage-backed securities and risk management. Whenever practical examples will use real market data. Extensive numerical exercises and projects in a general programming environment will also be assigned.

*3 credits, Letter graded (A, A-, B+, etc.)*

**AMS 515: Case Studies in Machine Learning and Finance**

The course will cover applications of Quantitative Finance to risk assessment, portfolio management, cash flow matching, securities pricing and other topics. Particular attention will be paid to machine learning approaches, such as neural networks and support vector machines, data collection and analysis, the design and implementation of software. We will study differences between theory and practice in model application, including in-sample and out-of-sample analysis.

*3 credits, Letter graded (A, A-, B+, etc.)*

**AMS 516: Statistical Methods in Finance**

The course introduces statistical methodologies in quantitative finance. Financial applications and statistical

methodologies are intertwined in all lectures. The course will cover regression analysis and applications to the Capital Asset Pricing Model and multifactor pricing models, principal components and multivariate analysis, statistical methods for financial time series; value at risk, smoothing techniques and estimation of yield curves, and estimation and modeling of volatilities. Prerequisite: AMS 507 3 credits, ABCF grading

*3 credits, Letter graded (A, A-, B+, etc.)*

**AMS 517: Quantitative Risk Management**

The course will cover structural and reduced-form approach to pricing credit default, Markovian models (or rating-based) pricing methods, statistical inference of relative risks, counting process, correlated (or dependent) default times, copula methods and pricing models for CDOs. Prerequisite: AMS 507 and AMS 511 3 credits, ABCF grading

*3 credits, Letter graded (A, A-, B+, etc.)*

**AMS 518: Advanced Stochastic Models, Risk Assessment, and Portfolio Optimization**

The course provides a thorough treatment of advance risk measurement and portfolio optimization, extending the traditional approaches to these topics by combining distributional models with risk or performance measures into one framework. It focuses on, among others, the fundamentals of probability metrics and optimization, new approaches to portfolio optimization and a variety of essential risk measures. Numerical exercises and projects in a high-level programming environment will be assigned. Prerequisite: AMS 512 or AMS 516 or AMS 522

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**AMS 519: Internship in Quantitative Finance**

Supervised internship in financial institution. Students will typically work at a trading desk, in an asset management group, or in a risk management group. Students will be supervised by a faculty member and a manager at their internship site. Written and oral reports will be made to both supervisors. Offered every semester, 3-6 credits, ABCF grading

*3-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

**AMS 520: Machine Learning in Quantitative Finance**

This course will merge ML and traditional quantitative finance techniques employed at investment banks, asset management, and securities trading firms. It will provide

a systematic introduction to statistical learning and machine learning methods applied in Quantitative Finance. The topics discussed in the course fall broadly into four categories which (as time permits) will be discussed in this order: Probabilistic Modeling, Feedforward neural networks, Sequential Learning, and Reinforcement Learning. Prerequisite: AMS 572& AMS 595 (or AMS 561 or based on Python knowledge per Instructor Consent)

*3 credits, Letter graded (A, A-, B+, etc.)*

**AMS 522: Bayesian Methods in Finance**

The course explores in depth the fundamentals of the Bayesian methodology and the use of the Bayesian theory in portfolio and risk management. It focuses on, among other topics, incorporating the prior views of analysts and investors into the asset allocation process, estimating and predicting volatility, improving risk forecasts, and combining the conclusions of different models. Numerical exercises and projects in a high-level programming environment will be assigned.

*3 credits, Letter graded (A, A-, B+, etc.)*

**AMS 523: Mathematics of High Frequency Finance**

Elements of real and complex linear spaces. Fourier series and transforms, the Laplace transform and z-transform. Elements of complex analysis including Cauchy theory, residue calculus, conformal mapping and Mobius transformations. Introduction to convex sets and analysis in finite dimensions, the Legendre transform and duality. Examples are given in terms of applications to high frequency finance.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**AMS 524: Modern Computational Data Analytics**

This course introduces the tools for the analysis of big data sets on server machines. It teaches how to store, preprocess, analyze and visualize data arriving at high volume and velocity. In the first part of the course, we will cover programming in Python, from its basic libraries to more advanced methods for big data analytics, and machine learning. Emphasis will be on the implementation in Python and practical hands-on examples. Next, we will learn essential Shell scripting and terminal window commands for computations on server machines. We will introduce database management systems and SQL querying. In the second part of the course, we will discuss code version control and collaboration solutions in GitHub and GitHub Actions, microservices,



containers (Docker and Kubernetes), API gateways, and other tools necessary in a professional data science pipeline.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 525: Geometric Deep Learning**

In the first part of the course, we will cover programming in Python, from its basic libraries up to the implementation of advanced deep learning models such as CNNs, RNNs, GNNs, and Transformer networks. The practical success of many of these models in high-dimensional problems such as image processing, playing GO, or protein folding comes from the predefined regularities in the underlying low-dimensional geometric structure of the data. Therefore in the second part of the course, we will extend the aforementioned deep learning models and their implementations to graphs and manifolds in spatial and spectral domains. The focus will be on the implementation of the models in Python and their practical applications.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 526: Numerical Analysis I**

Direct and indirect methods for solving simultaneous linear equations and matrix inversion, conditioning, and round-off errors. Computation of eigenvalues and eigenvectors. Corequisite: AMS 510 and AMS 595

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 527: Numerical Analysis II**

Numerical methods based upon functional approximation: polynomial interpolation and approximation; and numerical differentiation and integration. Solution methods for ordinary differential equations. AMS 527 may be taken whether or not the student has completed AMS 526.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 528: Numerical Analysis III**

An introduction to scientific computation, this course considers the basic numerical techniques designed to solve problems of physical and engineering interest. Finite difference methods are covered for the three major classes of partial differential equations: parabolic, elliptic, and hyperbolic. Practical implementation will be discussed. The student is also introduced to the important packages of scientific software algorithms. AMS 528 may be taken whether or not the student has completed AMS 526 or AMS 527.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 530: Principles in Parallel Computing**

This course is designed for both academic and industrial scientists interested in parallel computing and its applications to large-scale scientific and engineering problems. It focuses on the three main issues in parallel computing: analysis of parallel hardware and software systems, design and implementation of parallel algorithms, and applications of parallel computing to selected problems in physical science and engineering. The course emphasizes hands-on practice and understanding of algorithmic concepts of parallel computing.

*Prerequisite: A course in basic computer science such as operating systems or architectures or some programming experience.*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 531: Laboratory Rotations in Computational Biology**

This is a two semester course in which first year Ph.D. students spend at least 8 weeks in each of three different laboratories actively participating in the research of participating Computational Biology Faculty. At the end of each rotation, students give a presentation of their lab activities and accomplishments. The primary goal of rotations is to help students choose a research advisor and to help faculty members choose students. Students register for AMS 531 in both the Fall and Spring semesters of the first year.

*0-3 credits, S/U grading  
May be repeated for credit.*

### **AMS 532: Journal Club in Computational Biology**

The goal of this course is for students to hone critical reading and analytic skills through discussions of literature in the area of Computational Biology. Participants take turn being a "discussion leader" who informally guides the group through a peer-reviewed manuscript for which all Journal Club members will have to read in advance of the meeting. Meetings in the Spring semester will include in Person Training (IPT) in Responsible conduct of Research and Scholarship (RCRS) on topics that comprise (1) Integrity in Scholarship, (2) Scientific Misconduct, (3) Mentoring, (4) Ownership and Authorship, (5) Plagiarism, (6) Data Management, (7) Journalism and Science, (8) Human Subjects, and (9) Laboratory Animals.

*0-1 credits, S/U grading  
May be repeated for credit.*

### **AMS 533: Numerical Methods and Algorithms in Computational Biology**

An in-depth survey of many of the key techniques used in diverse aspects of computational biology. A major focus of this class is on how to successfully formulate a statement of the problem to be solved, and how that formulation can guide in selecting the most suitable computational approach. Examples will be drawn from a wide range of problems in biology, including molecular modeling, biochemical reaction networks, microscopy and systems biology. No prior knowledge of biology is required.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 534: Introduction to Systems Biology**

This course is geared towards teaching essential concepts and computational skills in Systems Biology. The course is centered upon two key programming languages: Matlab for modeling applications and the R language for statistical analysis and sequence manipulation.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 535: Introduction to Computational Structural Biology and Drug Design**

This course will provide an introduction to Computational Structural Biology with application to Drug Design. Methods and applications that use computation to model biological systems involved in human disease will be emphasized. The course aims to foster collaborative learning and will consist of presentations by the instructor, guest lecturers, and by course participants with the goal of summarizing key methods, topics, and papers relevant to Computational Structural Biology. All are welcome to attend. Grades are based on the quality of the presentations, participation in class discussion, attendance, and quizzes.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 536: Molecular Modeling of Biological Molecules**

This course will provide an introduction to Computational Structural Biology with application to Drug Design. Methods and applications that use computation to model biological systems involved in human disease will be emphasized. The course aims to foster collaborative learning and will consist of presentations by the instructor, guest lecturers, and by course participants with the goal of summarizing key methods, topics, and papers relevant to Computational Structural Biology. All are welcome to attend. Grades are based on

the quality of the presentations, participation in class discussion, attendance, and quizzes.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 537: Biological Dynamics and Networks**

This course will provide a solid foundation in key theoretical concepts for the study of dynamics in biological systems and networks at different scales ranging from the molecular level to metabolic and gene regulatory networks. Topics of this course include but are not limited to: Physical kinetics; Diffusion/Smoluchowski; Random flights; Waiting times; Poisson; Brownian ratchets; Chemical kinetics; Transition states; Stability, bifurcations, pattern development; Noise in cells: intrinsic and Extrinsic; Feedback; Biological Oscillators; Recurrence, period doubling, chaos; Networks; Topologies; Degree distribution, betweenness; Models of nets: Erdos-Renyi, scale-free, social, Watts-Strogatz, agents; Robustness, highly-optimized tolerance, bowties, epidemics; Biological networks: Protein-protein nets, regulatory and metabolic nets; Known biological circuits and their behaviors; How networks evolve: Preferential attachment, rewiring; Power laws; Fluxed through networks; Information and communication, entropy; Metabolic flux analysis; Artificial and Natural selection for traits; Darwinian evolution; Population dynamics.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 538: Methods in Neuronal Modeling**

Presentation of the mathematical modeling approach to information processing in nervous systems, from the level of individual ionic channels to large-scale neuronal networks. The course covers kinetic models of synaptic transmission, cable theory and compartment models for neurons, multiple channels and calcium dynamics, spike-train analysis and modeling small neuron networks.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **AMS 539: Introduction to Physical and Quantitative Biology**

This course is a seminar series organized by the Laufer Center for Physical and Quantitative Biology and is aimed at any incoming graduate students who might be interested in doing research in computational, mathematical or physical biology. Each seminar will be given by a different faculty member about their research and will span a range of topics including computational cell biology and evolutionary models.

*0-1 credits, S/U grading*

### **AMS 540: Linear Programming**

Formulation of linear programming problems and solutions by simplex method. Duality, sensitivity analysis, dual simplex algorithm, decomposition. Applications to the transportation problem, two-person games, assignment problem, and introduction to integer and nonlinear programming.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 542: Analysis of Algorithms**

Techniques for designing efficient algorithms, including choice of data structures, recursion, branch and bound, divide and conquer, and dynamic programming. Complexity analysis of searching, sorting, matrix multiplication, and graph algorithms. Standard NP-complete problems and polynomial transformation techniques. This course is offered as both AMS 542 and CSE 548.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 544: Discrete and Nonlinear Optimization**

Theoretical and computational properties of discrete and nonlinear optimization problems: integer programming, including cutting plane and branch and bound algorithms, necessary and sufficient conditions for optimality of nonlinear programs, and performance of selected nonlinear programming algorithms.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 545: Computational Geometry**

Study of the fundamental algorithmic problems associated with geometric computations, including convex hulls, Voronoi diagrams, triangulation, intersection, range queries, visibility, arrangements, and motion planning for robotics. Algorithmic methods include plane sweep, incremental insertion, randomization, divide-and-conquer, etc. This course is offered as both AMS 545 and CSE 555.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 546: Network Flows**

Theory of flows in capacity-constrained networks. Topics include maximum flow, feasibility criteria, scheduling problems, matching and covering problems, minimum-length paths, minimum-cost flows, and associated combinatorial problems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 547: Discrete Mathematics**

This course introduces such mathematical tools as summations, number theory, binomial coefficients, generating functions, recurrence

relations, discrete probability, asymptotics, combinatorics, and graph theory for use in algorithmic and combinatorial analysis. This course is offered as both CSE 547 and AMS 547.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 548: Optimization techniques in biomolecular simulations**

This practical hands-on course will teach basic techniques for building mathematical models, algorithms, and software for biomolecular simulations of macromolecular interactions. The topics of this course include, but are not limited to: the basics of statistical mechanics and its connection to the sampling algorithms; the origin of and approximations for the computation of molecular forces; geometry of the molecular configuration search space and multidimensional optimization; basics of software development and programming for high performance computing (HPC). During the course, the students will develop a multiscale approach for modeling protein-protein interactions from the ground up. No special background is required. Offered in the Spring Semester

*0-3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 549: Computational Biology**

This course focuses on current problems in computational biology and bioinformatics. Our emphasis will be algorithmic, on discovering appropriate combinatorial algorithm problems and the techniques to solve them. Primary topics will include DNA sequence assembly, DNA/protein sequence comparison, hybridization array analysis, RNA and protein folding, and phylogenetic trees.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 550: Operations Research: Stochastic Models**

Includes Poisson processes, renewal theory, discrete-time and continuous-time Markov processes, Brownian motion, applications to queues, statistics, and other problems of engineering and social sciences. Prerequisite: AMS 507 or equivalent

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 552: Game Theory I**

Elements of cooperative and non-cooperative games. Matrix games, pure and mixed strategies, and equilibria. Solution concepts such as core, stable sets, and bargaining sets. Voting games, and the Shapley and Banzhaff power indices. This course is offered as both ECO 604 and AMS 552. Prerequisite for ECO 604: Graduate standing in the Economics

Department or permission of the Graduate Director.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 553: Simulation and Modeling**

A comprehensive course in formulation, implementation, and application of simulation models. Topics include data structures, simulation languages, statistical analysis, pseudo-random number generation, and design of simulation experiments. Students apply simulation modeling methods to problems of their own design. This course is offered as CSE 529, AMS 553 and MBA 553.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 555: Game Theory II**

Refinements of strategic equilibrium, games with incomplete information, repeated games with and without complete information, and stochastic games. The Shapley value of games with many players, and NTU-values. This course is offered as both ECO 605 and AMS 555.

*Prerequisite for AMS 555: AMS 552/ECO 604. Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 556: Dynamic Programming**

Stochastic and deterministic multistage optimization problems. Stochastic path problems. Principle of optimality. Recursive and functional equations. Method of successive approximations and policy iteration. Applications to finance, economics, inventory control, maintenance, inspection, and replacement problems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 559: Smart Energy in the Information Age**

Energy and sustainability have become critical issues of our generation. While the abundant potential of renewable energy sources, such as solar and wind, provides a real opportunity for sustainability, their intermittency and uncertainty present a daunting operational challenge. This course studies how to use Information Technology (IT) to improve sustainability in our energy-hungry society. In particular, topics include the applications of mathematical modeling, algorithm design, optimization, game theory, and control theory in real systems. The goal of the course is to provide rigorous foundations for the study of smart energy management for sustainability. Offered in the Spring Semester

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 560: Big Data Systems, Algorithms and Networks**

Recent progress on big data systems, algorithms and networks. Topics include the web graph, search engines, targeted advertisements, online algorithms and competitive analysis, and analytics, storage, resource allocation, and security in big data systems. Offered in the Spring Semester

### **AMS 561: Introduction to Computational Science**

This course provides a foundation of knowledge and basic skills for the successful application in graduate research of modern techniques in computational and data science relevant to engineering, the humanities, and the physical, life and social sciences. It is consciously crafted to provide a rich, project-oriented, multidisciplinary experience that establishes a common vocabulary and skill set. Centered around the popular programming language Python, the course will serve as an introduction to programming including data structures, algorithms, numerical methods, basic concepts in computer architecture, and elements of object-oriented design. Also introduced will be important concepts and tools associated with the analysis and management of data, both big and small, including basic statistical modeling in R, aspects of machine learning and data mining, data management, and visualization. No previous computing experience is assumed. Students are assumed to have taken some introductory courses in two of these three math subjects: linear algebra, calculus, and probability.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 562: Introduction to Scientific Programming in C++**

This course provides students with foundational skills and knowledge in practical scientific programming relevant for scientists and engineers. The primary language is C++ since it is a widely-used, object-oriented language, includes C as a subset, and is a powerful tool for writing robust, complex, high-performance software. Elements of Python, Bash, and other languages will be introduced to complement the capabilities of C++, and essential tools for software development and engineering will be employed throughout the course (e.g., makefiles, version control, online code repositories, debugging, etc.).

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 565: Wave Propagation**

Theory of propagation of vector and scalar waves in bounded and unbounded regions. Development of methods of geometrical

optics. Propagation in homogeneous and anisotropic media.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 566: Compressible Fluid Dynamics**

Physical, mathematical, and computational description in compressible fluid flows. Integral and differential forms of the conservation equations, one-dimensional flow, shocks and expansion waves in two and three dimensions, quasi-one-dimensional flow, transient flow, numerical methods for steady supersonic flow, numerical methods for transient flow.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 569: Probability Theory I**

Probability spaces and sigma-algebras. Random variables as measurable mappings. Borel-Cantelli lemmas. Expectation using simple functions. Monotone and dominated convergence theorems. Inequalities. Stochastic convergence. Characteristic functions. Laws of large numbers and the central limit theorem. Prerequisite: AMS 510 3 credits, ABCF grading

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 570: Introduction to Mathematical Statistics**

Probability and distributions; multivariate distributions; distributions of functions of random variables; sampling distributions; limiting distributions; point estimation; confidence intervals; sufficient statistics; Bayesian estimation; maximum likelihood estimation; statistical tests. Prerequisite: AMS 507

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 571: Mathematical Statistics**

Sampling distribution; convergence concepts; classes of statistical models; sufficient statistics; likelihood principle; point estimation; Bayes estimators; consistency; Neyman-Pearson Lemma; UMP tests; UMPU tests; Likelihood ratio tests; large sample theory. Offered as HPH 697 or AMS 571. Prerequisite: AMS 570

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 572: Data Analysis I**

Introduction to basic statistical procedures. Survey of elementary statistical procedures such as the t-test and chi-square test. Procedures to verify that assumptions are satisfied. Extensions of simple procedures to more complex situations and introduction

to one-way analysis of variance. Basic exploratory data analysis procedures (stem and leaf plots, straightening regression lines, and techniques to establish equal variance). Offered as AMS 572 or HPH 698.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 573: Categorical Data Analysis**

Measuring the strength of association between pairs of categorical variables. Methods for evaluating classification procedures and inter-rater agreement. Analysis of the associations among three or more categorical variables using log linear models. Logistic regression.

*Prerequisite: AMS 572*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 575: Internship in Statistical Consulting**

Directed quantitative research problem in conjunction with currently existing research programs outside the department. Students specializing in a particular area work on a problem from that area; others work on problems related to their interests, if possible. Efficient and effective use of computers. Each student gives at least one informal lecture to his or her colleagues on a research problem and its statistical aspects.

*1-9 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AMS 577: Multivariate Analysis**

The multivariate distribution. Estimation of the mean vector and covariance matrix of the multivariate normal. Discriminant analysis. Canonical correlation. Principal components. Factor analysis. Cluster analysis.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 578: Regression Theory**

Classical least-squares theory for regression including the Gauss-Markov theorem and classical normal statistical theory. An introduction to stepwise regression, procedures, and exploratory data analysis techniques. Analysis of variance problems as a subject of regression. Brief discussions of robustness of estimation and robustness of design. Prerequisite: AMS 572

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 580: Statistical Learning**

This course will first review classical linear and generalized linear models such as Linear Regression, and Linear Discriminant Analysis. We shall then study modern Resampling Methods such as Bootstrapping, and modern variable selection methods such as the Shrinkage Method. Finally, we shall introduce

modern non-linear statistical learning methods such as the Generalized Additive Models, Decision Trees, Random Forest, Boosting, Bagging, and, Support Vector Machines.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 581: Analysis of Variance**

Analysis of models with fixed effects. The Gauss-Markov theorem; construction of confidence ellipsoids and tests with Gaussian observations. Problems of multiple tests of hypotheses. One-way, two-way, and higher-way layouts. Analysis of incomplete designs such as Latin squares and incomplete blocks. Analysis of covariance problems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 582: Design of Experiments**

Discussion of the accuracy of experiments, partitioning sums of squares, randomized designs, factorial experiments, Latin squares, confounding and fractional replication, response surface experiments, and incomplete block designs. Offered as AMS 582 or HPH 699. Prerequisite: AMS 572

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 583: Applied Longitudinal Data Analysis**

Longitudinal data takes the form of repeated measurements of the same subject (humans, animals, plants, samples, etc) over time (or other conditions). This type of data has a broad range of applications, including public health, medical research, pharmaceutical studies, life sciences, agriculture, engineering and physical sciences. Longitudinal data analysis allows one to study the changes in mean response over time and answer other scientific questions pertaining to the relationship between the response and time. This course aims to introduce statistical

models and methods for the analysis of longitudinal data. Both the classical (univariate and multivariate repeated analysis of variance) and more recent approaches (1) general linear models for correlation, random coefficient models, linear mixed effect models for normal repeated measurements; (2) generalized linear models for non-normal response and population-averaged models (generalized estimating equations) for non-normal repeated measurements, of analyzing longitudinal data will be covered in this course. Offered in the Spring Semester

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 585: Internship in Data Science**

Directed data science problem in conjunction with currently existing research programs outside the department. Students specializing

in a particular area work on a problem from that area; others work on problems related to their interests, if possible. Efficient and effective use of computers. Each student gives at least one informal lecture to his or her colleagues on a research problem and its statistical aspects.

*1-9 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AMS 586: Time Series**

Analysis in the frequency domain.

Periodograms, approximate tests, relation to regression theory. Pre-whitening and digital filters. Common data windows. Fast Fourier transforms. Complex demodulation, Gibbs phenomenon issues. Time-domain analysis. Prerequisites: AMS 570 or AMS 572 3 credits, ABCF grading

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 587: Nonparametric Statistics**

This course covers the applied nonparametric statistical procedures: one-sample Wilcoxon tests, two-sample Wilcoxon tests, runs test, Kruskal-Wallis test, Kendall's tau, Spearman's rho, Hodges-Lehman estimation, Friedman analysis of variance on ranks. The course gives the theoretical underpinnings to these procedures, showing how existing techniques may be extended and new techniques developed. An excursion into the new problems of multivariate nonparametric inference is made.

*Prerequisites: AMS 312 and AMS 572 or equivalents*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 588: Failure and Survival Data Analysis**

This course introduces both parametric and non-parametric statistical models for analysis of the failure and survival data - a critical topic in quantitative finance, econometrics, and biostatistics. Different censoring mechanisms will be discussed. The course will mainly cover Kaplan-Meier estimator for characterizing the distribution of the failure and survival data, non-parametric log-rank test for comparing multiple groups, and the accelerated failure time model and Cox regression model uncovering various predictor/explanatory variables to survival/failure. Applications to finance, economics and biomedicine will be illustrated. We have revised the course title and content to better suit our current graduate programs in Applied Mathematics and Statistics that have evolved substantially from our old forms. In our current program, students from many tracks, especially in statistics and in quantitative finance, need this updated course as a highly relevant and

important elective. This same subject is generally referred to as 'Survival data analysis' in biostatistics, but 'Failure data analysis' in finance. This updated title will reflect the content of the course clearly for students from all tracks.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 589: Quantitative Genetics**

Definition of relevant terminology. Statistical and genetic models for inheritance of quantitative traits. Estimation of effects of selection, dominance polygenes, epistasis, and environment. Linkage studies and threshold characteristics.

*Spring, odd years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 591: Topics for M.S. Students**

Various topics of current interest in applied mathematics will be offered if sufficient interest is shown. Several topics may be taught concurrently in different sections.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AMS 592: Mathematical Methods of Finance and Investments I**

A broad-based course in mathematical modeling and quantitative analysis of financial transactions and investment management issues such as debt and equity, measures of risk and returns, efficient markets and efficient set mathematics, asset pricing, one-factor and multiple-factor models, portfolio selection, futures and options.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 593: Interest Rate and Credit Modeling**

Introduction to most commonly used interest rate models: Heath-Jarrow-Morton, Brace-Gatareck-Musiela, etc. Cap, Floor, European and Bermudian option pricing. Credit Modeling: Merton structural approach vs. Intensity approach. Corporate bonds, CDS, securitized products (CDO, CLO, mortgages), Credit value adjustment (CVA, XVA).

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 594: Mathematical Methods of Finance and Investments II**

This course employs the techniques of mathematical statistics and empirical finance, e.g., estimation theory, linear and nonlinear regression, time series analysis, modeling and simulation to examine critically various models of prediction for asset-pricing, pricing of derivative products and term-structure of interest rates assuming stochastic volatility.

Statistics necessary for analysis is incorporated in the course.

*Prerequisite: AMS 592*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 595: Fundamentals of Computing**

Introduction to UNIX operating system, C language, graphics, and parallel supercomputing.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 596: Fundamentals of Large-Scale Computing**

Overview of the design and maintenance of large scale computer projects in applied mathematics, including basic programming techniques for massively parallel supercomputers.

*Prerequisite: AMS 595 or permission of instructor*

*Spring, 1 credit, Letter graded (A, A-, B+, etc.)*

### **AMS 597: Statistical Computing**

Introduction to statistical computing using SAS and S plus.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 598: Big Data Analysis**

This course introduces the application of the supercomputing to statistical data analyses, particularly on big data. Implementations of various statistical methodologies within parallel computing framework are demonstrated through all lectures. The course will cover (1) parallel computing basics, including architecture on interconnection networks, communications methodologies, algorithm and performance measurements, and (2) their applications to modern data mining techniques, including modern variable selection/Dimension reduction, linear/logistical regression, tree-based classification methods, Kernel-based methods, non-linear statistical models, and model inference/Resampling methods.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 599: Research**

Thesis research for Doctoral students who have not yet advanced to candidacy. Master's students may also enroll, but must have approval from a faculty advisor before registering. Pre-requisite: Student must obtain consent from individual faculty advisor in order to register for AMS 599 under his/her section. 1-12 credits, S/U grading, may be repeated for credit.

*1-12 credits, S/U grading*

*May be repeated for credit.*

### **AMS 600: Socially Responsible Investing**

Introduction to a scope of investments which are socially responsible because of the nature of the business the company conducts, including but not limited to: avoiding investment in companies that produce or sell addictive substances (like alcohol, gambling, and tobacco) and seeking out companies engaged in environmental sustainability. The course includes analysis of investments strategies maximizing financial return as well as social goods, such as: (i) Negative Screening: excluding securities with potentially social and/or environmental harmful characteristics; (ii) Shareholder activism: activities steering the management towards enhancing the well being of the stockholders, customers, employees, vendors, and communities. (iii) Positive investing: making investments in activities and companies believed to have a positive impact on issues such as social justice and the environment through stock selection, that guarantees sustainability, in environmental and humanitarian sense, and providing a company's long term potential to compete and succeed. Offered in Fall.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 601: Risk Management and Business Risk Control in BRIC Countries**

Introduction to the challenges and opportunities in investing in the BRIC countries Brazil, Russia, India, and China, with emphasis in the risk assessment, control and management. Opportunities in investing in BRIC: growth in infrastructure, middle class demand, educated cheap workforce, potential for outsourcing work, high risk/high reward. Risks facing investors in BRIC: strategic, operational, political, market risk, credit risks. Cultural barriers: family owned businesses, lack of business professionalism, poor transparency and disclosures of business practices, shallow and volatile markets, unstable macro-economics policies, tardy legal system. Responsibilities of investors in the BRIC countries: helping the BRIC governments and corporations in smooth transition to global markets and to developed status, providing co-ordination and transfer of business knowledge and technology from risk professionals in developed countries to emerging markets. Offered in Fall.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 603: Risk Measures For Finance & Data Analysis**

Risk analysis is important to quantitative finance, insurance, commercial credit and

many areas of data analysis. We emphasize risk analysis methods that capture observed features of risk, such as heavy tails, and validation of risk models against observed data. Students will be graded on the basis of projects drawn from multiple asset classes considered in the course work, including fixed income, options, portfolio optimization and foreign exchange. Professional standards for software development will be followed. Guest lectures by industry leaders will be included. Participation via conferencing software will be available. The course is open to all AMS graduate students and, with the instructor's permission, to CEAS graduate students.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **AMS 621: Finite Element Methods for Partial Differential Equations**

Variational form of the problem, Ritz Galerkins, collocation, and mixed methods; triangular, rectangular (2-D), and tetrahedral (3-D) elements; accuracy, convergence, and stability; solutions of linear, nonlinear steady-state, and dynamic problems; implicit and explicit time integration; equivalence of finite-element and finite-difference methods.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 641: Special Topics in Mathematical Programming**

The course is designed for second- and third-year graduate students with a strong foundation in linear algebra and analysis who wish to pursue research in applied mathematics. Varying topics from nonlinear programming and optimization to applied graph theory and applied combinatorics may be offered concurrently.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AMS 644: Special Topics in Applied Probability**

The course is designed for second- and third-year graduate students with a background in probability and stochastic modeling who wish to pursue research in applications of the probability theory. Several topics may be taught concurrently in different sections.

*Prerequisites: AMS 550 and permission of instructor  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AMS 651: Nonlinear Analysis and Optimization**

Iterative methods for solving nonlinear operator equations. Frechet differentials. The Newton-Raphson method in function space

and nonlinear boundary value problems. The Courant penalty concept and constrained optimization. General multiplier rules. Variable metric gradient projection for nonlinear least-square methods, with applications.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 652: Special Topics in Game Theory**

The course is designed for second- and third-year graduate students who wish to specialize in the mathematical theory of games.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AMS 670: Special Topics in Probability and Mathematical Statistics**

The course is designed for second- and third-year graduate students with a strong foundation in analysis and statistics who wish to pursue research in mathematical statistics. Several topics may be taught concurrently in different sections.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AMS 675: Special Topics in Applied Statistics**

The course is designed for second- and third-year students with a strong foundation in statistical analysis who wish to pursue research in applied statistics.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AMS 676: Internship in Applied Mathematics**

Directed research and/or practical experience in industry, financial and consulting firms, and research institutions. Students are required to have a department faculty adviser who coordinates and supervises the internship. Submission of the final report is required.

*1-9 credits, S/U grading  
May be repeated for credit.*

### **AMS 683: Biological Physics & Biophysical Chemistry: Theoretical Perspectives**

This course will survey a selected number of topics in biological physics and biophysical chemistry. The emphasis is on the understanding of physical organization principles and fundamental mechanisms involved in the biological process. The potential topics include: Protein Folding, Protein Dynamics, Biomolecular Interactions and Recognition, Electron and Proton Transfer, Motors, Membranes, Single Molecules and Single Cells, Cellular Networks, Development

and Differentiation, Brains and Neural Systems, Evolution. There will be no homework or exams. The grades will be based on the performance of the term projects. Crosslisted with PHY 680 and CHE 683.

*0-3 credits, Letter graded (A, A-, B+, etc.)*

### **AMS 690: Special Topics in Differential Equations and Applied Analysis**

The course is designed for second- and third-year graduate students with a strong foundation in analysis who wish to pursue research in applied mathematics. Several topics may be taught concurrently in different sections.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AMS 691: Topics in Applied Mathematics**

Varying topics selected from the list below if sufficient interest is shown. Several topics may be taught concurrently in different sections: Advanced Operational Methods in Applied Mathematics Approximate Methods in Boundary Value Problems in Applied Mathematics Control Theory and Optimization Foundations of Passive Systems Theory Game Theory Mixed Boundary Value Problems in Elasticity Partial Differential Equations Quantitative Genetics Stochastic Modeling

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AMS 695: Special Topics in Numerical Analysis and Scientific Computing**

Analysis and Scientific Computing

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **AMS 696: Applied Mathematics Seminar**

0-3 Credits, S/U Grading, May be repeated for credit.

*0-3 credits, S/U grading  
May be repeated for credit.*

### **AMS 698: Practicum in Teaching**

A practicum on teaching courses in applied mathematics and statistics. Topics may include designing a syllabus, planning lectures, developing assignments and assessments, coordinating and utilizing teaching assistants, monitoring for academic dishonesty, and using instructional technologies. Students will work with AMS instructors to both observe and practice teaching techniques.

*S/U grading  
May be repeated for credit.*

**AMS 699: Dissertation Research on Campus**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, and Summer, 0-9 credits, S/U grading*

*May be repeated for credit.*

**AMS 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading*  
*May be repeated for credit.*

**AMS 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.*  
*Fall, Spring, 1-9 credits, S/U grading*  
*May be repeated for credit.*

**AMS 800: SUMMER RESEARCH**

*May be repeated for credit.*

# ANT

**Anthropology, Cultural and Archaeology****ANT 504: Ecology: Linking People & Nature (emphasis Turkana Basin)**

This course is one of five that constitute the Advanced Graduate Certificate in Human Origins at the Turkana Basin Institute in

Kenya. With the world's longest sequence of datable deposits containing fossils of our ancestors, eastern Africa is the ideal place to examine humans' changing relations with our environment. This course familiarizes students with diverse ecological settings in the region today through field exercises in highland forests, low-altitude grasslands, and lacustrine and riparian settings. Students learn various methods for paleoenvironmental reconstruction, and practice integrating different kinds of paleoenvironmental evidence in field and laboratory facilities in Kenya. Examining modern vegetation and fauna in central and northwest Kenya shows students how human actions can degrade or conserve environments and resources in eastern Africa today.

*3 credits, Letter graded (A, A-, B+, etc.)*

**ANT 505: Earth & Life Through Time: Vert Paleo (Turkana Basin)**

This course is one of five that constitute the Advanced Graduate Certificate in Human Origins at the Turkana Basin Institute in Kenya. Vertebrate fossils are important sources of information about the appearance, evolution, and extinction of major organisms. As such, they provide a valuable window into changes in climate and selection pressures, and organisms' diverse adaptive responses to these changes. They are also significant in placing hominid discoveries within a relative local chronology and helping reconstruct environments associated with hominin remains. This course acquaints students with methods of vertebrate paleontology employed in different chronological contexts of the Turkana Basin and their use in addressing diverse theoretical questions.

*3 credits, Letter graded (A, A-, B+, etc.)*

**ANT 506: Human Evolution and evidence from the Turkana Basin**

This course is one of five that constitute the Advanced Graduate Certificate in Human Origins at the Turkana Basin Institute in Kenya. The Turkana Basin is home to many paleoanthropological discoveries that fundamentally reshaped ideas about human evolution. Important finds from the Turkana Basin, including Nariokotome (Turkana boy) and KNM-WT17000 (the "Black Skull") will be highlighted in lecture and lab activities, and their relevance to the larger picture of human evolution will be explored. In addition to highlighting the key role that Turkana Basin fossils have played in human evolutionary studies, lectures, seminars, and labs will cover the complete span of our evolutionary history from Miocene apes and the earliest putative hominins to the evolution of modern humans.

Field trips to discovery locations will provide students with the opportunity to understand the geological context of important fossils of the Turkana Basin.

*3 credits, Letter graded (A, A-, B+, etc.)*

**ANT 507: Prehistoric Archaeology of Africa (emphasis Turkana Basin)**

This course is one of five that constitute the Advanced Graduate Certificate in Human Origins at the Turkana Basin Institute in Kenya. Stone tools and other technologies enabled early hominins to become one of the few organisms that could purposefully change their environment to suit their needs, changing them from one among many African primates to the equivalent of a global geological force. This course traces the development of human technology where it first appears in Eastern Africa more than 3 million years ago. Course topics include the cognitive abilities of early humans implied by their technologies, early human adaptation and social behavior, and the inter-relationships between stone tool technology, paleoecology, and hominin biological evolution. Lectures and practical exercises teach students how to document the archaeological record and how to use it to test hypotheses about early human behavior. Field excursions teach archaeological survey and excavation techniques.

*3 credits, Letter graded (A, A-, B+, etc.)*

**ANT 508: Paleoanthropological Field Methods in the Turkana Basin**

This course is one of three that constitutes the Turkana Basin Institute Summer Field School, an opportunity to participate in all aspects of a paleoanthropological research project, focusing on practical aspects of vertebrate paleontology, geology, zooarchaeology and taphonomy. Students are trained in field reconnaissance, fossil survey, plotting, preservation, and collection, analysis and interpretation. Hands-on examination of fossils from Plio-Pleistocene or Holocene sites around Lake Turkana will teach students how human ancestors and other animals adapted to the environments around them. Experts from TBI, Stony Brook, and other institutions provide instruction in lectures, labs, and via fieldwork within the context of on-going projects.

*3 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

**ANT 510: Environments, Ecosystems and Evolution: Evidence from the Turkana Basin**

An introduction to the ways scientists use the fossil and archaeological records to learn about past changes in Earth's climates and environments, and how humanity's ancestors

responded to those changes physiologically and technologically. Interdisciplinary lectures will show evidence from the Turkana Basin's paleoenvironmental, fossil and archaeological records of the dynamic interactions between the climate, environment, local food webs, and ancient human populations. This background will prepare students for training in paleoanthropological and archaeological field methods.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ANT 513: Origins of Agriculture**

This course will trace the history of anthropological thought on the origins of agriculture and will assess the evidence from the Old and New worlds for this economic revolution. The course will not only explore areas where early agriculture is evidenced, but will also contrast these areas with those where agriculture was a later development. Emphasis will be on the environmental, technological, biological, social, and cultural processes associated with the "Neolithic Revolution." This course is offered as both ANT 513 and DPA 513.

*Fall, 4 credits, Letter graded (A, A-, B+, etc.)*

### **ANT 514: Human Osteology**

A detailed study of the anatomy of the human skeleton with special emphasis on the interpretation of skeletal remains from archaeological contexts. Consideration is given to the growth, structure, and function of bones, and to forensic aspects such as the determination of age, sex, stature, and pathology from skeletal remains. Students conduct a research project on a human skeleton.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **ANT 515: Approaches in Archaeology**

Theoretical and methodological approaches employed in archaeology. The goals of the course are to provide an historical perspective on the growth of theory and method in archaeology and to examine in detail some of the pertinent research topics being studied today. This course is offered as both ANT 515 and DPA 515.

*Fall, 4 credits, Letter graded (A, A-, B+, etc.)*

### **ANT 516: Research Design in Archaeology**

An examination of the ways in which archaeologists develop successful research strategies for arriving at answers to the key questions in the field. Students will analyze grant proposals that received funding from

the major sources of funding for archaeology before developing research proposals of their own. The aim of the course is to provide the class with the skills needed to plan their future and compete successfully for funding both for their thesis research and in their future careers.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ANT 518: Lithic Technology**

A detailed overview of the methods archaeologists use to extract behavioral information from prehistoric stone tools. The course examines raw material economy, technological strategies, tool use, and discard behavior. Analytical methods are practiced through the computer-assisted analysis of stone tools from simulated archaeological sites.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ANT 519: Zooarchaeology**

An introduction to the study of animal bones from archaeological sites. Special emphasis is on identification of fragmented bone, identification of bone surface modification, calculation of indexes of abundance, and measurement and metrical analysis of mammal bone. Computer analysis is stressed, and the class seeks to synthesize traditional zooarchaeological and actualistic studies. This course is offered as both ANT 519 and DPA 519.

*4 credits, Letter graded (A, A-, B+, etc.)*

### **ANT 525: Research Areas in Anthropological Sciences**

An overview of the current research areas of the Anthropological Sciences as represented in the Master's Program of the Department of Anthropology. All first-year students are expected to participate. Semesters offered: Fall

*0-1 credits, S/U grading*

*May be repeated 1 times FOR credit.*

### **ANT 527: Field Methods and Techniques in Archaeology**

An opportunity to participate in all aspects of an archaeological research project. Students develop practical skills in excavation, and design and execute plans for recording, artifact retrieval, surveying, field sorting techniques, and interpretation. This course involves faculty-led excavation of a prehistoric or early historic site. This course is offered as both ANT 527 and DPA 527. Prerequisite: Graduate standing or permission of instructor

*3-9 credits, Letter graded (A, A-, B+, etc.)*

### **ANT 535: Ethnoarchaeology**

Ethnoarchaeology uses observations of present-day peoples to inform archaeological inquiry. This course helps students to explore ways in which ethnoarchaeological data contribute to several aspects of archaeological research: hypothesis building, survey and excavation strategies, interpretation of site and artifact data, and understanding the causes and processes of human behavioral change. In addition to seminar discussions of theoretical issues and case studies, students complete a book review of a monograph-length ethnoarchaeological study, a practical exercise in collecting and interpreting ethnoarchaeological data, and a term paper.

*4 credits, Letter graded (A, A-, B+, etc.)*

### **ANT 536: Phylogenetic Comparative Methods for trait evolution**

The course provides an overview of biostatistical approaches that are used to estimate phenotypic trait evolution and provides participants with a springboard to using these methods to answer their own research questions. This course focuses on analyses that use a phylogenetic tree and observed trait information from tip taxa (extant and/or extinct) to describe how traits have changed along the branches of a phylogeny. The course covers methods that account for phylogenetic relatedness in standard parametric tests and methods that use models of evolution to infer how traits have changed along branches of phylogeny. The course will involve substantial preparation and take-home assignments. Students will become proficient in R programming.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ANT 555: Ancient African Civilizations**

The archaeology of Africa's later prehistoric and historic periods offers exciting contributions to global debates on the origins of agriculture and civilization. Covering the last 30,000 years, this course begins by examining the economic underpinnings of Africa's early complex societies: intensive hunting & gathering, animal domestication, and early farming. Detailed case studies of five ancient civilizations (Egypt, Aksum, Jenne, Swahili, and Great Zimbabwe), and then explore distinct processes of prehistoric social change in different parts of Africa. The course concludes by discussing African archaeological heritage conservation, education and synthesis. Beyond these main themes, we develop additional units and discussions on topics of special interest to the students enrolled.

*4 credits, Letter graded (A, A-, B+, etc.)*



**ANT 557: Building Bones: Bone Development and Evolution**

An overview of the evolution, development, and growth of the skeleton, with a focus on mammals, primates, and humans. Students will review fundamental bone biology concepts, then read and discuss classic and current research on the evolution of bone development and the developmental basis for specific evolutionary changes in bone morphology. While much bone biology research has been completed in animal models, this course specifically builds a foundation for students to understand and critique current studies on the evolution and development of primate and human skeletal morphology. Within this context, students independently complete a literature review of the potential developmental and genetic basis for evolutionarily relevant variation of a skeletal phenotype, then propose research to help test these hypothetical relationships. Prerequisites: Instructor Consent

*3 credits, Letter graded (A, A-, B+, etc.)*

**ANT 559: Archaeology of Food**

Explores the archaeological study of food and foodways. The emphasis is on the social aspects of food, particularly its roles in past power structures, social relationships, conceptions of identity, ritual practices, and gender roles. Also covers the theoretical and methodological approaches archaeologists use to study food in the past.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

**ANT 560: Ancient Mesopotamia**

An examination of the cultural history of Mesopotamia based on the archaeological, textual and art historical record. Focusing on the fourth through second millennia, this course investigates both the long term developmental process of this civilization, and ways to understand its settlement systems, urban structure, social and political organization, economic structure and the role played by religion.

*Fall, alternate years, 4 credits, Letter graded (A, A-, B+, etc.)*

**ANT 564: Primate Evolution**

The taxonomic relationships and evolutionary history of primates as documented by their fossil record and structural and chemical evidence. Emphasis on primates prior to the origin of the human lineage. This course is offered as ANT 564, DPA 564 and HBA 564.

*4 credits, Letter graded (A, A-, B+, etc.)*

**ANT 565: Human Evolution**

A survey of the fossil record of hominid evolution through the Pliocene and Pleistocene with emphasis on the morphological structure and function of locomotor, masticatory, and neural systems. Includes utilization of comparative anatomical material and an extensive cast collection. This course is offered as ANT 565, DPA 565 and HBA 565.

*4 credits, Letter graded (A, A-, B+, etc.)*

**ANT 567: Primate Behavior and Ecology**

A comparative approach to the behavior and ecology of living lemurs, monkeys, and apes. Emphasis is placed on sociobiological theory; life history strategies; morphological adaptations; comparisons of primate communities in Asia, Africa, Madagascar, and South America; and primate conservation. This course is offered as both ANT 567 and DPA 567.

*Fall, odd years, 4 credits, Letter graded (A, A-, B+, etc.)*

**ANT 582: Comparative Primate Anatomy**

The comparative anatomy of living primates. Laboratory work including evaluation of skeletal material and dissection (when possible) with emphasis on relating structural diversity to behavior and biomechanics. This course is offered as both ANT 582 and DPA 582.

*4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated 2 times FOR credit.*

**ANT 591: Professional Skills in the Anthropological Sciences, I.**

An overview of the skills necessary for scientific professionalism, with special reference to successful performance in the Anthropological Sciences. Topics covered in this course include: use of basic software tools, research design, data collection and management, dissertation proposal and journal article writing, oral and poster presentations, and professional conduct. This course is not an alternative to GRD 500. Recommended for students of G0 through G4 status. Permission by Instructor

*0-1 credits, S/U grading*  
*May be repeated for credit.*

**ANT 592: Professional Skills in the Anthropological Sciences, II.**

A development of additional professional skills necessary to master research and teaching in the Anthropological Sciences including career options and employment. Topics in

this course include: the dissertation writing process, review processes, job applications and negotiations, tenure process, and teaching strategies. Recommended for students of G5 status. Permission by Instructor

*0-1 credits, S/U grading*  
*May be repeated for credit.*

**ANT 593: Ethics in the Anthropological Sciences**

This course familiarizes students with the major issues in the ethics of anthropological science, research and teaching. Students discuss scientific and academic values and how best to comply with them in academic, field, and laboratory environments. Overarching research ethics topics addressed include data management, scientific misconduct, plagiarism, authorship, and mentoring. This portion of the course incorporates videos and readings from GRD 500. Anthropology-specific topics include fieldwork, museum work, animal research, US and international laws (biodiversity; cultural & natural heritage), and public anthropology. Anthropological Sciences faculty with particular expertise in these various areas lead these discussions.

*0-1 credits, S/U grading*  
*May be repeated for credit.*

**ANT 599: Capstone Project**

*Fall, 0-6 credits, S/U grading*  
*May be repeated for credit.*

**ANT 600: Practicum in Teaching**

A specialized tutorial in which students work with / shadow an instructor for a given course to learn pedagogy, and practical and professional skills with regard to classroom instruction. Instructor Consent

*0-3 credits,*  
*May be repeated for credit.*

**ANT 602: Research Seminar in Anthropological Theory**

This course is offered as both ANT 602 and DPA 602.

*Fall and Spring, 0-12 credits, S/U grading*  
*May be repeated for credit.*

**ANT 610: Individual Research**

Research supervised by faculty. Students must have permission of instructor and enroll in appropriate section. This course is offered as both ANT 610 and DPA 610.

*Fall and Spring, 1-12 credits, S/U grading*  
*May be repeated for credit.*

**ANT 620: Research Seminar in Topical Problems**

This course is offered as both ANT 620 and DPA 620.

*Fall and Spring, 3 credits, S/U grading  
May be repeated for credit.*

**ANT 630: Research Seminar in Physical Anthropology**

This course is offered as both ANT 630 and DPA 630.

*Fall and Spring, 3 credits, S/U grading  
May be repeated for credit.*

**ANT 650: Research Seminar in Archaeology****ANT 680: Special Seminar**

Selected topics in cultural and social anthropology. Topics reflect current interests of faculty and graduate students. This course is offered as both ANT 680 and DPA 680.

*Fall and Spring, 1-3 credits, S/U grading  
May be repeated for credit.*

**ANT 800: Summer Research**

This course is offered as both ANT 800 and DPA 800.

*S/U grading  
May be repeated for credit.*

# ARH

## Art History

**ARH 503: History of 20th-Century Art Criticism and Theory**

The literature of art has expanded enormously in the 20th century—far beyond attempts to organize it developmentally or conceptually. An attempt is made to define types of criticism both in relation to the critics and their relation to the support system for the arts of which they are part.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ARH 520: Media Aesthetics**

In this seminar we will focus on a comparative approach to theories of visual media aesthetics across photography, cinema, and new media, from the nineteenth century to the present, and across disciplinary methods of art history, film studies, philosophy/critical theory, and media theory. Mixing canons and objects will allow a cross-fertilization of ideas and strategies for analyzing visual culture, and it should be useful for students working in a number of fields. This course will not offer a comprehensive survey as much as a close

analysis of a body of related texts, ideas, and visual works. Students from any disciplinary background are welcome, and may adapt the final assignment to advance individual research goals. The selection of readings and examples we discuss will be adapted as the course unfolds. But, it is shaped by an interest in how/what media aesthetics can do or mean through the production of specific temporal and spatial forms of experience. This question has conditioned disciplinary formations, shaping canonical ideas about media in modernity as well as current interpretations of digital media. But it remains urgent to re-ask: how do, and how could, aesthetics and technics correlate with actual embodied and sociopolitical realities? How do specific material formats, specific practices of perception, and specific historical and cultural contexts interweave with and impact more abstract ontological, phenomenological, epistemological, and ethical potentials?

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**ARH 521: Global Postwar Art**

This course has a two-fold goal: to explore the recent scholarship on postwar art across a spectrum of situated geopolitics; and to explore the year 1989 in global exhibition contexts. In the semester's first half, the primary texts, Sonal Khullar, *Worldly Affiliations: Artistic Practice, National Identity, and Modernism in India, 1930-1990* (2015), Christine Ho, *Drawing from Life: Sketching and Socialist Realism in the People's Republic of China* (2020), and Joshua Cohen, *The Black Art Renaissance: African Sculpture and Modernism across Continents* (2020), are paired with a range of articles and book chapters written by more established scholars in the relevant subfields. As we will learn, the temporal demarcation of the year 1945 is not strictly observed in this representation of recent scholarship. In the semester's second half, the students will explore a case study of their choice, the 3rd Havana Bienal (Havana, 1989), *Les Magiciens de la Terre* (Paris, 1989), *The Other Story* (London, 1989), and *The Decades Show* (New York, 1990), by conducting research of both primary and secondary literatures. Each of these exhibitions manifests a particular picturing of the global, allowing us to trace multiple swan songs of the global postwar period.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**ARH 540: Methodologies of Art History**

This graduate seminar is designed to engage students with the history and methods of the discipline of art history. Through close

readings and focused discussions, the course examines issues raised by aesthetics, the problems of biography and 'periodization', and the role of canon formation. Particular focus is directed towards the interpretive tools that have developed from within the discipline of art. In addition, also stressed is the interdisciplinary nature of art history through readings that discuss how lines of thought and critical inquiry emerging within other disciplines have had enormous influence on art history and criticism in the last two decades: semiotics, feminist theory, psychoanalysis, anthropology and post colonial theory, cultural studies, theories of mass culture and the post-modern, and the current debates about visual culture.

*3 credits, Letter graded (A, A-, B+, etc.)*

**ARH 543: Topics in Renaissance Art**

This course, usually a seminar, deals with one or several of the following aspects of Renaissance art: iconographic problems, style and connoisseurship (including the study of individual works at the Metropolitan Museum or the Frick), patronage and its effect on the form and content of a work, the exchange of artistic ideas between northern and southern Europe, and Renaissance sources in antiquity and the Middle Ages.

*Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**ARH 544: Topics in Early Modern Art**

This seminar examines methodological developments and historical issues related to the art and visual culture of the early modern period. Though we are concerned with objects, discourses, and practices emerging in the seventeenth century, we also approach these through the perspective of contemporary critical tools (for example, theories of urban space, spectacle, and representation; psychoanalysis, sexuality and subjectivity; coloniality and the encounter with New world otherness; semiotics and the construction of absolutist power). Students are encouraged to engage with these issues through the study of traditional high art objects as well as through other forms of representation emerging in the early modern period—for example, scientific illustration, more ephemeral forms of print culture, and even urban and courtly spectacle.

*Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**ARH 545: Topics in 19th-Century Art**

Selected topics in 19th-century art with an emphasis on

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

#### **ARH 546: Topics in 20th-Century Art**

Twentieth-century art considered as an international movement, European and American, although national groups may be studied. Emphasis varies with topics ranging over stylistic analysis, iconographical interpretations, and theoretical studies. Students are expected to undertake original research and interpretation.

*Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **ARH 547: Topics in Global, Colonial, and Diasporic Art**

This course examines various issues in the appreciation, interpretation and appropriation of non-Western art. Emphasis is on developing a critical approach to these arts and the manner in which they have been represented and misrepresented in the Western imagination. Topics vary, but may include exploration of themes in the so-called traditional arts of Africa, Oceania, Native and Latin America, the transformations of these arts during the colonial period, issues of identity and the consequences of dislocation versus sense of place in the diaspora, and contemporary expressions of non-Western artists on the global scene.

*Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **ARH 548: Museum Studies**

Through a combination of field trips, visiting lecturers, group discussion, and student projects, the course surveys the diverse aspects of the museum field, including management, curatorship, exhibitions, public relations, conservation, and other areas of administration and professional practice.

3 credits, Letter graded (A, A-, B+, etc.)

#### **ARH 549: Topics in American Visual Culture**

This course examines selected issues in the history of American art and material culture. The course focuses upon, but is not necessarily limited to, the United States. Topics include public art and public culture; approaches to the study of material culture; art and commercial and/or popular culture; art and regional locations; realism; imaging the West; cross-cultural exchanges in art of the United States. (May be used to fulfill 20th-century requirement when material deals with 20th-century art.)

*Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **ARH 550: Inquiries into Art Criticism and Theory**

This course deals with the theoretical approaches to the study of art that cross historical boundaries. Topics vary from semester to semester. They may be an expansion of one of the areas generally covered in ARH 540, such as psychology of art or the iconography of architecture. Other investigations may focus on subjects requiring a special methodological approach, such as the theory and history of ornament and design or the role of public art.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **ARH 551: Topics in Performance**

The histories and theories of performance are explored. Topics may be the performing body, performance and political action, avant-garde performance, performing and artifact, virtual performance, performance and identity. Depending on the topic, there may be a performance and/or computer based projects.

3 credits, Letter graded (A, A-, B+, etc.)

#### **ARH 551: Theories of Performance**

This course examines different theories of performance as they relate to theatre and everyday life. Students explore ways of thinking about the performing body and different modes of cultural expression. There is a performing component to the course in addition to a final paper.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.

#### **ARH 552: Topics in Contemporary Art**

The course will examine the latest developments in visual art and architecture, beginning with the Neo-Expressionism and Neo-Conceptualism of the 1980s and extending to installation and video art. Postmodernist and activist art will be examined in particular detail, and contextualized in terms of the broader patterns of 20th century art.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

#### **ARH 553: Contemporary Art in New York**

A systematic survey of contemporary art on view in museums and galleries in New York. The class would alternate between gallery/museum visits and interpretative

analyses of the work in the classroom. A variety of theoretical approaches will be used and the full range of contemporary pluralism will be examined. Contemporary art will be understood as both a manifestation of contemporary society and in terms of its larger art historical context and significance. The New York art scene is the richest in the world. The class offers the student the opportunity for direct, informed contact with it.

3 credits, Letter graded (A, A-, B+, etc.)

#### **ARH 554: Topics in Visual Culture**

This class examines issues in the interdisciplinary field of visual culture. Visual culture studies look at the dynamic state of visual media in contemporary life and their historical origins, seeking to relate art and film to the mass media and digital culture.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **ARH 570: Issues in Architectural History and Criticism**

This course examines a series of topics that link architecture with other critical disciplines. Among the topics that may be addressed are architectural theory and the theories of language; the history of proportion and the construction of gender; and Orientalism.

*Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **ARH 580: Art Criticism or Gallery Internship**

An internship offering practical experience in some aspect of the field of art history and criticism, such as gallery and curatorial work in an on-campus or off-campus gallery or museum, or journalistic experience with an art or criticism publication such as the Art department journal *Art Criticism*.

*Prerequisite: Good standing in the graduate art history and criticism program  
Fall and Spring, 1-3 credits, S/U grading  
May be repeated 2 times FOR credit.*

#### **ARH 591: Practicum in the Writing of Art Criticism**

This course is designed as a practicum in the writing of art criticism under the supervision of the faculty.

*Fall and Spring, 3 credits, S/U grading  
May be repeated 2 times FOR credit.*

#### **ARH 592: Practicum in Teaching**

Instruction in the department under the supervision of the faculty. (This course may not be included more than once in the courses

taken in fulfillment of the 36 credit hour requirement.)

*Fall and Spring, 3 credits, S/U grading*

### **ARH 595: Directed Readings in Art History, Criticism, and Theory**

An independent reading course to be arranged with a particular faculty member. Normally, this course is reserved for second year Masters Students who have fulfilled most of their course requirements and for whom the proposed program of study cannot be completed within other existing course structures.

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ARH 598: Thesis**

Prerequisite: Completion of all degree requirements Fall, Spring and

*Summer, 1-6 credits, S/U grading*

*May be repeated for credit.*

### **ARH 602: Teaching Practicum, Advanced**

Instruction in the department by advanced graduate students under the supervision of faculty.

*3 credits, S/U grading*

*May be repeated 2 times FOR credit.*

### **ARH 690: Directed Readings for Doctoral Candidates**

An independent reading course to be arranged with a particular faculty member. Normally, this course is reserved for advanced PhD. students who have fulfilled most of their course requirements and for whom the proposed program of study cannot be completed within other existing course structures.

*Fall and Spring, 1-9 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ARH 699: Dissertation Research on Campus**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, and Summer, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **ARH 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/

or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **ARH 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.*

*Fall, Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **ARH 800: Summer Research**

*May be repeated for credit.*

## **ARS**

### **Art, Studio**

#### **ARS 520: Special Projects for M.F.A. Candidates**

Advanced projects in areas that may not be included in the M.F.A. curriculum, utilizing the unique talents of regular and visiting faculty, the facilities of the Art department, or other aspects of the university environment, and possibly facilities at other locations or institutions. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information. Prerequisites: Faculty sponsor, permission of graduate studies director.

*Fall, Spring and*

*Summer, 1-9 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **ARS 525: Electronic Media**

An exploration of the experimental artistic practices utilizing computer and electronic technologies: digital imaging, video and

audio, web and CD-Rom production, and interactive installation. It will provide practical instruction in the use of computer media with an orientation towards relating this to the graduate student's own practice. It will also analyze the unique possibilities of this hybrid and developing art form through theoretical readings and examination of recent works, exhibitions, festivals, and the worldwide web. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisite: Accepted candidate for M.F.A. or permission of department*

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **ARS 530: Professional Experience Internship**

Internship in the professional art world of New York City and its environs. Depending on the career objectives of the M.F.A. candidate, the student may choose to intern at a foundry, printmaking atelier, art gallery or museum, known artist's studio, or related facility or institution.

*Prerequisite: Accepted candidate for M.F.A. Summer, 1-3 credits, S/U grading*

*May be repeated 2 times FOR credit.*

#### **ARS 531: Graduate Teaching Practicum**

Supervised teaching practicum in undergraduate studio or studio, theory course.

*Prerequisite: Accepted candidate for M.F.A. Fall and Spring, 1-3 credits, S/U grading*

*May be repeated 2 times FOR credit.*

#### **ARS 532: Thesis Project**

Preparation of thesis under the program advisor.

*Prerequisites: Accepted candidate for M.F.A., review board passed*

*Summer, 1-6 credits, S/U grading*

*May be repeated for credit.*

#### **ARS 535: Projects in Studio Art**

Projects in studio art, field and media to be determined on a per semester basis by the individual instructor.

*1-6 credits,*

*May be repeated 2 times FOR credit.*

#### **ARS 540: Graduate Photo Studio**

Photographic studio, theory, and laboratory emphasizing individual development as a photographer. Color and black-and-white studios and darkrooms. Fine arts, reportage, illustration, commercial, and industrial. This course has an associated fee. Please see

www.stonybrook.edu/coursefees for more information. Prerequisites: Demonstration of appropriate level of proficiency, permission of instructor.

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ARS 550: In Process Critique**

Graduate theory and practice of art, investigating historical and contemporary concepts, concentrating on individual development as an artist. Conceptual, environmental and wide ranging solutions are encouraged. Required for first year MFA's, this course culminates in a body of work for the end of the year First Year Exhibition. The course also provides students with vigorous critical feedback throughout this process, augmenting it with readings and discussions of related New York City exhibitions in galleries and museums to inform the development of their work.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ARS 551: Graduate Painting Studio**

Studio and theory in painting and related visual forms, with instruction and facilities available in all media and techniques; emphasis on individual development as an artist. Models and space for environmental and conceptual works available. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

*Prerequisites: Permission of instructor; accepted candidate for M.F.A. or permission of department  
Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ARS 560: Graduate Sculpture Studio**

Theory and practice of sculpture for the graduate student, with instruction and facilities available in all media and techniques; emphasis on individual development as an artist. Studio facilities include air, electric, and hydraulic power equipment; TIG, MIG, Arc, and flame welding; forging; woodworking; modeling, molding, and casting facilities for clay, wax, plaster, and plastics; and metal casting capabilities in investment, shell, sand, and centrifugal. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

*Prerequisites: Permission of instructor; accepted candidate for M.F.A. or permission of department*

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ARS 561: Graduate Ceramics and/ or Ceramic Sculpture Studio**

Theory and practice of ceramics and ceramic sculpture for the graduate student with emphasis on individual development as an artist. Advanced studio instruction in handbuilding: coil, slab, pinch; wheelthrowing; casting, inclusive of multipiece plaster pour-molds; various firing techniques: reduction, oxidation, raku, and high- and low-fire glaze techniques. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

*Prerequisites: Permission of instructor; accepted candidate for M.F.A. or permission of department  
Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ARS 570: Graduate Printmaking Studio**

Graduate studio in the theory and practice of printmaking. Color, black-and-white, and photographic processes in plate and stone lithography, serigraphy, relief, and intaglio, emphasizing the student's individual development as an artist.

*Prerequisites: Permission of instructor; accepted candidate for M.F.A. or permission of department  
Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ARS 580: Visual Arts Seminar**

Required seminar and critique throughout the M.F.A. curriculum. Guest speakers, artists, and critics; demonstrations and lectures; seminars; individual and group critiques. The M.F.A. candidate, as part of this seminar, regularly participates in critiques in which his or her work is analyzed by guest faculty and art history/criticism faculty and graduate students, as well as by his or her peers. The visual arts seminar, where applicable, includes field trips and assignments of special lectures, panels, seminars, and other events of the professional art world.

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ARS 800: Summer Research**

## **BCB**

### **Biochemistry and Cell Biology**

### **BCB 551: Introduction to Research in Biochemistry and Cell Biology**

A series of talks, discussions, and practical exercises to address topics related to research in biochemistry and cell biology including laboratory etiquette, the laboratory notebook, experimental design, critical evaluation of the literature, analysis and presentation of data, ethical issues, and basic experimental techniques used in biochemistry and cell biology.

*Prerequisites: Matriculation in MS program or permission of instructor  
Fall, 2 credits, Letter graded (A, A-, B+, etc.)*

### **BCB 552: Advanced Laboratory Methods in Biochemistry and Cell Biology**

This course introduces theoretical principles and experimental techniques used to investigate the properties of biological molecules and their interactions. Students will familiarize themselves with the instrumentation and techniques used to investigate different biochemical and cell biological problems through a combination of lectures and demonstrations. Various topics will be covered such as protein purification and characterization using spectroscopic and thermodynamic techniques as well as gel electrophoresis and immunoblotting; identification of metabolites by mass spectrometry; bioinformatics analysis of DNA deep sequencing data; electron and fluorescence microscopy and the use of zebrafish and nematodes to understand biological processes.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BCB 559: MS Research Practicum in Biochemistry and Cell Biology**

The student will be introduced to modern biochemical and cell biological research techniques through participation in ongoing research in the laboratory of a Biochemistry and Cell Biology or associated faculty member for one semester. Student must obtain permission to register from the sponsoring faculty member.

*Prerequisite: Matriculation in MS program or permission of instructor  
Fall, Spring, and Summer, 0-4 credits, S/U grading  
May be repeated for credit.*

### **BCB 599: MS Thesis Research in Biochemistry and Cell Biology**

Thesis research will be conducted in the laboratory of a Biochemistry and Cell Biology or associated faculty member, including potentially an internship under the guidance

of an approved mentor in the laboratory of a local biotechnology company. Student must identify and obtain permission to register from the sponsoring faculty member. Prerequisite: Matriculation in MS program or permission of instructor Offered

*Fall, Spring, and Summer, 3-6 credits, S/U grading*

## BDA

### Decision Analytics

#### BDA 503: Data Analysis & Decision Making

An introduction to statistical techniques useful in the analysis of management problems.

We motivate each topic by managerial applications, and we analyze actual data sets using modern statistical software. Topics include probability estimation, hypothesis testing, and regression analysis. 3 credits, Letter graded (A, A-, B+, etc.) Prerequisite: Admission to the BDAMS - MS in Decision Analytics

*3 credits, Letter graded (A, A-, B+, etc.)*

#### BDA 508: Advanced Analytics

This course introduces students to challenging business problems in distribution, routing and scheduling, and to the solutions strategies for such problem via discrete optimization. The topics include integer programming techniques such as cutting plane and branch and bound, special purpose algorithms for distribution and network problems, and heuristic optimization techniques for combinatorial optimization, such as Simulated Annealing, Tabu Search, Evolutionary Algorithms, Ant Colony Optimization. Prerequisite: MBA 543

*3 credits, Letter graded (A, A-, B+, etc.)*

#### BDA 510: Advanced Data Analysis and Decision Making

By successfully completing this course, the student will have an understanding of the ways in which advanced statistical methods are used to address significant decision-making problems as they arise in the business setting. Specifically, the student will understand the various ways in which decision problems can be formulated and solved and how to deal with violations of the assumptions commonly found in standard methods. The student will have a greater understanding of multivariate models and ways to build them, and how to handle data collected over time in looking for trends and in making predictions. Prerequisite: MBA 503

*3 credits, Letter graded (A, A-, B+, etc.)*

#### BDA 513: Risk and Uncertainty Analysis

This is a hands-on course on computer simulation and other probabilistic modeling approaches to analyze and improve business, service, and manufacturing systems that are subject to risk. The course takes the perspective of the consultant whose job is to analyze managerial decision based on imperfect observations and unknown outcomes to understand the behavior of the system and explore the effects of alternative decisions. Prerequisite: MBA 503

*3 credits, Letter graded (A, A-, B+, etc.)*

#### BDA 540: Data Mining for Business Intelligence

The recent advances in the Internet and information technologies have resulted in an explosion of demand for big data analytics. The importance of data mining has already been recognized widely in the industry including many business areas, such as marketing science, financial analysis, and corporation management. In this course, we will be focusing on both key concepts and models of data mining and their implementations based on real-world data in business. Students will learn to process data using Excel, and apply data mining models using Weka, a data mining software. 3 credits, Letter graded (A, A-, B+, etc.) Prerequisite: Admission to the BDAMS - MS in Decision Analytics; BDA 503

*3 credits, Letter graded (A, A-, B+, etc.)*

#### BDA 543: Business Analytics

An introduction to mathematical models useful in the analysis of management problems. We motivate each topic by managerial applications, and we analyze problems using modern software. Topics include forecasting, linear, nonlinear, and integer optimization, simulation, Markov processes, decision analysis, and multi-criteria decision making. 3 credits, Letter graded (A, A-, B+, etc.) Prerequisite: Admission to the BDAMS - MS in Decision Analytics; BDA 503 prerequisite/corequisite

*3 credits, Letter graded (A, A-, B+, etc.)*

#### BDA 587: Decision Support Systems

#### BDA 588: Database Management

Database processing is the foundation upon which all current applications rely and represent the repositories of business intelligence that play a crucial role in the strategic success or failure of a corporation. Even though they vary in size, complexity and organizational scope, there is an underlying

common database engine that can be used to manipulate and analyze the stored information. The purpose of this course is to introduce the business professional to the fundamental concepts of database creation, design, application integration, maintenance, management, and subsequent analysis. 3 credits, Letter graded (A, A-, B+, etc.) Prerequisite: Admission to the BDAMS - MS in Decision Analytics

*3 credits, Letter graded (A, A-, B+, etc.)*

## BEE

### Ecology and Evolution

#### BEE 500: Directed Readings in Population Biology

Directed readings in topics of current interest, under supervision of a faculty sponsor, culminating in one or more critical review papers.

*Prerequisites: Sponsor and approval of master's program executive committee  
Fall and Spring, 1-3 credits, S/U grading  
May be repeated for credit.*

#### BEE 501: Directed Readings in the Biology of Organisms

Directed readings in topics of current interest, under supervision of a faculty sponsor, culminating in one or more critical review papers.

*Prerequisite: Sponsor and approval of master's program executive committee  
Fall and Spring, 1-3 credits, S/U grading  
May be repeated for credit.*

#### BEE 510: Biology Education Research: Teaching, Learning, and Assessment

Introduction to core policy documents, standards, concepts, and empirical methods in biology education research and their applications to undergraduate classroom settings. Appropriate for graduate students in the biological sciences and/or those enrolled in the Ph.D. Program in Science Education.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### BEE 520: Advanced Human Genetics

An advanced course in human genetics. Topics include the genotype/phenotype association, genetic architecture of disease/phenotype, human population genetics, coalescent theory, methylation, and ancient DNA. The course will emphasize hands-on engagement with genetic data and critical reading of scientific papers. Computer laboratory analysis/ assignments will make up a major component of this class. Students will be evaluated based

on computer assignments and a final individual research project.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 521: Genomics Lab**

This course provides a computer lab-based introduction to comparative genomics, molecular evolutionary analysis, and next generation sequencing (NGS) data and analysis. Activities will include familiarization with both web-based and command-line tools for analyzing genomic data and summarizing/visualizing results. Lectures and background reading will provide an introduction to basic principles of genomics to inform computer-based hands-on activities. A weekly recitation will promote discussion. Students will be evaluated based on computer lab assignments, as well as a final individual project that applies learned concepts and approaches to a novel research question.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 550: Principles of Ecology**

Population dynamics, interactions of organisms, theoretical concepts of community structure and their biological and evolutionary implications.

*Prerequisite: Permission of instructor  
Fall, 4 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 551: Principles of Evolution**

Biological evolution, including the genetics of populations, speciation, evolution of higher taxa, and the fossil record.

*Fall, 4 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 552: Biometry**

An intensive course in statistical theory and methodology. The analysis of real biological data is emphasized. Topics include analysis of variance, simple multiple and curvilinear regression analysis, correlation analysis, and goodness of fit tests.

*Spring, 4 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 553: Multivariate Analysis in Biology**

An introduction to multivariate statistical analysis for biologists. Topics include general least squares analysis, MANOVA, cluster analysis, and factor analysis.

*Prerequisite: BEE 552 or equivalent  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 554: Population Genetics and Evolution**

A general introduction to mathematical population genetics and evolutionary theory. The effects of mutation, recombination, selection, and migration are studied. Modern concepts in both theoretical and experimental population genetics are covered.

*Prerequisite: BEE 552 or equivalent, and a course in evolution  
Spring, odd years, 0-3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 555: Mathematical Methods in Population Biology**

This course covers a variety of mathematical methods used in modern theoretical biology. Topics include linear algebra and applications, ordinary and partial differential equations, and stochastic processes. Examples from population biology, i.e., mathematical ecology and population genetics, are used throughout.

*Fall, even years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 556: Research Areas of Ecology and Evolution**

A description of the current research areas of ecology and evolution, broadly conceived. All first-year ecology and evolution students are expected to participate.

*Fall and Spring, 1-2 credits, S/U grading  
May be repeated for credit.*

### **BEE 558: Tutorial Readings**

Individual tutorial study with an instructor in the Graduate Program in Ecology and Evolution for the purpose of background reading in an area of ecology and evolution.

*Fall and Spring, 1-4 credits, S/U grading  
May be repeated for credit.*

### **BEE 559: Individual Studies in Organisms**

A detailed study of the biology of a selected systematic group chosen by the graduate student and a faculty member. This is conducted as a tutorial course.

*Fall and Spring, 1-4 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BEE 560: Advanced Ecology**

This course will provide students with an understanding of the theoretical basis and empirical tests of diverse advanced topics in the field of ecology. The format includes both lectures and student-led discussions of primary literature.

*2 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BEE 562: Concepts and Methods in Evolutionary Biology**

The course aims at achieving two related objectives: first, to provide graduate students in Ecology & Evolution, other biology departments, as well as Philosophy, with a basic understanding of the varied methods (both experimental and statistical) that make up the body of evolutionary quantitative biology. The focus will be in particular on quantitative genetics and its interface with more modern approaches, including QTL mapping, bioinformatics and the various "omics" (genomics, proteomics, etc.). Second, students will become familiar with the fundamental concepts of philosophy of science, in particular as they relate to the conceptual analysis of the ideas that shape modern evolutionary and ecological theory. In this respect, the focus will be both on philosophical concepts such as falsificationism, induction, deduction, hypothesis testing and the nature of evidence, as well as on the meaning of key ideas in evolutionary ecology, like natural selection, genetic drift, and constraints.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 564: Geometric Morphometrics**

An introduction to theory and methods used in geometric morphometrics. Image analysis, outline methods, landmark methods, and shape statistics are covered.

*Prerequisite: BEE 552 or equivalent; BEE 553 recommended*

*Fall, even years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 566: Horizons in Ecology and Evolution**

The course is designed to provide beginning graduate students in Ecology and Evolution with an extended perspective on current and developing trends in this field. It will be based on readings (empirical and review papers) and discussion on diverse topics. The hour-long class will meet on a weekly basis. Each class session will be led by the faculty member with expertise in the scheduled topic of study.

*Offered:*

*Spring, 1 credit, S/U grading*

### **BEE 567: Molecular Diversity Laboratory**

This course will provide hands-on experience in established and recently developed methods of detecting and analyzing molecular variation (DNA, RNA, Proteins) in nature. Natural populations of *Drosophila melanogaster* will be the model material for this laboratory. The main theme of this course is that molecular

variation is abundant in nature and is an important tool for understanding adaptive evolution and species relationships.

*Prerequisite: permission of instructor  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 569: Bayesian Data Analysis and Computation**

An applied course in Bayesian analysis and hierarchical modeling for advanced graduate students in Ecology & Evolution or related sciences. Topics will include probability theory, Bayesian analysis, and MCMC methods such as Gibbs, sampling and Metropolis-Hastings sampling, as well as applied issues regarding the choice of prior distributions, posterior convergence, censored and missing data, and model checking and comparison. The course will be taught using WinBUGS and JAGS as accessed via the R packages R2WinBUGS and R2jags, respectively. Offered in the Fall.

*4 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 571: Ecology Laboratory**

This course stresses the collection, analysis, and interpretation of ecological data, mostly in terrestrial settings. Laboratory and field exercises demonstrate the operation of general ecological principles in specific populations and communities.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 572: Conservation Biology**

Society and individual lives are increasingly affected by environmental degradation at different scales. From the decline of local fisheries to global climate change, multiple crises threaten the biodiversity and ecosystems that sustain us humans. This course introduces the scientific foundations of conservation biology, along with examples from real-world conservation. The course reviews the biological concepts that underlie conservation including habitat requirements, population dynamics, biogeography, and population genetics. Analysis of case studies on the effects of human activities on biological diversity and ecosystem services will be used to explore the interdisciplinary nature of the practice of conservation. This course will prepare students for careers in environmental sciences and ecology.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 574: Landscape Ecology Laboratory**

A computer lab course focusing on spatial concepts, methods, and tools for addressing environmental problems. The course will be

based on fundamental concepts in ecology and environmental science and extend that knowledge, as well as teaching technical skills, including the use of geographic information systems (GIS) software, image processing, spatially explicit modeling, and spatial statistics. The lab exercises will introduce a variety of spatial approaches for addressing problems in environmental protection, ecotoxicology, natural resource management, conservation biology and wildlife management.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 575: Evolutionary Ecology**

The approach is to understand the theoretical basis and review empirical tests of diverse topics. The format includes both lectures and student-led discussions of primary literature.

*Prerequisite: BEE 550; BEE 551, or permission of instructor*

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 576: Principles and Applications of Ecology and Evolution**

An overview of the principles of ecology and evolutionary biology, and the applications of these principles in conservation biology, environmental and health sciences, and resource management. The course will cover fundamental concepts and research questions in population, community, and ecosystem ecology; population genetics; and evolutionary ecology. These principles will be discussed in the context of contemporary issues, such as global climate change, biodiversity loss, environmental contaminants, infectious diseases, invasive species, and management of ecological resources. Offered

*Fall, 4 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 577: Ecological Genetics**

An introduction to the concepts, research questions, and methods involved in modern ecological genetics and genomics. The course will provide a strong foundation and broad conceptual framework for students planning to engage in empirical work in conservation, management, ecology, and evolutionary biology. The course will cover basic Mendelian genetics, meiosis, and mating systems, standard population genetics methods for describing variation within and between populations, basic quantitative genetics, methods for molecular marker genotyping, bioinformatic and genomic concepts, and organism-specific methods and case studies, including plant and animal ecological genetics.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

### **BEE 583: Paleobiology**

Fossils are a fundamental component of the rock record and provide the only direct evidence of past life on Earth. They provide basic information for both geologists and biologists on topics like climate change, tectonic plate motion, the evolution of biological novelty, the nature of mass extinction, and the history of biodiversity. They are also increasingly used to establish natural baselines to inform modern conservation efforts. This course represents a process and systems-based study of the marine and terrestrial fossil record. The course will focus on preservation and taphonomy, macroevolution, biomechanics, paleoecology, ecomorphology, biogeography, and the extinction of biotas in the context of the environmental history of Earth. The course format consists of a mix of lecture, discussion, and lab activities. This course will additionally take advantage of connections with the Turkana Basin Institute here at Stony Brook University, where researchers play an important role in understanding the evolution and paleoecology of East African ecosystems, including that of our own ancestors.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 584: Intermediate Statistics**

This is an intermediate-level course in biostatistics, emphasizing the use of statistics as a tool to answer scientific questions in ecology and other biological disciplines. Topics from introductory statistics courses will be explored in greater depth using the R software package. Additional advanced topics will include experimental design, metaanalysis, general linear models, complex regression, multifactor analysis of variance, and multivariate analyses. Within each topic, the assumptions of statistical tests will be examined, as well as methods to cope with violations of those assumptions. Students will develop skills in graphical display of quantitative data, exploratory data analysis, and critical evaluation of published statistical analyses. Students will use R software throughout the course to develop their coding skills.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 585: Research Design and Analysis in Ecology and Evolution**

This course covers topics relevant to statistical aspects of carrying out research in ecology and evolution as well as interpreting the results of one's own and others analyses, particularly in field data and for experimental data in the lab and field. The topics include



quantification of spatial pattern and spatial heterogeneity, recognizing and accounting for indirect effects and artifacts, design and analysis of experiments, meta-analysis and quantitative research synthesis. This course will also provide an introduction to ecological niche modeling and bioinformatics (focused on species and traits). We will review a synthetic set of tools useful for a broad range of questions in ecology and evolution. Offered *Fall, odd years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 586: Introduction to Ecological Modeling**

This course will provide students with a familiarity of the major concepts, approaches, and underlying rationale for modeling in the ecological sciences. Topics will include reviews of theoretical and empirical models, the use of models in adaptive management, and how to confront models with data to evaluate alternative hypotheses. Roughly 1/3 of the course will be devoted to the use of models in management, focusing on the problems of fitting models to data and management pitfalls that follow. Course work will consist of readings, in class exercises, and group assignments that involve the construction, analysis, and interpretation of ecological models.

*Prerequisite: BEE 550, BEE 552; MAT 131 or equivalent; any statistics course.*  
*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 587: Applied Ecology and Conservation Biology Laboratory**

A computer laboratory course introducing students to ecological risk analysis and conservation biology. Laboratories are based on interactive software. Computer simulation techniques for addressing problems in applied ecology are emphasized. This course is co-scheduled with BEE 353 for Spring 2012. Prerequisites: A year of calculus; one-year undergraduate biology course for majors  
*Spring, even years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BEE 588: Current Topics in Ecology and Evolution**

Subject matter varies from semester to semester, depending upon the interests of students and staff.

*Fall and Spring, 2 credits, S/U grading*  
*May be repeated for credit.*

### **BEE 599: Research**

Original investigation undertaken with the supervision of a member of the staff.

*Fall and Spring, 1-12 credits, S/U grading*  
*May be repeated for credit.*

### **BEE 670: Informal Seminar**

Presentation of preliminary research results and current research problems by students and faculty.

*Fall and Spring, 0-2 credits, S/U grading*  
*May be repeated for credit.*

### **BEE 671: Ecology and Evolution Colloquium**

A weekly series of research seminars presented by visiting scientists as well as by the faculty. Required every semester of all ecology and evolution graduate students.

*Fall, 0-2 credits, S/U grading*  
*May be repeated for credit.*

### **BEE 672: Ecology and Evolution Colloquium**

A weekly series of research seminars presented by visiting scientists as well as by the faculty. Required every semester of all ecology and evolution graduate students.

*Spring, 0-2 credits, S/U grading*  
*May be repeated for credit.*

### **BEE 689: Seminar on Adaptations of Marine Organisms**

Seminars on selected topics concerning ecological, genetical, and evolutionary problems in the marine environment.

*Fall or Spring, alternate years, 0-2 credits,*  
*Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **BEE 690: Seminar on Evolutionary Processes**

Seminars on selected topics concerning evolutionary processes.

*Fall or Spring, alternate years, 0-2 credits,*  
*Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **BEE 691: Seminar on Systematics and Phylogeny**

Seminars on selected topics in systematics. Topics will include the theory of classification and numerical taxonomy, both phenetic and cladistic.

*Fall or Spring, alternate years, 0-2 credits,*  
*Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **BEE 692: Seminar on the Environment and Human Affairs**

Student seminars on selected topics concerned with the effect of man on the environment. Application of ecological and evolutionary theory to the solution of human problems.

*Fall or Spring, 0-2 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **BEE 693: Seminar on Population and Community Ecology**

Student seminars on selected topics in population and community ecology.

*Fall or Spring, 0-2 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **BEE 695: Seminar on Ecological Processes**

Seminars on selected topics concerning ecological processes at the individual, population, community, ecosystem, and global levels.

*Offered*  
*Fall and Spring, 0-2 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **BEE 699: Dissertation Research on Campus**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, and Summer, 1-9 credits, S/U grading*  
*May be repeated for credit.*

### **BEE 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading*  
*May be repeated for credit.*

### **BEE 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be

covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor. Fall, Spring, 1-9 credits, S/U grading May be repeated for credit.*

### **BEE 800: Summer/Winter Research**

*May be repeated for credit.*

## **BGE**

### **Genetics**

#### **BGE 510: Graduate Genetics**

This course investigates fundamental aspects of the transmission and expression of genetic information in prokaryotic and eukaryotic systems. The course is organized in a way that allows the students to appreciate the breadth of genetics research, while also gaining an in-depth understanding of selected important topics. Students explore the use of both classical and molecular genetic approaches to understand biological processes in genetics model systems including yeast, flies, worms, mouse, and man.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **BGE 530: Laboratory Rotation**

The student rotates through laboratories of four different genetics program faculty members during the first year. The selection of the laboratories is made by the student, in conjunction with individual faculty, and with the approval of the program director. By taking part in ongoing projects, the student will learn experimental procedures and techniques and become acquainted with research opportunities in the participating programs. Prerequisite: Permission of instructor

*Fall and Spring, 1-8 credits, S/U grading May be repeated 2 times FOR credit.*

#### **BGE 531: Graduate Student Seminar in Genetics**

Students have the opportunity to present their research to other students and faculty on an annual basis. Students in the first or second year will present brief seminars as part of a one-day symposium with all of their classmates. Advanced students present research seminars as part of a weekly research seminar series that is attended by faculty and students. Although the first and second year students do not present in this weekly seminar series, they should attend these seminars as it

provides an excellent mechanism for learning about current areas of research interest.

*Fall and Spring, 0-1 credits, S/U grading May be repeated for credit.*

#### **BGE 534: Introduction to Systems Biology**

This course is geared towards teaching essential concepts and computational skills in Systems Biology. The course is centered upon two key programming languages: Matlab for modeling applications and the R language for statistical analysis and sequence manipulation.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **BGE 550: Genetics Outside Seminar**

Outside seminars and special topics courses in areas relating to genetic studies.

*1-6 credits, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

#### **BGE 599: Graduate Research**

Original investigation undertaken with the supervision of a member of the program.

*Fall and Spring, 1-9 credits, S/U grading May be repeated for credit.*

#### **BGE 657: Principles of Development**

This course deals with developing systems at all levels from the morphological to the molecular. Illustrative material from both animal and plant kingdoms is used. Special attention is given to gametogenesis, genetic control of early development, transcriptional and translational control of protein synthesis, the role of cell division and cell movements, and cell-to-cell interactions in defining developing systems.

*Prerequisite: MCB 656, matriculation in graduate program or permission of instructor. Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **BGE 691: Readings in Genetics**

Journal Club on thematic topics in different areas of current genetics research

*Prerequisite: Permission of instructor Fall and Spring, 1 credit, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

#### **BGE 693: Research Proposal Preparation in Genetics**

A course, based upon literature in the broad field of Genetics, to instruct in scientific writing and the preparation of research proposals. In the first section of the course, students will become familiar with the components of a research proposal and will read and evaluate proposals written by the training faculty. Discussions guided by the

course co-directors will cover the basics of scientific writing, research proposal preparation, and the problems and concerns commonly voiced by reviewers of research proposals. In the second section, students will develop and write a research proposal for the student of a topic in genetics that is unrelated to their graduate research. The students' skills in proposal preparation will be enhanced by critiquing the draft proposals presented by other students in the course

*1 credit, Letter graded (A, A-, B+, etc.)*

#### **BGE 699: Dissertation Research on Campus**

Prerequisite: Advancement to candidacy (G5). Major portion of research must take place on SBU campus.

*1-9 credits, S/U grading May be repeated for credit.*

#### **BGE 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading May be repeated for credit.*

#### **BGE 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor. Fall, Spring, 1-9 credits, S/U grading May be repeated for credit.*

#### **BGE 800: Summer/Winter Research**

*May be repeated for credit.*

## **BIO**

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## Biology

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**BIO 511: Topics in Biotechnology**

An introduction to the field of biotechnology. The course will survey the history of the development of genetic engineering, methodologies used in biotechnology, applications of biotechnology in medicine, agriculture and manufacturing, and the implications of these technologies for society. Intended for the students in the MAT Science and MALS programs. This course has an associated fee. Please see [www.stonybrook.edu/course-fees](http://www.stonybrook.edu/course-fees) for more information. Offered

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**BIO 515: Current Topics in Microbiology**

A survey of microbiology with an emphasis on microbial ecology, the role of microbes in the biosphere and the methodology used to explore these areas. The course is organized around two resources available online: Unseen Life on Earth: An Introduction to Microbiology, which was produced by The American Society for Microbiology (<http://www.learner.org/resources/series121.html>) and the New York State core curriculum for The Living Environment (<http://www.p12.nysed.gov/cia/mst/sci/lis.html>). Intended for the students in the MAT Science and MALS programs. This course has an associated fee. Please see [www.stonybrook.edu/course-fees](http://www.stonybrook.edu/course-fees) for more information.

*3 credits, Letter graded (A, A-, B+, etc.)*

**BIO 520: Topics in Genetics**

A survey of genetics organized around a particular topic, including gene regulation, developmental genetics, cancer genetics, epigenetics with emphasis on areas with emerging new insight. The methodology used to study these areas will also be explored. Intended for students in the MAT Biology and PhD Science Education programs.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**BIO 521: Laboratory Science Curriculum Development**

Development of curriculum materials appropriate for a secondary school biology classroom. Students may take this course in their second semester of the Master of Arts in Teaching Science program. Offered

*Fall and Spring, 1-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**BIO 542: Model Systems for the Living Environment**

Introduction to microbial model systems used in biological research such as yeast, nematodes and slime molds. Particular attention will be given to using these systems in the classroom to illustrate key concepts in introductory biology. Students will read and discuss research papers selected from the current scientific literature. Topics to be covered include: life cycle, laboratory techniques and design of inquiry-based investigations.

*Offered*

*Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

**BIO 558: Biological Basis of Human Evolution and Behavior**

A exploration of biological theories of human evolution, properties, and behavior. We build an understanding of evolution of complex organisms by natural selection, followed by the emergence of humans as a uniquely complex species. Scientific hypothesis formation and testing using the extensive multidisciplinary empirical record of the 1.8 million years of human history is developed throughout. Implications of human evolutionary biology for contemporary social and sexual behavior are also investigated. This course is co-scheduled with BIO 558.

*Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**BIO 600: Practicum in Teaching**

*Fall and Spring, S/U grading*

*May be repeated for credit.*

**BIO 601: Practicum in Teaching**

*Fall and Spring, 1-3 credits, S/U grading*

*May be repeated for credit.*

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## BME

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**Biomedical Engineering****BME 501: Engineering Principles in Cell Biology**

Course content is directed toward describing the physico-chemical and biological interactions within cells, and between cells and their environment. The course has two main objectives: 1) to equip students with essential knowledge and stimulate intuitive understanding of molecular and cell biology; 2) to introduce and develop common engineering concepts and approaches for quantitative analysis of physical-chemical systems in context of cell biology. The long-

term goal is to help apply their knowledge of molecular and cellular phenomena and the analytical techniques learned in this course to design and development of products and processed for improving help and/or medical care. Therefore, a major component of this course will be an individual project requiring the development of a patent for a biomedical device or process, which relies on one or more of the biological (cell and molecular level) and engineering principles covered in class.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**BME 502: Advanced Numerical & Computation Analysis Applied to Biological Systems**

Numerical analyses of Biological Data. A unified mathematical/time series framework for modeling and mining biological data. Applications range from cardio-respiratory, renal blood pressure/flow and sequence (DNA, RNA, proteins) to gene expression data. Tools of data analysis include linear algebra, interpolation and extrapolation, parametric and nonparametric spectral estimation with the FFT and singular value decomposition, statistical description of data and integration of ordinary differential equations. Special focus will be placed on the use of linear and nonlinear numerical methods for the identification of physiological system dynamics and the development of computer simulation techniques to study dynamic response of physiological systems. Cannot be repeated for credit.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**BME 503: Cell and Molecular Imaging**

This course will cover basics of optics, microscopy, spectroscopy and fluorescence in the context of imaging at the cellular and molecular level. Recently developed advanced imaging techniques for probing protein interactions and live cell functions are also discussed. The course is organized in 3 modules:

*3 credits, Letter graded (A, A-, B+, etc.)*

**BME 504: Biomaterials Science and Analysis**

Course content is directed toward providing an introductory treatment of the engineering issues implicit in understanding living tissue interactions with processed materials. Emphasis on identifying and eliminating surface contamination, corrosion, and optimizing material surface properties and compatibility.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**BME 505: Principles and Practice of Biomedical Engineering**

Introduces first year students to the basic and clinical research at the cutting edge of biomedical engineering. The course has two key components: the first is a seminar series presented by internationally renowned bioengineers. An interactive discussion of topic-specific scientific literature precedes the formal presentation. The second component of the course is teaming up with a physician, in rounds, the operating theater, clinics, etc., to get exposure to the real-life problems which face the medical community. It is hoped that the mix of science and clinic will move students towards determining how they can make contributions to health and society.

*1 credit, Letter graded (A, A-, B+, etc.)*

**BME 508: Molecular and Cellular Biomechanics**

Course content revolves around the effects and interactions of mechanical forces at the cellular and molecular level. The topics range from describing the molecular and cellular basis of the adaptation of tissues to physical signals, to prescribing specific mechanical environments for improved tissue engineering, to delineating relevant molecular, cellular, and biomechanical techniques, to issues involved in the development and approval of diagnostics and therapeutics in molecular engineering. Course format is based on lectures and discussion of the current literature. For a deeper understanding of the scientific literature, this course will contain a module on the design and analysis of experiments (i.e., applied biostatistics).

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**BME 509: Fundamentals of the Bioscience Industry**

A 4-module course set up to provide students with a comprehensive introduction to the complexities of the bioscience business environment.

*Prerequisite: Must be either a BME or MBA graduate student (West Campus). All other students must obtain permission from the instructor.*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**BME 510: Biomechanics**

This course emphasizes the application of continuum mechanics to living tissues and organs in order to describe the material properties and their behavior under loading and stress. The interrelationship between biomechanics and physiology is examined in

normal function and in disease processes. This course focuses on the physiology of tissue and organ systems in the context of mechanics, stress, strain, viscoelasticity and material behavior, and the constitutive equations and the field equations governing fluids and fluid flow, with an emphasis on the cardiovascular and musculoskeletal systems. Emphasis is placed on the utilization of engineering principles to analyze processes at the tissue and organ levels, covering soft and hard tissues and organs (blood, cardiovascular system, bone, cartilage, etc.) and to understand how these principles could be applied towards the design and development of prosthetic devices.

*3 credits, Letter graded (A, A-, B+, etc.)*

**BME 511: BioTechnology Enterprises 2: Products & Markets**

This course will provide students with a comprehensive introduction to the bioscience business environment by examining the commercialization process - how an idea becomes a product. This includes evolving business models, product development cycles, regulatory issues, finance, managerial challenges and future trends in the life sciences. Special focus will be placed on preparing students to translate concepts presented in the course into commercial analysis of a technology.

*3 credits, Letter graded (A, A-, B+, etc.)*

**BME 512: Fundamentals of the Bioscience Industry**

This course will build on topics presented in BME-511: Fundamentals of the Bioscience Industry Program, and is a pre- or co-requisite for enrollment. Students will work through modules addressing each component of the commercialization process including intellectual property strategy, market analysis and opportunity, regulatory pathway and technology financing. Students will work in groups to develop commercialization reports based on real intellectual property disclosures, performing due diligence to identify areas of opportunity and challenges of their technologies. Based upon the commercialization report, students' groups will create a hypothetical company, and evolve their technology analyses into investor-like presentations delivered at a mock pitch session at the end of the term.

*3 credits, Letter graded (A, A-, B+, etc.)*

**BME 513: Introduction To Optical & Terahertz Imaging**

This course provides the foundations for advanced topics in modern optical imaging techniques, including nonlinear optics, Fourier optics, ultrafast time-domain and

terahertz spectroscopy and imaging. The emphasis will be on connecting theory to modern technological advancements and their biomedical applications. The course consists of the following four general modules: Review of fundamental Optics; Nonlinear Optics; Fourier Optics; Ultrafast and Terahertz Optics

*3 credits, Letter graded (A, A-, B+, etc.)*

**BME 515: Biomedical Optical Imaging**

An introduction to the principles and applications of biomedical optical imaging, with an emphasis on high-resolution imaging and spectroscopy. This course provides a conceptual overview, along with basic mathematical theory (assignments), of some of the key concepts that are relevant to biomedical optical imaging, including Gaussian beams, refraction, total internal

*3 credits, Letter graded (A, A-, B+, etc.)*

**BME 517: Radiation Physics**

This graduate offering provides an initial physical background required for the study of the Medical Physics. Sources of ionizing radiation including radioactivity (natural and manmade) and x-ray producing devices are studied as well as sources of nonionizing radiation such as radiofrequency and ultrasound. The physical aspects of these radiations are characterized by their interaction with matter and methods for their detection. Each student will select and present a proposal for solving a clinical medical physics problem.

*Prerequisites: Modern Physics or equivalent Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**BME 518: Radiobiology**

The biological consequences of irradiation (ionizing, ultrasound, laser, RF, etc.) will be examined. Interaction mechanisms will first be examined followed by examination of the radiation impact at the molecular and cellular level. The use of radiation for therapeutic gain will be considered. As well, models will be developed for risk estimates. Topics to be covered will include: target theory, biological response, NSD and risk estimates.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**BME 519: Medical Health Physics**

This course discusses the health physics and safety issues associated with radiological devices, facilities and procedures.

*Prerequisite: BME 517.*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**BME 520: Lab Rotation I**

**BME 521: Lab Rotation II****BME 525: Pathways from Bed to Bedside**

The course will emphasize diverse pathways from laboratory discoveries to product commercialization in Tissue Engineering and Regenerative Medicine (TERM). Depending on the field of discovery, pathways can be quite dissimilar, e.g. devices, biologics, drugs, or combination products. The foundational sciences include: biomaterials, biological processes including cell biology and physiology, genomics, proteomics, metabolomics, stem cell differentiation, growth factors, and tissue/organ development. An overarching core principle is engineering design. The course will be divided into 3 modules: Discovery and validation, Transition from laboratory prototype to fixed prototype, Progression through clinical trials. Although scale-up manufacturing and commercialization will be discussed, these final steps to the market-place will not be covered in detail. Students will work in teams. Each team will select a TERM project with a specific type of bench to bedside pathway (team size will depend on the class size). However, other BME areas may be included, e.g. microelectron-mechanical systems (MEMS), can be designed to stimulate muscle, thus avoid atrophy while awaiting a TERM construct. For such projects, the team should choose an appropriate BME faculty advisor to guide them. Reading material and writing/speaking assignments will be the basis for in-class discussions with embellishment of specific engineering or scientific principles.

3 credits,

May be repeated for credit.

**BME 526: Biological Systems Engineering**

This course is a hands-on study of systems engineering in biology, using computer modeling to conceptualize and simulate a wide variety of applications. All skills taught in class. Appropriate and applicable to all BME tracks. May not be repeated for credit.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

**BME 530: Medical Image Formation**

This course covers the physical aspects of medical image formation. Image receptor design/optimization, reconstruction techniques, device hardware and performance characteristics are considered.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

**BME 531: Biosensing and Bioimaging**

Basic concepts of biosensing and bioimaging, which include the elements of biological systems and bioimmobilizers, traditional electrode and novel optical transducers, and advanced biomedical optical imaging systems.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

**BME 532: Time Series Modeling of Biological Systems**

A unified mathematical/time series framework for modeling and mining biological data. Applications range from cardio-respiratory, renal blood pressure/flow and sequence (DNA, RNA, proteins) to gene expression data. Tools of analysis include neural networks, time-invariant and time-varying spectral methods, fractal and nonlinear dynamics techniques, hidden Markov Model, clustering analysis, and various system identification techniques.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

**BME 533: Biomedical Imaging Quantification and Analysis**

The overall objective is to introduce conceptual, mathematical, and computational implementational aspects of analyzing biomedical signals and image processing, including real data with preclinical and clinical applications based on the recently developing neurophotonics and optical neuroimaging field. Programming examples using MATLAB will be presented. The students will also be introduced to GUIbased Virtual Photonics and Virtual Tissue Simulator. Practical and recent studies with current state-of-the-art imaging technologies in the field are also discussed. The course involves traditional-style lectures, small lab experiments to apply the basic concepts, an imaging facility tour, and a concise final paper/grant writeup and presentation on the subject of the student's choice in accordance with the instructor.

3-4 credits, Letter graded (A, A-, B+, etc.)

**BME 534: Functional Genomics**

Course provides foundation in concepts of functional genomics and proteomics. Topics include organization and complexity of the mammalian genome and mechanisms of expression of genes, gene expression analysis technologies with a strong focus on construction and utilization of DNA microarrays, and tools for determining gene function by perturbation of gene expression.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

**BME 540: Radiation Oncology Physics**

This course provides a background in therapeutic instrumentation, dosimetry and treatment planning.

Prerequisite: BME 517

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

**BME 546: Statistical Analysis of Physiological Data**

Statistical methods useful in analyzing common types of physiological data. Topics include probability, data distributions, hypothesis testing, with parametric and non-parametric methods, ANOVA, regression and correlation and power analysis. Emphasis is on experimental design and appropriate, efficient use of statistical software.

1 credit, Letter graded (A, A-, B+, etc.)

**BME 547: Model-Based Analysis of Physiological Data**

The analysis of common biochemical and physiological data by non-linear regression of data models and biophysical models of physiological and biochemical processes. Examples include binding kinetics, compartmental mass transfer and spectral analysis.

1 credit, Letter graded (A, A-, B+, etc.)

**BME 548: Measurement and Analysis in Physiological Research**

The acquisition and analysis of data-arising from common biochemical and physiological measurements. Topics include computer-based data acquisition and processing, densitometry, microscopy, and image analysis and processing. Emphasis is on experimental design and strategies for optimizing signal to noise ratio of measurements.

1 credit, Letter graded (A, A-, B+, etc.)

**BME 549: Experimental Techniques in Systems Physiology**

A series of lectures and laboratory exercises designed to introduce students to invitro experimental techniques used in systems physiology. Emphasis will be placed on the ethical use of rodents in biomedical research and the measurement of physiological variables. Data acquisition and analysis procedures used in cardio-vascular, respiratory, neural and renal physiology will also be covered.

1 credit, Letter graded (A, A-, B+, etc.)

**BME 550: Mathematical Models of Physiologic & Biophysical Systems**

An introduction to mathematical modeling of cell and tissue function. Topics include the derivation and numerical solution of models of cell homeostasis, membrane transport and

excitability, and cell signaling and metabolism. Grading is based on problems, student presentation, and completion of a modeling project.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 558: Physical & Quantitative Biology**

This is a course on the principles of physical chemistry. We describe the nature of the forces and energies and entropies that drive molecular systems toward their states of equilibrium. We consider a broad range of applications throughout chemistry, biology, materials engineering and nanoscience. This course aims to give students an understanding of how the actions and behaviors of materials arise from their atomic and molecular structures. Co-listed with PHY 558 and CHE 558.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 571: Microfluids in Biological Systems**

This course will outline theory and applications of special fluid handling conditions associated with living systems.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 572: Biomolecular Analysis**

This interdisciplinary course is intended for graduate students and advanced undergraduates in departments such as Biomedical Engineering, Chemistry, Physics, Biology and Chemical Engineering. This course will give an introduction to single molecule experiments using fluorescence, optical traps, AFM cantilevers, microneedles, magnetic microbeads as well as micro and nanofluidic devices.

*Prerequisites: BME 501 and 502, or instructor approval.*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 573: iPhone Programming for Medical Applications**

iPhone Programming for Medical Applications.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 574: Machine Learning and Artificial Intelligence for Biomedical Engineering**

This course introduces students to machine learning and artificial intelligence methods applied to Biomedical Engineering problems. We will cover singular-value decomposition (SVD), and principal components analysis (PCA), Fourier and Wavelet Transforms, Regression and Model Selection, Clustering and Classification, Deep Learning using Neural Networks, and Scientific Machine

Learning. Course emphasis will be placed on the concepts and implementation of machine learning and AI methods as implemented in the Julia programming language. The final project will teach the students how to apply the various methods learned and practiced in the class to tackle real-world complex BME challenges.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 581: Biomedical Nanofabrication**

This one-semester, three section course, serves as an introduction to the applications of nanofabrication to various fields of importance to biomedical engineering. This will be done by a combination of examining how nature has accomplished nano-scale feats, how we can measure this, and whether we can duplicate nature's functions in vitro. A significant portion of the course includes technical communications, in the form of a written report and oral lecture component to class.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 590: Biomedical Engineering Seminar**

A weekly meeting devoted to current graduate student work in the program in Biomedical Engineering. Enrolled students present seminar each week throughout the semester, participate in seminars and responsible conduct of research training.

*0-1 credits, S/U grading*

*May be repeated for credit.*

### **BME 595: BME MS Project**

This course is taken M.S. students who select MS Project track. Conducted jointly by graduate students and one or more members of the faculty. A final project report must be submitted to the advisor as well as to the Graduate Program Director. Without the submitted report, credits from this course cannot be applied toward the MS degree.

*1-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **BME 599: Biomedical Engineering Research**

Research to be supported by a faculty member of the Department of Biomedical Engineering. Students must have permission of instructor to enroll in appropriate section. Faculty to be identified by the student.

*Fall and Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **BME 601: Cardiovascular Fluid Mechanics**

The course will cover the application of fluid mechanics principles to the analysis of blood flow in the cardiovascular system under normal and pathological conditions. It will follow an historical time line by beginning with the most basic models of arterial blood flow, and proceed to the most advanced theories related to physiology and pathology flow phenomena, including an examination of the most up to date research in the area and the development of devices and implants.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 602: Topics in Biomedical Applications of Neural Networks**

This is a project based course which includes weekly seminars discussing advanced topics in fuzzy logic and neural networks and their applications, in biomedical devices. Applications include drug delivery, diagnostics, management information handling. Students utilize simulation software to develop algorithms to deal successfully with training data sets of their own choosing.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 603: Advanced Quantitative Human Physiology**

This course is intended to provide a deep and rigorous understanding of human physiology using a quantitative approach. This course will develop the physical, chemical and mathematical foundation of physiology, which is then applied to membranes, transport, metabolisms, excitable cells and various organ systems. A major component of this course will be an individual project requiring mastery of concepts developed in class.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 604: Finite Element Modeling in Biology and Medicine**

Both finite difference and FEM are applied to solve the equations of incompressible and compressible fluid flow in porous media with emphasis on flows in skeletal tissues, i.e., bone and cartilage. Steady-state, transient flow, permeability and surface boundary conditions are discussed. Practical and recent studies in the field are also discussed. Programming using FORTRAN or C languages will be required. The student is also introduced to commercially available software packages.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 605: Biomechanics of Tactile Sensory Systems**

Detailed study of the biomechanics of tactile neurophysiology for engineers entering the field of haptics and robotics manipulations. Anatomy and electrophysiology of transducer cells and neurons starting at the fingertips and extending to the somatosensory cortex. Characteristics of the external stimulus and its peripheral transformation. Relations of these topics to perceptual and/or behavioral responses.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 608: Contemporary Biotechnology**

General discussion on the nature of biotechnology and its historical development, applications, impact, consequences, and some of the social and ethical considerations.

*Co-scheduled with BME 402*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 610: Magnetic Resonance**

This course provides a comprehensive study of magnetic resonance and its applications in medical imaging. An introduction of NMR is followed with development of the hardware and processing aspects required for MR image formation. An overview of basic and advanced MR imaging techniques is provided. Each student will select a topic in MR imaging for presentation at the conclusion of the course.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 611: Positron Emission Tomography**

Positron emission tomography (PET) is a unique and powerful functional imaging method used in the clinic and in medical research. It is a multidisciplinary endeavor involving the fields of chemistry, physics, mathematics and medicine. This course addresses the disparate areas of science underlying PET imaging, including radioisotope production, radiotracer synthesis, the physics of the imaging process, quantitative data processing, image reconstruction approaches, data analysis, and tracer kinetic modeling to extract quantitative physiological parameters. Radioactive validation and applications of PET will also be covered including the area of drug addiction. There is a hands-on component in which students will visit an active PET research center and acquire and manipulate PET data.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 612: Biomedical Engineering Aspects for the Use of Radiation in Medicine**

This course provides a comprehensive study of the use of radiation in medicine. Physical aspects of the interaction of radiation with matter and for the radiation production are initially considered. The underlying principles of current radiation based medical imaging is considered next. Topics include radiography, fluoroscopy, radionuclide imaging and computed tomography. The use of radiation for the treatment of malignancy is considered with the focus on required technology. Finally advanced applications of radiation are considered with focus on imaging and treatment. Each student will select a topic examining the engineering or technical application of radiation in medicine for presentation at the conclusion of the course.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BME 615: Clinical Nuclear Imaging**

This course is designed to prepare the Medical Physics graduate student in the area of clinical Medical Imaging. In this clinical rotation, medical physics methods for: planar film, DR, CR, mammography, fluoroscopy, CT, ultrasound and MRI performance evaluations will be introduced. In addition, basic medical ethics, radiographic anatomy and radiation safety will be covered. A total of 200 clinical hours will be completed in this program

Prerequisites: BME 517; BME 518; BME 519; BME 530 or BME 540.

*Fall, 4 credits, S/U grading*

### **BME 616: Clinical Nuclear Medicine Imaging**

This course is designed to prepare the Medical Physics graduate student in the area of clinical Nuclear Medicine Imaging. In this clinical rotation, the students will be exposed to radionuclide processes, radiopharmaceuticals including radioactive gases and aerosols-preparation, characteristics and radiation dosimetry, in vitro and in vivo radiation detection systems, imaging systems and their performance evaluations. In addition, basic medical ethics, clinical interpretations and radiation safety will be covered. A total of 150 clinical hours will be completed in this program.

*Fall, 4 credits, S/U grading*

### **BME 617: Clinical Radiation Oncology Physics**

This course is designed to prepare the Medical Physics graduate student in the area of clinical radiation oncology physics. In this clinical rotation, the student will learn by observation and participation some of a selection of the following medical physics procedures:

LINAC Beam Dosimetry (ion chamber measurement techniques, film dosimetry (radiographic and radiochromic), diode dosimetry, TLD dosimetry, water phantom scanning), implementation of photon and electron beam calibration protocols (AAPM TG51), LINAC beam data measurement and tabulation, commissioning a TPS system, LINAC, acceptance testing, LINAC monthly QA, HDR QA and planning, and IMRT inverse planning and IMRT clinical QA. A total of 120 clinical hours will be completed in this program. Prerequisite: BME 517 and BME 540 with a B+ or better.

*Spring, 4 credits, S/U grading*

### **BME 618: Anatomy for Medical Physics**

This course provides basic radiographic anatomy from both the projection and cross sectional point of view. This course also introduces basic disease processes including the nature and causes of disease and injury. The appearance of these diseases and injuries are examined on medical images acquired through all current methods: radiography, computed tomography, angiography, magnetic resonance, scintigraphy, positron emission tomography and sonography. Details of cancer initiation, growth, staging and treatment are considered. Prerequisite: In Medical Physic Track

*4 credits, Letter graded (A, A-, B+, etc.)*

### **BME 620: Space Radiation Biology**

An extensive series of lectures, training sessions and laboratory activities sponsored by the NASA's Radiation Health Program in collaboration with BNL. The material is oriented to cover basic and state of the art concepts in space radiation environment, physics and radiobiology. Content includes basic concepts in physics, dosimetry, radiobiology, space radiation problems and accelerator operations. Concurrent sessions are provided to complete specific BNL training and plan and prepare experiments for low- and high-LET radiation exposures. Students are trained in NSRL operations and are able to run control experiments using gamma rays in preparation for NSRL runs, and subsequently experiments at the NSRL using heavy ions. Data are obtained from different endpoints are discussed and analyzed with the instructors. Homework are used to test the student's level of comprehension of the lectures and laboratory activities. The write up of a full BNL beam time request proposal is required of each student.

*4 credits, Letter graded (A, A-, B+, etc.)*

### **BME 670: Special Topics in Biomedical Engineering**

Varying topics covering current active research projects and professional development skills for Biomedical Engineers. This course is designed to give the necessary flexibility to students and faculty to introduce and refine new material into the curriculum before it has attracted sufficient interest to be made part of the regular course material. Topics include biomedical engineering, regenerative medicine, bioimaging, biomechanics, career planning, negotiation, communications, long-range planning, among others.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BME 690: Biomedical Engineering Research**

Biomedical Engineering research for doctoral students who have already received their M.S. degree, but have not yet advanced to candidacy.

*Fall and Spring, 1-9 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BME 698: Practicum in Teaching**

Undergraduate teaching to be supervised by a faculty member of the Program in Biomedical Engineering. Course to be identified by the student and graduate studies director.

*Fall and Spring, 1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BME 699: Dissertation Research on Campus**

Prerequisite: Students must be advanced to candidacy (G5); permission of instructor and enroll in appropriate section. Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, and Summer, 1-9 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BME 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **BME 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.  
Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **BME 800: BME RESEARCH**

Full-time summer research.

*S/U grading  
May be repeated for credit.*

## **BMI**

### **Biomedical Informatics**

#### **BMI 501: Introduction to Biomedical Informatics**

This course introduces the unique characteristics of clinical and life science data and the methods for representation and transformation of biomedical data, information, and knowledge to improve human health. The course will provide an overview of basic concepts and will serve as a Launchpad into other more focused courses that explore the computational and analytics needs of BMI, as well as the clinical, research and translational applications of informatics. There will be three major themes: Information representation, management and sharing: biomedical data representation and management; standards, terminologies, and ontologies such as HL7, IHE, SNOMED, ICD-9; Privacy, confidentiality and data sharing. Clinical Informatics: Health care environment and processes; electronic health records and management; clinical decision making clinical information retrieval clinical natural language processing. Imaging informatics: radiological image modalities; DICOM and PACS systems; computer-aided diagnosis; digital pathology; analytical pathology imaging. This course will provide hand-on assignments for the participants

to familiarize the concepts. Prerequisite: Graduate standing in BMI or permission of instructor.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **BMI 502: Life Sciences for Biomedical Informatics**

This course presents the fundamentals of human cell biology, biochemistry, genetics and cell/organ physiology. The biochemical and molecular bases of cell structure, energy metabolism, gene regulation, heredity, and development are discussed, as are the structure and function of cell membranes and the physiology of cell to cell signaling, cellular respiration, and homeostasis of organs and individuals. Can be used for credit toward masters or doctoral degree in BMI only with permission and NOT in addition to BMI 503. Can NOT be used for credit toward certificate in Biomedical Informatics.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **BMI 503: Computer Science for Biomedical Informatics**

This course presents the fundamentals of computer science and problem solving for computer programming. Students learn how computers store and manipulate data using programming languages and algorithms and how computers are controlled by operating systems and networked. Software engineering, data abstractions, and database management systems are described. Applications include computer graphics and artificial intelligence. A theory of computing is presented. Approaches to devising solutions to problem are discussed. Structured programming tools are presented including sequential and decision logic and loops. Data and file operations are explained including processing arrays, sorting, stacks, queues, linked lists, and binary trees. Object-oriented programming and sequential file applications are discussed. Can be used for credit toward masters or doctoral degree in BMI only with permission and NOT in addition to BMI 502. Can NOT be used for credit toward certificate in Biomedical Informatics.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **BMI 511: Translational Bioinformatics**

This course will provide students with an integrative computational toolbox at the intersection between Biomedical and Quantitative Sciences. Students will develop storage, analytic, and interpretive methods to optimize the transformation of large biomedical and genomic datasets, into proactive, predictive, preventive, and participatory health information. Applying a working knowledge of Computational



Statistics in a Biomedical/Biomolecular context, students will gain the ability integrate those Computational Tools and Big Data resources in the Biomedical research enterprise as well as in the clinical workflow. Accordingly, this course will familiarize the participants with the data processing methodologies associated with a range of biological signals that spans from Biological sequences to Histology images, and from mining medical records to Genome Wide Association Studies (GWAS) and gene prioritization.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 512: Clinical Informatics**

This course offers a comprehensive study of Clinical Informatics. It provides a holistic review of the health care delivery system both historically and presently. It presents Clinical Informatics and its legal and ethical issues, followed by an overview of Clinical Informatics. This includes data content and structures; nomenclatures and classification systems; quality, performance, utilization, and risk management; Clinical Informatics databases; and a review of statistics and research. Clinical informatics management principles and theories presented include change, project, and knowledge management. Aspects of human resources and financial management, including reimbursement methodologies are presented as these relate to Clinical Informatics.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 513: Imaging Informatics**

Imaging Informatics is a multidisciplinary field which intersects Clinical Informatics, medical physics, engineering, computer and information sciences. It touches concepts across the whole imaging chain, including image creation and acquisition, image distribution and management, image storage and retrieval, image processing, analysis and understanding, image visualization and interpretation. The goals of the course are to gain familiarity with the terminology, core concepts, and standard practices, understand the current state of the field and enable critical reading of the literature and to perform research. The course will cover both radiological imaging and pathology imaging. Topics include: radiological imaging modalities, DICOM standards, image management and PACS systems, image exchange and IHE, image processing techniques, content based image retrieval, structured reporting and annotations, image visualization, digital pathology and analytical pathology imaging. The course will also cover emerging technologies in Imaging Informatics.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 514: Imaging Informatics Analysis**

This course will give an overview of the analytical aspects of the Biomedical Imaging Informatics. Topics include image visualization, enhancement, processing and analysis, with focus on the applications in medical fields. It covers a broad spectrum of biomedical image analysis techniques: image enhancement, segmentation, registration, texture analysis, morphometry, and tractography. Their applications in diagnostic and therapeutic imaging will be extensively discussed. The course will also cover a wide range of image modalities: Magnetic resonance imaging (with its various subtypes), Computed tomography, Ultrasound, Positron emission tomography, Single-photon emission computed tomography, etc., with an emphasis on the interplay and fusion of multi-source information. The computation/analysis will be carried out using languages such as Matlab, C++, Python, Java, etc., based on well tested open sources algorithm packages such as the Insight Toolkit. Moreover, softwares more geared towards end-users, such as 3D Slicer, ImageJ, FreeSurfer, etc. will also be introduced.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 517: Current Research in Signaling Pathways, Biochemistry, and Tissue Morphology of Disease**

In this seminar course, students will explore current knowledge and lines of research inquiry for a disease of their choice, with respect to Signaling Pathways, Biochemistry, and Tissue Morphology. Students will learn to analyze and synthesize research literature for a particular disease topic and propose a testable hypothesis for a research project that would advance one or more lines of research inquiry for the disease. Students will provide feedback for other students' literature reviews.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 520: Data Analytics and Software Stacks**

This course will cover cutting-edge data analytic applications, infrastructure, and analytic methods. Students will have the opportunity to analyze real (de-identified) healthcare datasets and spatio-temporal and molecular datasets drawn from cancer research. Each class session will include discussions of applications, infrastructure, and algorithms. Students will present papers, and there will also be guest lectures from visiting experts. Students will attend lectures, present and critique papers, and work with a team of students on a substantial project throughout the semester. Students are expected to demonstrate

a high level of independence, critical thinking, and initiative.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 530: Software Development in Biomedical Informatics**

This is an advanced topic in the BMI series, designed for participants with plans to develop Biomedical Informatics software applications. The BMI530 course is divided in two parts. The first part will provide an overview of approaches to software development in a Biomedical context, where reproducibility, governance and availability are particular concerns. The participants will be introduced, hands-on, to practices such as the use of version control services (such as GitHub), collaborative development models (such as agile programming, extreme programming, unit testing, continuous code review, pair programming etc) and software architectural patterns (such as Model-View-Controller, MVC, and Model-View-Adapter, MVA). The increasing reliance on Cloud Computing infrastructure and Web 3.0 technologies for both software development and deployment will be object of particular attention. The increasing reliance on Big Data resources in Biomedicine, and the broadening use of Web Computing will be approached as part of the exercise of configuring class projects for the second part of the course. Accordingly, a particular focus will be put on the use of Representation State Transfer (REST) architectures and hands-on familiarization with REST APIs (Application Programming Interfaces). The second part of the course will put these concepts into practice through the development of small software projects. Groups of one to three people per project development team will be configured to develop software that solves problems brought to the class by the participants, preferably, but not necessarily, as contributions to manuscripts and/or funded research. Prerequisite: BMI 503 and programming experience, BMI 520, or permission by instructor (face-to-face meeting required).

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 531: Advanced Computer Science for Biomedical Informatics (Data Management for Biomedical Informatics)**

Data management is a key area of competency in biomedical informatics. This course will cover the concept of database design, data modeling, data management and analytical queries. Topics include relational models, conceptual modeling, relational database implementation, SQL queries, spatial database and GIS, XML databases, NoSQL databases,

and big data platforms such as Apache Hadoop and Spark. It will also cover data management for electronic health records, and GIS for public health.

*3 credits,*

*May be repeated for credit.*

### **BMI 540: Statistical Methods in Biomedical Informatics**

Recent advances in high-throughput experimental technologies generate enormous amounts of data. In order to extract insights from such large-scale data sets, robust statistical models and efficient computation methods are indispensable. This course introduces probability and statistical modeling and analytical methods commonly used in biomedical-informatics. Basic probability theory will be briefly reviewed and the course will focus on the construction and solving of statistical modeling based on real biomedical data sets. The methods covered include maximum likelihood estimation, Bayesian inference, dynamic programming, Markov Models, Monte Carlo simulation, classification and clustering. Students will learn to use statistical programs and related resources locally and on the Internet, with an emphasis on the computational aspects of the statistical models in order to harness the ever-growing hardware power. Upon finishing the course, the students will master advanced applications of statistical computing in a wide range of biological and biomedical problems. PREREQUISITES: BMI 501; Basic knowledge in probability theory, algorithms and programming experience in R/MATLAB/C/C++ are expected. Knowledge in biology is a plus but not a must.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 541: Advanced Statistical Methods Informatics**

This course will introduce students to advance statistical methods in informatics. Students will be introduced to basics of optimization, control, information geometric techniques how such methods can be applied towards problems of imaging, networks and learning. This class will be a continuation of BMI 540 and basic statistical methods and probability concepts will be reintroduced. Students learn basic ability to derive new models that can be applied to generalized informatics. Upon finishing this course, student will have master advanced application of how to utilize standard statistical knowledge coupled with ability to implement such algorithms.

*3 credits,*

*May be repeated for credit.*

### **BMI 550: Clinical Informatics Practice Patterns**

This course provides detailed information on Clinical Informatics in a variety of practice settings including hospitals, freestanding ambulatory care, managed care, dialysis, correctional facilities, long-term and acute mental health, substance abuse, developmental disabilities, long-term care, rehabilitation, home health, hospice, dental, veterinary, and consulting. The role of Clinical Informatics in each setting is described with respect to regulatory issues; documentation; reimbursement and funding; information management, including data flow, coding and classification, computer systems, and data set; quality improvement, utilization and risk management, and legal issues; the role of the Clinical Informatics professional, and changes and trends.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 551: Case Studies in Clinical Informatics**

This course presents cases based on real-life challenges in Clinical Informatics. Critical thinking is essential for the Clinical Informatics professional and case studies demand that students develop thought and action plans and then, in class, present and defend their choices. Each case exposes the student to a complex Clinical Informatics scenario, requiring the student to synthesize information and strategically solve problems using Clinical Informatics principals. Learning through the case method helps students to "bridge the gap" from content knowledge for previous and/or current courses to on-the-job Clinical Informatics experience.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 552: Quality Improvement Methods for Clinical Informatics**

Teaches health care management professionals how to perform improvement projects and incorporate quantitative measurement into daily work routines to form the foundation for a quality improvement-oriented culture. Using Minitab software, provides strategies to gather and analyze the data needed to plan, implement, monitor, and evaluate health care quality improvement initiatives.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 560: Personalized Medicine**

This course is focused on the multidisciplinary research and clinical context associated with the development of personalized health care delivery solutions. It will place particular emphasis on assessing opportunities identified by translational and operational

research of the clinical settings that define the practical utility of personalized medicine. Accordingly, the clinical decision support systems (CDS)[JA1] being developed for clinical pharmacogenomics, specifically those that establish pharmacotyping in drug prescription, will play a central role in this course. Its content will cover innovative drug formulations and nanotheranostics, molecular imaging and signatures, medical genomics[JA2], translational nanomedicine and informatics, stem cell therapy approaches, modeling and predictability of drug response, pharmacogenetics-guided drug prescription, pediatric drug dosing, pharmacovigilance and regulatory aspects, ethical and cost-effectiveness issues, pharmacogenomics knowledge bases, personal genome sequencing, molecular diagnostics, as well as information-based medicine.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 590: Independent Study in Biomedical Informatics**

Independent study in Biomedical Informatics. Must have the approval of the Research and Directed Study Committee of the Department of Biomedical Informatics prior to registration. Prerequisite: Graduate standing in BMI, or permission of instructor

*1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **BMI 591: Independent Reading in Biomedical Informatics**

Supplementary specialized readings in Biomedical Informatics for graduate students under faculty supervision. Must have the approval of the Research and Directed Study Committee of the Department of Biomedical Informatics prior to registration.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

### **BMI 592: Biomedical Informatics Masters Pre-Candidates Seminar**

This course is designed to expose students to current research and other topics in Biomedical Informatics. Speakers are invited from both on and off campus.

*1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **BMI 595: Special Topics in Biomedical Informatics**

Examination of special topics on artificial intelligence in Biomedical Informatics. We present and critique literature on artificial intelligence in biomedicine, including but not limited to machine learning, signal processing, and deep learning. The literature will span

different fields of biomedical informatics such as imaging informatics, computational biology, clinical informatics etc. Students are required to review articles and connect the presented techniques to a bigger picture context within the different fields of biomedical informatics. Following the article presentation, the thoughts that the article provoked will be discussed together.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BMI 596: Special Problems in Biomedical Informatics**

Examination of special problems in Biomedical Informatics, conducted jointly by graduate students and one or more members of the faculty.

*1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BMI 598: M.S. Capstone Project in Biomedical Informatics**

M.S. Independent Capstone project planning and project execution under the supervision of a Biomedical Informatics faculty member. Only open to M.S. students in Biomedical Informatics who will do a Capstone project. Credits earned from BMI 599 may not be used to fulfill requirements for students in Biomedical Informatics who will write an M.S. thesis and not do a Capstone project.

*1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BMI 599: M.S. Research and Thesis in Biomedical Informatics**

M.S. Research and Thesis project under the supervision of a Biomedical Informatics faculty member. Only open to M.S. students in Biomedical Informatics who will write an M.S. thesis. Credits earned from BMI 599 may not be used to fulfill requirements for students in Biomedical Informatics who will do a Capstone project and not write an M.S. thesis.

*1-12 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BMI 620: Advanced Topics in Clinical Informatics**

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and faculty. Advanced topics and specialized topics will be discussed, particularly those of current interest.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BMI 622: Advanced Topics in Translational Bioinformatics**

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and faculty. Advanced topics and specialized topics will be discussed, particularly those of current interest.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **BMI 625: Advanced Topics in Imaging Informatics**

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and faculty. Advanced topics and specialized topics will be discussed, particularly those of current interest.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BMI 690: Independent Study in Biomedical Informatics**

Independent study in Biomedical Informatics. Must have the approval of the Research and Directed Study Committee of the Department of Biomedical Informatics prior to registration.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 691: Independent Reading in Biomedical Informatics**

Supplementary specialized readings in Biomedical Informatics for graduate students under faculty supervision. Must have the approval of the Research and Directed Study Committee of the Department of Biomedical Informatics prior to registration.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 692: Biomedical Informatics Candidates Seminar**

This course is designed to expose students to current research and other topics in Biomedical Informatics. Speakers are invited from both on and off campus.

*1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BMI 695: Special Topics in Biomedical Informatics**

Examination of special topics in Biomedical Informatics, by one or more members of the faculty.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BMI 696: Special Problems in BMI**

Examination of special problems in Biomedical Informatics, conducted jointly by

graduate students and one or more members of the faculty.

*1-6 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 697: Practicum in Teaching I**

An introduction to teaching Biomedical Informatics, including course design, learning theory, evaluation of teaching, and teaching with technology.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 698: Practicum in Teaching II**

Graduate students assist the faculty in teaching by conducting recitation or laboratory sections that supplement a lecture course.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BMI 699: Dissertation Research-On Campus**

Independent research conducted on campus under the supervision of a Biomedical Informatics faculty member in support of the Ph.D. Dissertation. Permission to register requires the agreement of the faculty member to supervise the research. May be repeated

*1-12 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BMI 700: Dissertation Research-Off Campus, Domestic**

Independent research conducted off campus, in the United States, under the supervision of a Biomedical Informatics faculty member in support of the Ph.D. Dissertation. Permission to register requires the agreement of the faculty member to supervise the research. May be repeated

*1-2 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **BMI 701: Dissertation Research-Off Campus, International**

Independent research conducted off campus, outside the United States, under the supervision of a Biomedical Informatics faculty member in support of the Ph.D. Dissertation. Permission to register requires the agreement of the faculty member to supervise the research.

*1-12 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **BMI 800: Full-Time Summer Research**

Independent research conducted off campus, in the United States, under the supervision of a Biomedical Informatics faculty member in support of the Ph.D. Dissertation. Permission to register requires the agreement of the faculty member to supervise the research. May be repeated.

0-12 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

# BNB

## Neurobiology and Behavior

### BNB 551: Writing Neuroscience

Seminar course for doctoral students in Neuroscience providing practical instruction in written communication in Neuroscience. Topics include writing effective abstracts, cover letters, figure captions, and grant specific aims, among others.

1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### BNB 552: Neurobiological Techniques

A series of laboratory exercises designed to give students hands-on experience in the basic laboratory techniques of contemporary neuroscience. Includes intracellular and extracellular recording, neuronal tissue culture, neuroanatomical techniques, and integrative physiology.

Fall, 2 credits, Letter graded (A, A-, B+, etc.)

### BNB 555: Laboratory Rotations in Neuroscience

Course for doctoral students in Neuroscience in which students participate in three formal laboratory rotations in program faculty laboratories during the first year. Student make oral presentations for each rotation. Instruction is provided in how to organize and present material in a seminar format, including the proper use of visual aids. Enrollment restricted to students in the Graduate Program in Neuroscience.

Fall and Spring, 0-5 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.

### BNB 560: Introduction to Mammalian Neuroanatomy

This course consists of visual presentations and supplemental lectures providing an overview of the structural organization of the nervous system. The mammalian nervous system and its sensory, motor and cognitive components are emphasized. Opportunities for examination of whole brains and historical sections, and some hands-on experience with basic neuroanatomical techniques may also be available.

1 credit, Letter graded (A, A-, B+, etc.)

### BNB 561: Introduction to Neuroscience I

First of a two semester core course introducing students to basic principles of neuroscience.

The major focus is cellular and molecular neuroscience. Topics covered include the ionic basis of resting potentials and electrical excitability, the structure, function and molecular biology of voltage- and ligand-gated ion channels, exocytosis, cellular networks, and gene regulation.

4 credits, Letter graded (A, A-, B+, etc.)

### BNB 562: Introduction to Neuroscience II

Second of two-semester core course introducing students to basic principles of neuroscience. The major focus is systems neuroscience. Topics covered include analyses of all major sensory systems, motor systems, and systems mediating higher order, cognitive functions in the nervous system.

4 credits, Letter graded (A, A-, B+, etc.)

### BNB 563: Advanced Topics in Neuroscience: Individual Learning Plans

In this 12 hour module course, students will work with an identified faculty preceptor on an agreed upon topic of interest. Agreement of preceptor and an outline of the topic must be submitted to and approved by the Course Director in order for students to register for this class. Students and preceptors will work together to develop a reading list (minimum 6-10 papers) from the primary literature that adequately covers the topic. Students will present two or more of these papers in journal club format to the preceptor and to a larger group, e.g., a lab group, as applicable. Students will also synthesize their readings into a written report that follows one of the following Nature Reviews Neuroscience formats (below, but strict adherence to word limits, reference numbers, etc., is NOT expected). NOTE: Students and their research faculty mentors are strongly encouraged to consider using this as a vehicle for beginning to develop the Introduction to the thesis/thesis proposal. Offered:

Fall, 1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.

### BNB 564: Advanced Topics in Neuroscience: Curriculum Development

In this 12 hour module course, students will work with an identified faculty preceptor on an agreed upon topic of interest that addresses a gap in the current Graduate Program in Neuroscience curriculum. Agreement of preceptor and an outline of the topic selected must be submitted to and approved by the Course Director in order for students to register for this class. Students and preceptors will work together to develop a course

based on the selected topic. Students will first investigate principles of curricular design. They will follow these in generating a course description, a list of overall learning objectives, and a detailed syllabus that identifies the titles, learning objectives and required background readings for each of the course's sessions. Required readings much include both texts and the primary literature. Students will also generate the in-class materials for at least two class sessions. One must be a Powerpoint for a standard lecture, and one must be any materials needed for some form of active learning (individual or group) of the material. Finally, students must identify the means that students will be evaluated, and identify how these methods will demonstrate achievement of the stated learning objectives, keeping in mind that the form of evaluation will differ depending on whether objectives are related to knowledge, skills, etc. NOTE: Students and their research faculty mentors are strongly encouraged to consider using this as a vehicle for delving deeply into a topic or technique of interest that is relevant to the thesis/thesis proposal. Offered:

Fall, 1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### BNB 565: Advanced Neuroscience

A modular course introducing concepts in the development of the nervous system. Topics can include neuroembryology, neuronal differentiation, synapse formation, and specificity and plasticity of connections in vertebrates and invertebrates.

Offered

Fall, 1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### BNB 566: Neurobiology of Disease

This advanced seminar course is coordinated with the Neurobiology of Disease lecture series hosted by the Program in Neuroscience each Spring semester. The Program invites 5-6 distinguished scientists to present research seminars organized around the broad topic of neurobiological and neurological diseases. Students read and discuss papers recommended by the guest speakers. This course also provides students the opportunity to meet with the guest seminar speakers.

Offered

Spring, 1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.

### BNB 567: Statistics and Data Analysis in Neuroscience I: Foundations

This course will introduce students to the fundamental principles and methods of the statistical analysis of neural and behavioral data. A major focus of the course will be

on how to properly design experiments to test hypotheses, how to avoid common misconceptions and errors in data analysis and how to report statistics correctly in manuscripts submitted for publication. This course will aim at providing a rigorous foundation of general statistical principles that can be applied generally, with an emphasis on material of high relevance to biology and neuroscience. A companion course (Statistics and data analysis for neuroscience II: Applications) will turn to selected applications to neuroscience. The students will also have the opportunity to hone their statistics skills by analyzing different types of datasets (genetic, molecular, cellular, synaptic, imaging, spike and behavioral) in the MATLAB (or similar) computing environment.

*2 credits, Letter graded (A, A-, B+, etc.)*

### **BNB 568: Statistics and Data Analysis in Neuroscience II: Applications**

This course will introduce students to modern tools for data analysis that are highly relevant for biology and neuroscience. Each application is studied starting from a specific question that the researcher in neuroscience is likely to encounter during his/her research activity. The emphasis will be on practical problems and how to solve them while avoiding the pitfalls of common misconceptions in statistics that may lead to statistical malpractice. The students will also have the opportunity to hone their statistics skills by analyzing different types of datasets (among genetic, molecular, cellular, synaptic, imaging, spike and behavioral) in the MATLAB (or similar) computing environment.

*2-3 credits, Letter graded (A, A-, B+, etc.)*

### **BNB 597: Seminar Themes**

This course focuses on current research topics in neuroscience and is integrated with the Neuroscience Seminar Series. It is centered on a common research theme. Students discuss manuscripts, attend seminars and meet with outside speakers.

*Offered Fall/*

*Spring, 1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **BNB 599: Research**

Original investigation undertaken with supervision of a member of the staff.

*Fall and Spring, 1-12 credits, S/U grading  
May be repeated for credit.*

### **BNB 655: Neuropharmacology**

An advanced course for graduate students interested in developing an understanding of neuropharmacology and research on this

topic. Following a general introduction to the nerve cell structure, synaptic and chemical transmission, three themes receptors, receptors as channels, and G-protein-coupled receptors are developed. Recent advances in cell and molecular biology provide the framework for instruction and discussion. This course is offered as both HBH 655 and BNB 655. Prerequisite: Admission to Graduate Health Sciences Center Program.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **BNB 697: Neuroscience Seminar Series**

Seminar presentations delivered by faculty, associates, students and visiting speakers.

*Fall and Spring, 0-2 credits, S/U grading  
May be repeated for credit.*

### **BNB 699: Dissertation Research on Campus**

Original investigations undertaken as part of the Ph.D. program under the supervision of the dissertation committee. Prerequisite: Must be advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, and Summer, 1-9 credits, S/U grading  
May be repeated for credit.*

### **BNB 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **BNB 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be

covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.  
Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **BNB 800: SUMMER RESEARCH**

*May be repeated for credit.*

## **BSB**

### **Biochemistry and Structural Biology**

#### **BSB 509: Experimental Biochemistry and Structural Biology**

An introduction to modern biochemical research techniques. The student spends a half-semester in the laboratory of each of four different members of the faculty. In each laboratory, the student participates in some aspect of the research being pursued by the faculty member. Prerequisite: Must be matriculated in BSB Graduate Program or permission of instructor. Fall

*1-9 credits, Letter graded (A, A-, B+, etc.)*

#### **BSB 510: Experimental Biochemistry and Structural Biology**

An introduction to modern biochemical research techniques. The student spends a half-semester in the laboratory of each of four different members of the faculty. In each laboratory, the student participates in some aspect of the research being pursued by the faculty member. Prerequisite: Must be matriculated in BSB Graduate Program or permission of instructor. Spring

*1-6 credits, Letter graded (A, A-, B+, etc.)*

#### **BSB 512: Structural Biology and Spectroscopy**

Theoretical principles and experimental methods used in the study of proteins and nucleic acids, e.g., spectroscopy, magnetic resonance and diffraction.

*Prerequisites: MCB 520, or undergraduate physical chemistry course, plus matriculation in graduate program or permission of instructor.*

*Fall, 2 credits, Letter graded (A, A-, B+, etc.)*

#### **BSB 515: Computational Methods in Biochemistry and Structural Biology**

Computational methods used in sequence searching and analysis, bioinformatics, graphical analysis of proteins, and nucleic

acids. Prerequisite: This class is restricted to first year BSB, HBM, MCB PHD, & HBH PhD students. Exception requires approval from the course instructor.

*Fall, 1 credit, S/U grading*

### **BSB 532: Journal Club in Biochemistry and Structural Biology**

Provides students with a forum for acquiring skills involved in the critical analysis and presentation of scientific data by active participation in seminars of major topics in structural biology and biochemistry, and critical discussion of selected topics with presentation of papers from the literature. Prerequisite: Must be matriculated in BSB Graduate Program or permission of instructor

*1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **BSB 580: Advanced Structural Biology/ Structural Methods in Drug Discovery**

This course is designed for students that want to gain theoretical and practical experience in macromolecular structure determination through NMR spectroscopy and/or X-ray crystallography. The course is organized into two modules: NMR spectroscopy and X-ray crystallography. Students may elect to take one or both modules. Emphasis will be placed on practical aspects of structural determination, including sample preparation, data collection and processing. In each of the modules, students will be guided through a complete structural determination project. A final project report per module will be required. Familiarity with Linux is desirable. Students are encouraged to contact instructors prior to enrolling. Crosslisted as BSB580 and HBH585.

*Spring, 0-4 credits, S/U grading*

### **BSB 581: Teaching Honors**

Selected students whose performance in the basic required courses for the graduate program is in the top 10 percent conduct tutorials for first-year graduate students in the program and other students taking graduate courses for credit. The tutors are supervised and graded by faculty of the graduate program. Successful completion of this course makes students eligible to receive "Honors in Teaching" on their transcripts.

*Fall and Spring, 1 credit, S/U grading*

### **BSB 599: Research**

Original investigation undertaken with the supervision of a faculty member.

*Prerequisite: Must be matriculated in BSB Graduate Program or permission of instructor*  
*Fall and Spring, 1-12 credits, S/U grading*

*May be repeated for credit.*

### **BSB 601: Colloquium in Biochemistry and Structural Biology**

A weekly series of talks and discussions by visiting scientists covering current research and thinking in various aspects of structural biology and biochemistry.

*Prerequisite: Must be matriculated in BSB Graduate Program or permission of instructor.*

*Fall, 0-1 credits, S/U grading*

*May be repeated for credit.*

### **BSB 602: Colloquium in Biochemistry and Structural Biology**

A weekly series of talks and discussions by visiting scientists covering current research and thinking in various aspects of structural biology and biochemistry.

*Prerequisite: Must be matriculated in BSB Graduate Program or permission of instructor.*

*Spring, 0-1 credits, S/U grading*

*May be repeated for credit.*

### **BSB 603: Student Seminars in Biochemistry and Structural Biology**

Seminars given by graduate students on the progress of their own thesis research. Required of all students every semester in which they are registered in the Graduate Program in Biochemistry and Structural Biology. Attendance is mandatory. Visitors are welcome.

*Prerequisite: Must be matriculated in BSB Graduate Program or permission of instructor.*

*Fall and Spring, 1 credit, S/U grading*

*May be repeated for credit.*

### **BSB 604: Student Seminars in Biochemistry and Structural Biology**

Seminars given by graduate students on the progress of their own thesis research. Required of all students every semester in which they are registered in the Graduate Program in Biochemistry and Structural Biology. Attendance is mandatory. Visitors are welcome.

*Prerequisite: Must be matriculated in BSB Graduate Program or permission of instructor.*

*Fall and Spring, 1 credit, S/U grading*

*May be repeated for credit.*

### **BSB 699: Dissertation Research on Campus**

Original investigations undertaken as part of the Ph.D. program under supervision of a research committee.

*Prerequisite: Advancement to candidacy (G5).*

*Major portion of research must take place on SBU campus, or at the Brookhaven National Laboratory.*

*Fall, Spring, and Summer, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **BSB 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Prerequisite: Must be matriculated in BSB Graduate Program or permission of instructor*

*Fall, Spring, 0-9 credits, S/U grading*

*May be repeated for credit.*

### **BSB 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*Prerequisite: Must be matriculated in BSB Graduate Program or permission of instructor*

*Fall, Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **BSB 800: SUMMER RESEARCH**

Prerequisite: Must be matriculated in BSB Graduate Program or permission of instructor

*S/U grading*

*May be repeated for credit.*

## **BUS**

### **Business Management**

#### **BUS 510: Biotechnology Startups and Operations**

A startup is not a smaller version of a large biotech company. Instead, it is a team testing a business plan for viability. In this course, students will learn about the operational side of a biotech startup, with particular focus on the first steps an entrepreneur must take

through to the initiation of a Phase I clinical trial. The goal of this course is not to gain expertise in all areas; rather students will be familiar with all of the varied topics a startup must consider and be better prepared to work holistically within a startup environment. Future CEOs will have a better understanding of the myriad topics they must form a team to address, patent attorneys will understand regulatory needs, and clinical trial coordinators will recognize the needs of the marketing department. For additional information on evaluating technologies and marketing strategies, students are encouraged to take BME-511 and BME-512 as part of the Bio-Based Entrepreneurship Advanced Graduate Certificate (BBE-AGC). Prerequisite: BME 511

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BUS 520: Law and Foreign Policy in International Business**

Law and Foreign Policy in International Business is designed to provide MBA candidates with an appreciation for the legal regimes and foreign policy issues affecting international business in the 21st Century. The course is designed for non-lawyers, and does not require any previous legal training or familiarity with legal concepts. For each topic, students will consider not only descriptive and practical considerations, such as the substance of a law, the mechanics of the relevant institutions, enforcement regimes, etc., but also normative and ethical questions. The course will rely heavily on current affairs and case studies drawn from the headlines. Although the course will focus predominantly on international regimes and U.S. laws and policies, we will, when appropriate, compare U.S. legal regimes and policies to those in other countries.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BUS 545: Ethics and Health Care**

This course provides students with a framework for identifying ethical dilemmas in professional health care settings and the skills and resources for addressing them. The course introduces students to the importance of respecting patient's rights, maintaining confidentiality and honoring professional codes of ethics and provides students with an ethical foundation for working as a professional in a health care environment. Prerequisite: Enrolled in Healthcare Management

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BUS 554: The Lean Launch Pad: Turning a great idea into a great company**

This course provides real world, hands-on learning of what it's like to actually start a high-tech company. This class is not about how to write a business plan, and the end result is not a PowerPoint presentation to venture capitalists. Instead, students will get their hands dirty talking to customers, partners and competitors as they encounter the chaos and uncertainty of how a startup actually works. Students work in teams learning how to turn a great idea into a great company. They will learn how to use a business model to brainstorm each part of a company and customer development to get out of the classroom to see whether anyone other than themselves would want/use their product. Finally, they will see how agile development can help them rapidly iterate their product to build something customers will use and buy. Offered in Fall and Spring. Cross-listed with EST 534.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **BUS 567: Intellectual Property Strategy**

Concepts and techniques of strategic management are examined and applied to relevant cases involving the management of intellectual property as applied to a wide range of industries and innovations. From targeted genomic medications based on new nanotechnologies to the Harry Potter series, the monetization of the creative output of scientists, artists, designers, writers, publishers, product designers, directors and so on all involve the use of one or more forms of intellectual property. The course will begin with a brief overview/review of some principals of management strategy. There will then be a survey of the types of intellectual property, and some of the laws that support exclusivity in intellectual property rights. Students will explore the use and importance of intellectual property rights by companies and individual innovators in building and sustaining a competitive advantage, as well as strategies used to realize the highest value from intellectual property. Prerequisite: MBA 501

*3 credits, Letter graded (A, A-, B+, etc.)*

## **CAR**

### **Career Development**

#### **CAR 551: Career & Life Design For Grad Students**

Created specifically for graduate students pursuing alt-ac career options, this accelerated course takes you through the four stages of career development using the design-thinking process. Starting with an assessment of where

you are now in your career thinking, your worldview/life view, values and strengths, you will engage in a series of discussions, personal reflections, and ideations to prototype and prepare to pursue career options.

*0-1 credits,*

## **CHE**

### **Chemistry**

#### **CHE 501: Instrumental Methods in Chemistry**

Practical and theoretical aspects of instrumentation in chemistry. The primary emphasis is on contemporary methods of molecular structure determination such as X-ray crystallography, NMR, IR, and MS. Other topics may also be presented.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 502: Mechanisms and Strategies in Organic Synthesis**

This course will focus on (1) the meaning and practice of writing organic reaction mechanisms and (2) standard synthetic reactions, their mechanisms, and modern refinements. Examples and applications will be presented. The course will also discuss biomimetic syntheses and the use of mechanism in designing total syntheses.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 503: Synthetic Organic Chemistry**

A survey of the most important organic reactions from the viewpoint of synthetic utility, including many recent innovations in this field. Throughout the discussion of these methods, emphasis is placed upon their use in the synthesis of complex organic structures.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 504: Structure and Reactivity in Organic Chemistry**

Electronic and stereochemical theories relating to organic structure and reactions. Topics such as bonding, strain, aromaticity, MO theory, molecular rearrangements, pericyclic reactions, and photochemistry are covered. This course is intended to provide a foundation of knowledge at the beginning graduate level as preparation for advanced subjects in CHE 502 and CHE 503, and is complementary to CHE 501.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 511: Structural Inorganic Chemistry**

Properties and reactions of inorganic compounds are considered from the viewpoint of molecular and electronic structure. The modern bonding theories used in inorganic chemistry including molecular orbital, valence bond, and ligand field theories are developed using symmetry and group theory. Selected main group, transition metal, and organometallic compounds are discussed. An introduction to crystallography and solid-state structure is included.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 514: Transition Metal Chemistry**

A survey course with an emphasis on the transition metals. Reaction mechanisms, synthesis, and structure are covered. Specific areas of concern include coordination chemistry, organometallic chemistry, bioinorganic chemistry, and selected topics from solid-state and non-transition metal chemistry.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 515: Advanced Inorganic Chemistry**

A topical course with an emphasis on the current literature. Subject matter varies and is announced in advance. Possible subjects include reaction mechanisms, organometallic chemistry, bioinorganic chemistry, and physical inorganic chemistry. May be repeated as the subject matter varies.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **CHE 516: Solid-State Chemistry**

This course will provide an introduction to structure and bonding in solid materials. This class will survey the important structural classes of periodic solids and will discuss space groups and the crystallographic symmetry elements important to these materials. Topics that will be covered may include, but are not limited to: (i) The mechanisms by which crystals grow and common types of defects. (ii) An introduction to the basics of band theory. (iii) An overview of the important synthetic methods for preparing solid state materials in nanocrystalline, powder, thin film, and single crystal form. (iv) A survey of the important techniques for assessing the composition, homogeneity, and crystallinity of materials (such as SEM, TEM, AFM, STM), with an emphasis on powder x-ray diffraction.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 517: Structural Chemistry**

Much of chemistry is concerned with the properties of atoms and molecules that are too small to see directly. This course will cover a variety of advanced techniques for elucidating the atomic-scale structure of molecules and periodic solids. A central technique is diffraction, which probes periodic arrays. The mathematical basis for diffraction will be presented, followed by practical examples of obtaining atomic coordinates from diffraction data (powder and/or single crystal). Other techniques that may be covered include the analysis of local structure in partially ordered or disordered solids (via techniques such as PDF, EXAFS, small angle scattering, or solid state NMR), and the basis of more complex diffraction experiments (neutron/electron diffraction, energy-dispersive/Laue diffraction, and diffraction under extreme pressure/temperature conditions).

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 518: Materials Chemistry**

Our high technology world is driven forward by advances in materials chemistry. This class will discuss the origin of this technology, covering the synthesis, structures, and properties of advanced materials. These materials will be studied from a multidisciplinary perspective, since the knowledge required for their development spans more than one traditional academic discipline. This class will focus on broad topics with great current societal importance (energy, computing, nanoscience, etc.), and will discuss the materials at the heart of our present technology as well as novel classes of materials being developed for future technology applications. Specific topics may include batteries, fuel cells, catalysts, metallic conductors, semiconductors, superconductors, permanent magnets, magnetic films.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 519: Electrochemistry and Electrochemical Materials Science**

This course will survey electrochemistry and electrochemical materials science. Topics will include fundamental measurements in electrochemistry, galvanostatic and potentiostatic methods, the electrochemical double layer, corrosion and passivation. Relevant applications such as fuel cells, batteries, and supercapacitors will be discussed.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 521: Quantum Chemistry I**

Quantum theoretical concepts are discussed. Schrodinger wave mechanics and related mathematical techniques are illustrated by treatment of systems of chemical interest. Designed to form the theoretical basis for the study of chemical bonding, molecular structure, spectroscopy, and molecular collision phenomena.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 522: Molecular Spectroscopy**

A detailed description of the theory and practice of molecular spectroscopy. Topics include the interaction of molecules with electromagnetic radiation and the time evolution of molecular energy states.

*Prerequisite: CHE 521*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 523: Chemical Thermodynamics**

A rigorous development of the fundamentals of thermodynamics and its application to a number of systems of interest to chemists, such as electrochemical cells, gases, and homogeneous and heterogeneous equilibrium. An introduction to statistical mechanics will also be included.

*Fall, 1-3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 524: Magnetic Resonance**

This course provides an introduction to the fundamental quantum mechanics of the magnetism of spin-1/2 (and higher) particles. It includes a study of the Bloch equations (the responses of the magnetism to continuous-wave and pulsed irradiation) and a discussion of the experimental hardware and techniques commonly employed. Topics covered include the basics of the spin Hamiltonian (chemical shifts, J, dipolar, and quadrupolar couplings), dynamics and relaxation 1-D spectroscopy (spin and chemical exchange, lineshapes, spin echos, etc.), 2-D spectroscopy (homonuclear and heteronuclear correlation), techniques for studies of solids and liquid crystals (magic angle spinning, cross polarization, quadrupolar echo), and the principles of magnetic resonance imaging. Applications to the biological and material sciences, as well as chemical problems, will be discussed.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHE 525: Theoretical Chemistry**

This course stresses the physical theory underlying chemical phenomena. Special emphasis is given to advanced topics in electronic structure theory, molecular dynamics, condensed matter and surfaces,



many-body and quantum ensemble theory, and the interaction of light and molecules.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 528: Statistical Mechanics**

Statistical theory of equilibrium systems and rate processes. Ensemble theory, spatial and time correlation functions. Model systems and methods of estimating their properties. Designed to enable the student to use the current literature dealing with application of statistical mechanics to problems in chemistry.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 529: Quantitative Analysis of Materials**

This course provides a brief overview of several quantitative approaches to characterizing materials, including small-angle X-ray and neutron scattering (SAXS/ SANS), fitting scattering data, colloidal phase behavior, dynamic light scattering (DLS), light scattering microrheology, crystallography and diffraction, grazing-incidence small-angle scattering (GISAXS), X-ray correlation photon spectroscopy (XPCS), and X-ray imaging and microscopy.

*Spring, 0-3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 530: Physical Chemistry of Macromolecules**

An investigation of the gross and fine structures of macromolecules and molecular aggregates in solution as revealed by hydrodynamic behavior (e.g., ultracentrifugation, viscosity), light scattering, spectroscopic properties (e.g., ultraviolet hypochromism, circular dichromism, Raman, fluorescence, magnetic resonance spectra), and the thermodynamics and kinetics of interaction with small molecules and ions. Theory of conformation changes and phase transitions.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 534: Computing in Chemistry**

The basic elements of scripting, design of computer programs, and numerical analysis are discussed within the framework of solving a variety of exciting problems chosen from all areas of chemistry. Topics include automation of repetitive tasks, fitting of data, numerical integration of rate equations, signal and image analysis, and quantum chemistry. No previous knowledge of computer programming is assumed.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 535: Introduction to Computational Structural Biology and Drug Design**

This course will provide an introduction to Computational Structural Biology with application to Drug Design. Methods and applications that use computation to model biological systems involved in human disease will be emphasized. The course aims to foster collaborative learning and will consist of presentations by the instructor, guest lecturers, and by course participants with the goal of summarizing key methods, topics, and papers relevant to Computational Structural Biology.

*Fall, 0-3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 536: Molecular Modeling of Biological Molecules**

This course is designed for students who wish to gain hands-on experience modeling biological molecules at the atomic level. In conjunction with the individual interests, Molecular Mechanics, Molecular Dynamics, Monte Carlo, Docking (virtual screening), or Quantum Mechanics software packages can be used to study relevant biological system(s). Projects will include setup, execution, and analysis. Course participants will give literature presentations relevant to the simulations being performed and a final project report will be required. Familiarity with UNIX (Linux) is desirable.

*Prerequisite: CHE 535 or permission of instructor*

*Spring, 0-3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 541: Biomolecular Structure and Analysis**

The structures of biological macromolecules and the relationship of their structure to biological function are described. Methodology employed to study macromolecules is also discussed. Topics include chemical and physical properties of cell and tissue constituents, including carbohydrates, lipids, nucleic acids, proteins and peptides. May not be taken by students with credit for MCB 520. Prerequisite: Strong foundation in physical and organic chemistry.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 542: Chemical Biology**

The reactivity and physiological function of biological macromolecules and their cofactors are described at the chemical biochemical level. The emphasis of this course reflects recent advances in chemical biology. Possible topics include catalysts, reaction mechanisms, correlation between three-dimensional

structure and reactivity, receptor-ligand interactions in extracellular and intracellular signaling, protein folding in vitro and in vivo.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 543: Chemical Approaches to Biology**

The use of molecular concepts and methodology to solve problems in biology and medicine. The course covers methods to elucidate and control biological systems. Possible topics include chemical genomics, metabolomics, and chemotherapeutics.

*Prerequisite CHE 542*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 558: Physical Biology**

This is a course on the principles of physical chemistry. We describe the nature of the forces and energies and entropies that drive molecular systems toward their states of equilibrium. We consider a broad range of applications throughout chemistry, biology, materials engineering and nanoscience. This course aims to give students an understanding of how the actions and behaviors of materials arise from their atomic and molecular structures. Co-listed with PHY 558

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 559: Biological Dynamics and Networks**

This course will provide a solid foundation in key theoretical concepts for the study of dynamics in biological systems and networks at different scales ranging from the molecular level to metabolic and gene regulatory networks. Topics of this course include but are not limited to: Physical kinetics; Diffusion/Smoluchowskii; Random flights; Waiting times; Poisson; Brownian ratchets; Chemical kinetics; Transition states; Stability, bifurcations, pattern development; Noise in cells: intrinsic and Extrinsic; Feedback; Biological Oscillators; Recurrence, period doubling, chaos; Networks; Topologies; Degree distribution, betweenness; Models of nets: Erdos-Renyi, scale-free, social, Watts-Strogatz, agents; Robustness, highly-optimized tolerance, bowties, epidemics; Biological networks: Protein-protein nets, regulatory and metabolic nets; Known biological circuits and their behaviors; How networks evolve: Preferential attachment, rewiring; Power laws; Fluxed through networks; Information and communication, entropy; Metabolic flux analysis; Artificial and Natural selection for traits; Darwinian evolution; Population dynamics.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**CHE 581: Departmental Research Seminar**

Meetings in which first-year graduate students learn about the research activities of the departmental faculty.

*Fall, S/U grading*

**CHE 582: Literature Seminar**

Students select and discuss topics from the current literature.

*Spring, Letter graded (A, A-, B+, etc.)*

**CHE 586: Professional Skills for Scientists**

Development and refinement of the professional skills used by scientists: An exploration of more sophisticated presentation skills used in oral and poster presentations; incorporation of collaborative problem solving that mimics real world situations, including simple proposal writing; exposure to professional societies and meetings; an exploration of career options and employment resources; tips for resume preparation and interviews. Recommended for upper division undergraduates and masters students. Winter, 2 credits, ABCF Grading

*2 credits, Letter graded (A, A-, B+, etc.)*

**CHE 588: Graduate Workshop**

Additional problem solving and team learning on topics from a concurrent formal graduate course. Topics vary.

*Fall and Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

**CHE 589: Directed Study**

Subject matter varies according to needs of student.

*Fall and Spring, 0-12 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**CHE 590: M.S. Term Paper**

Seminar leading to a term paper on a selected topic in chemistry, chemical applications, or chemical pedagogy.

*Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**CHE 591: Chemistry of the Environment**

This course provides an overview of the chemistry of environmental processes, environmental degradation, remediation and abatement processes, and energy production. Past actions and current efforts of the chemical enterprise in both exacerbating and addressing

anthropogenic environmental degradation are discussed.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CHE 593: Chemical Demonstrations**

The design and implementation of demonstrations to illustrate modern concepts of chemistry.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CHE 596: Teaching and Learning Chemistry**

The objective of CHE 596 is to better prepare students for the kinds of interactions they are likely to have in their careers when communicating their chemistry. Specifically, this course will help students to: (i) develop competency with research-based approaches to facilitating discourse that is generative for improving scientific understandings of chemistry phenomena; (ii) recognize the importance of representations in chemistry and to incorporate a more explicit modeling perspective and approach for developing scientific literacy; (iii) develop teaching strategies to effectively communicate abstract and complex chemical concepts to advise expert and non-expert audiences; (iv) develop curricular interventions aimed at improving individual and community practice of challenging conceptual ideas; (v) incorporate historical and philosophical perspectives on the development of fundamental chemical principles into the teaching of those topics in diverse settings; (vi) become aware of recent developments in the learning progressions literature to inform understanding of appropriate curriculum planning and implementation; and (vii) develop an identity towards reflective practice and empowerment of fellow chemistry educators into positions of leadership.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CHE 597: M.S. Research Thesis Development**

This course provides a structured environment for students to develop their research project into a written thesis. Students will receive instruction and guidance in performing literature research related to their project and in developing this background material along with their own research into a properly written document.

*3 credits, S/U grading  
May be repeated for credit.*

**CHE 598: Professional Masters Internship**

Participation in private corporations, public agencies, or non-profit institutions for research

and other experiential training activities related to the completion of a Master term paper. Students will be required to have a faculty coordinator as well as a contact in the outside organization, to participate with them in regular consultations on the project, and to successfully complete CHE 590. Prerequisites: Permission of Master's Program Director. 0-12 credits, S/U grading May be repeated for credit Offered

*Fall, Spring, and Summer, 0-12 credits, S/U grading*

*May be repeated for credit.*

**CHE 599: Research**

*Fall, Spring, 1-12 credits, S/U grading  
May be repeated for credit.*

**CHE 602: Special Topics in Physical Organic Chemistry**

The subject matter varies depending on interests of students and staff. It may cover such areas as photochemistry, theoretical organic chemistry, and the chemistry of unstable intermediates; the emphasis is on fundamental considerations and recent developments.

*1-12 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**CHE 603: Special Topics in Bioorganic Chemistry**

The subject matter varies depending on interests of students and faculty. Possible topics include asymmetric synthesis and natural product synthesis.

*Fall, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**CHE 606: Special Topics in Synthetic Chemistry**

*May be repeated for credit.*

**CHE 607: Modern Drug Design & Discovery**

A seminar course covering modern aspects and approaches to drug design. This course combines presentations by faculty and by industry representatives to provide a cross-disciplinary view of the development of pharmaceuticals.

*Fall, 1-3 credits, Letter graded (A, A-, B+, etc.)*

**CHE 610: Practicum in Teaching**

Practice instruction in chemistry at the undergraduate level, carried out under faculty orientation and supervision. A minimum of two semesters of CHE 610 or 611 is required of all candidates for graduate research degrees

in chemistry, unless explicitly waived by the chairperson.

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CHE 611: Practicum in Teaching**

Practice instruction in chemistry at the undergraduate level, carried out under faculty orientation and supervision. A minimum of two semesters of CHE 610 or 611 is required of all candidates for graduate research degrees in chemistry, unless explicitly waived by the chairperson.

*Fall and Spring, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **CHE 619: Critical Readings of Current Topics in Chemistry**

Recent research papers from the literature will be analyzed in depth. These papers may originate from the inorganic, organic, physical, and/or biochemical literature. The exact topic of the course is announced in advance. Fall and Spring

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **CHE 625: Molecular Structure and Crystallography**

Experimental methods in the determination of molecular structure. The emphasis is on the determination of structure in the solid state, particularly by X-ray crystallography. Students complete a single-crystal molecular structure determination using modern diffractometer techniques.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 641: Organometallic Chemistry**

A systematic presentation of the chemistry of organometallic compounds, particularly those of the transition metals. Topics include structure, bonding, reaction mechanisms, synthesis, and applications in catalysis and organic synthesis.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CHE 682: Special Topics in Inorganic Chemistry**

Subject matter varies, depending on interests of students and staff, but covers recent developments in inorganic chemistry.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **CHE 683: Special Topics in Physical Chemistry**

Subject matter varies, depending on interests of students and staff, but covers recent

developments and advanced topics in physical chemistry.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CHE 690: Internship in Dissertation-Related Research**

Supervised curricular training in dissertation-related research. Prerequisite: For full-time: Summer session or advancement to candidacy; Permission of Graduate Program Director.

*Fall and Spring, 1-3 credits, S/U grading  
May be repeated for credit.*

### **CHE 693: Physical Chemistry Seminar**

*Fall and Spring, 0-12 credits, S/U grading  
May be repeated for credit.*

### **CHE 694: Biological Chemistry Seminar**

*Fall and Spring, 0-12 credits, S/U grading  
May be repeated for credit.*

### **CHE 695: Inorganic Chemistry Seminar**

*Fall and Spring, 0-12 credits, S/U grading  
May be repeated for credit.*

### **CHE 696: Organic Chemistry Seminar**

*Fall and Spring, 0-12 credits, S/U grading  
May be repeated for credit.*

### **CHE 697: Seminar in Physical and Quantitative Biology**

Fall and spring, 0-1 credits, S/U grading.  
*0-1 credits, S/U grading  
May be repeated 1 times FOR credit.*

### **CHE 698: Colloquium**

*Fall and Spring, 0-12 credits, S/U grading  
May be repeated for credit.*

### **CHE 699: Dissertation Research on Campus**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, and Summer, 1-9 credits, S/U grading  
May be repeated for credit.*

### **CHE 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate

student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **CHE 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.  
Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **CHE 800: SUMMER RESEARCH**

*May be repeated for credit.*

## **CHI**

### **Chinese Language**

#### **CHI 501: Advanced Chinese I**

An advanced course in Chinese as a foreign or heritage language to strengthen their ability to understand, speak, read, and write Chinese beyond the intermediate level. Students learn to read and comprehend a variety of texts from Chinese newspaper/magazine articles, TV/films, and literary works and to write creatively and professionally in Chinese using sophisticated vocabulary and advanced Chinese characters. Student will also be trained to comprehend authentic spoken Mandarin Chinese, using a variety of audio-visual materials and to communication in Mandarin Chinese, applying appropriate socio-cultural norms.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CHI 502: Advanced Chinese II**

The second part of an advanced course in Chinese as a foreign or heritage language to strengthen their ability to understand, speak, read, and write Chinese beyond the intermediate level. Students learn to read and comprehend a variety of texts from Chinese newspaper/magazine articles, TV/films, and

literary works and to write creatively and professionally in Chinese using sophisticated vocabulary and advanced Chinese characters. Students will also be trained to comprehend authentic spoken Mandarin Chinese, using a variety of audio-visual materials and to communicate in Mandarin Chinese, applying appropriate socio-cultural norms. This course is not intended for students who already speak Chinese natively.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CHI 511: Readings: Journalistic Chinese**

Narrative readings in Chinese selected from Chinese newspapers and magazines, including news reports and narrations on lifestyles, people, and landscapes. Students are expected to improve their skills in the analysis and writing of narrative readings. This course is designed for students who already have advanced level proficiency in Chinese, who can read and write everyday vernacular Chinese, but who have not been exposed to more formal language and literary forms.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CHI 512: Readings in Classical Chinese**

Introduction to writings in Chinese that appeared before the May 4th Movement (circa 1920), which marked the beginning of modern Chinese. The course introduces students to readings in classical Chinese and to acquaint students with cultures and customs of traditional China. This course is designed for students who already have advanced level proficiency in Chinese, who can read and write everyday vernacular Chinese, but who have not been exposed to more formal language and literary forms.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CHI 521: Chinese Poetry & Short Stories**

### **CHI 526: Structure of Mandarin Chinese**

Mandarin Chinese is only one of a very few contemporary languages whose history is documented in an unbroken tradition extending back to the second millennium BC. At the same time, it has more speakers than any other language spoken in the modern world. This course provides an introduction to the phonology, morphology, syntax, semantics, and writing system of the Mandarin Chinese language. It is designed to familiarize students with some fundamental knowledge of the structure of spoken and written Mandarin Chinese. Specifically, it aims to enable the

students to acquire an understanding of basic methods used by linguists to observe and gather Mandarin Chinese data, to delineate structural properties with regard to the sound, tone, word, grammar, and discourse of the language, and to develop a basic typological comparison between Mandarin Chinese and English.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CHI 545: Learning of Asian Languages**

This course will analyze the cognitive processes involved in the acquisition of Asian languages as second or foreign languages. We will start with a discussion of first language acquisition and compare it with second language acquisition (SLA). Methodologies such as contrastive analysis and error analysis, and concepts such as interlanguage, native and non-native competence, bilingual competence, acceptability, correctness, standard language will be critically examined. We will also consider the variables that affect SLA, including age, context, exposure, attitude, cognition, attention and motivation. Special attention will be given to the applicability of current research paradigms and findings to the acquisition of languages such as Chinese, Japanese, Korean, and Hindi, both in terms of their structural characteristics and in their socio-cultural context.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CHI 585: Translation Studies of Asian Language**

Inquiry into issues in the translation of Asian languages into/from English. This course introduces the recent theories and concepts of translation studies and applies them to the analysis of a variety of Asian texts as source texts or target texts. Students are expected to gain insights into the lexical, grammatical, cognitive, pragmatic, and socio-cultural characteristics of Asian languages as well as social and political issues that surround translation of Asian texts. Texts to be analyzed include, but are not limited to, literary works, newspaper articles, advertisements, brochures, and business letters. Intermediate to advanced proficiency in one of the Asian languages such as Chinese, Japanese, and Korean is needed.

*3 credits, Letter graded (A, A-, B+, etc.)*

## **CIV**

### **Civil Engineering**

#### **CIV 502: Urban Transportation Planning**

This course focuses on the planning and design principles of urban transportation systems. The

class topics cover elements of transportation planning, concept of mobility, interaction between land use and transportation, 4-step transportation planning model (trip generation, trip distribution, modal split, and assignment), transportation project evaluation. The topics are also discussed with respect to the impact of emerging transportation issues on planning, such as autonomous vehicles, on-demand transportation, role of big data in planning.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CIV 505: Transportation Network Analysis**

Traffic flows on networks; Deterministic and user equilibrium traffic assignment problems; Transportation networks and optimality; Transportation network design and reliability; Vulnerability of transportation networks

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **CIV 507: Transportation Economics**

Microeconomics principles applied in the transportation field. Transportation demand and supply. Transportation costs (fixed costs, variable costs) and externalities. Economic and social benefits of transportation. Economic principles for transport pricing, e.g. toll pricing. Cost benefit analysis of a transportation project. History of government regulation of transportation.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CIV 509: Transportation Logistics Systems**

This course provides a deep understanding of logistics systems by introducing the models and analytic techniques to evaluate their design and operation. Emphasis will be placed on the development of models to demonstrate the core concepts involved in network distribution strategies, discrete facility location design, vehicle routing and scheduling, and inventory management.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CIV 510: Advanced Foundation Engineering**

The course is designed to provide students with the theory and experience-based knowledge necessary to evaluate and estimate soil properties and earth pressure for analysis and design of retaining walls, anchored bulkheads, and excavation bracing systems. Bearing capacity and settlement of shallow foundations are also covered. Semesters Offered: Fall

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 511: Advanced Shear Strength of Soils**

This course covers topics related to advanced analysis for shear strength of soils including stress-path, shear strength of cohesive soils, and shear strength of granular soils.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 513: Seepage and Slope Stability**

This class will expose students to water flow in soils and the associated seepage forces applied on underground structures. Also included in this class is a detailed discussion about determining the soil hydraulic properties in the lab and in the field. Additionally, the course will discuss the stability of earth slopes forming natural and manmade slopes using various analysis methods.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 514: Advanced Cons**

This course introduces several emerging materials in construction, some of which are already in use and some of which are still in development. First, students are taught overall material properties of concrete which include cement manufacturing, hydration, and microstructure. For each new material discussed, students are taught about its properties, how those properties are derived, and its potential applications.

In addition, principles and application of material characterization techniques of X-ray diffraction, X-ray fluorescence, scanning electron microscope, and isothermal calorimetry will be discussed. Examples of materials discussed are high performance steel, ultra high performance concrete, calcium aluminate cement concrete, calcium sulfoaluminate cement, and fiber-reinforced polymers. The students then take field trips as a group to concrete batch plant, construction sites, or LEED-certified building with innovative concrete use and have a presentation about their field trips. Semesters Offered: Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

**CIV 515: Analysis of Deep Foundations**

This course covers topics related to the analysis and design of deep foundations including the design of vertically loaded drilled shafts and driven piles, the analysis of laterally loaded piles, and in-situ pile load tests.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 516: Soil and Site Improvement**

This class will expose students to techniques currently used in practice to improve the

properties of soils in-situ. These techniques will include shallow and deep compaction, overexcavation and replacement, deep replacement, drainage and dewatering, preloading, deep soil mixing, and fill reinforcement. At the end of the class, students will be able to perform preliminary analysis to select the most appropriate soil improvement technique for a given project and deliver a detailed design of the selected technique.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 517: Engineering Geology**

Engineering geology is a multidisciplinary field that views geology from a civil engineering perspective. In this course, students will first learn how to characterize rocks and sediments as natural and engineering materials. Then, they will have a review over structural geology, geologic and engineering description of rock masses (geologic mapping, joint surveys, brief description of exploration techniques). Through case studies on different terrains (glacial, shore, alluvial, etc), students will explore how geology influences the design and construction of civil engineering projects. Prevention and mitigation of geohazards will also be discussed, along with the characteristics of different terrains.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 518: Subsurface Infrastructure**

This course explores the fundamental principles of subsurface space utilization, aiming to equip students with the knowledge and skills to conduct the analysis and design of tunnels, shafts and other subsurface infrastructure. The course has three major components: subsurface geology and geomaterial characterization, subsurface structure analysis and design, and construction methods. The course will also cover safety measures and monitoring for the operation of tunnels, as well as an introduction to new types of subsurface infrastructure, such as gas storage and geothermal.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 522: Introduction to Coastal Engineering**

Basic hydrodynamics of water waves. Topics include linear wave theory, energy, power and energy propagation, wave refraction, shoaling and breaking in the nearshore, diffraction by breakwaters and gaps, reflection and basin oscillations, wave statistics and spectra, wind-wave hindcast/forecast, wave forces on piles and pipes. Some coastal processes due to nonlinearity, including wave set-up/set-down, nearshore circulations and storm surges. Physical interpretations

of mathematical formulas are particularly emphasized. Semesters Offered: Spring  
*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

**CIV 523: Coastal Engineering Planning and Design**

The basic principles involved in the planning and design of various types and functions of coastal structures and shore protective measures will be discussed. Topics will include review of linear wave theory, considerations of site conditions; design processes; design of sloping- and vertical-front coastal structures; scour and scour protection; coastal sediment transport; shore protection measures such as coastal armoring, beach restoration, and beach stabilization; and introduction to harbor and marina.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 524: Coastal Processes and Sediment Transport**

This course describes processes associated with water and sediment movements close to shoreline. The topics covered in this course includes: sediment characteristics; long-term processes, hydrodynamics of coastal zone; field measurement techniques and analysis, equilibrium beach profiles, sediment transport, modeling of beaches and shorelines, shoreline modification and analysis including soft and hard engineering approaches and tidal inlets.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 526: Environmental Biotechnology**

This graduate course covers the fundamental concepts of biological processes that are important in natural and engineered environmental systems. The course will incorporate basic fundamental microbiology into a quantifiable engineering context in order to describe, predict and control behavior of environmental biological system.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 530: Structural Mechanics**

This course deals with fundamentals of the theory of structures with the objective of providing proper understanding and knowledge on structural analysis methods and structural behavior. The subject treatment is in the context of truss, beam, frame, and plate structural elements. A key objective is to provide the necessary knowledge and skills for capturing structural behavior through simple models. The course will extend concepts in matrix structural analysis by presenting a general framework for analyzing complex structural systems. A brief introduction to the

finite element method and nonlinear structural analysis is provided.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CIV 531: Nonlinear Structural Mechanics**

The course is aimed at advanced MS students and PhD students, and will complement other core courses in the sub-discipline of Structural Engineering and Mechanics. The course is designed as a follow-up from an existing fundamental introductory course: CIV 530 (Structural Mechanics). A justification on the importance of the topic for the training of students in the area of structural engineering and mechanics is give below. While the behavior of most structures under service loads is adequately captured by linear elastic analyses, their response near ultimate conditions is most often nonlinear. These limit-state conditions include the effects of cumulative elastic deformations that may lead to system instability (i.e., buckling), the effect of material inelastic response (e.g., yielding, or crushing) near ultimate capacities, or the combination of both. The area dealing with the theory and methods to determine the response of structures through their nonlinear behavior is commonly termed nonlinear structural mechanics. This advanced subject matter has become more conventional as the increase in computer power and increasingly user-friendly software is allowing more engineers to make use of the advantages of nonlinear analysis. These include load redistribution after plasticization, design of structural systems for specific performance levels (beyond linear-elastic state), design of reconfigurable and deployable structures, and the determination of collapse behavior under extreme events. The course will present relevant theory and analysis methods on geometric and material nonlinear behavior of structures. Concepts will be presented from first principles but their application will be focused on truss and beam/frame finite elements. Assignments include computer program development and use of existing commercial computer codes.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CIV 532: Structural Dynamics**

Analysis of the dynamic response of structures and structural components to transient loads and foundation excitation; single-degree-of-freedom and multi-degree-of-freedom systems; response spectrum concepts; numerical methods for integration of the equations of motion; simple inelastic structural systems; systems with distributed mass and flexibility.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CIV 533: Intermediate Steel Design**

Metal members under combined loads; connections, welded and bolted; moment-resistant connections; plate girders, conventional behavior, and tension field action.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CIV 534: Intermediate Reinforced Concrete Design**

Strength, behavior, and design of indeterminate reinforced concrete structures, with primary emphasis on slab systems; emphasis on the strength of slabs and on the available methods of design of slabs spanning in two directions, with or without supporting beams.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CIV 535: Earthquake Engineering**

Source mechanisms, stress waves, and site response of earthquake shaking; effect on the built environment; nature of earthquake actions on structures; fundamental structural response characteristics of stiffness, strength, and ductility; representation of the earthquake input in static and dynamic structural analysis; modeling of steel and concrete structures under earthquake effects; outputs for safety assessment; comprehensive source-to-design actions project.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CIV 540: Intermediate Computational Mechanics**

This course deals with some intermediate computational mechanics concepts and is a continuation of introductory finite element courses. The main objective is to provide proper understanding and knowledge on theoretical and practical aspects of finite element technology. Emphasis is placed on time dependent problems, nonlinear elasticity, stress update algorithms, mixed and penalty formulations, as well as computer implementation and programming concepts.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CIV 544: Environmental Fluid Dynamics**

Free surface flows of water and air occurring in natural fluid systems and influencing environmental transport and mixing. Fundamental principles of fluids, covering the scales relevant to both engineering and geophysical applications. Topics include waves, instability, stratification, turbulent boundary layers, jets and plumes, and river hydraulics

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CIV 545: Computational Fluid Dynamics**

Computational methods in hydraulics and coastal engineering, Incompressible flows, Turbulence modeling, Coupled hydrodynamics and Morphodynamics, Computational methods for modeling contaminant transport, Numerical algorithms for solving Navier-Stokes equations, Introducing parallel programming and high-performance computing in computational fluid dynamics.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CIV 546: Environmental Aquatic Chemistry**

This course introduces the application of physical chemistry to solve problems related to natural water systems (both freshwater and seawater) and anthropogenic impacts on these systems. We will cover thermodynamics and kinetics and how they can be used to understand the distribution and cycling of chemical species in natural waters and related processes, including dissolution and precipitation, oxidation and reduction, acid-base interactions, and complexation. We will also cover special topics related to current issues in water quality.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CIV 547: Environmental Physical-Chemical Processes**

Physical-chemical processes that affect environmental quality in natural and engineered systems. The focus is on developing a qualitative understanding of mechanisms as well as quantitative tools to describe, predict, and control physical-chemical processes. Topics include reactor mixing and reaction kinetics, gas transfer, sorption, particle dynamics, filtration, membranes, and disinfection. Most of the applications are in the water quality sub-domain, but overlap exists with air quality, soil and sediment contamination, and even some applications to biological systems.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CIV 548: Organic Pollutants in Environmental Systems**

This course covers topics in theoretical and applied environmental organic chemistry. We will focus on physical/chemical properties of organic pollutants and the processes that govern their fate and transport, particularly in air and water, as well as their interactions with soil and biota. Topics include equilibrium partitioning, molecular diffusion, air-water exchange, sorption, bioaccumulation and biomagnification, and transformation reactions. We will also touch on emerging issues involving novel organic contaminants.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 549: Environmental Exposure and Risk Assessment**

This course will introduce types of harmful pollutants, the pathways by which humans and ecological receptors are exposed to these pollutants, and the strategies used to monitor and measure exposure and to estimate risk. We will explore the mechanisms linking chemical exposure to biological effects and how these processes are measured and modeled to characterize risks, as well as concepts related to environmentally-relevant exposures involving multiple stressors. Methodologies to quantitatively estimate ecological and human health risk will be discussed and applied to case studies covering real-life pollutant exposure scenarios.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 550: Introduction to Smart Infrastructure Systems**

The course will include lectures that provide historical background of smart infrastructure systems, fundamental concepts of decision-making, data representation, sensing and actuation networks, and associated challenges specific to smart cities applications. Basics concepts of probability and statistics, optimization, and uncertainty and risk will be introduced to help students build a solid foundation for machine learning and engineering system modeling. The course includes assignments that will provide hands-on experience on applying what they have learned from lectures. The students will conduct a comprehensive independent research project on topics related to smart infrastructure systems to enhance their understanding of a specific topic of their interest. This course will cover topics including sensing systems, data visualization, probabilistic modeling, Bayesian updating, convex optimization, uncertainty and risks, as well as open-ended topics related to policy, economics, and information security challenges in infrastructure monitoring and decision-making.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 551: Sensing and Learning for Smart Cities**

An introductory course on practical applications and challenges of sensing, data analytics and machine learning in the context of physical urban systems. Background is provided on data analysis and associated challenges specific to smart cities applications, insights behind signal representation, statistical modeling, and machine learning, and critical interpretation of outcomes. The course is suitable for students without prior experience

in probabilistic and statistical modeling, or working with data. Topics include data visualization, noise cleansing, frequency domain analysis, forward and inverse modeling, feature extraction, sampling bias, statistical modeling, machine learning, and error analysis.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 555: Analytics for Engineering Systems**

This course systematically introduces methods of analytics with an emphasis placed on solving civil engineering problems. The design, operation, and management of civil engineering systems are increasingly complex and uncertain. This course aims to help students build the ability to use analytics for understanding, modeling, and optimizing civil engineering systems, and system of systems. Topics of this course include data description and visualization, modeling uncertainty with probability distribution, descriptive mining, sampling and statistical inference, regression analysis, time series analysis, neural networks, simulation, mathematical optimization, decision analysis, and optimization under uncertainty.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CIV 595: Independent Study in Civil Engineering**

Students can register this course in order to conduct research or participate in a project under the supervision of one or more members of the Civil Engineering faculty.

*1-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

**CIV 596: MS Project**

This course is taken by M.S. students who select MS Project track. Conducted jointly by graduate students and one or more members of the faculty. A final project report must be submitted to the advisor as well as to the Graduate Program Director. Without the submitted report, credits from his course cannot be applied toward the MS degree.

*0-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**CIV 599: M.S. Thesis Research**

This course is taken by M.S. students for their thesis research work.

*1-12 credits, S/U grading*

*May be repeated for credit.*

**CIV 680: Special Topics in Transportation Engineering**

The subject matter of special topics course can vary semester to semester depending on the

interests of the students and the faculty, and the contemporary topics in transportation field

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**CIV 681: Special Topics In Geomechanics and Geotechnical Engineering**

The subject matter of special topics course can vary semester to semester depending on the interests of the students and the faculty, and the contemporary topics in geotechnical engineering field.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**CIV 682: Special Topics in Ocean and Coastal Engineering**

The course is designed for the discussion of topics of special interest on demand that may not be covered in regularly scheduled courses. Varying topics from ocean wave mechanics, offshore structures, coastal processes, sediments and morphology to estuarine dynamics may be offered concurrently.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**CIV 683: Special Topics in Structural Engineering**

The subject matter of special topics course can vary semester to semester depending on the interests of the students and the faculty, and the contemporary topics in structural engineering field.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**CIV 684: Special Topics in Water Resources and Environmental Engineering**

The course is designed for the discussion of topics of special interest on demand that may not be covered in regularly scheduled courses. Varying topics from water treatment, solid waste management, urban and watershed hydrology, stormwater management, water quality modeling to environmental fluid mechanics may be offered concurrently.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**CIV 685: Special Topics in Materials Engineering**

The subject matter of special topics course can vary semester to semester depending on the interests of the students and the faculty, and the contemporary topics in materials engineering field.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**CIV 686: Special Topics in Smart Civil Infrastructure Systems**

The subject matter of special topics course can vary semester to semester depending on the interests of the students and the faculty, and the contemporary topics in transportation field.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**CIV 691: Civil Engineering Seminar**

This course is designed to expose students to cutting-edge research and development activities in civil engineering. Speakers are invited from both on and off campus. Fall and spring. 0 credits, S/U grading. May be repeated.

*S/U grading  
May be repeated for credit.*

**CIV 695: Civil Engineering Internship**

Participation in off-campus engineering practice in private corporations, public agencies, or non-profit institutions. Student will be required to have faculty coordinator as well as a contact in outside organizations, to participate with them in regular consultations on the project, and to submit a final report to both. A maximum of 3 credits can be accepted toward the M.S. degree.

*1 credit, S/U grading  
May be repeated 3 times FOR credit.*

**CIV 697: Practicum in Teaching I**

Every TA must register for this course

*Fall, S/U grading  
May be repeated for credit.*

**CIV 698: Practicum in Teaching II**

Practicum in teaching under faculty supervision 3 credits, S/U grading  
*3 credits, S/U grading*

**CIV 699: Dissertation Research On Campus**

Students have to register for this class during their dissertation research after advancement to candidacy. Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*0-9 credits, S/U grading  
May be repeated for credit.*

**CIV 700: Dissertation Research Off Campus-Domestic**

Students have to register for this class during their dissertation research after advancement to candidacy. Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. All international students must enroll in one the graduate

student insurance plans and should be advised by an international advisor.

*1-9 credits, S/U grading  
May be repeated for credit.*

**CIV 701: Dissertation Research Off Campus-International**

Major Portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver be second week of classes. The charge will only be removed if other plan is deemed comparable. All international students must receive clearance for an International Advisor

*1-9 credits, S/U grading  
May be repeated for credit.*

## CLT

### Comparative Literature

**CLT 501: Theories of Comparative Literature**

This course provides a survey of literacy theory and its role in the formation of comparative literature as a discipline.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CLT 509: History of Literary Criticism**

A history of literary theory from classical Greece to Freud. Offered Fall/

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**CLT 597: Directed Readings for M.A. Students**

A student and faculty member agree on a corpus of texts to read and discuss at weekly or biweekly meetings. The reading list must be filed with the program's form before the add/drop period ends. May be repeated for credit.

*Fall and Spring, 1-3 credits, S/U grading  
May be repeated for credit.*

**CLT 598: Thesis Research**

Research and writing of M.A. thesis supervised by faculty advisor.

*Offered Fall, Spring, 1-3 credits, S/U grading  
May be repeated for credit.*

**CLT 599: Independent Study**

A student and faculty member agree on a topic not offered in any seminars and a reading list to study at weekly or biweekly meetings. A final research paper or major annotated bibliography will be required. The syllabus must be filed with the program's form before the add/drop period ends. May be repeated for credit.

*Only three credits of Independent Study can be counted toward the M.A. requirements, and a maximum of six toward the Ph.D  
Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**CLT 600: Seminar in Stylistics**

Changing topics in the study of stylistic and structural elements of the literary text.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**CLT 601: Seminar in Literary and Cultural Theory**

Changing topics in the specialized examinations of recent or historical trends such as semiotics, Marxism, reader-response, psychoanalysis, hermeneutics, deconstruction.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**CLT 602: Interdisciplinary Seminar**

Specific problems in the relations between literature and other disciplines.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**CLT 603: Comparative Studies in Literary History**

Changing topics in the study of literary periods and styles.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**CLT 604: Comparative Studies in Genre**

Changing topics in the study of the history and theory of literary genres.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**CLT 607: Major Authors in Comparative Context**

Critical and comparative examination of two or more major figures from different literary or other aesthetic traditions. Recent topics have included "Kristejeva," Dostoevsky and the West," and "European Realisms." Offered Fall and Spring 3 Credits, ABCF Grading

*3 credits, Letter graded (A, A-, B+, etc.)*



*May be repeated for credit.*

### **CLT 608: Cross-Cultural Perspectives**

Key topics in genre, literary criticism, and methodology from a cross-cultural perspective. Emphasis will be placed on an examination of differences as well as similarities. Presuppositions of specific literary traditions will be questioned within the broader perspectives of philosophical and religious valences.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CLT 609: Advanced Topics in Comparative Literature**

A variable topics seminar in Comparative Literature. 3 credits, Letter graded (A, A-, B+, etc.) Course may be repeated as topics vary. Semesters Offered: Fall and Spring

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **CLT 680: Cultural Studies Research Seminar**

In addition to readings on issues, debates, and problems within the profession and field of Cultural Studies students will develop research for publication while engaging with practices of professionalization.

*Offered Fall/*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **CLT 690: Directed Readings for Doctoral Candidates**

A student and faculty member agree on a corpus of texts to read and discuss at weekly or biweekly meetings. The reading list must be filed with the program's form before the add/drop period ends. May be repeated for credit.

*Fall and Spring, 1-12 credits, S/U grading  
May be repeated for credit.*

### **CLT 696: Self-Directed Readings**

For doctoral students who have completed all course requirements and wish to dedicate themselves to full or part-time preparation for the Comprehensive Examination.

*Fall and Spring, 3-9 credits, S/U grading  
May be repeated 6 times FOR credit.*

### **CLT 698: Practicum in Teaching**

The course is divided into two parts: one half is normally given in the fall, one in the spring. The first part deals primarily with matters of pedagogy. The second part is designed to help students plan their own undergraduate courses. The practicum is required of all students during their first year.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **CLT 699: Dissertation Research on Campus**

Prerequisite: Advancement to candidacy (G5).

*A portion of dissertation research must take place on SBU campus.*

*Fall, Spring, and Summer, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **CLT 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **CLT 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.*

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **CLT 800: SUMMER RESEARCH**

*May be repeated for credit.*

### **CLT 850: SUMMER TEACHING**

*May be repeated for credit.*

## **CME**

### **Chemical and Molecular Engineering**

#### **CME 501: Fluid Mechanics**

This course aims to provide graduate-level students with fundamental concepts of fluid mechanics; mass, energy and momentum balances; fluids flow in pipes; Couette flows, Poiseuille flows, unsteady flows; viscous flow; fluid flow in porous media; laminar boundary layer and other unidirectional flow; turbulent flow; fluctuations and time-averaging, two phase flow and fluidization; non-Newtonian fluids; microfluidics and electro-kinetic flow effects; compressible flows and computational fluid dynamics.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CME 502: Mathematical Analysis & Modeling**

This course aims to provide graduate-level students with a practical approach to computational methods for the development of various modeling approaches to a variety of relevant chemical, physical and engineering processes. The course will cover linear algebra, nonlinear algebraic systems, matrix eigenvalue analysis, initial value problems numerical optimization, boundary value problems; probability theory and stochastic simulations, Bayesian statistics and parameter estimation and Fourier analysis.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CME 503: Chemical Engineering Thermodynamics**

This course aims to provide graduate-level students with understanding on the equilibrium thermodynamics and classical statistical thermodynamics, and to apply them to analyze chemical engineering problems down to molecular-scale. It contains mainly the following subjects: Fundamentals of Equilibrium Thermodynamics; Thermodynamic Properties of Fluids and Fluid Mixtures; Phase Transition and Critical Phenomena; Classical Statistical Mechanics; Statistical Thermodynamics of Ideal Gases and Liquid Mixtures; and Other Topics of Interest.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CME 504: Chemical Reaction Engineering**

Introduce the students to the fundamental principles of reaction engineering in order to enable them to handle kinetics and kinetic-transport interactions in a variety of situations. To introduce students to the analysis of the kinetics of homogeneous chemical reactions. To apply this analysis and the concepts of material and energy conservation to the design of idealized homogeneous chemical reactors operating both in batch and continuous modes and under both isothermally and non-isothermally conditions. To introduce the

analysis of non ideal flow and, using the flow model, to quantify its effect on an idealized reactor design.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CME 511: Transport Phenomena**

This course covers topics in advanced transport phenomena. Topics include, equations of change for isothermal systems, viscosity, momentum transport, laminar and creeping flow, multi-variable velocity potential, turbulent flow, Interphase transport, friction factors, rheology of polymeric liquids, non-Newtonian viscosity and generalized Newtonian models, equations of change for non-isothermal systems, temperature distributions and unsteady heat conduction in solids, temperature distributions in turbulent flow and heat flux, diffusivity and mass transport, mass and molar transport by convection.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CME 512: Thermodynamics and Transport in Physical and Chemical Systems**

This course provides in depth graduate level instruction in thermodynamic properties of physical and chemical systems, focusing on transport and rate processes. Topics include qualitative comparison of equilibrium and non-equilibrium systems, the description of the thermodynamic ensembles, irreversible processes, the concept of system fluctuations, the equipartition principle, balance equations, the Onsager relations, exergy analysis and its applications, the Maxwell-Stefan equation and thermoeconomics. 3 credits, Letter graded (A, A-, B+, etc.)

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CME 513: Rheology**

This course aims to provide graduate-level students with an in-depth acquaintance with important topics in rheology. Topics include a discussion of the role of rheology in science and engineering, the definition of viscosity, the classification of various types of viscous fluids and flows, deformation and stress, relaxation functions, relaxation time, conversion among response functions, complex modulus, glass transition, time-temperature superposition rule, WLF equation; stress expression in polymers, tension, free-energy and distribution-function of subchains, the Rouse and Zimm models, derivation of stress and relaxation modulus, discussion on the relaxation behavior, the deGennes reptation model, and contour length fluctuation in polymer chains. In addition to the text, the student will be exposed to classic and current literature in the field.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CME 514: Characterization Methods (Microscopy and Spectroscopy)**

This course aims to provide graduate-level students with an in-depth acquaintance with important characterization methods that are applicable to surface science, soft materials, thin films and nanotechnology. Topics include techniques such as atomic force microscopy (AFM) including contact-mode, tapping-mode and lateral-force AFM, scanning tunneling microscopy (STM), electrostatic force microscopy (EFM), magnetic force microscopy (MFM), AFM-based nano-lithography, surface force and adhesion measurement, as well as molecular recognition, Xray photon spectroscopy (XPS) and ultraviolet photon spectroscopy (UPS), including basic principle, instrumentation configuration, data interpretation and analysis, chemical shift, quantification, and depth-profiling; time-of-flight secondary ion mass spectrometry (ToF-SIMS), Fourier-transform infrared spectroscopy (FTIR) and Raman spectroscopy, attenuated total reflection (ATR), diffuse reflectance, and polarization modulation-infrared reflection-adsorption spectroscopy (PM-IRRAS) and finally, scanning and transmission electron microscopy (SEM and TEM). In addition to the text, the student will be exposed to classic and current literature in the field.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CME 515: Complex Fluids**

This course aims to provide graduate-level students with a unified approach to complex fluids. Complex fluids, also referred to as soft materials, are materials which have the capability to self-organize to form complex structures that may be manipulated to exhibit a variety of properties essential for specific functional requirements. The materials considered under this definition are the various classes of colloids, polymers, amphiphiles, liquid crystals and biological molecules. Topics covered include an overview and definitions of soft matter and complex fluids; Intermolecular interactions; Phase transitions and order parameters, scaling laws and polydispersity; Polymer systems, thermodynamics of polymer solutions; Polymers at interfaces, adsorbed polymer layers, polymer brushes; self-assembly in bulk, weak and strong segregation, microphase separation; Self-assembly in solution, polymeric micelles, surfactant micelles, planar assemblies, microemulsions; Colloidal systems, forces, and stability, interaction between charged surfaces, colloidal dynamics, diffusion and sedimentation; Amphiphilic

systems, surface activity, surfactants and monolayers, membranes; Liquid crystals, applications in microelectronics; Biological systems; Macromolecular and supramolecular assemblies.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CME 519: Electrochemistry and Electrochemical Materials Science**

This course will survey electrochemistry and electrochemical materials science. Topics will include fundamental measurements in electrochemistry, galvanostatic and potentiostatic methods, the electrochemical double layer, corrosion and passivation. Relevant applications such as fuel cells, batteries, and supercapacitors will be discussed.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CME 522: Heterogeneous Catalysis & Surface Reaction**

Heterogeneous catalysis is central to the petroleum chemical industry and it is directly related to products efficiency. This course will emphasize the fundamental and application of heterogeneous catalysis and introduce the catalytic reaction mechanism. Students who complete the course will have attained the following outcomes: 1) Basic of heterogeneous catalyst and catalysis 2) Kinetics of heterogeneously catalyzed reaction 3) Surface characterization by spectroscopic techniques 4) Knowledge of supported metal oxide and zeolites 5) Application of theoretical calculations 6) Industrial applications of heterogeneous catalyst.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CME 523: Nanocomposites**

This course aims to provide graduate-level students with an in-depth knowledge of the main types of nanocomposite materials and their specific physical and chemical properties required in applications. Topics include a discussion of the methods of preparation and characterization of specific physical properties of nanocomposite materials. The current state of theory and modeling of nanocomposites will be presented. At the end of the course, students will have enough understanding of the main concepts in nanocomposites physics, understand advantages and disadvantages of different thermoplastics and thermoset polymers as matrix materials. In addition students will gain the knowledge of different manufacturing techniques of nanocomposites. In addition to the text, the student will be exposed to classic and current literature in the field.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CME 524: Chemical Processes in Cell Biology**

The course specially designed for chemical engineering students to provide an introduction to the various aspects of cell biology. The ideas of cell biology, including biochemistry and bioenergetics, DNA and protein synthesis, and mechanisms of cancer will be introduced.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CME 525: Chemical and Biological Sensors**

Introduction to the field of chemosensor and biosensor, as well as an in-depth and quantitative view of the sensor design and performance analysis. Fundamental application of chemo/biosensor theory will be demonstrated including recognition, transduction, signal acquisition, and post processing/data analysis. Topics are selected to emphasize biomedical, bioprocessing, environmental, and energy application.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CME 526: Computational Methods**

This course aims to provide graduate-level students with an in-depth acquaintance with use of modern computational and mathematical techniques in chemical engineering including applied numerical analysis, programming algorithms using mathematical software, and applications of computational methods to the solution of mechanical engineering. Topics include a discussion of the different analytical methods and algorithms and how to apply these using Matlab. In addition to the text, the student will be exposed to classic and current literature in the field.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CME 555: Teaching and Mentoring Techniques for Chemical and Molecular Engineering**

Discussion of various phases of teaching, including preparation, classroom technique, and student evaluation. We will also explore skills and understanding necessary for mentoring of undergraduates and others involved in research

*1 credit, S/U grading*

*May be repeated for credit.*

**CME 556: Synchrotron X-ray Analysis: Intro to Advanced Techniques for Chemical and Molecular Engineering**

In this course, world-leading experts from Brookhaven National Laboratory (BNL) will discuss advanced concepts in synchrotron X-ray and electron-based methodologies for studies of various materials

in multiple scientific disciplines spanning from physical and chemical sciences to materials engineering. Emphasis is on applying fundamental knowledge of these cutting-edge methodologies to real-world materials studies in a variety of disciplines. Main aim of this course is to provide knowledge on broad range of X-ray based techniques available at BNL to assist the future research of the students that may involve use of advanced techniques at synchrotron light sources. The targeted audience includes graduate students and advanced undergraduate students in materials science, chemical engineering, physics, chemistry, geosciences & other related fields.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CME 590: Surfactants, dispersion technology and novel delivery vehicles**

In the first part of the course the students will learn the structures of monomeric, polymeric, and biopolymeric surfactants. Students will be taught how to prepare and characterize surfactants. In the second part students will learn how surfactants arrange on surfaces and how they self-assemble in solution. Micellar solutions and their properties such as interfacial tension, aggregation number, and solubilization will be studied. Also, preparation of micro emulsions; solubilization of bioactives; stability/instability parameters, and thermodynamic stability/instability mechanism of emulsions, creaming, flocculation and coalescence will be discussed. In addition, steric and depletion stabilization will be discussed as well as double emulsions, their characterization and stabilization by biopolymers. Foams and "solid in liquid" will be explored and compared to emulsions. In the entire course examples from the cosmetic, cosmeceuticals and dermal and transdermal applications will be discussed. In the last part industrial and practical problems will be discussed.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CME 591: Sustainable Future Through Renewable Energy- Advanced**

The course will expose students to the role of engineering, chemistry, climate change in defining energy options, and a basic understanding of chemical engineering and technology in developing broad energy options in developing countries. The course combines lectures with utilization of carbon management tools to calculate carbon footprint in a specific country in a virtual environment.

*3 credits, Letter graded (A, A-, B+, etc.)*

**CME 594: Technical Writing for Chemical and Molecular Engineering**

As a graduate student in Materials Science and Chemical and Molecular Engineering, you will be expected to do a considerable amount of writing, whether on your proposal, thesis, papers or presentations. All this writing will not end with your graduation either. Rather, it will continue into your workplace as you are called on to communicate your goals, project ideas, and technical know-how to others. This course is designed to help you find your voice in these communications. Toward this end, you will work on a series of short assignments that get to the crux of several writing tasks that you will need to do in your academic career and beyond. While there are many ways of going about writing, there are also many proven ways to facilitate the writing process. The goal for this semester is to discover how to make your writing clear, engaging and effective. In the process, it is expected that you will have attained the course outcomes detailed below.

*0-3 credits, S/U grading*

*May be repeated for credit.*

**CME 595: CME MS Project Course**

This course is taken by M.S. students who select MS Project (Non-thesis) track. Conducted jointly by graduate students and one or more members of the faculty. A final project report must be submitted to the advisor as well as to the Graduate Program Director. Without the submitted report, credits from this course cannot be applied toward the MS degree.

*1-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

**CME 599: Research**

Offered Fall and Spring

*0-9 credits, S/U grading*

*May be repeated for credit.*

**CME 695: Graduate Internship**

Participation in private corporations, public agencies, or non-profit institutions for ongoing research activities related to thesis research. Students will be required to have a faculty coordinator as well as a contact in the outside organization, to participate with them in regular consultations on the project, and to submit a final report to both.

*Letter graded (A, A-, B+, etc.)*

**CME 696: Special Topics in Chemical and Molecular Engineering**

Supervised reading and discussion of selected publications in particular fields of Chemical and Molecular Engineering. This course is designed primarily for advanced graduate students who are, or expect to be, involved in

research in these areas, although other students may enroll with permission of the instructor.

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CME 697: Chemical and Molecular Engineering Colloquium**

A weekly series of lectures and discussions by visitors, local faculty, and students presenting current research results.

*0-3 credits, S/U grading*

### **CME 698: CME 698 Practicum in Teaching**

Practicum in teaching under faculty supervision.

*0-3 credits, S/U grading*

*May be repeated for credit.*

### **CME 699: Dissertation Research on Campus**

Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at Brookhaven National Lab.

*0-9 credits, S/U grading*

*May be repeated for credit.*

### **CME 700: Dissertation Research off Campus**

Major portion of research will take place off-campus, but in the United States and/or U.S. provinces.

*0-9 credits, S/U grading*

*May be repeated for credit.*

### **CME 701: Dissertation Research off Campus-International**

Major Portion of research will take place outside of the United States and/or U.S. provinces.

*0-9 credits, S/U grading*

*May be repeated for credit.*

### **CME 800: Full Time Summer Research**

This course may be only taken by Ph.D. candidates who are defending in the summer

*S/U grading*

## **COM**

### **Communication**

#### **COM 500: Theories of Science Communication**

A foundational course in the theoretical underpinnings and empirical science of science communication. Students will learn about evidence-based approaches to communicate scientific concepts and data accurately and

effectively to diverse audiences. This course will provide students with a sense of how science communication fits into the larger communication discipline, and the important questions being asked today in science communication research. Students will hone their written science communication skills by evaluating existing science communication literature and proposing a novel project idea rooted in the evidence-based approaches discussed in the class.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **COM 501: Foundations of Science Communication I**

An introduction to the Alda Method®, the Alan Alda Center's proprietary training approach to science communication, rooted in empathy and connection. Students experience improvisation first hand to help them embrace flexibility while maintaining an appropriate level of preparation when presenting scientific information. The workshop nature of this course allows students to practice building connections with others through eye contact and body language, developing relevant analogies, sharing powerful examples, and storytelling. Students will learn to communicate scientific information with accuracy, integrity, and passion, to ensure it resonates with their audience.

*1 credit, Letter graded (A, A-, B+, etc.)*

#### **COM 503: Foundations of Science Communication II**

An extension of COM 501: Foundations of Science Communication I, students apply their foundational communication skills to develop and deliver compelling scientific presentations. Particular emphasis is placed on visual presentation strategies, allowing students the opportunity to practice using technology to complement and enhance their presentations, rather than detract from them. Students reflect on their own performance regularly, and also offer peer feedback to others. Prerequisite: COM 501

*1 credit, Letter graded (A, A-, B+, etc.)*

#### **COM 516: Communication Research Methods**

Inquiry into social science research that enables students to ask meaningful questions and conduct research to find reliable and valid answers to those questions. Students explore traditional and non-traditional data collection methods, tools for analysis, and current research trends. Students engage in the empirical research process by identifying research questions and hypotheses, reviewing past research, collecting and analyzing data, and evaluating the credibility of published

research findings. As part of this course students will identify and delve more deeply into a content area within the Science of Science Communication field to build greater knowledge about how specific areas of science communication are interpreted, measured, and disseminated. Numerical and statistical concepts to analyze and interpret empirical data will be explored using a commonly used statistical package (e.g., Statistical Package for the Social Sciences, SPSS).

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **COM 517: Advanced Communication Research Methods**

An advanced exploration of data analysis techniques commonly employed in the field of communication and related social science disciplines. Students will build on their foundational knowledge of communication research methods to explore more advanced concepts, data analysis procedures, and practice analyzing data with a commonly used statistical package (e.g., Statistical Package for the Social Sciences, SPSS). Instruction will be provided on how to employ SPSS to conduct a variety of specific analysis techniques such as descriptive statistics, analysis of variance, correlation and regression, and exploratory factor analysis. Prerequisite: COM 516

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **COM 522: Communicating Science to Policy Makers**

A hands-on experience that provides students with the skills, practice, and knowledge to clearly, concisely, and effectively communicate the importance of science to policy makers. Communication is essential to secure funding and successfully advocate for or against legislation that could greatly impact research. Learning how to effectively communicate science to state and federal elected officials and agency staff is crucial for scientists, healthcare professionals, and professional science communicators. Students will explore communication tactics and methods based in theory and practice.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **COM 526: Building and Assessing Communication Strategies**

A comprehensive overview of strategic communication focused on advancing effective communication about science and related fields (e.g., health, technology, engineering, math) in institutionally diverse settings. Students learn to build and assess strategic communication campaigns based in 21st century communication practices. Grounded in ethics and the concept of principled public relations, students learn core skills and practice

that enable them to work as effective science communication practitioners in an era of misinformation and information overload. Because project management is critical to advancing successful strategic communication efforts, students will also learn project management skills through the design and implementation of a targeted communication plan.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **COM 534: Communicating Science Using Digital Media**

An exploration into using digital platforms to communicate science to public audiences. Science and health information increasingly travels by digital media, as new ways emerge for scientists, health care professionals, and others to communicate directly with the public, without the intermediaries of press or public relations. Students will learn to be effective and engaged online communicators, to help science reach broader audiences in meaningful ways. This course offers a practical, hands-on approach to using digital "tools of the trade" such as blogs, videos, audio/podcasts, and social media platforms. Students will also learn about the great potential and perils of social media, as they learn to think critically about the broader issues surrounding this medium.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **COM 550: Climate Communication**

An introduction and exploration of the communication sub-discipline of climate communication. Students will learn evidence-based approaches to communicating climate change related topics, such as extreme weather and climate mitigation strategies to diverse audiences. Students will consider challenges and potential solutions for more effectively communicating climate science to public audiences, policy makers, journalists, and scientists. Emphasis will be placed on exploring audience-centered messaging for all communication modalities.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **COM 565: Foundations of Science Communication**

A foundational course in science communication and an introduction to the Alda Method®. Students will learn about evidence-based approaches to communicate scientific concepts and data accurately and effectively to diverse audiences. Through an exploration of science communication literature and applied-improvisational theater exercises, students build communication skills to help them understand, connect, relate, and adapt to various audiences such as peers, professors, employers, policy makers, funders, journalists,

and the public. Students hone their written and oral science communication skills by creating, delivering, and evaluating audience-centered messaging.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **COM 575: Special Topics in Science Communication**

A seminar course on a current topic in science communication. Students enrolled in the MS in Science Communication or the MS in Journalism may repeat the course as the topic changes. This course cannot be used more than once to satisfy requirements for the Advanced Graduate Certificate in Science Communication.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **COM 577: Communication Law and Ethics**

An exploration into the legal and ethical considerations that science communicators, journalists, mass media professionals, and consumers face in the 21st century. Students learn about the Society of Professional Journalists Code of Ethics, the First Amendment Handbook from the Reporters Committee for the Freedom of the Press, and review case studies and current newsworthy stories to build an analytical model through which they can understand, analyze, and act on relevant legal and ethical issues in public communication settings.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **COM 583: Principles of Inclusive Engagement**

An exploration of the role of communication in facilitating conversations that acknowledge and are inclusive of individual and group differences. Students will learn how individual and group differences can become disadvantages, the role of communication in developing responses to such disadvantages, and how differences can also become offers of discovery, development, and depth. Students will learn to engage others through communication that is inclusive, empathetic, and just. Among the techniques explored in this course are applied-improvisational theater exercises that will help students connect with others, pay close and dynamic attention, read nonverbal cues, respond freely, and work through nerves and self-consciousness in a variety of communication settings.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **COM 585: Communicating Science and Health Risks to the Public**

An exploration of risk communication theories and strategies, and their application to effective communication in science, environmental, and public health settings. The processes and effects of persuasive communication as they relate to message framing are also explored. Students will learn to use effective communication to advance individual and community-level decision-making about science and public health issues. Specifically, risk communication through interpersonal, organizational, and mediated channels will be explored, with particular attention paid to message features that are believed to generate predictable effects. Students will explore how communication impacts the public's experience of risk, and practice designing and delivering culturally competent messages about potential science, health, and environmental hazards. This hands-on course provides opportunities to practice designing and delivering a variety of risk messages.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **COM 587: Independent Study**

Intensive study of a special topic or intensive work on a reporting project undertaken with close faculty supervision. May be repeated. Prerequisites: Permission of instructor and graduate program director

*3 credits, Letter graded (A, A-, B+, etc.)*

### **COM 588: Graduate Internship**

A practical, hands-on application of science communication skills in a real-world setting. Students participate in a semester-long internship with an organization or institution devoted to one or more of the programs' themes of science, health, environment, and/or technology. The work must allow students to apply communication skills related to the educational goals of the program. Student interns will report regularly to a faculty member and will submit a portfolio of their work at the conclusion of the internship.

*0-6 credits, S/U grading*

*May be repeated for credit.*

### **COM 599: Project Work in Science Communication**

A culminating experience for students in the Advanced Graduate Certificate in Science Communication. Students work individually or in groups to plan, design, and complete a capstone project rooted in science communication. Projects should allow students to apply what they have learned about science communication to a real-world context.

Examples may include but are not limited to competing in science communication competitions, creating podcasts, writing book chapters, recording educational videos,

designing a social media campaign, and/or creating outreach opportunities in the community. Students will submit a project proposal and participate in peer workshops sessions to offer and receive feedback on their work throughout the semester. Students will formally present their work to peers, faculty, and members of the campus/community at the conclusion of the course.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **COM 605: Environmental Communication**

An overview of the empirical and theoretical foundations of environmental communication. This course will examine scholarship from the nascent days of the environmental movement to modern day research often focused on addressing the climate crisis. How experts, the public, and policy-makers interact with and perform environmental communication will be of considerable interest in this course. By analyzing broader public discourses about environmental topics such as environmental disasters and renewable energy, a deeper understanding of how our values and the environment are related will be reached. Students will also be expected to engage in environmental communication research during the course.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **COM 635: AI, Communication, and Care**

A seminar examining the relationships between AI and Communication under the rubric of *care*. The course begins from the proposition that communication is a key practice of collective human wellbeing, and communication requires care-ful tending for flourishing relationships, communities, organizations, and nations. Students will learn about AI's relationship to communication and care by reviewing how communication scholars have theorized artificial intelligence since the mid-20th century. Students will explore how implementing AI in digital platforms like Google search, Netflix, and social media have altered communication. This theoretical and historical overview will guide students in assessing new generative AI technologies like ChatGPT. Significant time will be devoted to student projects that identify how to care-fully use AI to communicate with publics in their intended sectors such as industry, academia, and government.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **COM 699: Master's Project in Science Communication**

A culminating experience for students in the MS in Science Communication. Students

will identify and secure a faculty mentor under whom they will work independently to plan, design, and complete a research-based, science communication project. The project should reflect what students have cumulatively learned in the program and respond to the needs of an organization, community, or stakeholder group. Projects may take the form of original research intended for submission to an academic conference or translational research that informs the content development for a specific audience (e.g., educational module, communication campaign, social media strategy, etc.). Each project will have written, visual, and/or interactive components. Students will formally present their work to peers, faculty, and members of the campus/community at the conclusion of the course.

*3 credits, Letter graded (A, A-, B+, etc.)*

## **CONSTRM**

### **Consortium Agreement**

#### **CONSTRM AGRMNT: Credit earned as transfer.**

The procedure, which involves the completion of a Consortium Agreement, permits a student to attend another institution while receiving financial aid through Stony Brook. It is a process which is to be utilized only in extenuating situations. A student who feels that his/her situation can be documented and therefore warrants the use of this option should contact the Financial Aid Office.

*0-12 credits,*

*May be repeated for credit.*

## **CSE**

### **Computer Science**

#### **CSE 502: Computer Architecture**

Topics covered include instruction pipelines and memory caches to improve computer performance; instruction-level parallelism; machines: superscalar versus VLIW; cache and main memory hierarchy design tradeoffs; compiler optimizations to speed pipelines; low-power computer system design: processor, OS, and compiler support; graphics, DSP, and media processor design; disk I/O system design; interconnections and networking; and introduction to parallel architecture. Advanced topics include asynchronous microprocessors; FPGA-based reconfigurable computing; system on a chip; embedded processors; intelligent RAM and superconducting computers.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CSE 504: Compiler Design**

This course covers advanced topics in compilation, including memory management, dataflow analysis, code optimization, just-in-time compilation, and selected topics from compilation of object-oriented and declarative languages.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CSE 505: Computing with Logic**

The course explores logic-based computing and logic programming. It includes an introduction to programming in logic, covering basic techniques for solving problems in a logic programming system. Particular attention will be paid to user interface issues and how a logic system can provide a useful computing environment. The course covers implementation issues, emphasizing how a logic programming system generalizes both traditional programming language systems and traditional database systems.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CSE 506: Operating Systems**

This course is an in-depth study of important concepts and techniques found in modern computer operating systems. The course focuses on an in-depth study of such important issues as virtual memory, resource management, locking and synchronization, file systems, networking, safety and security, and multiprocessor support, with an eye to recent directions in these areas. Textbook readings are supplemented where appropriate by papers from the research literature. An important part of the course is the case study of an actual modern operating system (e.g., Linux). Students study the source code for this operating system and do programming exercises and projects that involve modifying the operating system, testing their code's stability and functionality, and measuring its performance.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CSE 507: Introduction to Computational Linguistics**

Overview of computational approaches to language use. Core topics include mathematical and logical foundations, syntax, semantics, and pragmatics. Special topics may include speech processing, dialog systems, machine translation, information extraction, and information retrieval. Statistical and traditional approaches are included. Students will develop familiarity with the literature and tools of the field.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CSE 508: Network Security**

Principles and practice of Computer Network Security. Cryptography, authentication protocols, public key infrastructures, IP/www/E-commerce security, firewalls, VPN, and intrusion detection.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 509: Computer System Security**

Principles and practice of building and administering secure systems. Authentication and access control. Operating system security. Program security, database security. Key management. Information flow. Assurance. Vulnerability analysis and intrusion detection.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 510: Hybrid Systems**

Hybrid Systems combine discrete state-machines and continuous differential equations and have been used as models of a large number of applications such as real-time software, embedded systems, robotics, mechatronics, aerospace systems, process control and biological systems. The course will cover modeling, design, analysis, and verification methods for hybrid systems. Topics may include SAT/SMT solvers, timed automata, formal logics for system specification, verification algorithms and closed-loop neural network control systems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 511: Brain and Memory Modeling**

An introduction to brain modeling. Neuroscience topics include major brain structures, constituent glia and neurons, and synapses connecting neurons; how excited neurons send ionic firing spikes to other neurons; synapse changes during learning and forgetting; connection structures for stable ionic activity in neural networks; and distributed firing patterns underlying memory, perception, and thought. Computing topics include efficient methods for modeling electrical activity in single neurons using NEURON and in networks of millions of neurons using discrete event simulation. Participants will code simulations OR use neuroscience experience to refine brain models.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 512: Machine Learning**

A course on the fundamentals of machine learning, including basic models, formulations, and modern methods. Topics include PAC learnability, validation, classification, regression, clustering, component analysis, and graphical and deep learning models. Students are expected to have the following background: (i) working knowledge of

probability theory and statistics, (ii) working knowledge of linear algebra and algorithms, and (iii) working knowledge of basic computer science principles at a level sufficient to write non-trivial computer programs in a language of preference.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 514: Data Analytics Software Stacks and Algorithms**

Architecture, and design of data analytics software stacks. We will cover MapReduce/Hadoop/Dryad/Twister, Hadoop File System (HDFS), HBASE, NOSQL tools such as MongoDB, Cassandra, HIVE; column oriented database systems such as Vertica and MonetDB. We will also cover data analysis management systems that target the scientific domain such as ADIOS, sciDB; streaming systems such as IBM System S/ DataCutter. Systems, data structures and algorithms to support management and analysis of spatio-temporal data from video cameras, satellites, telescopes or beamlines. We will study statistical methods, machine learning and image analysis/reconstruction methods used in big data/data analytic problems. Finally, we will survey big data/data analytic problems from several domains including biomedical analysis of multi scale, multi-modal biomedical imaging data, next generation genetic and genomic data, analysis of electronic medical record/population health data; internet search, recommender systems; and engineering and physical science, analysis of experimental and simulation data associated with design of energetic materials, oil reservoir simulation, nuclear fusion and self-driving cars.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 515: Introduction to Transaction Processing Systems**

Discusses transaction processing systems. Topics covered include models of transactions, including nested transactions and workflow; architectures of transaction processing systems, including client-server, two-tiered, and three-tiered architectures; concurrency controls for conventional and relational databases including two-phase locking and the SQL isolation levels; logging and recovery; distributed transactions including the two-phase commit protocol; replication; Internet commerce, including encryption, the SSL and SET protocols, goods atomicity, and electronic cash.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 516: Science for Society I**

This is part one of an interdisciplinary course sequence (1 credit each) is designed for

students in computer science (CS) and students of technology and society (DTS). Students taking this course will enhance their abilities to critically think and build awareness for science and technology (ST) and their societal aspects. They will learn strategies for assessing important questions such as: what should I focus my efforts on, where are societal needs, what policies are required or can be taken advantage of, how can I possibly influence policy, and finally, what are the dangers when developing new ST. To teach these topics the course takes a practical approach. The first section of the sequence examines historical science and technology successes and failures. Then, in the second section, teams composed of students from both the CS and DTS departments conduct case studies of existing ST or design and implement new ST under the perspectives of the course. 1 credit  
*1 credit, Letter graded (A, A-, B+, etc.)*

### **CSE 517: Science for Society II**

This is part two of an interdisciplinary course sequence (1 credit each) is designed for students in computer science (CS) and students of technology and society (DTS). Students taking this course will enhance their abilities to critically think and build awareness for science and technology (ST) and their societal aspects. They will learn strategies for assessing important questions such as: what should I focus my efforts on, where are societal needs, what policies are required or can be taken advantage of, how can I possibly influence policy, and finally, what are the dangers when developing new ST. To teach these topics the course takes a practical approach. The first section of the sequence examines historical science and technology successes and failures. Then, in the second section, teams composed of students from both the CS and DTS departments conduct case studies of existing ST or design and implement new ST under the perspectives of the course. 1 credit  
*1 credit, Letter graded (A, A-, B+, etc.)*

### **CSE 518: Foundations of Human Computer Interactions**

The focus of this course is on the design, evaluation, and implementation of interactive computing systems for human use and on the study of major phenomena surrounding them. This course will provide the students with a strong grounding in the guidelines, principles, methodologies, tools, and techniques for analyzing, designing, and evaluating user interfaces and interaction techniques. Topics include: 1) Human Information Processing System 2) Interaction Behavior Modeling 3) Computational Interface Design 4) User Centered Design 5) Sketching and Prototyping

6) Usability Testing 7) Heuristic Evaluation 8) Natural User Interfaces & the Future of UIs 9) State-of-the-art research within HCI

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 519: Data Science Fundamentals**

This course will cover the building blocks of data science from managing the data itself to algorithmic and analytical techniques. Specific topics include data preparation, exploratory data analysis, statistics, visualization, optimization, unstructured data, distributed analyses.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 521: Data Mining Concepts and Techniques**

Data Mining is a new, promising and flourishing interdisciplinary field drawing work from areas including database technology, artificial intelligence, machine learning, pattern recognition, high-performance computing, and data visualization. It focuses on issues relating to the feasibility, usefulness, efficiency, and scalability of techniques for automated extraction of patterns representing knowledge implicitly stored in large databases, warehouses, and other massive information repositories. The course gives a broad, yet in-depth overview of the field of data mining and presents one or two techniques in rigorous detail.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **CSE 522: Special Project in Computer Science**

Project in a sub-discipline of Computer Science, including but not limited to, computer architecture, operating systems, programming languages, compilers, artificial intelligence, networking, computer graphics, data mining, databases, computer vision, visualization, computer security, mobile computing, parallel processing, logic programming, hybrid systems, simulation and modeling, computational biology, and multimedia.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **CSE 523: Advanced Project in Computer Science I**

First part of an advanced project in computer science that will extend over two semesters. The student starts the project in one semester by registering for CSE523 and completes the project in a following semester by registering for CSE524. CSE523/524 sequence must be on the same project under the direction of the

same advisor. The student must identify a faculty advisor before registering.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **CSE 524: Advanced Project in Computer Science II**

Part 2 of a 2-semester advanced research and development project undertaken by MS students under the supervision of a CS graduate program faculty member. The student starts the project in one semester by registering for CSE 523 and completes the project in a subsequent semester by registering for CSE 524 under the supervision of the same faculty member.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **CSE 525: Introduction to Robotics**

This course introduces the fundamental concepts in robotics, including coordinate transformations, visual perception, sensors, path planning, kinematics, feedback control, and feedforward control. These topics will be exemplified with several state-of-the-art robotics platforms. The course will also focus on applying the fundamental concepts to the key approaches to mobile robot control (reactive, behavior-based, and hybrid), and briefly discuss robot learning and multi-robot systems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 526: Principles of Programming Languages**

Discusses programming language concepts and design, with emphasis on abstraction mechanisms. Topics include language paradigms (procedural, object-oriented, functional, and logic), language concepts (values, bindings, types, modules), and foundations (lambda calculus, denotational semantics). Examples will be drawn from several representative languages, such as C, Java, Standard ML, and Prolog.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 527: Introduction to Computer Vision**

Introduction to basic concepts in computer vision. Low-level image analysis, image formation, edge detection, segmentation. Image transformations for image synthesis methods for 3D scene reconstruction, motion analysis, object recognition.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 528: Computer Graphics**

This course emphasizes a hands-on approach to the use of computer graphics. The

topics covered include models, picture description, and interaction; c windowing, clipping, panning, and zooming; geometrical transformations in 2D and 3D; algorithms for raster displays (scan-line conversion, polygon fill, polygon clipping, etc.); hidden line and hidden surface removal, shading models; user interaction. The students will implement a substantial graphics application program.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 529: Simulation and Modeling**

A comprehensive course in formulation, implementation, and application of simulation models. Topics include data structures, simulation languages, statistical analysis, pseudo-random number generation, and design of simulation experiments. Students apply simulation modeling methods to problems of their own design. This course is offered as CSE 529, AMS 553 and MBA 553.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 530: Geometric Foundations of Graphics and Visualization**

This course will focus on mathematical tools, geometric modeling techniques, and fundamental algorithms that are relevant to graphics, visualization, and other visual computing areas. The goal is to provide graduate students with a comprehensive knowledge of geometric concepts and demonstrate the significance of these mathematical tools and geometric algorithms in graphics and relevant areas. Course topics include geometric algorithms for both polygonal and curved objects, theory of parametric and implicit representations, modeling methods of curves, surfaces, and solids, in-depth spline theory, rudiments of wavelet theory and multi-resolution shape representations, differential geometry fundamentals, and other sophisticated topics and latest advances in the field.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 531: Performance Analysis of Systems**

This is a new course that covers topics in the performance analysis of computer systems. The contents of the course should prove very helpful for computer science students who wish to analyze computer systems and learn more about how to improve the performance of systems. Existing courses do not cover this material. The course is targeted primarily at PhD and Masters students in the Computer Science Department, however upper-level undergraduates can take the course as well. In addition, students from AMS, Math and ECE would also benefit from the course contents.



*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 532: Theory of Database Systems**

The course will cover advanced topics in modern database systems, including object-oriented databases, rule-based databases, temporal and active databases, parallel and distributed databases, distributed object model, data mining, online analytical processing, data warehousing, multimedia databases.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 533: Network Programming**

Topics include Unix and Linux socket API programming at the TCP, UDP, IP (raw sockets) and datalink access (Linux PF\_PACKET sockets, libpcap & libnet libraries) levels, in the context of developing and implementing client-server applications, reliable data transfer using TCP-like rdt and flow control mechanisms, routing protocols, address resolution protocols, multicasting, DNS protocols.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 534: Fundamentals of Computer Networks**

Internet protocol layers. Internet Architecture. Link layer and multiple access protocols. Local area networks including wireless LANs. Routing on the Internet. Intra- and Inter-domain routing. Mobile routing. Transport layer and TCP congestion control. Scheduling and fairness. Application layers. Overlay and P2P networks. Content distribution networks. Network performance modeling.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 535: Distributed Systems**

Distributed systems help programmers aggregate the resources of many networked computers to construct highly available and scalable services, such as petabyte storage, and massively parallel computation. This class teaches the abstractions, design, and implementation techniques that allow you to build fast, scalable, fault-tolerant distributed systems. Topics include multithreading, network programming, distributed file systems, replication, consistency models, fault tolerance, distributed transactions, agreement and commitment, consensus, and several case studies of distributed systems. This course helps students to gain (1) an understanding of the principles and techniques behind the design of distributed systems and (2) practical experience designing, implementing, and debugging real distributed systems. The course consists of lectures, exams, and a series of programming labs.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 536: Introduction to User-Interface Development**

Survey of user-interface systems, includes command language, windowing, multiple input/output devices, architecture of user interface management systems, toolkits for designing user-interface, human factors, standards, visual languages. The course also includes discussion of emerging technologies, such as systems for cooperative work, physically distributed user-interfaces, parallelism and user-interfaces, virtual reality. A substantial project requiring the design, implementation, and evaluation of a user-interface will be required

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 537: Artificial Intelligence**

A comprehensive introduction to the problems of artificial intelligence and techniques for attacking them. Topics include problem representation, problem-solving methods, search, pattern recognition, natural language processing, learning, expert systems, and AI programming languages and techniques. Covers both theoretical methods and practical implementations.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 538: Natural Language Processing**

The course offers an introduction to Natural Language Processing techniques and applications. The course introduces basic deep learning techniques for constructing representations of natural language texts, syntactic analyses, and canonical applications such as Question Answering, and Machine Translation. The emphasis is on understanding how (i) the basic requirements of language analyses and specific application needs can be formulated as learning problems, (ii) how aspects of natural language, such as syntactic and semantic structure, inspire the design of and are captured by modern state of the art techniques, and (iii) how to evaluate and understand the limitations and shortcomings of the models

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 540: Theory of Computation**

Topics include models of computation: finite-state machines, stack machines, Turing machines, Church's thesis; computability theory: halting problem and unsolvability, introductory recursion theory; complexity theory: complexity measures, time and space hierarchy, NP-complete problems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 541: Logic in Computer Science**

A survey of the logical foundations of mathematics and the relationships to computer science; development of propositional calculus and quantification theory; the notions of a proof and of a model; the completeness theorem.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 542: Big Data Systems, Algorithms and Networks**

Recent progress on big data systems, algorithms and networks. Topics include the web graph, search engines, targeted advertisements, online algorithms and competitive analysis, and analytics, storage, resource allocation, and security in big data systems. Offered in the Spring Semester

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 544: Probability and Statistics for Data Scientists**

The course will cover core concepts of probability theory and an assortment of standard statistical techniques. Specific topics will include random variables and distributions, quantitative research methods (correlation and regression), and modern techniques of optimization and matching learning (clustering and prediction).

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 545: Big Data Analytics**

The course will cover concepts and standard tools used to analyze, so called, Big Data. Specifically, it will cover algorithmic approaches to analyzing large datasets: MapReduce, graph analytics, text analytics, streaming algorithms, as well as modern distribution analysis platforms (e.g. Hadoop, Spark).

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 546: Cryptography**

Cryptography studies how to perform computational tasks securely in adversarial environments. It plays an important role in designing secure systems. This is an introductory course that covers basic concepts and proof techniques in this area, as well as some recent research trends. The course is theoretical in nature, with emphasis on proofs and algorithmic reductions, even when discussing applied topics. No prior background in cryptography is assumed. However, students should have mathematical maturity and be comfortable with definitions and proofs.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 547: Discrete Mathematics**

This course introduces such mathematical tools as summations, number theory, binomial

coefficients, generating functions, recurrence relations, discrete probability, asymptotics, combinatorics, and graph theory for use in algorithmic and combinatorial analysis. This course is offered as both CSE 547 and AMS 547.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 548: Analysis of Algorithms**

Techniques for designing efficient algorithms, including choice of data structures, recursion, branch and bound, divide and conquer, and dynamic programming. Complexity analysis of searching, sorting, matrix multiplication, and graph algorithms. Standard NP-complete problems and polynomial transformation techniques. This course is offered as both AMS 542 and CSE 548.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 549: Computational Biology**

This course focuses on current problems in computational biology and bioinformatics. Our emphasis will be algorithmic, on discovering appropriate combinatorial algorithm problems and the techniques to solve them. Primary topics will include DNA sequence assembly, DNA/protein sequence comparison, hybridization array analysis, RNA and protein folding, and phylogenetic trees.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 550: Quantum Computing and Applications**

This course is an introduction to and survey of the Quantum Computing, an emerging interdisciplinary field of science which has the potential to revolutionize computation over the next ten years, to transform chemistry, medicine, engineering and communications, as well as to change our understanding of physical world. The course will build intuitive approach to quantum computation and algorithms, but also will advance relevant vocabulary and skills for faculties and graduate students in engineering, computing, applied mathematics, chemistry, physics and related sciences.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 551: Smart Energy in the Information Age**

Energy and sustainability have become critical issues of our generation. While the abundant potential of renewable energy sources, such as solar and wind, provides a real opportunity for sustainability, their intermittency and uncertainty present a daunting operational challenge. This course studies how to use Information Technology (IT) to improve sustainability in our energy-hungry society.

In particular, topics include the applications of mathematical modeling, algorithm design, optimization, game theory, and control theory in real systems. The goal of the course is to provide rigorous foundations for the study of smart energy management for sustainability. Offered in the Spring Semester

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 552: Energy Efficient Computing**

Energy is an important resource for a wide range of computer systems from laptops to data centers and clouds. There has been considerable recent research on the topic of improving energy efficiency, cutting across different areas of Computer Science including Computer Architecture (e.g., energy efficient processor design), Networking (e.g., putting the network to sleep), Storage (e.g., exploiting idle I/O periods to spin down disks), Distributed Systems (e.g., capacity provisioning), Mobile Systems (e.g., putting the radio receiver to sleep in a smartphone), and Modeling/Analytics (e.g., modeling a server's power consumption). This course covers the recent research trends in energy-efficient computing, focusing specifically on themes and techniques for achieving efficiency in computer systems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 555: Computational Geometry**

Study of the fundamental algorithmic problems associated with geometric computations, including convex hulls, Voronoi diagrams, triangulation, intersection, range queries, visibility, arrangements, and motion planning for robotics. Algorithmic methods include plane sweep, incremental insertion, randomization, divide-and-conquer, etc. This course is offered as both AMS 545 and CSE 555.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 564: Visualization**

The course emphasizes a hands-on approach to scientific, medical, and information visualization and visual analytics. Topics include: traditional visualization techniques, the visualization process, visual perception and cognition, basic graphics and imaging concepts, visualization of sampled, observed, and computed data, volume and flow visualization, information visualization, human-computer interaction, and the coupling of intelligent computing with visualization

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 566: Virtual Reality**

Virtual Reality (VR) is a fast-moving technology and has the potential to

revolutionize our lives. VR stimulates the user's senses, thereby believing in an artificial version of reality. The course will cover VR fundamentals and technologies and related topics, including an introduction to VR, VR systems, geometry and transformations in VR, viewing and projections, light, optics, and human vision physiology, temporal human vision and perception, motion, vection, and tracking, 3D user interfaces (selection, manipulation, and travel), augmented reality (AR), audio in VR, and non-visual senses.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 570: Wireless and Mobile Networks**

Wireless communication fundamentals: wireless signal transmission, coding, multiplexing. Link, network, and transport layer protocols for wireless and mobile networking: medium access control, transmission scheduling, wireless capacity, protocols for wireless multi-hop networks. Cellular networks. Wireless LANs: mobile IP, TCP over wireless networks. Mobile applications. Localization and location management, Network coding. Wireless security.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 577: Medical Imaging**

This course presents an introduction to the mathematical, physical, and computational principles underlying modern medical imaging systems. It covers fundamentals of X-ray radiography, X-ray computed tomography (CT), ultrasonic imaging, nuclear imaging, magnetic resonance imaging (MRI), and functional MRI (fMRI), as well as more general concepts required for these, such as linear systems theory, the Fourier Transform, and numerical optimization. Popular techniques for the visualization, segmentation, and analysis of medical image data will also be discussed, as well as applications of medical imaging, such as image-guided intervention.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 581: Computer Science Fundamentals: Theory**

The course consists of two parts. The first part covers discrete mathematics -- a division of mathematics that is extensively used in computer science. The topics covered include: logic (propositional logic and predicate logic), proof techniques, sequences (mathematical induction and recursion), and functions. The second part covers the theory of computation -- a division of theoretical computer science that deals with what can be computed and what cannot be computed on a computer. The topics covered include: computational models

(FA, PDA, and Turing machines), grammars accepted by different computational models (regular grammars, context-free grammars, and unrestricted grammars), languages accepted by different computational models (regular languages, context-free language, and Turing-acceptable languages), Turing-complete systems, and algorithmically unsolvable problems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 582: Computer Science Fundamentals: Data Structures and Algorithms**

The course consists of two parts. The first part covers data structures to efficiently store, organize, modify, and access data. Topics include: arrays, stacks, queues, linked lists, trees, sets, hash maps, priority queues, and graphs. The second part covers the design and analysis of algorithms for solving computer science problems. Topics include: algorithm analysis, exhaustive search algorithms, divide-and-conquer algorithms, greedy algorithms, and dynamic programming algorithms.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 583: Comp Sci Fundamentals: Prog.Abstract.**

Programming concepts and paradigms, including functional programming, object-orientation, basics of type systems, program and data abstractions, parameter passing, and modularity.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CSE 587: Proficiency Requirement**

This course is used by students to fill any gaps in key CS proficiency background) areas identified at the time of admission. This course is done under the supervision of a faculty member teaching an undergraduate course in the needed proficiency area. By permission of the Graduate Program only.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CSE 590: Topics in Computer Science**

An advanced lecture course on a new topic in computer science. The course is primarily designed for M.S. students, but can be taken by Ph.D. students as well. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for credit as the topic changes, but cannot be used more than twice to satisfy CSE major requirements for M.S. Limited to CSE graduate students; others permission of instructor.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CSE 591: Topics in Computer Science**

An advanced lecture course on a new topic in computer science. The course is primarily designed for M.S. students, but can be taken by Ph.D. students as well. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for credit as the topic changes, but cannot be used more than twice to satisfy CSE major requirements for M.S. Limited to CSE graduate students; others, permission of instructor.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CSE 592: Advanced Topics in Computer Science**

An advanced lecture course on a new topic in computer science. The course is primarily designed for M.S. students, but can be taken by Ph.D. students as well. Semester supplements to this Bulletin contain specific description when course is offered. may be repeated for credit as the topic changes, but cannot be used more than twice to satisfy CSE major requirements for M.S. Limited to CSE graduate students; others, permission of instructor.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CSE 593: Independent Study in Computer Science**

Research and/or project work under the supervision of a Computer Science graduate program faculty.

*1-9 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CSE 594: Advanced Topics in Computer Science**

An advanced lecture course on a new topics in computer science. This course is primarily designed for M.S. students, but can be taken by Ph.D. students as well. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated as the topic changes, but cannot be used more than twice to satisfy the CSE major requirements for the M.S.

*Fall, Spring, every year, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CSE 595: Advanced Topics in Computer Science**

An advanced lecture course on a new topic in computer science. This course is primarily designed for M.S. students, but can be taken by Ph.D. students as well. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for credit as the topic changes, but cannot be used more than twice to satisfy the SCE major requirements for the M.S.

*Fall, Spring, every year, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CSE 596: MS Internship Project Off-Campus**

Participation in internships at private corporations, public agencies, or non-profit institutions. Students will be required to have a faculty coordinator as well as a contact in the outside organization to participate with them in regular consultations on the project, and to submit a final report to both. This course is intended for MS students interning off campus.

*1 credit, S/U grading*

*May be repeated for credit.*

### **CSE 597: MS Internship Project on Campus**

Participation in internships at private corporations, public agencies, or non-profit institutions. Students will be required to have a faculty coordinator as well as a contact in the outside organization to participate with them in regular consultations on the project, and to submit a final report to both. This course is intended for MS students interning on campus.

*1 credit, S/U grading*

*May be repeated for credit.*

### **CSE 599: M.S. Thesis Research**

Thesis research under supervision of CS graduate program faculty for MS students.

*1-12 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CSE 600: Research in Modern Computer Science**

A survey of current computer science research areas and issues. This course comprises lectures by faculty members and visitors, selected readings, and introductory-level research problems. Prerequisite: Permission of instructor

*0-1 credits, S/U grading*

*May be repeated for credit.*

### **CSE 602: Advanced Computer Architecture**

The focus will be on the architectural rather than micro-architectural issues, and a systems approach to computer architecture taking

into account the interaction between the architecture and the compiler, operating system, database, and networking. The course starts with superscalar/VLIW processor architecture and proceeds to memory hierarchy, storage systems, network hardware, graphics processor, and database machines. The emphasis will be on hands-on evaluation of architectural ideas, the exploration of software/hardware design trade-offs, and the articulation of experimental procedures and performance analysis. A publication-quality class project will be required.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 605: Performance Evaluation of Computer Systems**

The purpose of this course is to provide background and training in understanding and evaluating the performance of computer systems, including centralized, distributed, parallel, client/server-based systems, and computer communication networks. The goal is to develop a perspective on how the performance of computer systems or networks should be evaluated in order to decide on various design alternatives. The course will include various analytical techniques, mainly based on Markov models and queuing theory, and simulation modeling.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 608: Advanced Computer Security**

Advanced course on principles and practice of engineering secure information systems. Topics covered include threats and vulnerabilities, counter measures, legal policy issues, risk management and assurance. In-depth coverage of various research problems, which will vary from one offering of the course to another.

*Prerequisite: CSE 508 or CSE 509 or permission of instructor.*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 610: Parallel Computer Architectures**

Topics include parallel computer systems; important parallel applications; parallel computation models; interconnection networks; SIMD and MIMD architectures; hybrid architectures; memory management; cache coherence; distributed shared memory; synchronization methods; operating systems; compilers; and programming tools.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 613: Parallel Programming**

Algorithms and techniques for programming highly parallel computers. Trends in parallel and distributed computing; shared address

space and message passing architectures; design issues for parallel algorithms; converting sequential algorithms into equivalent parallel algorithms; synchronization and data sharing; improving performance of parallel algorithms; interconnection network topologies, routing, and flow control; latency limits on speedup of algorithms by parallel implementations.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 614: Advanced Programming Languages**

Selected topics on advanced programming languages technology. Program analysis and transformation, program optimization and program manipulation systems. Very high-level and declarative languages such as sets and relations based languages and deductive and object-oriented languages.

*Prerequisite: CSE 526 or CSE 504*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 615: Advanced Computer Vision**

Survey of methods used for the analysis of images by computer, including computer vision and pattern recognition. Topics to be covered are image formation, image segmentation, and edge detection, binary images, and shape analysis, shape from shading, motion field, and optical flow, surface inference, classification techniques.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 617: Advanced Topics in Wireless Networks**

Advance topics taken from ad hoc wireless networks and sensor networks. Will comprise of lectures, presentations and/or a project.

*Prerequisite: Limited to CSE graduate students; others, permission of instructor. Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **CSE 620: Virtual Reality**

Practical issues in the design and implementation of virtual environments. Topics include system requirements, transformations, user-interaction models, human vision models, input/output devices and techniques, tracking systems, augmented reality, and virtual-reality applications. The course will involve a substantial programming project to implement an immersive virtual reality system.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 621: Physics-based Modeling for Visual Computing**

A unified approach to various fields such as graphics, visualization, computer-aided geometric design, biomedical imaging, vision, and virtual environment. The course will explore select research topics centered on physics-based modeling methodology and associated computational methods for theoretical and practical problems in widespread areas of visual computing. The emphasis will be on geometric and solid modeling, geometric design techniques, wavelets and multi-resolution analysis, deformable models based on mathematical physics, variational analysis, optimization methods, numerical simulation with finite-difference and finite-element algorithms, differential equations for initial-value and boundary-value problems, force-driven interaction with constraints, dynamic sculpting system, and a large variety of applications for visual computing.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 624: Advanced Operating Systems**

Students will study advanced operating system topics and be exposed to recent developments in operating systems research. In addition to being conversant in classic and recent research papers, this course aims to teach students to read research papers critically, formulate new research questions, and evaluate these questions experimentally. Topics to be covered typically include: distributed systems, cloud computing and data centers, operating system design, virtual machines, OS interaction with the hardware architecture, synchronization and communication, file systems, and security.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 625: Advanced Asynchronous Systems**

Formal specification and verification of asynchronous systems. Topics include concurrent programming, process algebras, logics for describing the properties of concurrent systems, and formal semantics of communication.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSE 626: Switching and Routing in Parallel and Distributed Systems**

This course covers various switching and routing issues in parallel and distributed systems. Topics include message switching techniques, design of interconnection networks, permutation, multicast and all-to-all routing in various networking nonblocking, and rearrangeable capability analysis and performance modeling. Prerequisite: ESE 503 and 545 or CSE 502 and 547, or permission of instructor

3 credits, Letter graded (A, A-, B+, etc.)

### **CSE 628: Natural Language Processing**

The course offers computationally-oriented introduction to natural language processing (NLP). The focus is on modern quantitative techniques in NLP: algorithms and statistical approaches to word-level, syntactic, and semantic processing of natural language. The choice of topics includes practically motivated questions in NLP such as (1) can we teach computers to automatically detect authorship of a document? (2) can computers automatically suggest paraphrases (phrases with similar meaning) to help with writing? Prerequisite: Familiarity with either Artificial Intelligence or Machine Learning is strongly recommended, but not absolutely required. Limited to CSE Graduate Students

Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)

### **CSE 633: Computability and Undecidability**

Computability theory based on Turing machines and recursive functions; proof by diagonalization and reducibility; unsolvable problems in set, group, number and language theory; reducibility orderings and degrees of unsolvability; priority methods and Post's problem. Prerequisite: CSE 540 or consent of instructor.

3 credits, Letter graded (A, A-, B+, etc.)

### **CSE 638: Advanced Algorithms**

This is an advanced course in the design and analysis of combinatorial algorithms, focusing on recent material and special topics, including randomized algorithms, approximation algorithms for NP-complete problems, string algorithms, amortized analysis of data structures, and heuristic methods such as simulated annealing. Material will be selected to have little or no overlap with traditional introductory algorithms courses.

3 credits, Letter graded (A, A-, B+, etc.)

### **CSE 639: Seminar in Advanced Topics in Computer Science**

May be repeated for credit.

### **CSE 641: Seminar in Logic in Computer Science**

### **CSE 642: Seminar in Algorithms**

May be repeated for credit.

### **CSE 643: Seminar in Concurrency**

May be repeated for credit.

### **CSE 644: Seminar in Databases**

May be repeated for credit.

### **CSE 645: Seminar in Languages**

May be repeated for credit.

### **CSE 646: Seminar in Artificial Intelligence**

### **CSE 648: Seminar in Graphics**

May be repeated for credit.

### **CSE 649: Seminar in Operating Systems**

May be repeated for credit.

### **CSE 650: Seminar in Architecture**

May be repeated for credit.

### **CSE 651: Seminar in Secure Computation**

May be repeated for credit.

### **CSE 652: Seminar in User Interfaces**

May be repeated for credit.

### **CSE 653: Seminar in Virtual Reality**

May be repeated for credit.

### **CSE 654: Seminar in Visualization**

May be repeated for credit.

### **CSE 655: Seminar in Natural Language Processing**

May be repeated for credit.

### **CSE 656: Seminar in Computer Vision**

Current readings in computer vision and image understanding.

Prerequisite: Limited to CSE graduate students; others need instructor consent  
Fall, 1 credit, S/U grading  
May be repeated for credit.

### **CSE 657: Seminar in Design Analysis**

Methods for constructing reliable and efficient computer systems. Topics include: modeling and specification, analysis and verification, design and optimization, code generation, simulation and testing. Tool support. Applications and case studies.

Prerequisite: Limited to CSE graduate students; others need instructor consent  
Fall, 1 credit, S/U grading  
May be repeated for credit.

### **CSE 658: Seminar on Mobile and Wireless Networking**

This seminar course will draw topics from mobile and wireless networks of current interest. The main focus will be multi-hop wireless networks. It will cover topics on mobile routing, multiple access and transport protocols for such networks. It will also cover topics from micromobility architectures and pervasive computing.

Prerequisites: Limited to CSE graduate students; others permission of instructor.  
Fall, 1 credit, S/U grading  
May be repeated for credit.

### **CSE 659: Seminar in Computer Security**

Seminar course, covering various research problems in computer security.

Spring, 1 credit, S/U grading  
May be repeated for credit.

### **CSE 660: Seminar in Media Networks**

Graduate seminar that covers recent work on multimedia and networks.

Fall, 1 credit, S/U grading  
May be repeated for credit.

### **CSE 660: Seminar in Sustainable Computing**

Seminar course which focuses on research in sustainable computing.

1 credit, S/U grading  
May be repeated for credit.

### **CSE 661: Seminar in Data Privacy**

Current research in Data Privacy.

Limited to CSE graduate students; others, permission of instructor.  
Spring, 1 credit, S/U grading  
May be repeated for credit.

### **CSE 662: Seminar in Medical Imaging**

May be repeated for credit.

### **CSE 663: Cyber Physical Systems and Verification**

Seminar course which focuses on research in Cyber-Physical Systems and Verification.

1 credit,  
May be repeated for credit.

### **CSE 664: Distributed Systems**

Seminar course which focuses on research in Distributed Systems.

1 credit,  
May be repeated for credit.

### **CSE 665: Special Topics in Theory of Computing**

May be repeated for credit.

**CSE 669: Special Topics in Databases**

May be repeated for credit.

**CSE 670: Special Topics in Languages**

May be repeated for credit.

**CSE 671: Special Topics in Artificial Intelligence**

May be repeated for credit.

**CSE 672: Special Topics in Image Processing**

May be repeated for credit.

**CSE 674: Special Topics in Operating Systems**

May be repeated for credit.

**CSE 677: Special Topics in User Interfaces**

May be repeated for credit.

**CSE 681: Special Topics in Computer Vision**

Advanced research topics course.

*Prerequisite: Limited to CSE graduate students; others need instructor consent*  
Fall, 2 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

**CSE 684: Special Topics in Computer Security**

Special topics course, covering selected research areas in computer security.

Spring, 2 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

**CSE 686: Special Topics in Data Privacy**

Advanced research topics course.

*Limited to CSE graduate students; others, permission of instructor.*  
Spring, 2 credits, S/U grading  
May be repeated for credit.

**CSE 687: Special Topics in Applied Cryptography**

May be repeated for credit.

**CSE 690: Advanced Topics in Computer Science**

An advanced lecture course on a new topics in computer science. This course is primarily designed for PhD students, but can be taken by M.S. students as well. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for credit as the topic changes, but cannot be used more

than twice to satisfy CSE major requirements for M.S. Limited to CSE graduate students; others permission of instructor

Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

**CSE 691: Advanced Topics in Computer Science**

An advanced course on a new topic in computer science. This course is primarily designed for Ph.D. students, but can be taken by M.S. students as well. Semester supplements to this Bulletin contain specific description when course is offered. may be repeated for credit as the topic changes, but cannot be used more than twice to satisfy CSE major requirements for M.S. Limited to CSE graduate students; others permission of instructor.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

**CSE 692: Advanced Topics in Computer Science**

An advanced lecture course on a new topic in computer science. This course is primarily designed for Ph.D. students, but can be taken by M.S. students as well. Semester supplements to this Bulletin contain specific description when course is offered. may be repeated for credit as the topic changes, but cannot be used more than twice to satisfy CSE major requirements for M.S. Limited to CSE graduate students; others permission of instructor.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

**CSE 693: Advanced Topics in Computer Science**

An advanced lecture course on a new topic in Computer Science. This course is primarily designed for Ph.D. students, but can be taken by M.S. students as well. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for credit as the topic changes, but cannot be used more than twice to satisfy CSE major requirements for M.S. Limited to CSE graduate students; others permission of instructor.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

**CSE 694: Seminar in Sustainable Computing**

Sustainability is a societal problem that affects us all. With the recent emphasis on

the adverse impact of carbon emissions from data centers, there is renewed interest from industry, government, and academia in making computing more sustainable. This seminar course will cover recent advances in this space. Specifically, we will first discuss the nature of the problem and the cost of unsustainable data center operations, especially for AI workloads. We will then discuss factors that contribute to unsustainable operations in data centers and computing broadly, including operational and embedded carbon. The remaining of the course will focus on defining the problem, the metrics of sustainability in computing, and possible approaches to stem unsustainable computing in data centers, including space- and time-scheduling of workloads to better leverage clean energy, lowering the compute demand of workloads, and harnessing latest hardware advances to reduce embodied carbon in computing. This 1-credit seminar course will cover topics in computation sustainability, including (but not limited to): - definition of computational sustainability, including components and metrics of sustainability used in research and practice - current state of computational sustainability in data centers and for specific workloads, such as AI and ML training - unsustainable practices in data centers and computing and reasons behind them - survey of proposed solutions in literature and discussion Students enrolling for the seminar will be expected to lead at least 2 weekly meetings by summarizing recent papers on computational sustainability, and to participate in all meeting discussions.

1 credit, S/U grading

**CSE 695: Seminar in Deep Learning Theory**

This course will cover some recent optimization theory as it relates to training deep neural networks, covering topics including: - landscape analysis of overparameterized nonconvex networks - implicit bias of gradient descent - tools for computing generalization bounds - the neural tangent kernel as an analysis tool Students enrolling for the course will be expected to watch a handful of online lectures, lead at least 1 weekly meeting which either summarizes a paper or an online lecture, and participate in all meeting discussions.

1 credit, S/U grading  
May be repeated for credit.

**CSE 696: PhD Internship Project Off-Campus**

Participation in internships at private corporations, public agencies, or non-profit institutions. Students will be required to have a faculty coordinator as well as a contact in the

outside organization to participate with them in regular consultations on the project, and to submit a final report to both. This course is intended for PhD students interning off campus.

*1-3 credits, S/U grading  
May be repeated for credit.*

### **CSE 697: PhD Internship Project On Campus**

Participation in internships at private corporations, public agencies, or non-profit institutions. Students will be required to have a faculty coordinator as well as a contact in the outside organization to participate with them in regular consultations on the project, and to submit a final report to both. This course is intended for PhD students interning on campus.

*1 credit, S/U grading  
May be repeated for credit.*

### **CSE 698: Practicum in Teaching**

Supervised teaching in a course identified by the student and the Graduate Program Director.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **CSE 699: Dissertation Research on Campus**

Thesis research for PhD students who have advanced to candidacy (G5 status). This course is taken by students when a major portion of the research is done on campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*0-9 credits, S/U grading  
May be repeated for credit.*

### **CSE 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 0-9 credits, S/U grading  
May be repeated for credit.*

### **CSE 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by

mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver be second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.  
Fall, Spring, 0-9 credits, S/U grading  
May be repeated for credit.*

### **CSE 800: FT SUMMER RESEARCH**

*May be repeated for credit.*

## **CSM**

### **Center for Science and Mathematics Education**

#### **CSM 510: Biology Education Research: Teaching, Learning, and Assessment**

Introduction to core policy documents, standards, concepts, and empirical methods in biology education research and their applications to undergraduate classroom settings. Appropriate for graduate students in the biological sciences and/or those enrolled in the Ph.D. Program in Science Education.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CSM 545: The Nature of Science**

The nature of science refers to the values and assumptions inherent in the development, understanding and interpretation of scientific knowledge. Scientific knowledge is empirically based, culturally embedded, tentative, and incorporates subjectivity and creativity. This course will address the following: What is science? What distinguishes science from other ways of knowing or as being basic science, applied science or technology? What philosophical, social, ethical and historical perspectives are important in understanding the nature of science?

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CSM 546: Topics Biotechnology**

An introduction to the field of biotechnology. The course will survey the history of the development of genetic engineering, methodologies used in biotechnology, applications of biotechnology in medicine, agriculture and manufacturing, and the implications of these technologies for society. Intended for the students in the MAT Science and MALS programs. This

course has an associated fee. Please see [www.stonybrook.edu/course-fees](http://www.stonybrook.edu/course-fees) for more information. Offered

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **CSM 547: Topics in Genetics**

A survey of genetics organized around a particular topic, including gene regulation, developmental genetics, cancer genetics, epigenetics with emphasis on areas with emerging new insight. The methodology used to study these areas will also be explored. Intended for students in the MAT Biology and PhD Science Education programs.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CSM 548: Current Topics in Microbiology**

A survey of microbiology with an emphasis on microbial ecology, the role of microbes in the biosphere and the methodology used to explore these areas. The course is organized around two resources available online: Unseen Life on Earth: An Introduction to Microbiology, which was produced by The American Society for Microbiology (<http://www.learner.org/resources/series121.html>) and the New York State core curriculum for The Living Environment (<http://www.p12.nysed.gov/ciai/mst/sci/l.html>). Intended for the students in the MAT Science and MALS programs. This course has an associated fee. Please see [www.stonybrook.edu/course-fees](http://www.stonybrook.edu/course-fees) for more information.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **CSM 549: Laboratory Science Curriculum Development**

Development of curriculum materials appropriate for a secondary school biology classroom. Students may take this course in their second semester of the Master of Arts in Teaching Science program.

*1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

#### **CSM 550: Independent Study in Biology**

A research project or body of readings will be selected with an instructor. It is expected that participants will gain current information in a topic of interest with applicability to middle school or high school curriculum. Prerequisite: Permission of instructor

*1-6 credits, Letter graded (A, A-, B+, etc.)*

#### **CSM 551: Polymerase Chain Reaction: Theory and Practice**

The polymerase chain reaction (PCR) has become an indispensable tool in biology.

PCR has revolutionized our approach to medical diagnostics, basic research, and forensic applications. This laboratory and lecture course is designed to teach a solid theoretical and practical framework for PCR, including primer and application protocol design, trouble-shooting, and interpretation of results.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 552: Current Concepts in Neurobiology**

Neurological disorders such as Parkinson's and Alzheimer's have been the center of much media attention recently. This lecture and laboratory course is designed to provide students with a basic overview of the brain and nervous system. Course participants will also utilize current approaches taken by research scientists to investigate the properties of the nervous system and its disorders. Laboratory activities that can be used in secondary school curricula will be emphasized. Prerequisite: Undergraduate degree in Biology

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 553: Biology and Human Social and Sexual Behavior**

A biological theory of human uniqueness is presented and explored through the examination of empirical evidence from a multidisciplinary prospective including insights from ethnology, human social and sexual behavior, evolutionary biology, history, economics, the humanities and political science.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 554: Current Topics in Immunology**

This is a comprehensive course in Immunology designed to be taught to secondary school teachers and it will address the new living environment curriculum standards for Immunology. The proposed course will combine lectures in Immunology with practical laboratory exercises. Laboratory activities will be provided that can be modified for secondary school education. Emphasis will be made on recent developments in Immunology and the essential role of the immune system in protection from infections and cancer. Concepts to be covered include how the immune system distinguishes self from non-self, how it handles various pathogens and why it sometimes fails.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 556: Ecology**

An examination of the interactions of living organisms with their physical and biological

environments. Special attention is given to population dynamics and the interactions among organisms that determine the structure, function, and evolutionary development of biological communities. In addition, teacher candidates will conduct an independent project consisting of either a research paper or development of an ecology laboratory for a secondary school science class.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 557: Forensic Science**

Forensic science is focused upon the application of scientific methods and techniques to crime and law. In this course, scientific methods specifically relevant to crime detection and analysis will be presented. Emphasis is placed upon understanding the science behind the techniques used in evaluating physical evidence. Science MAT students or permission of the instructor.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 560: Concepts in Life Sciences K-8**

This is an integrated lab/lecture course designed to increase confidence and enthusiasm while building fundamental knowledge of middle-level science teaching and learning in the Life Sciences. Topics include chemical basis of life (biochemistry), cell structure and function, vital life process (respiration and photosynthesis), genetics, evolution and ecology. This course includes standards-based curriculum design and research-based teaching strategies as well as hands on laboratory experiences. It focuses on developing and presenting inquiry-based lessons designed to encourage students to investigate science using educational technologies to support science lessons, integrated other subject matter areas with science, designing differentiated lesson that include all students in learning science, and assessing student understanding of science and the nature of science.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 562: Concepts in Chemistry K-8**

This course provides participants with the necessary chemistry content needed to teach physical science applications at the upper elementary and middle school levels. The New York State Science and Learning Standards (NYSSLS) are utilized to provide a structure for the topics that teachers are required to teach within the new standards. In addition, the science and engineering practices and cross-cutting concepts addressed in NYSSLS are integrated within the discussion of chemistry content. During each lesson, chemical safety requirements are addressed and discussed. This

course is designed to provide teachers with chemistry content required for the disciplinary core ideas of the NYSSLS standards through integration of activities, hands on learning and reading assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 599: Graduate Research in STEM Education**

Research to be supported by a faculty member in the Programs in Science and STEM education. Prerequisite: Permission required.

*Fall, 1-9 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CSM 600: History and Philosophy of STEM Education**

An introduction to the history of the field of STEM (science, technology, engineering, mathematics) and the related philosophical underpinnings. The course will survey the major events, ideas and philosophies and how these have changed over time. Particular focus will be on the time period from 1890 to the present day. Offered

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 610: The Nature and Practice of Science**

An overview of the nature and practice of science through the analysis of current issues in science. Through the extensive use of case studies, students will address questions such as: What is science? What distinguishes science from other ways of knowing? What standards of evidence and scientific explanations, processes, and conventions are used in science? What philosophical, social, ethical, and historical perspectives are important in understanding science?

*Offered*

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 620: STEM Teacher Education**

Introduction to the historical, philosophical and pedagogical issues surrounding STEM (science, technology, engineering, mathematics) teacher education. Introduction to the nature of the research that has been conducted on teacher education in the past and current trends. Offered

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 630: STEM Education Research Seminar**

Introduction to the major theoretical frameworks and paradigms in societal issues (gender, culture, and diversity) contextualized



in STEM (science, technology, engineering, mathematics) education. Students will be required to critique research papers in the field and will conduct a literature review in their general thesis area. Offered

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 635: Qualitative Research Methods in STEM Education**

Introduction to qualitative research methods in STEM (science, technology, engineering, mathematics) education including a) its purposes, b) data collection techniques, c) methods of data analysis, and d) preparing appropriate research reports.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 640: Directed Study in STEM Education**

In their fifth semester students will individually complete a directed study with a faculty advisor. The intent of this course is to prepare the students for the doctoral qualifying examination and assist them in refining their research topics. Offered

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **CSM 645: Introduction to Quantitative Research Methods**

This course will provide doctoral student with an introduction to various quantitative research methods (non-experimental, experimental, and quasi-experimental designs) and the corresponding data analysis/statistical procedures used for conducting empirical research in STEM (science, technology, engineering, mathematics) education. Appropriate statistical analysis associated with each research method will be discussed and SPSS assignments included. Students will develop a research proposal for a peer reviewed conference or journal.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **CSM 650: Introduction to Measurement and Assessment in Science Education**

CSM 650: Introduction to Measurement and Assessment in Science Education. 3 Credits. Introduction to core standards, concepts, and empirical methods in educational measurement and assessment; introduction to the development, use, and evaluation of measurement instruments in science education. Semesters Offered: Fall and Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

### **CSM 699: Dissertation Research on Campus**

Prerequisite: Must be advanced to candidacy (G5); major portion of the research will take place on SB campus, at Cold Spring Harbor; or at Brookhaven National Lab. Semesters offered:

*Fall, 0-9 credits, S/U grading*

*May be repeated for credit.*

### **CSM 700: Dissertation Research Off Campus-Domestic**

Prerequisite: Must be advanced to candidacy (GS); major portion of the research will take place off Campus, but in U.S. and/or U.S. provinces. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **CSM 701: Dissertation Research Off Campus-International**

Prerequisite: Must be advanced to candidacy (GS). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home

*country are charged for the mandatory health insurance (if they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable); all international students must receive clearance from an International Advisor.*

*Fall, 1-9 credits, S/U grading*

*May be repeated for credit.*

## **CST**

### **Cultural Studies**

#### **CST 502: Theories in Cultural Studies**

This course examines the role of theory in the practice of cultural studies. 3 credits.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

#### **CST 510: History of Cultural Studies**

This course will examine the intellectual and disciplinary stakes of raising the question, "what is Cultural Studies?" The intention is

not so much to define Cultural Studies as to study the polemics and histories that sparked its delineations.

*Offered Fall/*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

#### **CST 597: Directed Readings for M.A. Students**

A student and faculty member agree on a corpus of texts to read and discuss at weekly or biweekly meetings. The reading list must be filed with the program's form before the add/drop period ends. May be repeated for credit.

*Fall and Spring, 1-3 credits, S/U grading*

*May be repeated for credit.*

#### **CST 598: Thesis Research**

Research and writing of M.A. thesis supervised by faculty advisor.

*Offered Fall, Spring, 1-3 credits, S/U grading*

*May be repeated for credit.*

#### **CST 599: Independent Study**

A student and faculty member agree on a topic not offered in any seminars and a reading list to study at weekly or biweekly meetings. A final research paper or major annotated bibliography will be required. The syllabus must be filed with the program's form before the add/drop period ends. May be repeated for credit. Only three credits of Independent Study can be counted toward the M.A. requirements, and a maximum of six toward the Ph.D

*Offered*

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **CST 609: Advanced Topics in Cultural Studies**

A variable topics seminar in Cultural Studies. 3 Credits, Letter graded (A,A-,B+,etc.) Course may be repeated as topics vary. Semesters Offered: Fall and Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **CST 680: Cultural Studies Research Seminar**

In addition to readings on issues, debates, and problems within the profession and field of Cultural Studies students will develop research for publication while engaging with practices of professionalization.

*Offered Fall/*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

**CST 690: Directed Readings for Doctoral Candidates**

A student and faculty member agree on a corpus of texts to read and discuss at weekly or biweekly meetings. The reading list must be filed with the program's form before the add/drop period ends. May be repeated for credit.

*Fall and Spring, 1-12 credits, S/U grading  
May be repeated for credit.*

**CST 696: Self-Directed Readings**

For doctoral students who have completed all course requirements and wish to dedicate themselves to full or part-time preparation for the Comprehensive Examination.

*Fall and Spring, 3-9 credits, S/U grading  
May be repeated 6 times FOR credit.*

**CST 698: Practicum in Teaching**

The course is divided into two parts: one half is normally given in the fall, one in the spring. The first part deals primarily with matters of pedagogy. The second part is designed to help students plan their own undergraduate courses. The practicum is required of all students during their first year.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

**CST 699: Dissertation Research on Campus**

Prerequisite: Advancement to candidacy (G5).

*A portion of dissertation research must take place on SBU campus.*

*Fall, Spring, and Summer, 1-9 credits, S/U grading  
May be repeated for credit.*

**CST 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

**CST 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by

mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.*

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

**CST 800: SUMMER RESEARCH**

*May be repeated for credit.*

**CST 850: SUMMER TEACHING**

*May be repeated for credit.*

## CWL

### Creative Writing and Literature

**CWL 500: Introduction to Graduate Writing**

A seminar that introduces students to one another, the faculty, the program in Writing and Literature, and to issues in contemporary writing. Offered in conjunction with the Writers Reading Series. Students will attend the regular series of readings sponsored by the Writing program and meet at weekly intervals under the direction of a faculty advisor to discuss and write about topics raised in the lecture series, as well as issues generated from seminar discussions.

*Offered Fall, Spring, 3-4 credits, Letter graded (A, A-, B+, etc.)*

**CWL 510: Forms of Fiction**

Regular submission, discussion, and analysis of students' work in one or more of the modes of fiction, including the short story, the novella, and the novel. Writing assignments may include exercises, imitations, responses, and original work. Students will examine relevant works that illustrate point of view, character development, dialogue, plot, setting, theme, motif, and other aspects of fiction. Specific mode or topic to be studied will be announced in the course schedule.

*Prerequisite: Permission of instructor and/or departmental consent*

*Offered Fall, Spring, 3-4 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**CWL 520: Forms of Poetry**

Regular submission, discussion, and analysis of students' work in one or more of the modes of poetry. Writing assignments may include exercises, imitations, responses, and original work. Students will examine relevant works that illustrate structural principles, metrical and syntactical rhythm, sound and rhyme, formal and stanzaic organization, the use of figurative language, and other aspects of poetry.

*Prerequisite: Permission of instructor and/or Program Director*

*Offered Fall, Spring, 3-4 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**CWL 530: Forms of Scriptwriting**

Regular submission, discussion, and analysis of students' work in one or more of the contemporary modes of scriptwriting, including writing for film, theater, radio, and television. Writing assignments may include exercises, imitations, responses, and original work. Students will examine relevant works that illustrate point of view, character development, dialogue, plot, setting, and other techniques vital to scriptwriting. Specific mode or topic to be studied will be announced in the course schedule.

*Prerequisite: Permission of instructor and/or departmental consent*

*Offered Fall, Spring, 3-4 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**CWL 535: Writing in Multiple Genres**

Regular submission, discussion, and analysis of students' work in two or more genres of creative writing. Topics include Truth and Humor; Three Characters in Search of an Author; Imagining What You Know; What We Write About When We Write About Love; Fiction, Fact and the Heart of the Story; Writing about Place; Writing Everything; and Writing on Location. Semesters Offered: Fall & Spring Campus: Manhattan & Southampton

*3-4 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**CWL 540: Forms of Creative Nonfiction**

Regular submission, discussion, and analysis of students' work in one or more of the contemporary fields of non-fiction writing, including biography, autobiography, memoir, expository writing, and social commentary. Writing assignments may include exercises, imitations, responses, and original work. Students will examine relevant works that illustrate the methods and techniques available to the non-fiction writer. Specific mode or topic to be studied will be announced in the course schedule.

*Prerequisite: Permission of instructor and/or departmental consent*  
*Spring, 3-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **CWL 550: Forms of Professional and Scientific Writing**

Regular submission, discussion, and analysis of students' work in one or more of the contemporary modes of professional writing, including technological writing, writing about science, and writing for advertising, business, and public relations, as well as for governmental, educational, and professional organizations. Writing assignments may include exercises, imitations, responses, and original work. Students will examine relevant works that illustrate the strategies available in modern professional communication. Specific mode or topic to be studied will be announced in the course schedule.

*Prerequisite: Permission of instructor and/or departmental consent*  
*Offered Fall, Spring, 3-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **CWL 560: Topics in Literature for Writers**

A seminar for writers concentrating on the study of one area of literary study, to be announced in the course schedule. The course may examine a contemporary or historical trend in literature, the rise of a specific genre, a social issue expressed in literature, an issue in literary theory, or any other topic of relevance and concern to students of writing. The emphasis will be on scholarly analysis.

*Offered Fall, Spring, 3-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **CWL 565: Special Topics in Writing**

A seminar concentrating on a specific topic or concern in writing. The particular theme of the course will be announced in the course schedule. Topics may include, among others, studies of character development, the uses of humor, writing about place, finding one's voice, and narrative style. Written work will be supported by the reading of related texts.

*Offered Fall, Spring, 3-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **CWL 570: Advanced Writing Workshop**

The focus is on work in progress and the extension of the manuscript. The workshop is open to students interested in any form of writing. Students are encouraged to pursue their own writing interests while

simultaneously being exposed to the work of others in varying genres. Regular writing is required, and vigorous analysis and discussion are encouraged. Strongly recommended for students preparing for the thesis.

*Offered Fall, Spring, 3-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **CWL 575: Writers Conference**

The Southampton Writers Conference is an intensive program of workshops in contemporary writing that includes lectures, readings, workshops, and panels featuring nationally distinguished authors who join the department's summer faculty. Graduate students in the program will assist in planning and running the Conference, and will have the option of taking a Conference workshop for credit. The Writers Conference will also encourage participation by visiting students, new writers, established writers, teachers of writing and editors, who will be admitted by application and may receive academic credit upon request.

*1-6 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **CWL 580: Practicum in Arts Administration**

Practicum in Arts Administration Under the guidance of a faculty advisor, students will learn the essentials of Arts administration. This may include assisting in the coordination of reading and lecture series, conference organization, or other writing and arts administration activities. 1-4 Credits. May be repeated for credit Prerequisites: Permission of instructor and program director SEMESTER: On Demand

*1-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **CWL 581: Practicum in Teaching Writing**

Students take the seminar in conjunction with teaching a section of first year composition. This course provides hands-on experience and instruction in the basics of writing pedagogy, including designing writing assignments, sequencing assignments, motivating writing, writing skill development and evaluating writing. Students will also be given a preliminary overview of the major theories driving composition pedagogy. 3 Credits. Prerequisites: Permission of instructor and program director SEMESTER: On Demand

*1-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **CWL 582: Practicum in Publishing and Editing**

Under the guidance of the faculty advisor, students will be exposed to the hands-on process of editing and publishing a literary journal.

*Offered Fall, Spring, 1-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **CWL 588: Independent Study**

Independent studies in topics chosen by the student are arranged through an individual instructor.

*1-6 credits, S/U grading*  
*May be repeated for credit.*

### **CWL 599: Thesis**

CWL 599 Thesis Every student in the M.F.A. program in Creative Writing and Literature must complete a thesis that is a publishable, book-length work. It may be fiction, nonfiction, poetry, a series of related short pieces, or some other creative writing project. The thesis is judged solely on the quality of its intelligence and its writing. Every student will propose a thesis project and upon approval will work independently under the guidance of faculty mentors. Additional resources such as meetings with faculty, editors, or agents will be equally available to students. Thesis study culminates with a group reading and submission of a bound copy of the thesis to the program. 1 - 9 Credits. Prerequisites: Permission of program SEMESTER: Every Semester

*1-9 credits, S/U grading*  
*May be repeated for credit.*

### **CWL 600: Post MFA Creative Writing Fellow**

CWL 600 provides students who have successfully completed the MFA in Creative Writing and Literature degree requirements access to an intellectual community of writers. Participants will be allowed to participate in one workshop or course per semester on a space available basis. The program office will communicate with enrollees prior to the start of the semester the workshops and courses available.

*S/U grading*  
*May be repeated for credit.*

### **CWL 800: Summer/Winter Research**

Independent reading, writing, research on topics or problems related to work on the MFA Thesis.

*Prerequisite: Permission of instructor and/or program director*  
*Summer, S/U grading*  
*May be repeated for credit.*

# DAN

## Dance

### DAN 501: Yoga and Somatics

A practicum in the ancient Indian philosophy of yoga approached from the somatic perspective of equally conditioning the physical, psychical, and discriminating mental body. Moments of harmonious action within the human system will be investigated through the physical challenges of Hatha Yoga. Participants will learn dynamic movement sequences, static poses, and breathing techniques, as they relate to the varied historical lineages from India. The student will gain experiential knowledge of yoga as used for healing pain, improving body image through somatic awareness, prevention of mental and physical disease, muscular control, and as training to balance strength and flexibility. Although the course will focus primarily on the physical experience, related texts will be used to contextualize modern practices and familiarize the student with the extent of varied methodologies available. Offered Fall and

*Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### DAN 568: Dance Improvisation

The practice and movement investigation through discipline, spontaneity, and awareness. Skills in improvisation will be developed through creative projects and experiments in dance.

*Prerequisite: DAN 165, 166, or 167*

*Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

# DCS

## Data and Computational Science

### DCS 501: Quantum Computing and Applications

This course is an introduction to and survey of the Quantum Computing, an emerging interdisciplinary field of science which has the potential to revolutionize computation over the next ten years, to transform chemistry, medicine, engineering and communications, as well as to change our understanding of physical world. The course will build intuitive approach to quantum computation and algorithms, but also will advance relevant vocabulary and skills for faculties and graduate students in engineering, computing, applied mathematics, chemistry, physics and

related sciences. The key questions of the quantum computing will be introduced. How to describe quantum systems and quantum operations? What is a quantum computer and what are the limits of quantum power? What is the difference between classical and quantum computation? Quantum teleportation? Quantum entanglement and superposition? How to mitigate errors and decoherence and transmit information through noisy channels? What are business applications and engineering challenges of the quantum computers? What are the gains in running quantum vs. classical algorithms? What are the physical principles of the current quantum computers hardware and what are technology requirements for realistic quantum computers?

*3 credits, Letter graded (A, A-, B+, etc.)*

### DCS 504: Compiler Design

This course covers advanced topics in compilation, including memory management, dataflow analysis, code optimization, just-in-time compilation, and selected topics from compilation of object-oriented and declarative languages. Prerequisites: CSE 304 and CSE 307

*3 credits, Letter graded (A, A-, B+, etc.)*

### DCS 521: Introduction to Computational and Data Science

This course provides a foundation of knowledge and basic skills for the successful application in graduate research of modern techniques in computational and data science relevant to engineering, the humanities, and the physical, life and social sciences. It is consciously crafted to provide a rich, project-oriented, multidisciplinary experience that establishes a common vocabulary and skill set. Centered around the popular programming language Python, the course will serve as an introduction to programming including data structures, algorithms, numerical methods, basic concepts in computer architecture, and elements of object-oriented design. Also introduced will be important concepts and tools associated with the analysis and management of data, both big and small, including basic statistical modeling in R, aspects of machine learning and data mining, data management, and visualization. No previous computing experience is assumed. Students are assumed to have taken some introductory courses in two of these three math subjects: linear algebra, calculus, and probability.

*3 credits, Letter graded (A, A-, B+, etc.)*

### DCS 522: Introduction to Scientific Programming in C++

This course provides students with foundational skills and knowledge in practical scientific programming relevant for scientists and engineers. The primary language is C++ since it is a widely-used, object-oriented language, includes C as a subset, and is a powerful tool for writing robust, complex, high-performance software. Elements of Python, Bash, and other languages will be introduced to complement the capabilities of C++, and essential tools for software development and engineering will be employed throughout the course (e.g. makefiles, version control, online code repositories, debugging, etc.).

*3 credits, Letter graded (A, A-, B+, etc.)*

### DCS 525: Fundamentals of Computing

Introduction to several modern approaches for developing computer programs and their use to solve mathematical problems. It will cover the fundamentals of programming in MATLAB, Python, and C/C++, including scripting, basic data structures, algorithms, scientific computing, performance optimization, software engineering and program development tools. No previous programming experience is required. This is a project-based, 3-credit course. Homework projects will focus on using computation to solve mathematical problems (e.g. linear algebra and differential equations), data management, data analysis, etc.

*3 credits, Letter graded (A, A-, B+, etc.)*

### DCS 544: Computational Methods in Physics and Astrophysics

An introduction to procedural and object-oriented programming in a high-level language such as C++ or modern Fortran with examples and assignments consisting of rudimentary algorithms for problems in physics and astronomy. Students will use the UNIX/Linux operating system to write programs and manage data, and the course will include an introduction to parallel computing and good programming practices such as version control and verification. The course will prepare students for courses in algorithms and methods that assume a knowledge of programming.

*3 credits, Letter graded (A, A-, B+, etc.)*

### DCS 569: Bayesian Data Analysis and Computation

An applied course in Bayesian data analysis and hierarchical modeling for advanced graduate students in Ecology& Evolution or related sciences. Topics will include probability theory, Bayesian analysis, and MCMC methods such as Gibbs sampling and Metropolis-Hastings sampling, as well as applied issues regarding the choice of prior

distributions, posterior convergence, censored and missing data, and model checking and comparison. The course will be taught using WinBUGS and JAGS as accessed via the R packages R2WinBUGS and R2jags, respectively.

*4 credits, Letter graded (A, A-, B+, etc.)*

### **DCS 572: Geophysical Simulation**

Basic equations and boundary conditions. Linear and nonlinear instabilities. Finite difference and time integration techniques for problems in geophysical fluid dynamics. Numerical design of global atmospheric and ocean models.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **DCS 581: Phase Transformations**

Thermodynamics and kinetics of solid state phase transformations. Mathematical formulation of equilibrium conditions and application to multicomponent homogenous/heterogeneous systems using chemical potential surfaces and free energy diagrams. Common tangent construction involving multiphase equilibria and miscibility gaps. Kinetics of phase transformations including classical nucleation theory followed by diffusion and diffusionless growth mechanisms.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **DCS 590: Introduction to Advanced Computational Social Science**

A multidisciplinary introduction to computational social science (CSS), emphasizing how social scientists develop and utilize computational-related social theory and methods to understand and analyze social behavior in the digital era. Topics include the CSS history and its latest development as well as how to use computational methods to collect, process, analyze, and visualize large-scale data from the real-world for social problems. This course also introduces state-of-the-art tools such as Python, R, and its scientific libraries for web-scraping, natural language processing, topic modeling, network analysis, and machine learning for text, image, and video data.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **DCS 697: Computational Linguistics 2**

An introduction to the theoretical foundation of computational linguistics. The course emphasizes the importance of algorithms, algebra, logic, and formal language theory in the development of new tools and software applications. Empirical phenomena in phonology and syntax are sampled from a variety of languages to motivate and illustrate

the use of concepts such as strictly local string languages, tree transducers, and semirings. Students will develop familiarity with the literature and tools of the field.

*3 credits, Letter graded (A, A-, B+, etc.)*

## **DPA**

### **Doctoral Program in Anthropological Sciences**

#### **DPA 505: Earth & Life Through Time: Vert Paleo (Turkana Basin)**

This course is one of five that constitute the Advanced Graduate Certificate in Human Origins at the Turkana Basin Institute in Kenya. Vertebrate fossils are important sources of information about the appearance, evolution, and extinction of major organisms. As such, they provide a valuable window into changes in climate and selection pressures, and organisms' diverse adaptive responses to these changes. They are also significant in placing hominid discoveries within a relative local chronology and helping reconstruct environments associated with hominin remains. This course acquaints students with methods of vertebrate paleontology employed in different chronological contexts of the Turkana Basin and their use in addressing diverse theoretical questions.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **DPA 513: Origins of Agriculture**

This course will trace the history of anthropological thought on the origins of agriculture and will assess the evidence from the Old and New worlds for this economic revolution. The course will not only explore areas where early agriculture is evidenced, but will also contrast these areas with those where agriculture was a later development. Emphasis will be on the environmental, technological, biological, social, and cultural processes associated with the "Neolithic Revolution." This course is offered as both ANT 513 and DPA 513.

*Fall, 4 credits, Letter graded (A, A-, B+, etc.)*

#### **DPA 514: Human Osteology**

A detailed study of the anatomy of the human skeleton with special emphasis on the interpretation of skeletal remains from archaeological contexts. Consideration is given to the growth, structure, and function of bones, and to forensic aspects such as the determination of age, sex, stature, and pathology from skeletal remains. Students conduct a research project on a human skeleton. Prerequisites: Previous course in human or vertebrate anatomy and permission

of instructor. Alternate years, 4 credits, Letter graded (A, A-, B+, etc.)

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

#### **DPA 515: Approaches in Archaeology**

Theoretical and methodological approaches employed in archaeology. The goals of the course are to provide an historical perspective on the growth of theory and method in archaeology and to examine in detail some of the pertinent research topics being studied today. This course is offered as both ANT 515 and DPA 515.

*Fall, 4 credits, Letter graded (A, A-, B+, etc.)*

#### **DPA 516: Research Design in Archaeology**

An examination of the ways in which archaeologists develop successful research strategies for arriving at answers to the key questions in the field. Students will analyze grant proposals that received funding from the major sources of funding for archaeology before developing research proposals of their own. The aim of the course is to provide the class with the skills needed to plan their future and compete successfully for funding both for their thesis research and in their future careers.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **DPA 518: Lithic Technology**

A detailed overview of the methods archaeologists use to extract behavioral information from prehistoric stone tools. The course examines raw material economy, technological strategies, tool use, and discard behavior. Analytical methods are practiced through the computer-assisted analysis of stone tools from simulated archaeological sites.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **DPA 519: Zooarchaeology**

An introduction to the study of animal bones from archaeological sites. Special emphasis is on identification of fragmented bone, identification of bone surface modification, calculation of indexes of abundance, and measurement and metrical analysis of mammal bone. Computer analysis is stressed, and the class seeks to synthesize traditional zooarchaeological and actualistic studies. This course is offered as both ANT 519 and DPA 519.

*4 credits, Letter graded (A, A-, B+, etc.)*

#### **DPA 525: Research Areas in Anthropological Sciences**

An overview of the current research areas of the Anthropological Sciences as represented in the IDPAS. All first-year students of Anthropological Sciences are expected to participate. Semesters Offered: Fall Grading: S/U

*0-1 credits, S/U grading  
May be repeated 1 times FOR credit.*

### **DPA 527: Field Methods and Techniques in Archaeology**

An opportunity to participate in all aspects of an archaeological research project. Students develop practical skills in excavation, and design and execute plans for recording, artifact retrieval, surveying, field sorting techniques, and interpretation. This course involves faculty-led excavation of a prehistoric or early historic site. This course is offered as both ANT 527 and DPA 527. Prerequisite: Graduate standing or permission of instructor

*3-9 credits, Letter graded (A, A-, B+, etc.)*

### **DPA 535: Ethnoarchaeology**

Ethnoarchaeology uses observations of present-day peoples to inform archaeological inquiry. This course helps students to explore ways in which ethnoarchaeological data contribute to several aspects of archaeological research: hypothesis building, survey and excavation strategies, interpretation of site and artifact data, and understanding the causes and processes of human behavioral change. In addition to seminar discussions of theoretical issues and case studies, students complete a book review of a monograph-length ethnoarchaeological study, a practical exercise in collecting and interpreting ethnoarchaeological data, and a term paper.

*4 credits, Letter graded (A, A-, B+, etc.)*

### **DPA 536: Phylogenetic Comparative Methods for trait evolution**

The course provides an overview of biostatistical approaches that are used to estimate phenotypic trait evolution and provides participants with a springboard to using these methods to answer their own research questions. This course focuses on analyses that use a phylogenetic tree and observed trait information from tip taxa (extant and/or extinct) to describe how traits have changed along the branches of a phylogeny. The course covers methods that account for phylogenetic relatedness in standard parametric tests and methods that use models of evolution to infer how traits have changed along branches of phylogeny. The course will involve substantial preparation and take-home assignments. Students will become proficient in R programming.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **DPA 541: Evolutionary Anatomy**

A lecture and laboratory with emphasis on dissection of the entire human body. Includes functional and comparative anatomy with special emphasis on the musculoskeletal morphology of humans and higher primates. This course is offered as both DPA 541 and HBA 541. There is a lab fee associated with this course. 8 credits, Letter graded (A, A-, B+, etc.)

*8 credits, Letter graded (A, A-, B+, etc.)*

### **DPA 555: Ancient African Civilizations**

The archaeology of Africa's later prehistoric and historic periods offers exciting contributions to global debates on the origins of agriculture and civilization. Covering the last 30,000 years, this course begins by examining the economic underpinnings of Africa's early complex societies: intensive hunting & gathering, animal domestication, and early farming. Detailed case studies of five ancient civilizations (Egypt, Aksum, Jenne, Swahili, and Great Zimbabwe), and then explore distinct processes of prehistoric social change in different parts of Africa. The course concludes by discussing African archaeological heritage conservation, education and synthesis. Beyond these main themes, we develop additional units and discussions on topics of special interest to the students enrolled.

*4 credits, Letter graded (A, A-, B+, etc.)*

### **DPA 557: Building Bones: Bone Development and Evolution**

An overview of the evolution, development, and growth of the skeleton, with a focus on mammals, primates, and humans. Students will review fundamental bone biology concepts, then read and discuss classic and current research on the evolution of bone development and the developmental basis for specific evolutionary changes in bone morphology. While much bone biology research has been completed in animal models, this course specifically builds a foundation for students to understand and critique current studies on the evolution and development of primate and human skeletal morphology. Within this context, students independently complete a literature review of the potential developmental and genetic basis for evolutionarily relevant variation of a skeletal phenotype, then propose research to help test these hypothetical relationships. Prerequisites: Instructor Consent

*3 credits, Letter graded (A, A-, B+, etc.)*

### **DPA 559: Archaeology of Food**

Explores the archaeological study of food and foodways. The emphasis is on the social aspects of food, particularly its roles in past power structures, social relationships, conceptions of identity, ritual practices, and gender roles. Also covers the theoretical and methodological approaches archaeologists use to study food in the past.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **DPA 560: Ancient Mesopotamia**

An examination of the cultural history of Mesopotamia based on the archaeological, textual and art historical record. Focusing on the fourth through second millennia, this course investigates both the long term developmental process of this civilization, and ways to understand its settlement systems, urban structure, social and political organization, economic structure and the role played by religion.

*Fall, alternate years, 4 credits, Letter graded (A, A-, B+, etc.)*

### **DPA 563: Aspects of Animal Mechanics**

An introduction to biomechanics. Covers free body mechanics and kinetics as applied to vertebrate locomotion. Considers the structure and physiology of muscle as it relates to adaptations of the musculoskeletal system. This course is offered as both HBA 563 and DPA 563. Prerequisites: Introductory physics and biology or permission of instructor.

*Spring, odd years, 2 credits, Letter graded (A, A-, B+, etc.)*

### **DPA 564: Primate Evolution**

The taxonomic relationships and evolutionary history of primates as documented by their fossil record and structural and chemical evidence. Emphasis on primates prior to the origin of the human lineage. This course is offered as ANT 564, DPA 564 and HBA 564. 4 credits, Letter graded (A, A-, B+, etc.)

*4 credits, Letter graded (A, A-, B+, etc.)*

### **DPA 565: Human Evolution**

A survey of the fossil record of hominid evolution through the Pliocene and Pleistocene with emphasis on the morphological structure and function of locomotor, masticatory, and neural systems. Includes utilization of comparative anatomical material and an extensive cast collection. This course is offered as ANT 565, DPA 565 and HBA 565. 4 credits, Letter graded (A, A-, B+, etc.)

*4 credits, Letter graded (A, A-, B+, etc.)*

**DPA 566: Studies in Functional Morphology**

Introduction to the theory and methods of functional morphology. Various methods of analysis and the application of experimental techniques such as electromyography or bone strain analysis are discussed as they pertain to the understanding of the interaction between form and function. Special emphasis is placed on the analysis of human and nonhuman primate morphology, and the application of this analysis to interpretation of the fossil evidence for human and nonhuman primate evolution. This course is offered as both HBA 566 and DPA 566.

*Prerequisite: Permission of instructor. Spring, even years, 2 credits, Letter graded (A, A-, B+, etc.)*

**DPA 567: Primate Behavior and Ecology**

A comparative approach to the behavior and ecology of living lemurs, monkeys, and apes. Emphasis is placed on sociobiological theory; life history strategies; morphological adaptations; comparisons of primate communities in Asia, Africa, Madagascar, and South America; and primate conservation. This course is offered as both ANT 567 and DPA 567.

*Fall, odd years, 4 credits, Letter graded (A, A-, B+, etc.)*

**DPA 582: Comparative Primate Anatomy**

The comparative anatomy of living primates. Laboratory dissection with emphasis on relating structural diversity to behavior and biomechanics. This course is offered as both HBA 582 and DPA 582. 4 credits, Letter graded (A, A-, B+, etc.)

*4 credits, Letter graded (A, A-, B+, etc.)*

**DPA 591: Professional Skills in the Anthropological Sciences, I.**

An overview of the skills necessary for scientific professionalism, with special reference to successful performance in the Anthropological Sciences. Topics covered in this course include: use of basic software tools, research design, data collection and management, dissertation proposal and journal article writing, oral and poster presentations, and professional conduct. This course is not an alternative to GRD 500. Recommended for students of G0 through G4 status. Permission by Instructor

*0-1 credits, S/U grading  
May be repeated for credit.*

**DPA 592: Professional Skills in the Anthropological Sciences, II.**

A development of additional professional skills necessary to master research and teaching in the Anthropological Sciences including career options and employment. Topics in this course include: the dissertation writing process, review processes, job applications and negotiations, tenure process, and teaching strategies. Recommended for students of G5 status. Permission by Instructor

*0-1 credits, S/U grading  
May be repeated for credit.*

**DPA 593: Ethics in the Anthropological Sciences**

This course familiarizes students with the major issues in the ethics of anthropological science, research and teaching. Students discuss scientific and academic values and how best to comply with them in academic, field, and laboratory environments. Overarching research ethics topics addressed include data management, scientific misconduct, plagiarism, authorship, and mentoring. This portion of the course incorporates videos and readings from GRD 500. Anthropology-specific topics include fieldwork, museum work, animal research, US and international laws (biodiversity; cultural & natural heritage), and public anthropology. Anthropological Sciences faculty with particular expertise in these various areas lead these discussions.

*0-1 credits, S/U grading  
May be repeated for credit.*

**DPA 600: Practicum in Teaching**

*May be repeated for credit.*

**DPA 602: Research Seminar in Anthropological Theory**

This course is offered as both ANT 602 and DPA 602.

*Fall and Spring, 0-12 credits, S/U grading  
May be repeated for credit.*

**DPA 610: Individual Research**

Research supervised by faculty. Students must have permission of instructor and enroll in appropriate section. This course is offered as both ANT 610 and DPA 610.

*Fall and Spring, 1-12 credits, S/U grading  
May be repeated for credit.*

**DPA 620: Research Seminar in Topical Problems**

This course is offered as both ANT 620 and DPA 620.

*Fall and Spring, 3 credits, S/U grading  
May be repeated for credit.*

**DPA 630: Research Seminar in Physical Anthropology**

This course is offered as both ANT 630 and DPA 630.

*Fall and Spring, 3 credits, S/U grading  
May be repeated for credit.*

**DPA 650: Research Seminar in Archaeology****DPA 680: Special Seminar**

Selected topics in cultural and social anthropology. Topics reflect current interests of faculty and graduate students. This course is offered as both ANT 680 and DPA 680.

*Fall and Spring, 1-3 credits, S/U grading  
May be repeated for credit.*

**DPA 699: Dissertation Research on Campus**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, and Summer, 1-9 credits, S/U grading  
May be repeated for credit.*

**DPA 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

**DPA 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

All international students must received clearance from an International Advisor. Fall, Spring, 1-9 credits, S/U grading May be repeated for credit.

### DPA 800: Summer Research

This course is offered as both ANT 800 and DPA 800.

S/U grading  
May be repeated for credit.

## ECO

### Economics

#### ECO 500: Microeconomics I

The first semester of a one-year course in microeconomic theory. Deals with decision-making of economic agents in different choice environments using the analytical approach of duality theory. Topics include theory of the consumer, theory of the firm, decision-making under risk and uncertainty, intertemporal choice, aggregation, and capital theory.

*Prerequisite: Graduate standing in the Economics Department or permission of the Graduate Director.*

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

#### ECO 501: Microeconomics II

A continuation of ECO 500, focusing on theories of equilibrium and market structure. Topics include general competitive equilibrium, imperfect competition and game theory, imperfect information, theory of public goods, and social choice.

*Prerequisite: ECO 500, Graduate standing in the Economics Department or permission of the Graduate Director.*

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

#### ECO 510: Macroeconomics I

The first semester of a one-year course in macroeconomic theory. Deals with theories and determinants of income, employment, and inflation. Topics include static equilibrium models, theories of money demand and monetary phenomena, theories of the labor market and unemployment, rational expectations and stabilization policy, consumption, and investment.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

#### ECO 511: Macroeconomics II

A continuation of ECO 510, focusing on dynamic models. Topics include models of economic growth, optimal growth and efficiency, overlapping-generations models, rational expectations, and optimal policy.

*Prerequisite: ECO 510, Graduate standing in the Economics Department or permission of the Graduate Director.*

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

#### ECO 520: Mathematical Statistics

The first semester of a one-year course in quantitative methods. Statistical methods and their properties of particular usefulness to economists. Topics include probability theory, univariate and multivariate distributions, limiting distributions, point and interval estimation, hypothesis testing.

*Prerequisite: Graduate standing in the Economics Department or permission of the Graduate Director.*

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

#### ECO 521: Econometrics

A continuation of ECO 520. The application of mathematical and statistical methods of economic theory, including the concept of an explanatory economic model, multiple regression, hypothesis testing, simultaneous equations models, and estimating techniques.

*Prerequisite: ECO 520, Graduate standing in the Economics Department or permission of the Graduate Director.*

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

#### ECO 522: Applied Econometrics

A continuation of ECO 521. The application and extension of econometric techniques developed in ECO 521. Emphasis on the relationship among economic theory, econometric modeling and estimation, and empirical inference. Computer usage for calculation of estimators. Critical examination of econometric studies in current journals.

*Prerequisite: ECO 521, Graduate standing in the Economics Department or permission of the Graduate Director.*

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

#### ECO 531: Introduction to Computational Methods in Economics

A first course in the computational and graphical techniques for finding numerical solutions to a set of economic models (from more elementary models such as Edgeworth Box to a more general competitive equilibrium model to finding the policy function of a dynamic growth model) based on concepts and constructs presented in the 1st year graduate theory courses. Includes the foundations of programming (using a symbolic algebra language), and finding maxima of functions, finding equilibria of markets, and exploring and fitting functions graphically and through finite difference and projection methods.

Emphasis is put on understanding the connections between the concepts, the algebra, the algorithm of the computation and the graphical presentation of economic models and on using the numerical models to perform experiments. Prerequisites: ECO500, ECO590, limited to Economics Department M.A. students Offered

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

#### ECO 590: Mathematical Foundations of Contemporary Economic Theory

A one-semester course dealing with mathematical concepts and techniques relevant to economic theory. Topics in set theory, topology, linear algebra, and optimization theory. Applications to economic theory developed as time permits.

*Prerequisite: Graduate standing in the Economics Department or permission of the Graduate Director.*

Fall, 0-3 credits, Letter graded (A, A-, B+, etc.)

#### ECO 597: Masters Project in Economics

In this required course students will work with an adviser of their choice to write a paper to be submitted by the end of the semester. This research piece will be a well-structured and coherent article on an economic research question in a field of the student's choice, with some elements of originality. The paper cannot be just an extended example that carries out known techniques on a problem that has known answers even if those techniques are complicated. The approval of the master's project advisor and the Graduate Program Director are required to register for this class. Offered fall and

Spring, 0-3 credits, S/U grading

#### ECO 599: Research in Special Topics

Prerequisite: Graduate standing in the Economics Department or permission of the Graduate Director.

Fall and Spring, 1-12 credits, S/U grading  
May be repeated for credit.

#### ECO 604: Game Theory I

Elements of cooperative and non-cooperative games. Matrix games, pure and mixed strategies, and equilibria. Solution concepts such as core, stable sets, and bargaining sets. Voting games, and the Shapley and Banzhaff power indices. This course is offered as both ECO 604 and AMS 552. Prerequisite for ECO 604: Graduate standing in the Economics Department or permission of the Graduate Director.



3 credits, Letter graded (A, A-, B+, etc.)

### **ECO 605: Game Theory II**

Refinements of strategic equilibrium, games with incomplete information, repeated games with and without complete information, and stochastic games. The Shapley value of games with many players, and NTU-values. This course is offered as both ECO 605 and AMS 555.

*Prerequisite for AMS 555: AMS 552/ECO 604. Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 606: Advanced Topics in Strategic Behavior in Economics**

An analysis of varying topics in strategic behavior in economics. One or more of the following topics and others will be dealt with each week: repeated games with incomplete information; stochastic games; bounded rationality complexity and strategic entropy; values of non-atomic games; strategic aspects in the telecommunication industry; general equilibrium and financial markets; auction mechanisms; knowledge, common knowledge, and strategic equilibria.

*Prerequisites: ECO 501, ECO 604, ECO 605, or permission of instructor, Graduate standing in the Economics Department or permission of the Graduate Director.*

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ECO 610: Special Topics: Advanced Macroeconomics Theory**

Topics in macroeconomic theory, including microfoundations of macroeconomics, temporary general equilibrium and disequilibrium, monetary theory, equilibrium theory of business cycles, implicit contracts, rational expectations, and econometric implications. Prerequisites: ECO 501, ECO 511, Graduate standing in the Economics Department or permission of the Graduate Director Semesters Offered: Fall and Spring 3 credits, Letter graded (A, A-, B+, etc.)

*May be repeated 3 times FOR credit.*

### **ECO 612: Computational Economics and Dynamic Modeling**

An analysis of the theory and applications of the dynamic modeling literature using computational methods, and on the methods themselves. Dynamic Modeling and Computational Economics are possibly the fastest growing areas of interest in the profession due to its suitability to model, solve and also estimate realistic decision making problems in most areas of economics.

*Prerequisite: Graduate standing in the Economics Department or permission of the Graduate Director*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 613: Computational Macroeconomics**

A concentration on numerical methods commonly used to solve dynamic macroeconomic models. These include methods relying on dynamic programming techniques, linear approximation methods, and non-linear methods that can be applied to models with distortions and heterogeneous agents. The different methods will be explained and their application to macroeconomics will be illustrated with examples from various areas such as Real Business Cycles, Asset Pricing with Complete and Incomplete Markets, and Recursive Contracts.

*Prerequisite: ECO 612, Graduate standing in the Economics department or permission of the Graduate Director*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 615: Advanced Macroeconomics workshop**

This course is designed for PhD students in their 2nd year and above who are thinking about writing a dissertation in macroeconomics. The course will provide the students with research methods for finding a PhD topic as well as for developing their preliminary ideas for their dissertation topic. The course will

*involve presentations not only from faculty members but also from students, allowing them to obtain direct feedback and direction for future research from all the faculty members in macroeconomics. The course will also provide students with reviews of the most important literature through discussions and presentations by the faculty members of seminal papers in the cutting edge research areas in macroeconomics. Some examples of these areas are consumer bankruptcy, Housing Markets, Social Security Reform, Health Care reform and Tax reform. The course will deal with stochastic, dynamic general equilibrium models which do not have a close form solution. Students will have to use these models to study their question of interest and the course will also provide them with direction as to which numerical methods are more appropriate to solve their particular problems.*

*Fall and Spring, 0-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 4 times FOR credit.*

### **ECO 623: Introduction to Computational**

Survey of major sources of data in economics and theoretical hypotheses and statistical methods for organizing and analyzing such data. Statistical models for quantitative data as well as qualitative choices are presented. Computer usage is expected.

*Prerequisite: ECO 521; Graduate standing in the Economics department or permission of the Graduate Program Director.*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 629: Studies in Quantitative Methods**

Prerequisite: ECO 521; Graduate standing in the Economics department or permission of the Graduate Program Director.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 636: Industrial Organization I**

Applications of microeconomic theory to the determinants of market structure. Relationships between market structure, firm behavior, and allocational efficiency. Econometric estimation and testing of some hypotheses suggested by the theory.

*Prerequisites: ECO 501, ECO 521; Graduate standing in the Economics department or permission of the Graduate Program Director. Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 637: Industrial Organization II**

This course is a continuation of ECO 636. It deals with the same questions and tools as ECO 636, and provides an introduction to antitrust policy and to public policy toward industry, including regulation and deregulation, the design of optimal regulation, and the effectiveness of current regulation.

*Prerequisites: ECO 501, ECO 521; Graduate standing in the Economics department or permission of the Graduate Program Director. Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 640: Labor Economics I**

This is the first course in the graduate sequence in labor economic theory and empirical applications. Topics include human capital theory, labor supply, life cycle behaviors, and the behavioral effects of social insurance programs. The emphasis is on up to date treatments of these topics in the literature. Offer

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 641: Labor Economics II**

This is an advanced course in labor economics which continues ECO 640. Topics include

both theory and estimation of job search, matching, dynamic discrete and continuous choice models of the labor market. Special emphasis will be given to the role of economic theory in specification and testing econometric models.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 642: Demographic Economics I**

This course deals with the economics of the family. It utilizes recently developed techniques in economics and demography to deal with questions concerning marriage, divorce, fertility, contraception, the intrafamily distribution of resources, and the intergenerational distribution of resources. Students will do original theoretical and empirical research under the professor's supervision. Prerequisite: ECO 501; Graduate standing in the Economics department or permission of the Graduate Program Director.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 643: Demographic Economics II**

This course is a continuation of ECO 642. It deals with the same questions and tools as ECO 642, but emphasizes developing economies. The connections between population growth and development are stressed.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 645: Health Economics I**

Critical reviews of research in health economics topics of current interest, such as empirical and conceptual models of physician behavior, competition in the pharmaceutical industry, the economic impacts of managed care, and the causes and consequences of unhealthy behaviors. Students will present and critique original research and produce a research paper on a topic of their interest.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 646: Health Economics II**

Theoretical and econometric analysis of selected aspects of the health care delivery system, such as the demand for medical services, the supply and distribution of physician services, the utilization of non-physician medical personnel, alternative models of hospital behavior, third-party insurance reimbursement, national health insurance and cost, and price inflation in the hospital and long-term care sectors. Offered as ECO 646 or HPH 664.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ECO 647: Research Methods in Applied Microeconomics**

Presentation, discussion and analysis of student and faculty research in the areas of applied microeconomics, labor economics, health economics and industrial organization, as well as applied econometrics. The purpose of the course is to provide skills and feedback to students at various levels in the program that assist them toward the completion of their second year paper, dissertation proposals and thesis. It is a course in research and presentation methods that provides an effective mechanism for learning about current areas of research interest.

*Prerequisite: Graduate standing in the Economics Department or permission of the Graduate Director*

*Fall or Spring, 0-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ECO 690: Seminar in Applied Economics**

Preparation, presentation, and discussion of student and faculty research in applied economics. Topics covered by student papers are usually related to students' long-term research interests.

*Fall or Spring, 0-6 credits, S/U grading  
May be repeated for credit.*

### **ECO 695: Research Workshop**

Designed to direct students to the selection of dissertation topics. Oral & written presentation of student papers with active faculty participation. Several sections may be offered each semester in areas of broad research interest.

*0-3 credits, S/U grading  
May be repeated 4 times FOR credit.*

### **ECO 698: Practicum in Teaching**

Prerequisite: Graduate standing in the Economics department or permission of the Graduate Program Director.

*Spring, 0-3 credits, S/U grading  
May be repeated for credit.*

### **ECO 699: Dissertation Research on Campus**

Prerequisite: Have declared thesis advisor in Economics Ph.D. program (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, and Summer, 1-9 credits, S/U grading  
May be repeated for credit.*

### **ECO 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 0-9 credits, S/U grading  
May be repeated for credit.*

### **ECO 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.  
Fall, Spring, 0-9 credits, S/U grading  
May be repeated for credit.*

### **ECO 800: Summer Research**

Prerequisite: Pre-approved participation in Economics dept. activity.

*S/U grading  
May be repeated for credit.*

## **EGL**

### **English**

#### **EGL 501: Studies in Chaucer**

#### **EGL 502: Studies in Shakespeare**

#### **EGL 503: Studies in Milton**

#### **EGL 505: Studies in Genre**

*May be repeated for credit.*

#### **EGL 506: Studies in Literary Theory**

Prerequisite: Matriculation in a graduate program or the composition studies certificate.

3 credits, Letter graded (A, A-, B+, etc.)

**EGL 509: Studies in Language and Linguistics**

**EGL 510: Old English Language and Literature**

**EGL 515: Middle English Language and Literature**

**EGL 520: Studies in the Renaissance**

**EGL 525: 17th-Century Literature**

**EGL 530: Studies in Restoration Literature**

**EGL 535: Studies in Neoclassicism**

**EGL 540: Studies in Romanticism**

**EGL 545: Studies in Victorian Literature**

**EGL 547: Late 19th-Century British Literature**

**EGL 550: 20th-Century British Literature**

**EGL 555: Studies in Irish Literature**

**EGL 560: Studies in Early American Literature**

**EGL 565: 19th-Century American Literature**

**EGL 570: 20th-Century American Literature**

**EGL 575: British and American Literature**

**EGL 582: Drama Workshop**

**EGL 583: Nonfiction Workshop**

Participants will learn to compose, critique and revise nonfiction forms such as essays and memoirs, incorporating narrative techniques that will make their work accessible and engaging to general readerships.

3 credits, Letter graded (A, A-, B+, etc.)

**EGL 584: Topics in Genre Studies**

Changing issues in the historical study of particular genres, such as the novel, lyric poetry, film, drama, etc.

Fall, Spring, Summer, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**EGL 585: Topics in Cultural Studies**

Changing issues in the interdisciplinary study of culture, including literature, popular culture, discourse studies, media studies, etc. Focus is on the analysis of historical contexts and on methods derived from contemporary cultural theory.

Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**EGL 586: Topics in Gender Studies**

Changing historical or theoretical focus on issues in gender studies, sexuality, queer studies, or women's writing.

Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**EGL 587: Topics in Race, Ethnic, or Diaspora Studies**

Changing historical or theoretical focus on issues of race or ethnicity, on U.S., British, or global ethnic literatures, or on experiences, histories, or theories of colonization, decolonization, empire, globalism, or diaspora.

Fall, Spring, Summer, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**EGL 588: Writing Workshop**

Changing focus on various forms of writing, including poetry, drama, fiction, the essay, etc.

Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**EGL 592: Problems in Teaching Writing or Composition**

This course provides an overview of writing pedagogy as applied to tutoring in a Writing Center or in an English classroom. Included in the course is fieldwork in the campus Writing Center.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

**EGL 594: Contexts of Literary Study**

**EGL 597: Practicum in Methods of Research**

**EGL 598: Thesis Research**

Research and writing of M.A. thesis supervised by faculty advisor.

Fall, Spring, Summer, 1-3 credits, S/U grading  
May be repeated for credit.

**EGL 599: Independent Study**

May be repeated for credit.

**EGL 600: Proseminar: The Discipline of Literary Studies**

Pro-seminar: Introduction to critical analysis, including theoretical and methodological approaches, and an orientation to the profession both in the academy and other careers. Faculty members will speak on their own scholarship and professional experiences.

3 credits, Letter graded (A, A-, B+, etc.)

**EGL 601: Problems in History and Structure of the English Language**

A survey of the English language from its historical beginnings through the present.

3 credits, Letter graded (A, A-, B+, etc.)

**EGL 602: Problems in Bibliography, Editing, and Textual Criticism**

An introduction to the study of manuscripts and printed books, with special emphasis on editorial and textual problems and decisions.

3 credits, Letter graded (A, A-, B+, etc.)

**EGL 603: Problems in Literary Theory and Criticism**

A seminar on any of the current theoretical approaches to texts.

3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**EGL 604: Problems in Literary Analysis**

An introduction to the explication of texts.

3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**EGL 605: Problems in Convention and Genre**

An examination of literary types and categories.

3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**EGL 606: Period and Tradition**

An examination of the major issues that pertain to particular historical literary periods.

3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**EGL 607: Individual Authors**

In depth study of specified writers, from Old English to Contemporary World Literatures in English.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **EGL 608: Problems in the Relationship of Literature to Other Disciplines**

This seminar will encourage the interdisciplinary focus of our program by examining the intersection between textual studies and other forms of inquiry.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **EGL 611: Critical Theory**

A seminar on influential theoretical approaches to texts.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **EGL 612: Theories in Composition**

This course explores the relationship between reading and writing skills, the differences between speech production and writing production, and the relationship between literacy, culture, and language politics.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

### **EGL 613: Research in Composition**

This course provides an introduction to the nature of empirical research in Composition Studies. Students will survey landmark research studies, learn how to read research reports critically, and conduct a mini-research project in their own classrooms or tutoring situations to analyze underlying causes of students' writing problems.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

### **EGL 614: Topics in Composition and Writing**

This course will consist of directed readings in particular areas of interest in rhetoric, the history of rhetoric and pedagogy, and teaching strategies for teachers.

*Offered*

Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

### **EGL 615: Independent Study**

Semesters Offered: Fall and Spring

0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **EGL 620: Literary Studies Research and Writing Seminar**

This course focuses on the research and writing skills necessary to submit work for publication. In addition to shared readings, students will conduct substantial new research

and expand a paper they have previously written for a graduate seminar. Please note that this course cannot be taken until students have completed at least one semester of the doctoral program.

3 credits,

### **EGL 688: Experiential Learning/ Internship**

This course is designed for students who engage in a substantial, structured experiential learning activity under the direction of a faculty member. Experiential learning occurs when knowledge acquired through formal learning and past experience are applied to a "real-world" setting or problem to create new knowledge through a process of reflection, critical analysis, feedback and synthesis. Beyond-the-classroom experiences that support experiential learning may include: service learning, field work, or an internship. The course is intended to foster professional development, helping students to apply and extend the specialized content knowledge and skills gained through academic coursework towards prospective careers in higher education or other sectors.

0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **EGL 690: Directed Readings**

May be repeated for credit.

### **EGL 695: Methods of Teaching English**

### **EGL 697: Practicum in Teaching English Literature**

Teaching workshop for introductory courses in poetry, fiction, and drama.

3 credits, S/U grading

### **EGL 698: Practicum in Teaching Writing**

This course provides hands-on experience and instruction in the basics of writing pedagogy, including designing writing assignments, sequencing assignments, motivating writing, writing skill development and evaluating writing. Students will also be given a preliminary overview of the major theories driving composition pedagogy.

3 credits, Letter graded (A, A-, B+, etc.)

### **EGL 699: Dissertation Research on Campus**

Prerequisite: Advancement to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

Fall, Spring, and Summer, 0-9 credits, S/U grading

May be repeated for credit.

### **EGL 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.

### **EGL 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.*

Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.

### **EGL 800: SUMMER RESEARCH**

May be repeated for credit.

## **EHM**

### **Environmental Humanities**

#### **EHM 501: Environmental Humanities & Ecoliteracy**

This course will provide an introduction to the multidisciplinary field of environmental humanities through the study of ecocritical concepts and theories, including environmental justice, social ecology, ecofeminism, deep ecology, conservationism, and biocentrism. Readings will include historical, literacy, and philosophical sources. Environmental film and visual art will be included. Semesters offered:

Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)

**EHM 502: Environmental Media, Film, Writing**

An examination of a variety of genres - social media; advertising; film; video; photojournalism; fiction; children's literature; and non-fiction - in order to understand ways in which these texts are utilized to inform and manipulate public opinion regarding the environment. The culmination of the course will be a final research project using multiple genres. Semesters offered:

*Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**EHM 503: Ecofeminism**

The course will examine ecofeminist critical theory from its inception in the early 1970s to the present. Ecofeminist thought will be utilized as the lens through which students read, research and study a wide variety of fiction and nonfiction literature, history, film, media and culture. Semesters Offered:

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**EHM 504: Environmental Justice**

This course will examine a wide range of environmental issues such as climate change, toxic pollution, water and food rights, and more--within socioeconomic and racial contexts. The course will look at how underprivileged and nonwhite socioeconomic communities are most adversely impacted by environmental degradation in the U.S. and around the world. Semesters Offered:

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**EHM 505: Environmental Narrative Nonfiction**

A study of the literary genre of environmental narrative nonfiction, which includes a blend of scientific and historical fact and creative expression and memoir. Students will read a wide variety of creative nonfiction and narrative nonfiction books and articles, research a particular environmental issue in depth, and write their own original work of environmental narrative nonfiction (incorporating both their research and personal voice). Semesters Offered:

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**EHM 560: Topics in Sustainability and Study Abroad**

This course offers students the opportunity to study abroad in a foreign setting and learn about another culture's approaches to environmental sustainability. The course will focus on one or more of the following subject areas: environmental creative writing, eco-aesthetics, renewable energy, environmental policy and design, environmental politics

and history, environmental advocacy, permaculture, horticulture and landscape design. Participants will be assigned readings and research assignments prior to departure. Community service may be included. While traveling abroad, student will participate in lectures, readings, workshops, and site visits, and the course will culminate in a research capstone project.

*3-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

## EMP

### Engineering Management

**EMP 501: Leadership**

In this course, we review current and classic concepts and theories in leading in engineering contexts. We examine leadership at different levels: leading groups and teams, leading projects, and leading complex organizations. We consider seminal questions in leadership studies including: What are the differences between managing and leading? How do leadership styles interact for effective leadership? How do leaders build community in their organizations? And we review several practical concerns of leadership, including leading change, leading in diverse contexts, and leader succession planning.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

**EMP 502: Engineering Economics**

This is a course in advanced cost justifications for business and projects. The objective is to give the student a better understanding of what is required to justify, budget, plan and carry out technological projects in industry today. The student will also understand how management decisions are influenced by financial analysis when making budgetary project plans.

*3 credits, Letter graded (A, A-, B+, etc.)*

**EMP 504: Quantitative Methods in Management**

This course is a rapid introduction to the application of modern mathematical concepts and techniques in management science. Algebraic operations, mathematical functions and their graphical representation, and model formulation are reviewed. Topics covered include the following: algebraic and graphic methods of linear programming; PERT, CPM, and other network models; and inventory theory. Simple management-oriented examples are used to introduce mathematical formulations and extensions to more general problems. The computer laboratory may be

used to give students experience with PC software packages that solve problems in all course topics. Interpretation of computer outputs is also stressed. We will also discuss several quantitative methods for analyzing and controlling cost, lead time, and quality of the goods or services being produced.

*3 credits, Letter graded (A, A-, B+, etc.)*

**EMP 506: Strategic Technology Analysis**

This course is a rapid introduction to the application of modern mathematical concepts and techniques in management science and the foundation for an understanding of Operations Management principles for Engineers. Algebraic operations, mathematical functions and their graphical representation, and model formulation are reviewed. Topics and quantitative methods covered, include the following: algebraic and graphic methods of linear programming; PERT, CPM, cost controls, Enterprise Resource Planning (ERP), lead-time, inventory, just-in-time systems, quality control and other network models for product goods or services as well as facility location and plant layout analysis, and project management. Simple management-oriented examples are used to introduce mathematical formulations and extensions to more general problems. The "Value Chain" process will be fully investigated and analyzed through the; design, forecasting, supply chain, production and quality control stages. This is the process of creating company equity by transforming ideas and materials into true value-added, goods and services for stakeholders. Computer laboratories may be used to give students experience with PC software packages that solve problems in all course topics. The interpretation of computer outputs is also stressed.

*3 credits, Letter graded (A, A-, B+, etc.)*

**EMP 507: Research and Special Topics in Global Industrial Management**

An individual study course for students investigating special topics relating to global industrial management.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

**EMP 509: Enterprise Information and Knowledge Systems Management**

This course covers the different types of enterprise systems, how they are used to manage an organization's processes, re-engineering the business with enterprise systems, and the relationship among technology, organization, and management. Knowledge-based and web-based features in modern enterprise systems will be emphasized.

Database Management, Security, Control, Ethical, and Social issues of enterprise systems will be discussed.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EMP 511: Starting a Business Venture**

This course covers the necessities of beginning a business from turning a concept into a new venture and developing a business plan for a venture. Topics include how to identify and evaluate the product and its market potential; management and organization issues; production and channels of distribution; and how to present a plan to the financial community. Specific case studies and guest speakers are utilized.

*Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EMP 517: Quality and Value Management**

Management's approach to quality has changed radically; this course explains why and how. It covers methods used by both manufacturing and service organizations to achieve high quality: how each organizational function is involved in quality; how improving quality can reduce costs; importance of communication; importance of involving all employees; need to measure quality; and introduction to statistical quality control and how it is used.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EMP 518: Project Management**

This is a course in project management. The objective is to give the student a fundamental understanding of what is required to plan organize and carry out projects in industry today. The student will also understand how management decisions are influenced by project and financial analysis when making project plans.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EMP 521: Developing New Products**

This course covers how to manage enterprise innovation, corporate innovation cultures, ideation and creative thinking, product design and development processes and phases, issues in product design, collaboration between R&D and operations/marketing. Also, this class will focus on how to use forecasting to ensure the successful launch of a technology product. Case studies will be discussed.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EMP 522: Strategic Marketing: Planning and Process**

This course will examine the vital role that strategic marketing and planning plays in

all businesses, as well as non-profit and government organizations. Marketing's role in our economy, society and the appropriate marketing target and mix of media will also be presented. The various careers which exist in marketing and the structure of marketing plans and departments are studied. The class will create a marketing plan based on real products and present it.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EMP 523: International Business and Management**

This course covers the world's marketplace, international environment, managing international business, and managing international business operations. Additional topics include cultural issues in a global marketplace, the impact of law and legal differences in the world marketplace compared to the U.S., and addressing competitive issues related to items such as a need for local contact.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EMP 524: Modern Transportation Systems and Logistics**

The integration of the activities that procure materials and services, transform them into intermediate goods and final products, and deliver them to the customers in a global environment. This course covers all the logistical, ethics, and outsourcing issues in strategic and global ways.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EMP 525: Technology Assessment for Emerging Technologies**

This course will address the technology assessment for emerging technology through four basic components of technology assessment: scope, technology, impact, and policy. Emerging technology will cover information technology, energy, and medical technology.

*Offered*

*Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **EMP 530: Intro of Big Data & Data Science for Technological Management**

This course is an introduction to big data techniques, its applications and its challenges. We will analyze customer relationship management processes using software management tools such as DFD and UML and Lean & Six Sigma management to improve applications or services in a cloud computing environment. Data modeling, mining and visualization tools will be introduced for

developing business intelligence, predictive analytics and decision support applications. Technologies in related areas such as data warehousing, data sharing, data security, networking, and operating systems will also be included to support big data applications in cloud computing environments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EMP 531: Data Mining for Technological Management**

Data mining can be used to extract meaningful and actionable information from large data sets and then used for business intelligence, predictive analytics and decision support. Supervised and unsupervised machine learning techniques, such as linear regression, classification, decision trees, support vector machines, and clustering, will be discussed.

These techniques and associated tools will be introduced in the context of customer relationship management (CRM), supply chain management (SCM), and global operations management applications. Semesters Offered:

*Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EMP 532: Big Data Systems for Technology Management**

Over the past two decades, the amount of data that is generated has grown exponentially and there is an increasing need to analyze all this data. This class will introduce students to the statistical software R, data analysis, text mining, and big data analyses.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EMP 572: Special Topics**

This multidisciplinary course provides a comprehensive overview of emerging topics in society from both policy and technology point of view. Topics include energy, smart city, big data, disaster, bio-medical, and security. The goal of the course is to assist students to gain insights into different special topics to solve challenging problems and discover new ones. Offered Spring & Fall

*3 credits, Letter graded (A, A-, B+, etc.)*

## **ESE**

### **Electrical Engineering**

#### **ESE 500: Introduction to Engineering Education**

This graduate course provides an in-depth examination of engineering knowledge and practices in the context of secondary science content and instruction. The focus is on engineering design principles and how they may be applied to biology, chemistry, and

physics disciplinary domains. Key concepts of effective engineering education will be introduced: design-based approaches, optimization, STEM integration, assessment, and transfer of science principles to technology solutions. Students will participate in engineering education opportunities through project design, research, and/or curriculum opportunities at the secondary and post-secondary levels.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 501: System Specification and Modeling**

A comprehensive introduction to the field of System-on-Chip design. Introduces basic concepts of digital system modeling and simulation methodologies. Various types of hardware description language (HDL) will be studied, including Verilog, VHDL, and SystemC. Topics include top-down and bottom-up design methodology, specification language syntax and semantics, RTL, behavioral and system-level modeling, and IP core development. Included are three projects on hardware modeling and simulation.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 502: Linear Systems**

Development of transfer matrices and state-space equations from the concepts of linearity, time-invariance, causality, and lumpedness. Op-amp circuit implementations. Solutions and equivalent state equations. Companion and modal forms. Stability and Lyapunov equations. Controllability, observability, and their applications in minimal realization, state feedback, and state estimators. Coprime fraction of transfer functions and their designs in pole-placement and model matching. Both the continuous-time and discrete-time systems will be studied.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 503: Stochastic Systems**

Basic probability concepts and application. Probabilistic bounds, characteristic functions, and multivariate distributions. Central limit theorem, normal random variables, stochastic processes in communications, control, and other signal processing systems. Stationarity, ergodicity, correlation functions, spectral densities, and transmission properties. Optimum linear filtering, estimation, and prediction.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 504: Performance Evaluation of Communications and Computer Systems**

Advanced scheduling theory, queuing models and algorithms for communication and computer systems. Transient analysis and M/G/1 queue models. Networks of queues, mean value analysis and convolution algorithms. Petri networks. Bursty and self-similar traffic. Divisible load theory for scheduling and parallel computer performance evaluation. Prerequisite: ESE 503 or permission of instructor.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 505: Wireless Communications**

This course covers first year graduate level material in the area of wireless communications: Wireless channels, overview of digital communications and signal processing for wireless comm., voice and data applications, design basics for wireless modems, analysis of system issues like resource management and handoff, cellular and wireless LAN systems.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 506: Wireless Network**

This course will examine the area of wireless networking and mobile computing, looking at the unique network protocol challenges and opportunities presented by wireless communications and host or router mobility. The course will give a brief overview of fundamental concepts in mobile wireless systems and mobile computing, it will then cover system and standards issues including second generation circuit switched and third generation packet switched networks, wireless LANs, mobile IP, ad-hoc networks, sensor networks, as well as issues associated with small handheld portable devices and new applications that can exploit mobility and location information. This is followed by several topical studies around recent research publications in mobile computing and wireless networking field. This course will make the system architecture and applications accessible to the electrical engineer. Prerequisites: ESE 505 and ESE 546 or ESE 548, or permission of instructor

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 507: Advanced Digital System Design and Generation**

This course focuses on languages, tools and abstractions for design and implementation of digital systems. Course material is divided roughly into three categories: Limitations and constraints on modern digital systems; Hardware design abstractions, languages, and tools (including the SystemVerilog hardware description language); and new architectures and paradigms for digital design.

Coursework will be primarily project and assignment based; there will also be reading and discussion of published papers in these areas. Students should have experience with hardware description languages (VHDL, Verilog, or System Verilog) and software (C, C++ or Java).

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 509: Modern Energy Technologies**

This course cover a broad array of technologies that are essential to the modern energy industry, specifically focusing on the most contemporary topics and "hot" areas of research, development, and deployment. Students will gain a quantitative understanding of selected energy generation technologies, energy storage technologies, and pollution control technologies.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 510: Electronic Circuits**

This is a course in the design and analysis of analog circuits, both discrete and integrated. The first part of the course presents basic topics related to circuit analysis: laws, theorems, circuit elements and transforms. Fundamental semiconductor devices are introduced next. A number of aspects of circuit design beginning with basic device operation through the design of large analog functional blocks including amplifiers, oscillators and filters are discussed.

*Cannot be used to fulfill any ESE degree requirements.*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 511: Solid-State Electronics**

A study of the electron and hole processes in solids leading to the analysis and design of solid-state electronic devices. Solutions to the Schrodinger representation of quantum effects, perturbation techniques. Simple band structure, effective mass theorem. Derivation and application of the Boltzmann transport theory. Electrical and thermal conductivities of metals and of semiconductors, and their application to electronic devices. Properties of semi conductors and the theories underlying the characteristics of semiconductor devices.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 512: Introduction to Quantum Systems Engineering**

A study of fundamental properties of homojunction and heterojunction semiconductor devices. Derivation of the characteristic equation for p-n junction diodes, for the bipolar junction transistor (BJT) and for the heterojunction bipolar transistor (HBT); the device parameters for low- and high-

frequency operation, the effects on the device characteristics of fabrication methods and of structural arrangements. The development of the large-signal and small-signal equivalent circuits for the p-n diode and the BJT and HPT devices, with emphasis on models used in prevalent computer-aided analysis (e.g., SPICE). Consideration of the devices in integrated-circuit applications.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 513: Introduction to Photovoltaics**

Introduction to the basic concepts of photovoltaic solar energy conversion, including: 1. The solar resource in the context of global energy demand; 2. The operating principles and theoretical limits of photovoltaic devices; 3. Device fabrication, architecture, and primary challenges and practical limitations for the major technologies and materials used for photovoltaic devices. Students will gain knowledge of the device physics of solar cells, the operating principles of the major commercial photovoltaic technologies, the current challenges and primary areas of research within the field of photovoltaics, and a basic understanding of the role of photovoltaics in the context of the global energy system.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 514: MOSTransistor Modeling**

An overview of the metal-oxide semiconductor (MOS) transistor and its models for circuit analysis. The course is modular in structure. In a common first part, CMOS fabrication, device structure and operation are introduced. Starting from basic concepts of electrostatics, MOS field-effect transistor operation is presented in an intuitive fashion, and no advanced background in solid-state theory is required. Analytical models of increasing complexity and their SPICE Implementations are discussed. The second part of the course allows students to focus on their field of preference: Device physics; digital circuits; Analog circuits. The course includes a project in one of these subtopics.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 515: Quantum Electronics I**

Physics of microwave and optical lasers. Topics include introduction to laser concepts; quantum theory; classical radiation theory; resonance phenomena in two-level systems; Bloch equations-Kramers-Kronig relation, density matrix; rate equation and amplification; CO<sub>2</sub> lasers; discharge lasers; semiconductor lasers.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 516: Integrated Electronic Devices and Circuits I**

Theory and applications: elements of semiconductor electronics, methods of fabrication, bipolar junction transistors, FET, MOS transistors, diodes, capacitors, and resistors. Design techniques for linear digital integrated electronic components and circuits. Discussion of computer-aided design, MSI, and LSI.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 517: Integrated Electronic Devices and Circuits II**

Theory and applications: elements of semiconductor electronics, methods of fabrication, bipolar junction transistors, FET, MOS transistors, diodes, capacitors, and resistors. Design techniques for linear digital integrated electronic components and circuits. Discussion of computer-aided design, MSI, and LSI.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 518: Advanced design of low noise and low power analog circuits**

Students will learn state-of-the-art circuit techniques for low-noise and low-power amplification and processing of signals from sensors. Examples of circuits are low-noise amplifiers, filters, peak detectors and discriminators. Applications range from medical, to security, safety, industrial measurements and physics research. As a course project, students will develop part of a front-end circuit from transistor level to physical layout using industry-standard CAD tools, and will participate in the experimental characterization of those similar circuits. At the end of the course the student will own a solid background and the basic instruments to design low-noise and low-power amplifiers and processing circuits.

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 519: Semiconductor Lasers and Photodetectors**

The course provides an introduction to performance, testing and fabrication techniques for semiconductor lasers and photodetectors. The topics include fundamentals of laser and detector operation, devices band diagram, device characteristics, and testing techniques for analog and digital edge emitting and surface emitting lasers, avalanche and PIN photodetectors. Special attention is given to the design and working characteristics of transmitters and pumping lasers for telecommunication networks.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 520: Applied Electromagnetics**

Wave phenomena and their importance in electromagnetic engineering. Harmonic waves. Phase and group velocities. Dispersive and nondispersive propagation. Transmission lines. Maxwell Equations. Uniform plane waves, waveguides, resonators. Scattering matrix theory. Introduction to antenna theory. Electrostatics and magnetostatics as special cases of Maxwell equations.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 522: Fiber Optic Systems**

This course covers the essential components of a modern optical fiber communication system: (I) wave propagation in optical fiber waveguides, (II) transmitter design, (III) receiver design, (IV) single wavelength fiber-optic networks, and (V) wavelength division multiplexing networks.

*Prerequisite: ESE 319*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 523: Quantum Computing and Applications**

This course is an introduction to and survey of the Quantum Computing, an emerging interdisciplinary field of science which has the potential to revolutionize computation over the next ten years, to transform chemistry, medicine, engineering and communications, as well as to change our understanding of physical world. The course will build intuitive approach to quantum computation and algorithms, but also will advance relevant vocabulary and skills for faculties and graduate students in engineering, computing, applied mathematics, chemistry, physics, and related sciences. The key questions of the quantum computing will be introduced. How to describe quantum systems and quantum operations? What is a quantum computer and what are the limits of quantum power? What is the difference between classical and quantum computation? Quantum teleportation? Quantum entanglement and superposition? How to mitigate errors and decoherence and transmit information through noisy channels? What are business applications and engineering challenges of the quantum computers? What are the gains in running quantum vs. classical algorithms? What are the physical principles of the current quantum computers hardware and what are technology requirements for realistic quantum computers?

*4 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 524: Microwave Acoustics**



Continuum acoustic field equations. Wave equation, boundary conditions, and Pointing vector. Waves in isotropic elastic media: plane-wave modes, reflection and refraction phenomena, bulk-acoustic-wave (BAW) waveguides, surface acoustic waves (SAW). Plane and guided waves in piezoelectric media. BAW transduction and applications: delay-line and resonator structures, the Mason equivalent circuit, monolithic crystal filters, IM CON dispersive delay lines, acoustic microscopes, SAW transduction and applications: the interdigital transducer, band-pass filters, dispersive filters, convolvers, tapped delay lines, resonators.

*Prerequisite: ESE 319*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 525: Modern Sensors in Artificial Intelligence Applications**

Sensors are devices that convert physical values into electrical signals. This course will provide practical information on diversified subjects related to the operation principles, design and use of various sensors. Established and novel sensor technologies as well as problems of interfacing various sensors with electronics are discussed.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 526: Silicon Technology for VLSI**

This course introduces the basic technologies employed to fabricate advanced integrated circuits. These include epitaxy, diffusion, oxidation, chemical vapor deposition, ion implantation lithography and etching. The significance of the variation of these steps is discussed with respect to its effect on device performance. The electrical and geometric design rules are examined together with the integration of these fabrication techniques to reveal the relationship between circuit design and the fabrication process.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 528: Communication Systems**

This course provides a general overview of communication theory and addresses fundamental concepts in this field. After a review of signals and systems representations, various continuous and digital modulation schemes are analyzed. Spread spectrum systems and their application to multiuser communications are also addressed. Advanced communication systems are described and general concepts of wide and local area networks are introduced.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 530: Computer-Aided Design**

The course presents techniques for analyzing linear and nonlinear dynamic electronic circuits using the computer. Some of the topics covered include network graph theory, generalized nodal and hybrid analysis, companion modeling. Newton's method in n-dimensions and numerical integration.

*Prerequisite: B.S. in Electrical Engineering Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 531: Statistical Learning and Inference**

Minimum variance unbiased estimation, Cramer- Rao lower bounds, learning and inference with linear models, maximum likelihood estimation, least squares estimation, Bayesian inference, statistical decision theory, hypothesis testing with deterministic and random signals, composite hypothesis testing, model selection.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 532: Theory of Digital Communication**

Optimum receivers, efficient signaling, comparison classes of signaling schemes. Channel capacity theorem, bounds on optimum system performance, encoding for error reduction, and the fading channel. Source coding and some coding algorithms. Prerequisite: ESE 503

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 533: Convex Optimization and Engineering Applications**

Introduction to convex optimization and its applications. Convex sets, functions, and basics of convex analysis. Linear and quadratic programs, second-order cone and semidefinite programming, geometric programming. Duality theory and optimality conditions. Unconstrained minimization methods. Interior-point methods. Nondifferentiable problems. Decomposition methods. Applications in engineering fields including statistical signal processing, communications, networking, energy systems, circuit design, and machine learning.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 534: Cyber Physical Systems**

As computers and communication bandwidth become ever-faster and ever-cheaper, computing and communication capabilities will be embedded in all types of objects and structures in the physical environment. Applications with enormous societal impact and economic benefit will be created by harnessing these capabilities in time and across space. We refer to systems that

bridge the cyber-world of computing and communications with the physical world as cyber physical systems (CPS). This course covers important areas from the research literature on SPS. Three application domains are emphasized: medical devices for health care, smart transportation systems, and smart buildings. Several key cross-cutting principles, independent of the application domain, are also covered, including formal modeling, embedded systems, real-time systems, feedback control and sensor networks. Prerequisite: Background in embedded systems and computer networking is necessary.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 535: Power System Analysis**

The course focuses on fundamental analytics of power systems. It will help students understand major problems in power system static, dynamic, and stability analysis, as well as fundamental optimization issues in power system operation. The course covers power system steady-state modeling with emphasis on admittance and impedance matrix, power system dynamics modeling with emphasis on the functional state-space model, power system analytics with emphasis on power flow analysis, eigenvalue analysis, and time-domain transient simulation, as well as fundamental power system operation issues with emphasis on optimal power flow, unit commitment, and power system control. Emphasis is on using applied mathematics and computer-based methods to analyze power system problems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 536: Switching and Routing in Parallel and Distributed Systems**

This course covers various switching and routing issues in parallel and distributed systems. Topics include message switching techniques, design of interconnection networks, permutation, multicast and all-to-all routing in various networking nonblocking, and rearrangeable capability analysis and performance modeling. Prerequisite: ESE 503 and 545 or CSE 502 and 547, or permission of instructor

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 537: Mobile Sensing Systems & Applications**

This is a graduate course focusing on recent advances and developments in mobile sensing systems and their applications, especially those leveraging modern mobile devices and embedded sensors. Topics include: conventional mote-class sensor networks, participatory sensing leveraging mobile devices, intelligent hardware and Internet-of-

Things, location sensing, future information centric networking, and applications in smart homes, buildings, transportation, environment and health/fitness. Student need to read latest literature and write reviews, work on research problems and develop solutions, present their work and write formal reports. The practice of the basic research skills are major components. This course intends to be self-sufficient and prior experiences in programming, mobile devices and embedded systems is a plus.  
3 credits, Letter graded (A, A-, B+, etc.)

### **ESE 538: Nanoelectronics**

The major goals and objectives are to provide graduate students with knowledge and understanding of physical background and applications of nanoelectronics. The course will cover electrical and optical properties of materials and nanostructures, fabrication of nanostructures, nanoelectronic devices including resonant-tunneling devices, transistors, and single-electron transfer devices, as well as applications of nanotechnologies in molecular biology and medicine.

3 credits, Letter graded (A, A-, B+, etc.)

### **ESE 539: Power Electronics and Motor Drives**

This course is designed to cover the basic concepts of motor control, motor drive design and power electronics inverters.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **ESE 540: Reliability Theory**

Theory of reliability engineering. Mathematical and statistical means of evaluating the reliability of systems of components. Analytical models for systems analysis, lifetime distributions, repairable systems, warranties, preventive maintenance, and inspection. Software reliability and fault tolerant computer systems. Prerequisite: ESE 503 or permission of instructor

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **ESE 541: Digital System Design**

The course provides an introduction to digital and computer systems. The course follows a top-down approach to presenting design of computer systems, from the architectural-level to the gate-level. VHDL language is used to illustrate the discussed issues. Topics include design hierarchy and top-down design, introduction to hardware description languages, computer-aided design and digital synthesis, basic building blocks like adders, comparators, multipliers, latches, flip-flops,

registers etc, static and dynamic random access memory, data and control buses, fundamental techniques for combinational circuit analysis and design, sequential circuit design procedures, and programmable logic devices. Testing of digital designs is addressed throughout the course. A mini project will complement the course.

*Cannot be used to fulfill any ESE degree requirements.*

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

### **ESE 542: Product Design Concept Development and Optimization**

This graduate course will concentrate on the design concept development of the product development cycle, from the creative phase of solution development to preliminary concept evaluation and selection. The course will then cover methods for mathematical modeling, computer simulation and optimization. The concept development component of the course will also cover intellectual property and patent issues. The course will not concentrate on the development of any particular class of products, but the focus will be mainly on mechanical and electromechanical devices and systems. As part of the course, each participant will select an appropriate project to practice the application of the material covered in the course and prepare a final report.

*Prerequisites: Undergraduate electrical or mechanical engineering and/or science training.*

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

### **ESE 543: Mobile Cloud Computing**

Introduction to the basic concepts of mobile cloud computing, including 1. The mobile computing technology used in modern smart phones; 2. The cloud computing technologies used in existing data centers; 3. The synergy of mobile and cloud computing and its applications; and 4. Programming on smart phone utilizing data center services. Students will gain knowledge of the fundamental principles of mobile cloud computing, the major technologies that support mobile cloud computing, the current challenges and primary areas of research within the field of mobile cloud computing, and a basic understanding of the role of mobile cloud computing in the context of the everyday living.

3 credits, Letter graded (A, A-, B+, etc.)

### **ESE 544: Network Security Engineering**

An introduction to computer network and telecommunication network security engineering. Special emphasis on building security into hardware and hardware working

with software. Topics include encryption, public key cryptography, authentication, intrusion detection, digital rights management, firewalls, trusted computing, encrypted computing, intruders and virus. Some projects.

Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)

### **ESE 545: Computer Architecture**

The course covers uniprocessor and pipelined vector processors. Topics include: hierarchical organization of a computer system; processor design; control design; memory organization and virtual memory; I/O systems; balancing subsystem bandwidths; RISC processors; principles of designing pipelined processors; vector processing on pipelines; examples of pipelined processors. The course involves a system design project using VHDL.

*Prerequisite: ESE 218 or equivalent*

Spring, 4 credits, Letter graded (A, A-, B+, etc.)

### **ESE 546: Networking Algorithms and Analysis**

An introduction to algorithms and analysis for computer and telecommunication networks. Continuous time and discrete time single queue analysis. Algorithms from public key cryptography, routing, protocol verification, multiple access, error codes, data compression, search.

*Prerequisite: ESE 503 or permission of instructor.*

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

### **ESE 547: Digital Signal Processing**

A basic graduate course in Digital Signal Processing. Sampling and reconstruction of Signals. Review of Z-Transform theory. Signal flow-graphs. Design of FIR and IIR filters. Discrete and fast Fourier transforms. Introduction to adaptive signal processing. Implementation considerations.

*Prerequisite: Senior level course in signals and systems*

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

### **ESE 548: Computer Networks**

Basic theory and technology of computer communications. Introduction to performance evaluation, error codes and routing algorithms. Other topics include Ethernet, wireless networks including LTE and 5G, fiber optic networking, software defined networking, networking on chips, space networks, data centers, grids and clouds, and network security. 3 credits, grading ABCF.

3 credits, Letter graded (A, A-, B+, etc.)

**ESE 549: Advanced VLSI System Testing**

This course is designed to acquaint students with fault diagnosis of logic circuits. Both combinatorial and sequential circuits are considered. Concepts of faults and fault models are presented. Emphasis is given to test generation, test selection, fault detection, fault location, fault location within a module and fault correction.

*Prerequisite: BS in Electrical Engineering Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESE 550: Network Management and Planning**

This course provides an introduction to telecommunications and computer network management and planning. Network management is concerned with the operation of networks while network planning is concerned with the proper evolution of network installations over time. Network management topics include meeting service requirements, management operations, management interoperability, and specific architectures such as Telecommunications Management Network (TMN), and Simple Network Management Protocol (SNMP). Network planning topics include planning problem modeling, topological planning design, heuristic and formal solution techniques.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESE 551: Electronics and Radiation Effects**

A study of the effects of radiation on electronic circuit operation. Radiation may come from space or man-made sources such as nuclear reactors or CAT scan machines. Coverage includes types of radiation, types of effects on circuits such as SEE (Single Event Effects), designing circuits to mitigate radiation effects and testing of circuits prior to deployment. Applications include electronics for space and for use in nuclear reactors and certain medical imaging machines.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESE 552: Interconnection Networks**

Formation and analysis of interconnect processing elements in parallel computing organization. Topics include: SIMD/MIMD computers, multiprocessors, multicomputers, density, symmetry, representations, and routing algorithms. Topologies being discussed include: Benes, Omega, Banyan, mesh, hypercube, cube-connected cycles, generalized chordal rings, chordal rings, DeBruijn,

Moebius graphs, Cayley graphs, and Borel Cayley graphs.

*Prerequisite: ESE 545 or equivalent Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESE 553: A/D and D/A Integrated Data Converters**

This is an advanced course on analog integrated circuit design aspects for data converters. Topics include: continuous and discrete-time signals and systems; sampling theorem; ideal ND and D/A converters; specifications and testing of data converters; basic building blocks in data converters: current sources and mirrors, differential gain stages, voltage references, S/H circuits, comparators; Nyquist D/A and ND converters; principles of data conversion and circuit design techniques; oversampling data converters: low-pass and band-pass delta-sigma modulators, decimation and interpolation for delta-sigma data converters. The attending students must be acquainted with principles of transistor operation, function of simple analysis. Familiarity with SPICE is required.

*3 credits, Letter graded (A, A-, B+, etc.)*

**ESE 554: Computational Models for Computer Engineers**

This course covers mathematical techniques and models used in the solution of computer engineering problems. The course heavily emphasizes computer engineering application. Topics covered include set theory, relations, functions, graph theory and graph algorithms, and algebraic structures.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESE 555: Advanced VLSI Systems Design**

Techniques of VLSI circuit design in the MOS technology are presented. Topics include MOS transistor theory, CMOS processing technology, MOS digital circuit analysis and design, and various CMOS circuit design techniques. Digital systems are designed and simulated throughout the course using an assortment of VLSI design tools.

*Prerequisite: B.S. in Electrical Engineering or Computer Science Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESE 556: VLSI Physical and Logic Design Automation**

Areas to be covered are Physical Design Automation and Logic Design Automation. Upon completion of this course, students will be able to develop state-of-the-art CAD tools and algorithms for VLSI logic and physical design. Tools will address design tasks such as

floor planning, module placement and signal routing. Also, automated optimization of combinational and sequential circuits will be contemplated.

*Prerequisite: B.S. in Computer Engineering/ Science or Electrical Engineering Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESE 557: Digital Signal Processing II: Advanced Topics**

A number of different topics in digital signal processing will be covered, depending on class and current research interest. Areas to be covered include the following: parametric signal modeling, spectral estimation, multirate processing, advanced FFT and convolution algorithms, adaptive signal processing, multidimensional signal processing, advanced filter design, dedicated signal processing chips, and signal processing for inverse problems. Students will be expected to read and present current research literature.

*Prerequisite: ESE 547 or permission of instructor Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESE 558: Digital Image Processing I**

Covers digital image fundamentals, mathematical preliminaries of two-dimensional systems, image transforms, human perception, color basics, sampling and quantization, compression techniques, image enhancement, image restoration, image reconstruction from projections, and binary image processing.

*Prerequisite: B.S. in Engineering or Physical or Mathematical Sciences Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESE 559: EMI in Power Electronics Converters: Generation, Propagation and Mitigation**

This course is designed to cover the basic concepts of electro-magnetic-interference issues in power electronics converters. The course materials will cover basic concepts of EMI measurement, modeling and mitigation, with the focus on conducted EMI in power electronics converters. The course is structured with lectures and a lab session. This course is offered to both senior undergraduate and graduate students. Students cannot get credit for both undergraduate level and graduate level. Undergraduate and graduate students will take exams and quizzes at the same time but with different designed questions.

*3 credits, Letter graded (A, A-, B+, etc.) May be repeated 1 times FOR credit.*

**ESE 561: Theory of Artificial Intelligence**

Problem solving by searching, game trees, constraint satisfaction problems, uncertain knowledge and reasoning, probabilistic reasoning, probabilistic reasoning over time, Markov decision processes, partially observable Markov decision processes, reinforcement learning, generalized reinforcement learning.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 562: AI Driven Smart Grids**

The course focuses on Artificial Intelligence (AI) applications to power system analysis, planning and operation. Topics include basics of AI and smart grid, data preprocessing, predictive analytics, AI driven static analytics, such as optimal dispatch, state estimation and security assessment, and AI-based dynamical analytics such as transient stability assessment, dynamic model discovery and emergency control. Emerging topics, including transfer learning, data-driven formal methods, learning-based cybersecurity and big data platform, are also discussed. Prerequisite: An undergraduate course in power systems

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 563: Fundamentals of Robotics I**

This course covers homogenous transformations of coordinates; kinematic and dynamic equations of robots with their associated solutions; control and programming of robots.

*Prerequisite: Permission of instructor  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 564: Artificial Intelligence for Robotics**

Artificial Intelligence is intelligence demonstrated by machines, unlike the natural intelligence displayed by humans and animals. Research and AI focuses on the development and analysis of algorithms that learn and perform intelligent behavior with minimal human intervention. This course aims to introduce students some basic techniques and algorithms in AI including probabilistic inference, planning and search, localization, tracking and control, and their applications to robotics.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ESE 565: Parallel Processing Architectures**

This course provides a comprehensive introduction to parallel processing. Topics include types of parallelism, classification of parallel computers, functional organizations, interconnection networks, memory organizations, control methods,

parallel programming, parallel algorithms, performance enhancement techniques and design examples for SIMD array processors, loosely coupled multiprocessors, and tightly coupled multiprocessors. A brief overview of dataflow and reduction machines will also be given.

*Prerequisite: ESE 545 or equivalent  
Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 566: Hardware-Software Co-Design of Embedded Systems**

This course will present state-of-the-art concepts and techniques for design of embedded systems consisting of hardware and software components. Discussed topics include system specification, architectures for embedded systems, performance modeling and evaluation, system synthesis and validation.

The course is complemented by three mini-projects focused on designing and implementing various co-design methods. Prerequisite: ESE 545, ESE 554 and ESE 333 Fall

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 568: Computer and Robot Vision**

Principles and applications of computer and robot vision are covered. Primary emphasis is on techniques and algorithms for 3D machine vision. The topics include image sensing of 3D scenes, a review of 2D techniques, image segmentation, stereo vision, optical flow, time-varying image analysis, shape from shading, texture, depth from defocus, matching, object recognition, shape representation, interpretation of line drawings, and representation and analysis of 3D range data. The course includes programming projects on industrial applications of robot vision.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 569: Translational Bioinformatics**

Advanced technologies have driven rapid increases in the quantities of biomedical data. Translational bioinformatics develops the specified computational and analytic methods to transform these large-scale datasets into biomedical applicable information and knowledge. It is one of major applications of machine learning and data mining. This course introduces large-scale biomedical data resources and management, data processing and modeling, data mining and machine learning approaches in translational bioinformatics, and provides the hands-on projects for students to practice these approaches for real-world biomedical data.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 575: Advanced VLSI Signal Processing Architecture**

This course is concerned with advanced aspects of VLSI architecture in digital signal processing and wireless communications. The first phase of the course covers the derivation of both data transformation and control sequencing from a behavioral description of an algorithm. The next phase reviews the general purpose and dedicated processor for signal processing algorithms. This course focuses on low-complexity high-performance algorithm development and evaluation, system architecture modeling, power-performance tradeoff analysis. The emphasis is on the development of application-specific VLSI architectures for current and future generation of wireless digital communication systems. An experimental/research project is required.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 576: Power System Dynamics**

The course provides the background for understanding power system dynamics and numerical simulation techniques. Topics include the numerical integration for large-scale power networks, numerical oscillation and its solution, power system component modeling, frequency-dependent transmission network, nonlinear elements, network equivalents, power network stability, and microgrid stability & control. The area of real-time simulation for cyber-physical power infrastructures will also be discussed.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ESE 577: Deep Learning Algorithms and Software**

This course is an introduction to deep learning which uses neural networks to extract layered high-level representations of data in a way that maximizes performance on a given task. Deep learning is behind many recent advances in AI, including Siri's speech recognition, Facebook's tag suggestions and self-driving cars. Topics covered include basic neural networks, convolutional and recurrent network structures, deep unsupervised and reinforcement learning, and applications to problem domains like speech recognition and computer vision. Classes will be a mix of short lectures and tutorials, hands-on problem solving, and project work in groups.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 578: Quantum-Engineered Power Grids**

The course focuses on the applications of quantum information science (QIS) to power system analysis, operation and communication.

Topics will cover basics of QIS and smart grid, quantum computing, quantum circuits, quantum-enabled power grid steady-state/transient/stochastic analysis, application of quantum optimization and quantum machine learning in power grids, quantum control, quantum security, quantum Internet. Emphasis of the course is the practical quantum algorithms in power system applications and hands-on experiments on IBM Quantum platform.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 579: Advances Topics in Translational Bioinformatics**

This course introduces the current applications of machine learning and data mining techniques in biomedical data science, discusses the latest translational research areas and progresses, and provides the hands-on team projects for graduate students to explore, design and practice their "data-driven" solutions for the cutting-edge research topics in biomedical data science.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 581: Microprocessor-Based Systems Engineering II**

This course is a study of methodologies and techniques for the engineering design of microprocessor-based systems. Emphasis is placed on the design of reliable industrial quality systems. Diagnostic features are included in these designs. Steps in the design cycle are considered. Specifically, requirement definitions, systematic design implementation, testing, debugging, documentation, and maintenance are covered. Laboratory demonstrations of design techniques are included in this course. The students also obtain laboratory experience in the use of microprocessors, the development of systems, circuit emulation, and the use of signature and logic analyzers.

*Spring, 4 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 585: Nanoscale Integrated Circuit Design**

This course describes high performance and low power integrated circuit (IC) design issues for advanced nanoscale technologies. After a brief review of VLSI design methodologies and current IC trends, fundamental challenges related to the conventional CMOS technologies are described. The shift from logic-centric to interconnect-centric design is emphasized. Primary aspects of an interconnect-centric design flow are described in four phases: (1) general characteristics of on-chip interconnects, (2) on-chip interconnects for

data signals, (3) on-chip power generation and distribution, and (4) on-chip clock generation and distribution. Existing design challenges faced by IC industry are investigated for each phase. Tradeoffs among various design criteria such as speed-power-noise-area are highlighted. In the last phase of the course, several post-CMOS devices, emerging circuit styles, and architectures are briefly discussed. At the end of the course, the students will have a thorough understanding of the primary circuit and physical level design challenges with application to industrial IC design.

Prerequisites: ESE555 or ESE330 and ESE 355

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 586: Micro Grids**

This course will discuss techniques useful for the grid modernization from a unique angle of microgrid design, analysis and operation. It will cover smart inverters, microgrid architectures, distributed energy resources modeling, microgrid hierarchical control, microgrid stability, fault management, resilient microgrids through programmable network, reliable networked microgrids, and cyber security.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ESE 587: Hardware Architectures for Deep Learning**

This course focuses on the design and implementation of specialized digital hardware systems for executing deep learning algorithms. The course is divided into three sections. First, students will study field-programmable gate arrays (FPGAs) and related tools. Second, the course will present an overview of modern deep learning algorithms and applications (e.g., visual object recognition, or speech recognition). Third, students will apply this knowledge to complete a significant design project implementing and optimizing a deep learning algorithm on an FPGA.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 588: Fundamentals of Machine Learning**

The fundamentals of machine learning are introduced including learning with parametric models, online learning: stochastic gradient descent family of methods; classification; logistic regression; the naïve Bayes classifier; the nearest neighbor rule; classification trees; boosting methods; sparsity aware learning: concepts and methods; learning in reproducing kernel Hilbert spaces; Bayesian learning; variational approximation, sparse

Bayesian learning, relevance vector machines; neural networks and deep learning; the backpropagation algorithm; convolutional neural networks; recurrent neural networks; adversarial training; dimensionality reduction; PCA; ICA; nonlinear dimensionality reduction. Prerequisite: Stochastic processes or permission by instructor

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 589: Learning Systems for Engineering Applications**

The course presents the main methods used in automated (machine) learning for engineering applications. The course discusses representation models for learning, extraction of frequent patterns, classification, clustering and application of these techniques for diverse engineering applications, such as Intranet-of-Things, electronic design automation, and healthcare. The covered topics include an overview of learning systems, learning representations i.e. ontologies, regression models, stochastic models and symbolic models, data preparing techniques, different frequent pattern extraction methods, supervised and unsupervised classification, and basic and advanced clustering algorithms. The course is organized as three modules, each module being centered on a specific theme. Students will learn the characteristics of the enumerated topics, and devise and implement software programs for discussed techniques as part of their project work for the course. Student projects will be assessed using standard benchmarks.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ESE 590: Practical Machine Learning and Artificial Intelligence**

The course provides a broad introduction to the state-of-the-art of machine learning methods through lectures and labs, where the lectured summarize the theoretical foundations of the methods. Students work in teams and utilize modern tools to develop a specific application in areas like computer vision, biomedical engineering and social sciences.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 591: Industrial Project in OEMS Engineering**

A student carries out a detailed design of an industrial project in OEMS engineering. A comprehensive technical report of the project and an oral presentation are required.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 592: Distributed Computation, Control and Learning Over Networks**

Network Science is an interdisciplinary research area, which typically deals with large-scale complex networks. This course covers fundamental problems in distributed computation and control, including consensus and distributed averaging, distributed optimization, discusses the rendezvous problem and formation control, and explores recent development in distributed machine learning over networks.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ESE 593: High Power RF Engineering**

The course starts with an essential review of the properties of low and medium power RF waves and components including transmission lines, waveguides and cavities, and then proceeds to highlight the properties and limitations under high power RF conditions. The principal deleterious effects taking place at high power levels are caused by arcing (a high peak power effect) and the ohmic dissipation in the metal walls (a high average power effect). Exceeding the power handling capacity of the RF components can result in expensive repairs. Methods of mitigating or avoiding these expensive repairs are discussed. Important applications of high power rf are discussed in depth. Finally the students are given an extended project on implementing a particle accelerator using the traditional method of placing cylindrical cavities in tandem and using the longitudinal electric field in the TM<sub>010</sub> cavity mode to pump RF power into a particle beam and cause the desired acceleration of the charge particles.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 597: Practicum in Engineering - Internship**

This course is for part-time and full-time graduate students, relating to their current professional activity. Participation is in private corporations, public agencies or non-profit institutions. Students will be required to have a faculty advisor as well as a contact in the outside organization to participate with them in regular consultations on their project. Students are required to submit a final written final report to both.

*The maximum credits which can be accepted towards the M.S. degree is 3 credits.  
Fall, Spring, Summer, 1-3 credits, S/U grading  
May be repeated for credit.*

### **ESE 599: Research Master's students**

*Fall and Spring, 1-12 credits, S/U grading  
May be repeated for credit.*

### **ESE 610: Seminar in Solid-State Electronics**

Current research in solid-state devices and circuits and computer-aided network design.

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 670: Topics in Electrical Sciences**

Varying topics selected from current research topics. This course is designed to give the necessary flexibility to students and faculty to introduce new material into the curriculum before it has attracted sufficient interest to be made part of the regular course material. Topics include biomedical engineering, circuit theory, controls, electronics circuits, digital systems and electronics, switching theory and sequential machines, digital signal processing, digital communications, computer architecture, networks, systems theory, solid-state electronics, integrated electronics, quantum electronics and lasers, communication theory, wave propagation, integrated optics, optical communications and information processing, instrumentation, and VLSI computer design and processing.

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ESE 691: Seminar in Electrical Engineering**

This course is designed to expose students to the broadest possible range of the current activities in electrical engineering. Speakers from both on and off campus discuss topics of current interest in electrical engineering.

*Fall and Spring, 1 credit, S/U grading  
May be repeated for credit.*

### **ESE 697: Ph.D. Practicum in Teaching**

The course provides hands-on experience in classroom teaching. Other activities may include preparation and supervision of laboratory experiments, exams, homework assignments and projects. Final report that summarizes the activities and provides a description of the gained experience and a list of recommendations is required. Prerequisite: G5 status and Permission of Graduate Program Director

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESE 698: Practicum in Teaching**

This course enables graduate students to gain experience in teaching and interacting with students enrolled in an electrical and computer engineering course. Students enrolled in ESE-698 are expected to perform various teaching duties required by the course instructor, such as attending lectures, providing office hours, holding review/recitation

sessions, assisting in lab sections and grading, etc.

*Fall, Spring, Summer, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **ESE 699: Dissertation Research on Campus**

Prerequisite: Advancement to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, and Summer, 1-9 credits, S/U grading  
May be repeated for credit.*

### **ESE 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **ESE 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver be second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.  
Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **ESE 800: FULL TIME SUMMER RESEARCH**

*May be repeated for credit.*

## **ESL**

### **English as Second Language**

**ESL 593: Advanced Composition**

Advanced training in writing for ESL students who need to concentrate on paragraph development. The first half of the semester deals with paragraph construction, stressing concepts of the main thesis and supporting arguments. Some advanced grammar is reviewed, but the assumption is that basic structures and mechanics of writing have already been mastered. The second half of the semester stresses combining paragraphs into short compositions. Both descriptive and argumentative writing are practiced. Diagnostic test during first week of classes determines placement in the course. A through C/Unsatisfactory grading only.

*3 credits, Letter graded (A, A-, B+, etc.)*

# ESM

## Materials Science

**ESM 501: Teaching and Mentoring Techniques**

Discussion of various phases of teaching, including preparation, classroom technique, and student evaluation. Also exploration of skills and understanding necessary for mentoring of undergraduates and others involved in research.

*Fall, 1 credit, S/U grading*

**ESM 502: Scanning Electron Microscopy Skills**

Practical introduction to the operation of scanning electron microscopes, including energy-dispersive X-ray spectrometers. Required of all students who use the SEM in their research.

*Spring, 1 credit, Letter graded (A, A-, B+, etc.)*

**ESM 503: Electron Diffraction**

A quantitative discussion of electron diffraction as a means of micro-characterization of materials and as a basis for understanding image contrast in the transmission electron microscope. Topics covered include atomic, kinematical, and dynamical scattering; indexing diffraction patterns; and convergent-beam diffraction.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESM 508: Impact of Materials on Environment**

This course will focus on several concepts underlying the impact of materials on the environment and various methods of minimizing them. More specifically this course will explore the concepts of air and

water pollution associated with product manufacturing, various concepts of hazardous materials impact on human health, several topics of sustainable developments and selected methods of contaminated water and air treatment. Additionally this course will be addressing the issues of how to minimize the environmental pollution by product substitution and by decreasing the energy input into materials production. It will also give an overview of the concepts of green chemistry, green engineering and industrial ecology.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESM 511: Thermodynamics of Solids**

Current knowledge regarding the thermodynamic properties of condensed phases is discussed. The thermodynamic treatment of ideal, regular, and real solutions is reviewed. Estimation of reaction-free energies and equilibria in condensed phase reactions such as diffusion, exiccation, and phase transformations; thermodynamic analysis of phase equilibrium diagrams.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESM 512: Structure of Materials**

The structure of solids can be studied using X-ray, neutron, and electron diffraction techniques. Topics covered are coherent and incoherent scattering of radiation, structure of crystalline and amorphous solids, stereographic projection and crystal orientation determination, the concept of reciprocal vector space. Laboratory work in X-ray diffraction is also included.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESM 513: Strength of Materials**

A unified approach for all solid materials will be used with regard to the correlation between microstructure and their macroscopic mechanical properties. The course deals with various testing techniques for delineating mechanical properties of materials, considering elasticity, inelasticity, plasticity, dislocation theory, cohesive strength, fracture, and surface wear. Attention is given to strengthening mechanisms for solids, metals, ceramics, and polymers.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESM 514: Technical Writing for Materials Scientist**

Students will examine writing as it appears in published and draft format, taking into account different audience needs. Processes we will cover include: planning, organizing, writing, review, editing and rewriting. Grammar issues, particularly those that challenge non-native

speakers, will also be addressed. We will be working with Professor Gerald Graff's idea of "They Say/I Say," a cornerstone strategy of academic conversation, in which newer colleagues in a field (i.e., undergraduate and graduate students) learn by apprenticeship how to engage their peers in the discussion of ideas through written format. Offered

*Spring, 0-3 credits, S/U grading*

**ESM 519: Electrochemistry and Electrochemical Materials Science**

This course will survey electrochemistry and electrochemical materials science. Topics will include fundamental measurements in electrochemistry, galvanostatic and potentiostatic methods, the electrochemical double layer, corrosion and passivation. Relevant applications such as fuel cells, batteries, and supercapacitors will be discussed.

*3 credits, Letter graded (A, A-, B+, etc.)*

**ESM 521: Kinetics of Materials**

This Kinetics of Materials course will discuss important kinetic phenomena in materials science and engineering. The studies of kinetics explore how materials evolve and change in structure, morphology and composition. The understanding of kinetics in materials leads to a broad impact in all scientific and engineering fields concerning materials design and processing. This course will cover topics ranging from core knowledges such as various diffusion phenomena and motions of defects and interfaces, to more complex subjects such as phase transformations and development of microstructure. It emphasizes the comprehension of fundamentals, leading to a better understanding of processing-structure-property relationships.

*3 credits, Letter graded (A, A-, B+, etc.)*

**ESM 522: Imperfections in Crystals**

The characteristics of point defects in metals, semiconductors, and ionic solids are described, and the thermodynamics of point defects is developed. Dislocation theory is introduced and the structures of internal boundaries are described. Finally, interactions between lattice imperfections are discussed, with emphasis on plasticity and fracture.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**ESM 523: Solid-State Electronics**

A study of the electronic processes in solids leading to the analysis and design of materials and devices. Crystal structures, binding, electrical and thermal conductivities,

diffusion, galvomagnetic, thermomagnetic, and thermoelectric effects. Hall effect and magnetoresistance. Conductivity in thin films.  
*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### ESM 531: Phase Transformations

Kinetics and Transformations II changed to Phase Transformations. A review of the processes by which structures are changed in the solid state. Classical nucleation theory including homogeneous and heterogeneous mechanisms. Diffusion and diffusionless growth mechanisms. Transformation kinetics.  
*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### ESM 532: Materials Processing

A study of manufacturing processes used in the semiconductor industries. Topics include single crystal growth, compound formation, zone refining, epitaxial growth, doping techniques, thin film techniques, thick film techniques, passivations, isolations, lead bonding techniques, cleaning and etching, and failure analysis; discrete devices and integrated circuit devices; various modern concepts in IC processing.  
*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### ESM 533: Polymeric Materials

This course offers an opportunity to students for learning mechanical, optical, and transport properties of polymeric materials including polymer solutions/melts/thin films as well as the underlying physics behind the properties. Topics include thermodynamics of polymer solutions/blends/thin films, phase separation and phase transition of polymer blends, block copolymers, crystallization of polymers, structural and property characterization, and commercial polymer production, processing, and recycling.  
*3 credits, Letter graded (A, A-, B+, etc.)*

### ESM 534: Advanced Laboratory

Students perform a series of advanced materials experiments which involve some independent research. The results are then written in a report suitable for publication in a journal or proceeding.  
*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### ESM 537: Cellular Interactions

This course is intended to introduce cellular and biological concepts and principles for graduate students in chemical engineers related to their research projects that involve cellular interactions with materials as possible scaffolds in bioengineering. This course may be counted as either CSE 370 or ESM 537.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### ESM 542: Modern Electron Microscopy

Principles and practice for transmission and scanning transmission electron microscopes. Instrument design. Specimen preparation. Instrument operation. Electron diffraction and imaging theory. Microanalysis using X-ray and electron spectra. Typical electron microscope investigations are outlined and used as examples.  
*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### ESM 550: Introduction to Homeland Security

The course is a combination of lectures and laboratory experience to introduce students to critical issues and assess needs for homeland security. The course includes invited lectures by experts on special topics such as fundamentals of nuclear, chemical, and biological weapons and the associated threat to the transportation of goods and the public. The students will learn about cyber security, devices to safeguard materials from terrorist threats, safety of nuclear power plants and water supply, forensics and emergency preparedness. The students will submit a term paper on a selected topic in lieu of the final exam.

*Prerequisite: undergraduate level biology, chemistry and physics.*

*Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### ESM 553: Nuclear Safeguards and Security

The course is intended to familiarize students with the fundamentals of nuclear physics, radiation, mining, weapons and fuel cycle, other than producing electricity, as it pertains to nuclear power plants. Topics include nuclear detection, devices to safeguard nuclear materials from terrorist threats, needed physical protection for safe handling and its relevance to Homeland Security. The course combines lectures with hands-on experience at the newly installed nuclear detection facility located at the nearby United States Department of Energy's Brookhaven National Laboratory.

*Prerequisite: undergraduate equivalent physics and chemistry.*

*Fall, Spring, 4 credits, Letter graded (A, A-, B+, etc.)*

### ESM 554: Chemical & Biological Weapons: Safeguards and Security

This course deals with the fundamentals of chemistry and biochemistry related to chemical weapons (CW) and biological weapons (BW) that could be used by terrorists. Topics include

CW and BW history, production, control, detection, identification, and emergency response measures to deal with intended or unintended release and escape, and security measures to protect and control stockpiles.

*Prerequisite: Undergraduate equivalent chemistry, biochemistry, and microbiology.*  
*Fall, Spring, 4 credits, Letter graded (A, A-, B+, etc.)*

### ESM 555: Synchrotron X-ray Analysis: Introduction to Advanced Techniques

In this course, world-leading experts from Brookhaven National Laboratory (BNL) will discuss advanced concepts in synchrotron X-ray and electron-based methodologies for studies of various materials in multiple scientific disciplines spanning from physical and chemical sciences to materials engineering. Emphasis is on applying fundamental knowledge of these cutting-edge methodologies to real-world materials studies in a variety of disciplines. Main aim of this course is to provide knowledge on broad range of X-ray based techniques available at BNL to assist the future research of the students that may involve use of advanced techniques at synchrotron light sources. The targeted audience includes graduate students and advanced undergraduate students in materials science, chemical engineering, physics, chemistry, geosciences and other related fields.

*3 credits, Letter graded (A, A-, B+, etc.)*

### ESM 560: Risk Assessment, Regulation, and Homeland Security

The course focus is on risk assessment associated with nuclear, chemical and biological weapons as it relates to Homeland Security. Topics include air dispersion, uncertainty analysis, exposure measurements, epidemiology, toxicology, regulatory issues, risk management, risk communication, risk perception, and risk preparedness. The course will also cover laws and regulation, and disaster preparedness, various acts passed by the U.S. Congress to regulate water, air, and controlled substances.

*Prerequisite: undergraduate or equivalent physics, math and chemistry.*

*Fall, Spring, 4 credits, Letter graded (A, A-, B+, etc.)*

### ESM 561: Crystal Growth Technology

The main goal of this course is to introduce graduate students to the fundamentals and physical principles that govern the process of crystal growth and show them how to apply those principles to design and engineer growth systems for different crystalline materials. While microscopic theory of nucleation and



growth kinetics will be an essential part of this course, its core will mainly focus on applying transport phenomena and thermodynamics of chemical reactions to the design of processing reactors. As part of the academic requirements associated with this course, students will form teams and work on the virtual design of crystal growth reactors using software packages for transport phenomena modeling.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESM 562: Traditional Fossil Fuels**

The course will focus on the original and history of traditional fossil fuels, coal, petroleum and natural gas. Discuss mining methods and the role of fossil fuels play in the post-industrial revolution era. A comparison of the three fossil fuels with respect to their energy content, CO<sub>2</sub> output and associated environmental impact tied to global warming.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESM 566: Fuel Combustion**

The course will focus on combustion process for heat and power generation. Describe both fundamentals and actual systems involving fossil fuels and upcoming CO<sub>2</sub>-neutral biofuels. Emphasis on fuel combustion in stationary equipment, emissions characteristics of burning fuels and challenges in developing the next-generation combustion equipment.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESM 569: Biofuels**

The course will focus on biofuels- a promising option to replace fossil fuels. Topics to be covered include crop-growth cycle and its impact on land-use, biomass to various fuel options, their integration into the exiting energy delivery infrastructure and potential benefit in CO<sub>2</sub> reduction.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESM 575: The Material World**

The evolution of the Material World starting from the Big Bang, the creation of stars and galaxies, the nucleosynthesis of the elements in supernova explosions, formation of the Earth and Solar System, human adaptation of Earth resources to create the Modern World will be discussed. In this process we will discover the fundamental laws governing material behavior and explore the cosmic significance of our existence.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **ESM 595: ESM MS Project Course**

*May be repeated 2 times FOR credit.*

### **ESM 599: Research**

*Fall and Spring, 1-12 credits, S/U grading  
May be repeated for credit.*

### **ESM 604: Seminar in Ultrasonic Methods and Internal Friction in Solids**

Review of advanced measurement techniques in the field of ultrasonics coupled with quantitative descriptions of experimental variables related to the sample microstructure. Applications to optical, electrical, and mechanical properties are discussed. Use of ultrasonics for nondestructive evaluation is considered.

*Prerequisite: ESM 513*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESM 608: Seminar in Catalysis**

Introduction to homogeneous and heterogeneous catalysis. Geometric factors in catalysis. The kinetics of heterogeneous catalysis. Electronic factors in catalysis: metals, semiconductors, and surface species. Preparation and properties of metal surfaces. Porosity. Typical industrial processes, e.g., Fischer-Tropsch, ammonia synthesis, ammonia oxidation, etc.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESM 614: Seminar in Diffusion in Solids**

Diffusion in solids is considered in detail, including solution of the transport equations for volume, grain boundary, and surface diffusion. Kirkendall effect and other diffusion phenomena, atomic mechanisms of diffusion, correlation effects, etc. Next, the theory of processes in which diffusion plays an important role is considered, such as ionic conduction, oxidation of metals, and the sintering of solids.

*Spring, 3 credits, S/U grading*

### **ESM 694: Directed Studies in Materials Science**

This course is designed for research on special topics in Materials Science and is directed by a faculty member. Designed for students who want to research areas that are not typically covered by regular coursework. Registration requires the faculty member's and departmental approval. Cannot be repeated for credit with the same faculty member.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ESM 695: Graduate Internship**

Participation in private corporations, public agencies, or non-profit institutions for ongoing research activities related to thesis research.

Students will be required to have a faculty coordinator as well as a contact in the outside organization, to participate with them in regular consultations on the project, and to submit a final report to both. Not accepted for credit toward the M.S. degree.

*1-3 credits, S/U grading  
May be repeated for credit.*

### **ESM 696: Special Topics in Materials Science**

Supervised reading and discussion of selected publications in particular fields of Materials Science. This course is designed primarily for advanced graduate students who are, or expect to be, involved in research in these areas, although other students may enroll with permission of the instructor.

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ESM 697: Materials Science Colloquium**

A weekly series of lectures and discussions by visitors, local faculty, and students presenting current research results.

*Fall and Spring, 0-3 credits, S/U grading  
May be repeated for credit.*

### **ESM 698: Practicum in Teaching**

*Fall and Spring, 0-3 credits, S/U grading  
May be repeated for credit.*

### **ESM 699: Dissertation Research on Campus**

Prerequisite: Advancement to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, and Summer, 1-9 credits, S/U grading  
May be repeated for credit.*

### **ESM 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, 1-9 credits, S/U grading  
May be repeated for credit.*

### **ESM 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces.

*Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home countries are not covered by the mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home countries are charged for the mandatory health insurance. If they are to be covered by other insurance plans they must file waivers by the second week of classes. The charge will only be removed if the other plans are deemed comparable. All international students must receive clearance from an International Advisor.*

*Fall, 1-9 credits, S/U grading  
May be repeated for credit.*

### **ESM 800: FULL TIME SUMMER RSH**

*May be repeated for credit.*

## **ESS**

### **Earth and Space Sciences**

#### **ESS 501: Foundations of Earth Science**

Comprehensive analysis of the New York State Earth Science Curriculum taught by an experienced Earth Science teacher. This course is intended for science teachers and science education students.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **ESS 511: Pine Barrens Sustainability**

The ecologically diverse Long Island Pine Barrens region provides a habitat for a large number of rare and endangered species, but faces challenges associated with protection of a natural ecosystem that lies in close proximity to an economically vibrant urban area that exerts intense development pressure. In this course we will consider the interaction of the ecological, developmental and economic factors that impact the Pine Barrens and the effectiveness of decision support systems in promoting sustainability of the Pine Barrens.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **ESS 522: The Planets**

A study of present knowledge of planets and their satellites, the interplanetary medium, asteroids, meteorites, comets, and the Sun. Emphasizes the methods of science including the history of astronomical sciences, ongoing deep-space missions, modern astronomical instrumentation, and exoplanet discoveries. Emphasis will be placed on topics contained

in the Earth Science curriculum in New York State. A research report is required. This course is intended for science teachers and science education students and requires knowledge of trigonometry, algebra and introductory college level physics.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **ESS 523: Collisions in the Solar System**

A discussion of the evidence that comet and asteroid impacts have played a significant part in the evolution of the Earth, and other planets of the solar system, as well as an assessment of the actual and perceived hazard posed by terrestrial impacts and discussion of what can be done about it. Research report required. This course is intended for science teachers and science education students and requires knowledge of trigonometry, algebra and introductory college level physics. Offered

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **ESS 524: The Universe**

The origin, evolution, and ultimate fate of the universe. The course begins with a historical approach with emphasis on the evolution of cosmological ideas from geocentric universes to the Big Bang. Consideration of the evolution of the universe from the earliest moments after the Big Bang to the distant future, including the formation of the galaxies, stars, and planets. Research report required. This course is intended for science teachers and science education students and requires knowledge of trigonometry, algebra and introductory college level physics.

*Co-scheduled with AST 304 The Universe.  
Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **ESS 532: Atmospheric Fundamentals**

This course considers: the principles of atmospheric thermodynamics to assess adiabatic and saturated adiabatic processes; the concepts of radiative transfer such as blackbody radiation, scattering, absorption, and emission by molecules and particles will be discussed; tropospheric and stratospheric chemistry with its subsequent effects on air pollution and chemical cycles; meteorological physical concepts such as geostrophic and gradient winds, and general circulation; and the microphysics of cloud formation and precipitation. Research report required. This course is intended for science teachers and science education students.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **ESS 533: Global Climate**

This course explores the fundamental physical processes associated with various weather phenomena: tropical cyclones, extratropical cyclones, fronts, convective storms, and local air-sea and mountain flows. The latest analysis techniques, datasets, and tools will be used to understand the climatology and structural evolution of these weather phenomena. Basic forecasting techniques will be applied using observations and numerical model output. Research report required. This course is intended for science teachers and science education students.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **ESS 534: Air Pollution and Control**

This course provides an overall picture of air pollution caused by gas phase species and airborne particulate matter. The sources of air pollution and the transport of air pollutants will be discussed. We will study the underlying chemical processes which can lead to the formation of secondary air pollutants. Their effect on an urban, regional, and global scale and on human health will be assessed. National and international air quality policy regulations will be discussed. The causes and consequences of the stratospheric ozone hole will be outlined. The international efforts in form of policy protocols to stop stratospheric ozone depletion will be discussed. The natural greenhouse effect will be introduced and our current understanding of global warming will be presented. Research report required. This course is intended for science teachers and science education students.

*Offered*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **ESS 536: Principles of Weather Analysis and Forecasting**

This course explores the fundamental physical processes associated with various weather phenomena: tropical cyclones, extratropical cyclones, fronts, convective storms, and local air-sea and mountain flows. The latest analysis techniques, datasets, and tools will be used to understand the climatology and structural evolution of these weather phenomena. Basic forecasting techniques will be applied using observations and numerical model output. Research report required. This course is intended for science teachers and science education students.

*Offered*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **ESS 541: Earth's Surficial Environment**

This course includes creating and using topographic maps, weathering, soil development, stream systems, groundwater, glacial geology, mass movement, erosion and deposition. Instruction will include lectures and laboratory exercises. Research report required. This course is intended for science teachers and science education students.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESS 542: Tectonic Environment**

The use of maps in recognizing, describing and interpreting tectonic features in New York State and around the world; understanding the origin of structural features of the earth's crust and interior; using seismic data to understand the tectonic significance of earthquakes and to describe the earth materials through which seismic waves travel; and understanding the role of plate tectonics in the earth's geologic evolution. Instruction will include lectures and laboratory exercises. Research report required. This course is intended for science teachers and science education students. Offered *Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESS 543: Rocks and Minerals**

Identification, properties, formation and occurrence of rock-forming minerals: characterizing igneous, sedimentary and metamorphic rocks including the diverse geologic settings in which they occur with emphasis on their occurrence in the Metropolitan New York area. Instruction will include lectures and laboratory exercises. Research report required. This course is intended for science teachers and science education students.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESS 544: Geology of New York**

The course will explore the geologic development of New York from the Mesoproterozoic to the present and will also explore how the rocks were dated using radiometric methods and fossils. Research report required. This course is intended for science teachers and science education students. Offered

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ESS 585: Directed Studies**

Special studies directed by various faculty members to be taken for variable and repetitive credit.

*Fall, Spring, and Summer, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ESS 589: Research for Earth Science Teachers**

This course is intended to provide science teachers or graduate students in the Science Education program an opportunity to obtain research experience. A written report is required.

*Fall, Spring and*

*Summer, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ESS 600: Independent Research**

This course is required for students in MAT Earth Science and MS in Geosciences with a concentration in Earth and Space Sciences to document that the student has completed an independent research project as part of a graduate earth science academic or research course.

*S/U grading*

### **ESS 601: Topics in Earth and Space Sciences**

This course is intended for science teachers or science education students.

*Fall, Spring, and Summer, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ESS 610: Capstone Project in Earth and Space Sciences**

This required capstone project considers unifying themes or "big ideas" such as scale and structure, models, stability, and change, systems and interactions, energy and time as they apply to astronomy, atmospheric science and geology. This capstone course integrates "big ideas" across the earth and space sciences. Students should have taken at least two undergraduate or graduate courses in each of astronomy, atmospheric science and geology.

*1 credit, Letter graded (A, A-, B+, etc.)*

## **EST**

### **Technology and Society**

#### **EST 500: Foundations of Educational Technology for Administrators**

This course is designed to teach administrators basic principles surrounding educational technology throughout the school and/or district. Students will explore and discuss critical issues surrounding technology in education. Students will understand administrative technology applications, web 2.0 presentation tools, Internet protocol, cyber

safety and cyber bullying, Google Apps, social networking, collaboration tools, portable devices and appivities. The semester project for this course is the development of a needs assessment and research of an educational technology for your school/district.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **EST 501: Educational Technology Integration for Administrators**

This course is designed to teach administrators how to integrate educational technology within their school/district. Students will understand ISTE Technology Standards for Administrators, the National Technology Plan and the Common Core Standards in relation to educational technology. Students will explore distance education, media streaming and communication tools such as Twitter and Facebook. They will review management systems, data collection/analysis tools and technology funding resources. Students will also learn how to evaluate technology integration throughout their school and/or district. The semester project for this course is the development of an implementation plan and the evaluation of an educational technology that may be used in your school or district.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **EST 502: Ethical Decisions in Engineering**

"The engineering design process involves more than material choices and cost concerns. Individuals and organizations that create technological innovation must also address social and, more importantly, ethical issues. This course will review formal frameworks drawn from classical ethics. These frameworks will be used as a basis for considering case studies drawn from a variety of engineering disciplines. In addition, modern multi-disciplinary design approaches such as Value Sensitive Design and Biophilic Architecture will be considered as exemplar templates for the explicit incorporation of social and ethical principles into product development.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **EST 508: Projects in Global Operations Management**

This is a capstone course. Students will demonstrate what they have learned during their masters studies. This course will review several significant research areas in modern Global Processing Management Operations. Topics include Performance Management, Lean Management, Six Sigma Management in conjunction with Cloud Computing and Cloud computing applications. The students will be given a selected case study and

asked to demonstrate their knowledge by proposing a comprehensive technical and management solution. Students will use software engineering tools such as Data Flow Diagram (DFD) and Unified Modeling Language (UML) to analyze and design an implementation plan using cloud computing infrastructure, platform and services.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 510: Fundamentals of Technology in Higher Education**

Higher education is impacted by technology on an ever changing scale. Students are bringing in new technology every day. This course will show higher education instructors what technology is available, how higher education students are using technology and offer innovative ways to use that technology to motivate students to learn. Throughout the course students learn about best practices in higher education, a number of web based productivity and course management tools, cyber-ethics and digital footprint, organization of your digital world, collaborating with technology, social media, virtual worlds as well as presentation strategies and tools. The culminating project for this course is the research, assessment, analysis and presentation of a college student profile. Semesters offered *Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 511: Infusing Technology into Higher Education Curriculum**

The power of technology allows higher education instructors to teach and motivate students to learn in ways never thought possible. This course will show students how to fully integrate technology into the curriculum. For the semester project, students will review and modernize an existing course to make learning more effective and exciting for the higher education student. Students will learn the best way to update courses by understanding different instructional design models, content management systems and the Google Apps for Education suite. Students will enhance his/her web presence and digital profile by harnessing the power of social media and personal learning networks. Students will also explore potential technology grant opportunities for his/her curriculum, department or instructional area. Semesters offered,

*Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 516: Science for Society I**

This is part one of an interdisciplinary course sequence (1 credit each) is designed for students in computer science (CS) and students

of technology and society (DTS). Students taking this course will enhance their abilities to critically think and build awareness for science and technology (ST) and their societal aspects. They will learn strategies for assessing important questions such as: what should I focus my efforts on, where are societal needs, what policies are required or can be taken advantage of, how can I possibly influence policy, and finally, what are the dangers when developing new ST. To teach these topics the course takes a practical approach. The first section of the sequence examines historical science and technology successes and failures. Then, in the second section, teams composed of students from both the CS and DTS departments conduct case studies of existing ST or design and implement new ST under the perspectives of the course. 1 credit *1 credit, Letter graded (A, A-, B+, etc.)*

### **EST 517: Science for Society II**

This is part two of an interdisciplinary course sequence (1 credit each) is designed for students in computer science (CS) and students of technology and society (DTS). Students taking this course will enhance their abilities to critically think and build awareness for science and technology (ST) and their societal aspects. They will learn strategies for assessing important questions such as: what should I focus my efforts on, where are societal needs, what policies are required or can be taken advantage of, how can I possibly influence policy, and finally, what are the dangers when developing new ST. To teach these topics the course takes a practical approach. The first section of the sequence examines historical science and technology successes and failures. Then, in the second section, teams composed of students from both the CS and DTS departments conduct case studies of existing ST or design and implement new ST under the perspectives of the course. 1 credit *1 credit, Letter graded (A, A-, B+, etc.)*

### **EST 519: Systems Engineering Management**

Systems engineering (SE) establishes the technical framework for delivering material capabilities to the customer. SE provides the foundation upon which everything else is built and supports program success. SE ensures the effective development and delivery of capability through the implementation of a balanced approach with respect to cost, schedule, performance and risk, using integrated, disciplined and consistent SE activities and processes regardless of when a program enters the developmental life cycle. *3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 521: The Social and Global Impact of Technology in Education**

This course will explore educational systems and practices globally and how the use or lack of use of technology within education impacts society. Inversely students will research how society dictates the use or lack of use of technology in education within the specified educational system. Throughout the course, students will focus on one region of the world and research the current educational system and specifically how they use technology within education. In their research they will find out what technology is available within the educational system, how that technology is used, explore the effectiveness of the technology and research the social impact of that technology use. Students will connect with a global participant via distance communication or video conferencing to gain real world knowledge of the educational system and the use of technology for the specified region. The culminating project is a research based project that assesses the use of technology within the selected global region, offers solutions on how to improve the use of technology and compares that system and the use of technology with our own use of technology locally in our current educational system.

*Fall, Spring, and Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 522: Integrating Educational Technology into Social Studies and Language Arts**

Students will learn how to integrate technology into Social Studies and Language Arts curriculum using the ISTE/NETs standards and National Technology Plan to aid in the delivery of instruction. Students will develop a push-in training model focused on the Social Studies and Language Arts Core Curriculum and subject related needs. Students will meet with a Social Studies and Language Arts educator, assess their needs, design an educational technology push-in around those needs and push-in the training with the educator to their class. The culminating activity for this course is to conduct the push-in training with a Social Studies and Language Arts educator and their class. After the push-in training students will work with the instructor to evaluate the delivery and content of the lesson as well as assess the outcome and results of educator learning.

*Fall, Spring, and Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 523: Integrating Educational Technology into Mathematics and Science**

Students will learn how to integrate technology into Math and Science curriculum using ISTE/NETs standards and the National Technology Plan to aid in the delivery of instruction. Students will develop an educational technology workshop focused on the Math and Science Core Curriculum and subject related needs. Students will meet with a group of Math and Science educators, assess their needs, design an educational technology workshop around those needs and deliver the workshop to the educators. The culminating activity for this course is to conduct the developed workshop to a group of Math and Science educators. After the delivery of the workshop, students will work with the instructor and classmates to evaluate the delivery and content of the lesson as well as assess the outcome and results of educator learning.

*Fall, Spring, and Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 524: The Role of Educational Technology Specialist**

In this course students will learn the role and responsibilities of an Educational Technology Specialist. Students will research new educational technologies and resources that enhance classroom learning. They will learn how to navigate the social, political, ethical and legal issues surrounding educational technology. Students will learn how to provide ongoing professional development which includes scheduling and conducting workshops, push-ins and individual appointments, and working with educators to develop lesson plans and student projects. Students will learn how to infuse the ISTE Standards and the ideology of the National Technology Plan into curriculum and learn to assess the effectiveness of student learning using technology in the classroom. Throughout the course students will work the instructor to: develop a plan for future integration of technology into the curriculum addressing specific needs, develop a data driven needs assessment based on current goals and technology available, incorporate the best model for the specific group of educators and decide on a focus for technology integration using workshops, push-ins or one-on-one sessions to deliver instruction. The culminating activity for this course is the submission of a year-long technology integration plan.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 525: Google for Education: Foundations**

Google for Education (GfE) is a powerful suite that now seamlessly integrates into curricula and district technology goals. In this course, students will learn the tools necessary to

become a Google Certified Trainer. Students will create and learn how to use Google for Education tools in their classroom. They will also develop a comprehensive knowledge of a number of different products within Google Apps including - Drive, Calendar, Gmail, Sites, Classroom and more. Students will focus on skills necessary to become a Google Certified Trainer through hands-on coursework, review and preparation for the Google for Education Exams. The culminating activities for this course are a showcase of best practices highlighting Google for Education tools, the preliminary work for your portfolio, and the completion of the certification requirements. This class cannot be used to satisfy master's degree requirements.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 526: Google for Education: Curriculum Integration**

In this course, students will learn how to fully integrate the Google for Education products beyond the core apps, including Google Groups, Earth, Scholar, Blogger, and Google +. Students will complete the Google modules as well as they develop their portfolio. They will begin to deliver training by conducting a live webinar session which highlights Google tools or apps and sharing best practices. The culminating activities for this course are the development of a portfolio highlighting the lessons or trainings they conducted throughout this program. This class cannot be used to satisfy master's degree requirements.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 527: Google for Education: Professional Development**

Students will explore educational best practices and examples of materials needed to submit the application to become a Google Certified Trainer. Students will thoroughly review Google for Education best practices, organize additional training materials and create their portfolio. Through the delivery of training sessions or lessons, students will focus on the power of Google for Education tools and their use in PK-12 education. Students will also create, run their own workshop. The culminating activity of this course is the completion of the portfolio with a screencast and the submission of the application to Google. This class cannot be used to satisfy master's degree requirements.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 528: Teaching with Interactive Whiteboards and Immersive Technologies**

Interactive whiteboards and other immersive technologies have changed the way educators

deliver instruction. They are a technology that has enormous potential to impact student learning in a hands-on, kinesthetic way. Throughout this course students will explore best practices using immersive technologies within education. Students will learn how to effectively integrate interactive whiteboards, interactive projectors and cameras, learner responses systems, document cameras as well as other technologies. The culminating project for this course a comprehensive lesson plan utilizing immersive technology hardware and the associated software within the curriculum.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 529: Supporting Common Core Standards Using Educational Technology**

In this course students will learn how to support Common Core Standards through the infusion of educational technology by identifying, sharing, and exploring technology tools that support all curricula. Students will unpack the Common Core Standards and analyze and discuss best practices that effectively integrate technology to promote rigorous teaching and learning. The culminating assignment for this course is the design, delivery, reflection, revision and presentation of your technology infused Common Core lessons

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 530: Internet Electronic Commerce**

Topics addressed in this course include: technology infrastructure, business models and concepts, technological skills needed to build an E-Commerce web site, marketing, communications, security and encryption, payment systems in E-Commerce/M-commerce. Financial transactions, advertising models, content ownership and the prospects for E-Commerce are also covered.

*Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 531: Virtual Distance Management Course**

In today's global corporations, the challenges associated with leadership and management has grown increasingly difficult and complex. More and more, companies are using networked organizational models to deliver work and interact with customers. As globalization and diffused networks of people and companies combine, issues related to virtual/distributed employees, partners and customers have moved front and center. Implications for leadership has grown beyond current skill sets drawn from traditional academic fields and training

programs. The Virtual Distance Management course offers business students a powerful model and a set of proven practices to address these challenges in a unique way. Students will learn to: Understand and diagnose barriers to effective communication Develop ways to work with others using virtual technologies and social media Contribute to high performance, cross-discipline and cross-cultural teams Management strategies for the globally distributed workforce Virtual Distance, pioneered by Karen Sobel Lojeski, is a conceptual as well as quantitative approach that helps to explain organizational behavior changes when much of our communications are electronically mediated. Understanding these changes and how they impact organizational outcomes is critical to leaders and managers around the world. During this course, students will be exposed to both theoretical models and real-life case studies to more fully develop knowledge and skills for working in the digital age. Students will gain an in-depth understanding of Virtual Distance and how this growing phenomenon impacts critical success factors such as productivity, innovation, and employee engagement and satisfaction. Students will also get hands-on experience with Virtual Distance Index data. Drawing from over 700 project teams from around the world, students will learn how to interpret Virtual Distance data

*3 credits, Letter graded (A, A-, B+, etc.)*

**EST 534: The Lean Launch Pad: Turning a great idea into a great company**

This course provides real world, hands-on learning of what it's like to actually start a high-tech company. This class is not about how to write a business plan, and the end result is not a PowerPoint presentation to venture capitalists. Instead, students will get their hands dirty talking to customers, partners and competitors as they encounter the chaos and uncertainty of how a startup actually works. Students work in teams learning how to turn a great idea into a great company. They will learn how to use a business model to brainstorm each part of a company and customer development to get out of the classroom to see whether anyone other than themselves would want/use their product. Finally, they will see how agile development can help them rapidly iterate their product to build something customers will use and buy. Offered in Fall and Spring. Cross-listed with EST 534.

*3 credits, Letter graded (A, A-, B+, etc.)*

**EST 535: Electric Power Systems**

Electric power system is at the center of achieving mid-century carbon neutrality to address climate change. This course deals with the physics, design, plan, and operation of the electric power systems, essentially the engineering principles of the electric power systems. We will cover the basic components of electric power systems, including generation technologies, transmission and distribution, electricity loads, transformers, and safety equipment. We will then discuss the design and operation of the power systems. We will cover power system planning, power system operation and control, and emerging technical and policy issues in the electricity industry.

*3 credits, Letter graded (A, A-, B+, etc.)*

**EST 536: Resilience in Urban Environments**

Resilience lacks a universally agreed-upon definition, in part due to its multi-dimensional nature that crosses disciplines, and this inconsistency in terminology and framing is reflected in current research. For this course, we adopt a newer, more dynamic framing of resilience that incorporates change and adaptation: Cities and buildings are operated by social actors; they may be stationary engineering structures, but they are not static, and during a disruption they evolve and change based on the decisions made by people. Thus, this class focuses on conceptual and theoretical frameworks for resilience but applies them to important social science questions in the urban built environment, such as vulnerability, decision making, risk perception, organizational behavior, and policy formation.

*3 credits, Letter graded (A, A-, B+, etc.)*

**EST 540: Environmental Management**

This is an introduction to environmental management, and will focus on the interplay between science and public policy. Concepts include problem identification and definition, collection and analysis of relevant data to produce information, and the roles of public perception and action in ultimately determining outcomes when consensus is not reached. Specific fields to which these concepts will be applied will be solid waste management and coastal management. Current local problems will be used to illustrate the broader conceptual issues. Offered as MAR 514, EST 540 and CEY 501. 3 Credits, ABCF Grading

*3 credits, Letter graded (A, A-, B+, etc.)*

**EST 541: Long Island's Groundwater**

This course will cover basic groundwater concepts in unconsolidated sediments, and

examine contamination issues in light of Long Island's particular hydrogeology, land use, and waste management history. Mathematical principles will be discussed but not stressed; scientific and technical papers discussing particular concepts or problems, including important local examples, will be closely read.

*Prerequisite: Permission of instructor. Offered as MAR 521 or HPH 673.*

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**EST 542: Water and Wastewater Engineering Practices**

This course will provide basic engineering concepts and practices associated with water supply and wastewater management, with an emphasis on New York metropolitan area technologies. Topics covered will include water supply and distribution, wells, water quality testing and regulation, onsite, package and standard wastewater treatment, and stormwater collection. Policy issues considered will include source water protection and wastewater impact mitigation programs.

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**EST 546: Integrating Technology, Policy and Financing Instruments to Catalyze Climate Finance**

The sums involved in a shift to a low-carbon society are daunting but not impossible to achieve. The world is planning to invest over \$15 trillion in fixed-asset investments in the next 10 years. Rather a problem of capital generation, the key challenge of financing the transition towards a low carbon society is to redirect existing and planned capital flows from traditional high-carbon to low-carbon investments. This course is designed to allow students to: (1) Review a number of public policies, public finance mechanisms and market-based instruments designed to shift investments from fossil fuels to more climate friendly alternatives over the past few years; (2) Gain knowledge of the global commercial, political, innovation and technological challenges and opportunities in the transition to a low-carbon society; (3) Develop and practice professional skills in raising and spending public finance to catalyze capital towards low carbon and climate resilient development; and (4) Develop and practice professional skills in accessing carbon finance and designing innovative financing instruments. This course is aimed at engineering students who are interested in the energy challenges in a carbon-constrained world and their implications to technology innovation; at business-and public-administration students and at mid-career

professionals who want to develop innovative financing solutions to real-world energy and environmental problems. Offered: Summer Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)

### **EST 547: Advanced Problems in Integrated Planning: Theory, Practice, and Analytical Tools**

This course explores in depth new theories and practical applications of integrated planning through the lens and land use, transportation and urban infrastructure systems. A series of problem sets is undertaken in close coordination with the instructor to produce a portfolio of networked research which, with further research, can be publishable quality.

*Offered*

Summer, 3 credits, Letter graded (A, A-, B+, etc.)

### **EST 551: The Atom and Environmental Radiation in the Nuclear Age**

This course will address technical and societal aspects relating to nuclear power and the general issue of environmental radioactivity. It will cover basics of the nuclear industry and the nature of radioactivity. This includes the production, storage, and disposal of diverse radionuclides emanating from the nuclear fuel cycle and nuclear weapons testing. The properties of major radionuclides will be explored. The course will also consider the complex issue of biological risks posed by radionuclides at different doses to living organisms, including man. Economic and political constraints on nuclear power generation will be discussed for the US and other countries, as will the actual and perceived risks associated with environmental radioactivity.

3 credits, Letter graded (A, A-, B+, etc.)

### **EST 553: Nuclear Security**

The course will familiarize students with the fundamentals of nuclear physics, radiation, mining, weapons and fuel cycle, other than producing electricity, as it pertains to nuclear power plants. Topics include nuclear detection, devices to safeguard nuclear materials from terrorist threats, needed physical protection for safe handling and its relevance to Homeland Security. The course combines lectures with hands-on experience at the newly installed nuclear detection facility located at the nearby United States Department of Energy's Brookhaven National Laboratory. Prerequisite: Undergraduate equivalent physics and chemistry.

Fall, Spring, 4 credits, Letter graded (A, A-, B+, etc.)

### **EST 554: Chemical & Biological Weapons: Safeguards and Security**

This course deals with the fundamentals of chemistry and biochemistry related to chemical weapons (CW) and biological weapons (BW) that could be used by terrorists. Topics include CW and BW history, production, control, detection, identification, and emergency response measures to deal with intended or unintended release and escape, and security measures to protect and control stockpiles. Prerequisite: Undergraduate equivalent chemistry, biochemistry, and microbiology. Fall, Spring, 4 credits, Letter graded (A, A-, B+, etc.)

### **EST 555: Preventing Weapons Proliferation**

The student will learn: what some of the key international tools to stem weapons proliferation are, how they have developed over the last 50 years, and how they work; the kinds of technologies used to develop nuclear, chemical, or biological weapons & missile delivery systems; and the complexities & methods of controlling these technologies. The student will also learn about the use of UN Security Council sanctions, and about multilateral [e.g., EU, ECOWAS] and national sanctions; and about how interdicting illicit transfers does or does not work. The course will emphasize how technology, international law, and international and domestic politics all play important roles in the evolution, current practice, and effectiveness of the international nonproliferation regime.

3 credits, Letter graded (A, A-, B+, etc.)

### **EST 556: Nuclear Nonproliferation & International Safeguards**

The student will learn the history of the nuclear nonproliferation regime since 1946, with emphasis on the evolution of concepts & practice. The student will also learn the variety and complexity of motivations for governments to seek nuclear weapons, and in many cases, to forswear nuclear weapons. The course will emphasize how nuclear energy technologies, verification technologies, international legal practice, and politics all play important roles in the evolution, current practice, and effectiveness of the international nuclear nonproliferation regime.

3 credits, Letter graded (A, A-, B+, etc.)

### **EST 557: Nuclear Energy-the nuclear fuel cycle & technologies**

Nuclear energy has many applications beyond the well known (and controversial) civil nuclear power plant. These applications include medical and industrial isotope

production, research reactors, particle accelerators, propulsion reactors, and nuclear weapons. Supporting these applications is a complex infrastructure involving several diverse scientific, engineering, and industrial processes. One of the key processes is the nuclear fuel cycle, involved principally in civil nuclear power and related civil nuclear activities, from uranium mining to spent fuel reprocessing. However, the same set of technologies can be used to manufacture nuclear weapons - thus these technologies become a double-edged sword. This course provides a comprehensive first look at this complex of technologies for those interested in nuclear weapons proliferation, nuclear energy, or nuclear safety. It is directed at those with no foundation in nuclear physics or nuclear engineering, but who seek to understand these technologies in terms well beyond those of the layman, but short of the nuclear engineer. Individuals interested in taking this course should have completed a course in algebra. Students should be familiar and comfortable working with exponents and logarithms. Higher levels of math such as calculus will not be utilized in this course.

3 credits, Letter graded (A, A-, B+, etc.)

### **EST 558: Digital technologies in disaster risk reduction**

"This seminar surveys major topics in the emerging field of digital technology management for disaster risk reduction. The first several weeks of the course introduce major perspectives and conceptual approaches to understanding the new role of digital technologies in disaster risk reduction. Subsequently, the course focuses on more specific topics including the evolution of next-generation public safety networks, innovation and such digital technologies as robotics, augmented and virtual reality, big data, mobility, block chain and artificial intelligence.

3 credits, Letter graded (A, A-, B+, etc.)

### **EST 559: Mobile Revolution in Disaster Risk Reduction**

This course explore three themes: [1] current and future trends of three major mobile technologies applied to disaster risk reduction (ICT, [mobile phones, service apps, Remote GIS, GPS], energy [batteries, microgrids], and other technologies increasingly repurposed and adapted toward mobility (drones, ad hoc networks, base stations, wearables, IoT, smart grids), [2] combined with proven tactics to achieve successful collaborative disaster management and trust relationships between three groups (government/corporate 'big data' aggregation and sharing, emergency response

personnel, and local knowledge of citizens, NGOs, businesses, and volunteers), [3] in order to effectively reduce vulnerability and inequality before, during, or after natural hazards and/or human disasters toward a goal of more resilient, equitable, sustainable development.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 560: Risk Assessment, Regulation, and Homeland Security**

The course focus is on risk assessment associated with nuclear, chemical and biological weapons as it relates to Homeland Security. Topics include air dispersion, uncertainty analysis, exposure measurements, epidemiology, toxicology, regulatory issues, risk management, risk communication, risk perception, and risk preparedness. The course will also cover laws and regulation, discouraging terrorism, and disaster preparedness, various acts passed by the U.S. Congress to regulate water, air, and controlled substances. Offered as EST 560 or HPH 656.

*Prerequisite: Undergraduate or equivalent physics, math and chemistry.*

*Fall and Spring, 4 credits, Letter graded (A, A-, B+, etc.)*

### **EST 561: Sensing Technologies for Disaster Risk Reduction**

This graduate seminar will survey the main topics in the emerging field of digital technology management for disaster risk reduction. Throughout it will introduce relevant theoretical concepts and relate them to policies and practices. Topics will include the evolution of next-generation public safety networks, related digital technologies such as robotics, augmented and virtual reality, big data, mobility, innovation and entrepreneurship as well as conceptual approaches to distorters and the relationship of disaster to broader environment and sustainable development issues. Departmental faculty and guest lecturers from partner organization (UN office for Disaster Risk Reduction, Korean Red Cross, International Federation of Red Cross Red Crescent Societies, SafeNet Forum) will participate.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 562: Decision Support Systems**

A decision support system (DSS) is a computer system that combines, data, analytical tools, and models to support decision making. A DSS may be model-driven or data-driven. A model-driven DSS is a stand-alone system that uses some type of model to perform "what-ifs" and other kinds of analysis. A data-driven DSS is a system that supports decision making by allowing users to extract and analyze useful

information that was previously buried in large databases. In this course, both model-driven and data-driven decision support services will be considered. Students will identify an appropriate engineering or management application. By collecting relevant data, building suitable mathematical models, designing an accessible user interface, and connecting these components via computer code, students will develop a deliverable DSS. Through a series of presentations, they will demonstrate how their DSS addresses the stated engineering or management problem. In doing so, students will gain insight into the interrelationships among information systems, statistics and management science. Prerequisite: EMP 504 or permission of instructor Offered

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 563: Computer Literacy for Educators**

This course is an introduction to computer and software basics and was formally listed as EST 583. Students will develop an understanding of the underlying concepts and principles behind computers. Students will gain sufficient knowledge to successfully navigate the digital world. Emphasis will focus on computer literacy areas used in education and other professional environments. Students will leave this course with the ability to grasp the risks and benefits surrounding new and current computer technologies. The following skills will be addressed; electronic communication, application-based projects, information management, assessment, and the societal impacts of computer based technologies. Students having completed EST 565 in a prior semester can not receive credit for EST 563. EST 563 and EST 565 may be taken in the same semester.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 565: Foundations of Technology in Education**

Throughout this course students will explore the basic pedagogical issues and social impact of using technology in education. This course examines the basic principles of integrating technology and computer applications into the curriculum. Students will learn how to use and integrate word processing, spreadsheet, and presentation applications for educator planning and student project work. Students will also learn how to use a number of online based applications within school curriculum. The culminating activity for this course is the design and a presentation of a micro-lesson using one these applications as they would in the classroom.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 567: The Internet, Social Networking and Collaborative Environments**

In this course students will learn the basic principles of using the Internet for instruction, the science and engineering concepts behind modern communication systems and their impact on education as well as the evolution of the Internet in education. Students will design and create a website and explore the use and social impact of collaborative learning environments and social networking. Students will learn how to evaluate and effectively integrate a variety of educational resources, such as web 2.0 tools and modern communication devices for active learning. Students will also develop a clear understanding of the issues surrounding cybersafety, cyberbullying, and the ethical issues raised by the use of technology in education. The culminating activity for this course is the development and publishing of a collaborative website that showcases the material and skills mastered throughout this course.

*Fall, Spring, Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 568: Networked Communication Technologies**

EST 568 Network Communication Wired and Wireless

*This course examines the range of technologies used in teaching, learning, and communication. Instructional technologies both stand-alone and networked are surveyed with a focus on how they can be used effectively to enhance learning. Students will learn fundamental hardware and software principles underlying the development of the Internet and other networked communications tools. Emphasis will be placed on assessment of these technologies in terms of societal impacts and learning outcomes. This course combines topics from EST 565 and EST 567. Fall, Spring, Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 569: Technology in the City**

Urban technology includes exciting IT processes and breakthroughs and also mundane but necessary infrastructure such as sewage treatment and traffic control. In this course we will discuss some basic elements of traditional urban technology and examine how modern electronic and information processing technologies have changed and are continuing to change these processes: how the smart City has been and will continue to be implemented. There will be a focus on information and



its role in driving innovation but physical improvements to engineering designs will also be considered. Technological lock-in due to structural choices and sunk costs will be a course theme. Course content will change depending on tour opportunities. There are extra course costs for train-subway tickets and field trip lunches.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 570: Educational Technology Lesson Development**

In this course students will learn principles of instructional design and how to fully integrate technology into daily curriculum. Throughout the course students will plan, develop and evaluate a lesson plan that demonstrates an expertise in the integration of educational technology. Students will apply the skills, techniques, resources and research necessary to effectively create an educational technology inspired lesson plan. The lesson plan may include the use of emerging technologies, distance learning, multimedia projects, collaborative environments, computer applications and Internet resources. The culminating project for this course is the completion of a lesson plan in a specific content area that incorporates multiple modalities of technology into pedagogical practices.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 571: Educational Technology Research Methods**

This course evaluates the impact and value of educational technology through detailed research based on a number of current topics. Course goals include understanding research methodology and literature and exploring assessment design and implementation. The course includes class discussions and project work based on student learning with technology, access and the digital divide, the National Education Technology Plan, Internet literacy, emerging technologies, virtual schools, and data driven research.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 573: Interactive Multimedia Curriculum Design and Development**

"This course allows students to learn how to use a variety of multimedia tools for the classroom. Principles of user interface and interaction design will be covered. Throughout the course students design an interactive unit plan using multimedia authoring software. Students will work with audio/video editing software, collaborative learning software, and learn how to embed online games, activities and video within their unit plan. Development of the interactive multimedia unit requires

students to: submit a proposal, use graphic organizers to plan and design, create a draft version, create assessment tools, test market with a specific target audience, then evaluate the unit before the final version is completed. The culminating activity is the presentation and delivery of the finished interactive multimedia unit.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 574: Distance Learning and Virtual Environments**

Web-based distance learning applications are quickly growing within higher education institutions, K-12 schools, and corporate environments. The focus of this course is on the underlying theories, design, and implementation of effective modes of elearning. Students will explore virtual schools, virtual learning, virtual environments and other forms of distance education. The social differences between face-to-face and virtual learning will also be examined and discussed throughout the course. Students will explore virtual learning resources and design their own virtual learning lesson. The culminating project for this course will be the demonstration and write up of the experience.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 575: Developing Grants and Managing Projects**

This course will develop the skills necessary to take a program proposal from idea through reality with an emphasis on new technological resources available to help with this process. Topics include: techniques for successful fundraising, grant writing, program design, staffing, publicity and outreach, and reporting and evaluation. It is designed for current educators and administrators as well as students about to enter the education, social service and health fields.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 576: Geographic Information Systems in Education and Research**

Students use Geographic Information Systems (GIS) software to create, manipulate and interpret layers of interactive maps and databases. Students collect and modify geographical materials from the Internet, satellite and aerial imagery, and field data. They design and test scientific inquiry-driven educational modules and/or visualizations for research and analysis on global and local geography, for use in economics, earth science, politics and civic action, history and sociology, global studies, and environmental planning and assessment. Prerequisite: EST 565 or EST 595 or permission of instructor.)

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 577: Environmental Information Systems (EIS)**

Due to the complex nature of environmental and spatial data, these systems require state-of-the-art computer technology to achieve environmental science and information technology. This course will address the technical and conceptual bases of data capture, data storage, data analysis and decision support, and metadata management.

*This course will address the technical and conceptual bases of data capture, data storage, data analysis and decision support, and metadata management. Environmental Information Systems are concerned with the management of data about the rock of soil, the water, the air, and the species around us. Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **EST 578: Human-Computer Interaction Design for Construction**

Principles of human-computer interaction applied to the design of educational courseware. Usability engineering, with a focus on the audience and learning objectives. Interface design principles. Human computer dialogs. Multimedia as a communication tool, using images, audio and video. Multimodal input devices and strategies. Students will use a multimedia authoring tool to create a prototype of an educational application or learning tool.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 579: Educational Games**

Simulations and computer games as a learning tool. Traditional game and simulation genres, and their appropriate uses in education. Gameplay design. Game development process, from storyboarding to delivery. Assessing games as learning tools. Students will use a multimedia tool to prototype an educational game or simulation of their own design.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 580: Advanced Technology assessment: Business, Government and Strategy**

This course has a two-fold objective: (1) to help students develop strong conceptual foundations for understanding and addressing issues at the intersection of science, technology, public policy, and business strategy; and (2) to provide students with knowledge of analytical frameworks and tools that are essential to technology assessment in business, government, and government,

and other organizations with understanding of their strengths, limitations, and underlying assumptions. Topics covered include utility/profit maximization theory, its limitations and alternative theories, business and government interactions, technology innovation and management, technology forecasting, impact assessment, technology valuation, and basic tools for technology assessment (monitoring, simulation, expert opinion, scenario analysis, cost-benefit analysis, AHP method, etc.).

*Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 581: Decision-making in Technology Settings**

Complex problems (choices) need to be resolved in the course of socio-technical processes. Quantitative decision-making techniques have been evolved to address these situations. We will investigate a number of these techniques in detail, in order to understand the advantages that can be gained by using them. We will also discuss common criticisms and issues associated with these methods, and consider the heuristic methods that are often used instead to resolve complicated problems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 582: Socio-Technological Systems**

Systems thinking requires changing perspectives as to how to analyze problems and seek solutions. Socio-technological systems are the more complicated kinds of systems that require integrating knowledge of technologies with human elements. We will examine common concepts used to analyze systems, including a number of conceptual approaches to modeling systems. The course is qualitative not quantitative in its approach.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 583: National Energy Decision Making**

The Course approaches Energy Decision Making through a wide perspective of countries, cities, corporations, facilities and homes. The course will provide tools to analyze the energy use for different entities including governments, corporations and individuals. It will provide a framework to analyze both the choices and constraints of sources and uses of energy. The course is a practical overview of techniques and processes useful for people who will have decision-making responsibilities for energy systems in policy, business or engineering domains.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 585: Assessment of Technology in Learning Environments**

This course is designed to provide educators with an overview of the uses of technology to improve instruction. Students will understand the design and function of learning environments, individual applications related to the student's area of professional practice, and assessment of educational uses of technology today and tomorrow. Students will chose a current technology used in a specific learning environment and analyze and evaluate its effectiveness within instruction including practical classroom use and staff development for the particular technology. Students will then research and make recommendations on how the particular technology could be integrated most effectively to increase teacher understanding and enhance student learning. Students then present their findings about the current use of the chosen technology, possible improvements on its use as well as future technology recommendations.

*Fall, Spring, and Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 590: Seminar for MS, TSM Students**

How can practitioners avoid fads or impressions and instead use reliable evidence from multiple sources to understand "big questions" in Science, Technology and Society Studies (STS)? This course is designed to help you understand and use a scientific, analytic approach to review and summarize a body of knowledge in STS. You will identify an STS question of personal interest and/or career relevance. You will then conduct a review of the scholarly literature on that topic, draw conclusions, and write a research report. In sum, through this course you will access, evaluate, and use empirical research to evaluate and inform your understanding of an STS "big question". In this way, you and your seminar colleagues will have an opportunity to learn both about chosen topics in depth, and more generally to learn to be savvy consumers of research.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **EST 591: Independent Study in Technology and Society**

The primary objective of independent study is to provide a student with opportunities to interact with faculty members who can be of assistance in his or her master's project. Students should consult individually with faculty members on workload and credit(s).

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **EST 592: Sustainable Energy: Technologies, Systems, Markets, and Policies**

The ample supply and appropriate use of energy is critical to the well being of human society. Energy plays an enormous role in environmental degradation, national insecurity, international conflict, and in solutions to these problems. This course aims to introduce the major energy issues to students in engineering, business, and public policy areas. It discusses the energy choices to meet regional and global energy needs. Major renewable and conventional energy sources, energy supply technologies, and end-use efficiency options will be assessed in the context of political, social, economic, and environmental goals.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 593: Risk Assessment and Hazard Management**

An introduction to the methods and techniques for assessing and managing risks to humans and the environment from natural and technological hazards. The course consists of lectures and readings on risk assessment and hazard management and discussions of published case studies. Students will conduct their own case studies and present them in oral and written reports.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 594: Diagnosis of Environmental Disputes**

Diagnosis of disagreements about environmental and waste problems. Tools for evaluating disputes about (a) scientific theories and environmental models, (b) definitions and analytical methodologies for estimating risk, "real" cost, net energy use, and life-cycle environmental impact, (c) regulatory and legal policy, (d) siting of controversial environmental facilities, and (e) fairness and other ethical issues. These diagnostic tools are brought to bear upon case studies of pollution prevention, recycling, nuclear waste disposal, and climate change.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 595: Principles of Environmental Systems Analysis**

This course is intended for students interested in learning systems engineering principles relevant to solving environmental and waste management problems. Concepts include compartmental models, state variables, optimization, and numerical and analytical solutions to differential equations.

*Prerequisites: MAT 132 and one year of quantitative science such as physics,*

*chemistry, or geology; or permission of instructor. Offered as EST 595 or HPH 688. Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 597: Waste Management: Systems and Principles**

Integrated municipal waste management and zero waste concepts. Technologies and policy options in waste management: recycling, incineration, landfilling, and source reduction, including extended producer responsibility and pay-as-you throw. How regulation, economics, environmental impacts, and public perception affect policy and technology selections. Specific regional implementations and planned projects.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 598: Master's Project in Technology and Society**

This course requires direct supervision by a member of DTS faculty. Students work independently to complete their master's project. Students typically address the MS project in three ways: 1) a literature search on a technical area relating to their concentration; 2) a project that combines content from two or more courses; 3) a work related problem that requires additional technical information or training. Note: These credits cannot be counted as part of the 30 credits required for the degree

*S/U grading*

*May be repeated for credit.*

### **EST 599: Special Projects and Topics**

A technology assessment laboratory for emerging problems and focused research. May be run as a hands-on, group research study of an important educational, environmental or waste problem (perhaps to provide an assessment to a regulatory agency or administrative system).

*1-12 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **EST 600: Technology, Policy, and Innovation: Theory and Practice**

This course provides students with frameworks and models for analysis of issues at the intersection of science, technology and public policy, and business strategy; and helps students develop skills to work on policy issues that require deep understanding of the technical details. Topics include utility/profit maximization theory, its limitations and alternative theories, business and government interactions, technology innovation and managements, policy process (agenda setting, problem definition, framing the terms of debate, formulation and analysis of options, evaluation of policy outcomes). Cases drawn from energy and environmental policy,

educational technology, STEM education will be used to illustrate stakeholders and their value structures, high levels of uncertainty, multiple levels of complexity, and their influence on policy intervention. This course emphasizes quantitative policy analysis methods, and critical thinking.

*Fall, 4 credits, Letter graded (A, A-, B+, etc.)*

### **EST 601: Grand Challenges in Energy and Environmental Policy**

The survey course will be taught by the faculty of Technology and Society and provide an introduction to the major energy and environmental issues of our time. The course will take an interdisciplinary perspective drawing from policy, engineering, social and physical sciences, the course will cover challenges and opportunities related to society's demand for energy and resources, and resulting environmental impacts. It is a required course for all elective for all PhD candidates and advanced Masters students outside of the energy and environmental program who may take the course with the permission of the senior faculty member responsible for the course. The course will be conducted in a mixture of lecture and seminar styles. An extensive reading list will be provided on each issue. Responsible Instructor: Gerald Stokes Co-instructors: Elizabeth Hewitt, Gang He

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 602: Energy, Technology and Society: Energy Nexus Research Frontiers**

Energy is at the center of the nexus challenges-energy, water, food, land, environment and development-that human being faces, critical linkages between those issues demand system integrative thinking and of growing interest in research and policy communities. This course will provide a deep working knowledge, technically and socially, of the energy technologies, policies, and transition. This course will survey the energy nexus concepts and principles, introduce tools of analysis, and engage students in case studies of critical energy nexus issues: energy and development, energy and water, energy and food, energy and land, energy and environment, and energy and climate change. This course aims to explore the frontier of energy nexus research and empower students to contribute in the energy nexus debate and policy design.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 603: Energy Systems Analysis**

This class offers a systems analysis approach and introduces useful modeling tools to

capture and reveal the complexity of energy systems. The scope of this class includes main forms of energy, major energy production, conversion, and consumption activities, and technology innovation and transition embedded in the energy systems. We'll first discuss the theoretical and empirical knowledge base and data sources to understand the energy-environmental and climate problems. The class will then introduce the modeling tools and skills to analyze energy systems or individual energy projects so to understand energy systems and enable evidence-based decision making. This class encourage students to design research projects, using the modeling tools, and presenting results.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 604: Grand Challenges in English, Education, Management & Policy**

New technologies are created by and for people. In this course, we examine how that happens, or fails to happen. We will examine policies at the organizational, community, sectoral, national, and cross-national levels and how they influence the lives and work of the many and varied people who create, use, benefit from, and suffer from new technologies. We will cover six grand challenges in engineering education, management and policy (EEMP): Educating wisely with technology (i.e., effectively and efficiently); Ensuring equity; Sparking and sustaining innovation; Managing, organizing, and leading engineering enterprises; Harnessing the power of emerging technologies; and Coexisting with technology to maximize rewards and minimize risks (i.e., our individual and collective health, well-being, and happiness).

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 605: Economics and Public Policy**

This course focuses on theoretical economic concepts and their planning and policy applications, and it is structured as an introductory-level survey of economics. This course covers foundations of microeconomics including supply & demand, elasticity, market efficiency, externalities, and public goods. We then expand to key concepts in environmental economics, urban economics, and macroeconomics, and will discuss recent challenges to neoclassical economic theory, such as behavioral economics. Importantly, the connection to policy implementation and practical societal challenges will be heavily stressed.

*3 credits, Letter graded (A, A-, B+, etc.)*

**EST 606: The Economics of Technology, Policy, and Innovation**

This course is the second in a two part economics sequence that applies the tools from Part 1 to evaluate sectors of the economy related to technology, public goods, and innovation. Readings cover the literature related to the cross between public economics and technology / innovation. Policies related to technology and innovation enhancements will be assessed using the criteria of effectiveness, efficiency, equity, economic growth, and economic stability. How technology and innovation impact the economy and industry, how well advances are being implemented, will all be examined from the economist's perspective. Pre-Requisite: EST 605, Economics and Public Policy with a grade of C+ or better Fall semester, 3 credits, A, B, C, F. 3 credits, Letter graded (A, A-, B+, etc.)

**EST 607: Energy and Environmental Economics and Markets**

The landscape of global energy markets over the past decades has largely driven by economics and regulations. This course will draw the theories and tools of economics and regulations to study the evolution of the energy and environmental markets and the policy implications of such evolution. This course will examine the development of effect of organized energy markets, the industry structure and evolution of competition in the energy and environmental markets, the political economy of regulation and deregulation, market power and antitrust, climate change and environmental policy and their impacts in energy and environmental markets. This course will also discuss the emerging markets for clean energy, energy efficiency, and transport and storage of energy. This course aims to analyzing the rationale for and effects of public policies in energy and environmental markets.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

**EST 610: Data Analysis for Technology, Policy and Innovation**

This course covers many of the common empirical tools used for research in Technology, Policy, and Innovation. Topics include: descriptive statistics, clustering, discrimination analysis, estimation, hypothesis testing, and regression analysis. To learn these topics, students will use modern statistical software programs to analyze data sets with socio-technological applications. After this course, students will have the tools to conduct robust data analyses and present the work in written and visually appealing formats.

This course assumes that students have basic knowledge of statistics or data analysis.

3 credits, Letter graded (A, A-, B+, etc.)

**EST 620: Decision Making in Socio-Technological and Global Contexts**

Methodologies and applications to enhance students' abilities to use qualitative and quantitative approaches to examine decision problems within socio-technological and global contexts. Psychological, social and cultural influences on decision making in organizations. Power and limitations of the theories, models and tools of decision analysis. Applications to decision problems in a variety of areas, including energy and environmental systems, educational technology and education in science and engineering, technology management, and science and technology policy.

3 credits, Letter graded (A, A-, B+, etc.)

**EST 625: Advanced Theory and Practice in Technology and Policy**

Technology change entails more than the commercialization of an invention. Likewise, policy making encompasses much more than cost-benefit analysis and regulation. This advanced, graduate level course examines critical theory for both subjects by drawing on ideas from systems and science, policy and management, economics, and STS. Emphasis is placed on deconstructing theoretical applications in the context of policy-based problem-solving and innovation objectives. Topics will include policy cycles, regulatory capture, innovation systems, dimensions of technology change, and lock-in, among others. Students will develop skills to work in roles at the interface of technology and management.

3 credits, Letter graded (A, A-, B+, etc.)

**EST 650: Directed Study**

Individual studies under the guidance of a faculty member. Subject matter varies according to the needs of the student. May be repeated for credit.

1-9 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

**EST 680: Teaching, Learning, and Technology**

A professional development seminar that is designed to help Ph.D. students develop the competencies needed to become effective teachers in colleges and universities. Students will learn relevant teaching and learning theories and their applications to teaching courses and laboratory sessions. Students will learn methods for the design and assessment of courses, including courses that integrate

appropriate technologies to enhance learning and teaching. Students will learn how to create learning environments that build on the strengths and address the varied needs of a diversity of learners.

Restricted to Ph.D. students registered in the Certificate Program on College Teaching. Fall and Spring, 0-3 credits, Letter graded (A, A-, B+, etc.)

**EST 688: Internship in Research**

Participation in private corporations, public agencies, or non-profit institutions. Students will be required to have a faculty coordinator as well as a contact in the outside organization to participate with them in regular consultations on the project, and to submit a final report to both. At most one credit can be accepted toward the degree.

1-3 credits, S/U grading  
May be repeated for credit.

**EST 690: Seminar in Theory Building**

Science is about discovering facts as well as explaining what the facts mean. Theories provide explanations and interpretations of empirical phenomena and building and modifying theories are at the heart of core scientific activities. Good theory is essential to many new fields for several reasons. First, good theory provides guidance for practical action and therefore should be at the foundation of curricula. Second, without good theory in any particular field, researchers must borrow theories from other academic disciplines. While this can be useful, sometimes these theories might not fit our subject matter well. For example social theories based on behavioral assumptions stemming from non-digital communications do not fully address substantive features of social behavior in a digital age. Research courses commonly emphasize empirical research methods and formal modeling approaches to theory development. There is much less guidance for those who want to build a theory for managerial and behavioral studies-Yet every researcher must do so to develop a good research proposal. This seminar aims to fill that gap by focusing on theory types and evaluation criteria, theory development processes, and theoretical writing.

Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)

**EST 691: Seminar on Innovation, Invention, and Diffusion**

Innovation is viewed as central to progress for any individual, organization, nation or global effort. In this seminar we will discuss invention, the two main phases of innovation, exploration and exploitation, the notion of

diffusion of innovation and finally innovation policy as well as policy innovation. We will explore a number of types of innovation including radical versus incremental, technological versus administrative, product versus process and more. Using relevant case studies and selected readings from the most influential voices on innovation, including those in academia, corporate America as well as policy-making organizations, we will explore the many different sides of innovation, why it is one of the most critical issues of our time and how seminar participants can contribute to overall innovative efforts. Offered

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 692: Research Seminar**

This seminar is a forum for the discussion of research methods, project ideas, proposal preparation and the written and presentation of research proposals and results. It is designed to meet the needs of early career researchers at both the Masters and Ph.D. level. For Masters students, final product of this seminar is an approved master's project proposal. Ph.D. students will present progress on their own research. All students will participate in peer review of each others' work and learn the basics of the responsible conduct of research.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **EST 694: Energy and Buildings: Technology, Policy, and Behavior**

Buildings consume vast amounts of energy and resources, and are one of the largest contributors to greenhouse gas emissions. Major advances in building design and technology over the past decade have given us tools to make buildings more energy efficient, but buildings lag far behind their potential. There are many avenues to green the built environment sector, including technological innovations, occupant behavior programs, retrofits of existing buildings, and innovative building codes. Ultimately, reducing energy consumption in the building stock will require an interdisciplinary approach and some combination of a range of program and policy types. This course will introduce students to the many interdisciplinary issues surrounding energy use in buildings, with a particular focus on the intersection of policy with technology, economics, social science, and behavior. The course will combine lectures, student-led discussions, guest speaker(s) and field trip(s) to green buildings, depending on scheduling.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EST 695: Topics in Technology, Policy, and Innovation**

Topics selected on the basis of the needs of the graduate program and research interests of the staff.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **EST 696: Advanced Topics in Technology, Policy and Innovation**

Advanced topics selected on the basis of the needs of the graduate program and research interests of the staff.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **EST 697: Directed Study**

Individual studies under the guidance of a faculty member.. Subject matter varies according to the needs of the student.

*1-9 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **EST 698: Practicum in Teaching**

This course enables graduate students to gain experience in teaching and interacting with students enrolled in Technology, Policy, and Innovation courses. Students enrolled in EST 698 are expected to perform various teaching duties required by the course instructor, such as attending lectures, providing office hours, holding review/recitation session, proctoring exams, grading, etc...

*Fall, Spring, and Summer, 1-3 credits, S/U grading  
May be repeated for credit.*

### **EST 699: Dissertation Research on Campus**

Dissertation research under direction of advisor.

*1-9 credits, S/U grading  
May be repeated for credit.*

### **EST 700: Dissertation Research Off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G%). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*1-9 credits, S/U grading  
May be repeated for credit.*

### **EST 701: Dissertation Research Off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or

U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by the second week of classes. The charge will only be removed if other plan is deemed comparable. All international students must receive clearance from an International Advisor. May be repeated for credit. Offered every semester, 1-9 credits, S/U Grading

*1-9 credits, S/U grading  
May be repeated for credit.*

### **EST 800: Summer Research**

*May be repeated for credit.*

## **EUR**

### **European Studies**

#### **EUR 501: Historical and Cultural Frameworks of Europe**

Intended as a General Introduction to European Civilization and Cultures, this course begins with the "idea" of Europe and traces how it developed over the course of 25 centuries. Through the juxtaposition of historical, philosophical and creative texts, as well as images, it will cover key points from ancient Middle-Eastern and Mediterranean cultures through the Middle Ages and the Early Modern period, examine various social, religious, political and artistic configurations through the XIX and XX centuries, and end with the creation of the European Union. Approaches may vary from the philosophical to the artistic/literary, from the socioeconomic to the political.

*Fall &  
Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **EUR 502: Methods of Research and Theories of Interpretation**

An introduction to research techniques in philology and manuscript retrieval, including an acquaintance with major libraries and collections throughout Europe and the United States. This includes basic digital humanities research techniques. Students will also be introduced to the major currents of criticism in literature, history and philosophy, including the basic concepts of structuralism, Marxism,

reception aesthetics, historiography, and hermeneutics. Students will be required first to locate, identify, and describe certain texts, and then to analyze them according to the given theories of interpretation. 3 credits. ABCF grading.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **EUR 503: Perceptions and Inventions of Europe**

This seminar will focus on the problematic of how Europe dealt with the rest of the world, taken mainly in a historical perspective, and stressing different aspects of the relation. The running thread is represented by the triple topics of contact, conflict, and exchange, using various types of travelers, such as explorers, geographers and merchants, as the starting points, but extending it scholars, artists, emigrants and exiles. Course will also look at how non-Europeans first met, described, and reacted to Europeans. Several media used. 3 credits. ABCF grading.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **EUR 504: European Arts, Poetics, Culture**

The aim of this course is to make an in-depth critical assessment of the signal contribution of French, German, Italian and British thinkers and artists to two major turning points: Romanticism and Postmodernism, debates which raged in Europe (and by reflection the US), the first from the 1790s through the 1830s, the second from the post-World War Two period through the late Nineties. Among the topics: the nature, ideologies and structure of the attack on traditional (i.e.: Enlightenment, and/or Modernist) modes of thought and organization; the theories and methods proposed in turn; and implications for literary theory, education, politics and history; the evolving features of selected works of art 3 credits. ABCF grading. May be repeated for credit if syllabus or instructor is different.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **EUR 571: Special Topics In European Studies**

Course will focus on the imaginative construction of other worlds as a critique of or alternative to the existing one in specific moments of Europe's social and cultural development. Each utopistic project manifests striking different stylistic, social, symbolic and philosophical takes on what the different authors conceive as an alternative to Europe's complex history. Actual texts may vary depending on Instructor, and different mediums may be used.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **EUR 581: Independent Individual Studies**

Studies in specialized topics under the direction of a designated faculty. Fall, Spring or

*Summer, 1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **EUR 599: Thesis Research**

Research and writing of MA Thesis supervised by faculty advisor.

*Fall, Spring, or  
Summer, 3-6 credits, S/U grading  
May be repeated for credit.*

## **EXT**

### **Externships**

#### **EXT 588: Grad Externship**

An externship is a form of experiential learning in which knowledge gained in classes is applied to an authentic, real-world setting. With guidance from a faculty sponsor, each student sets learning goals and works with a site supervisor to create a mutually beneficial experience. During the semester, externs reflect upon their learning experience through journaling. An externship also provides opportunity for personal and professional growth, and increased understanding of a career field from the insider perspective. Prerequisite: Only matriculated SBU students may enroll in EXT. Minimum overall GPA of 3.0 with at least G1 standing and at least one semester of graduate school completed at Stony Brook University; acceptance by a faculty sponsor and permission of the Career Center

*0-3 credits,  
May be repeated 1 times FOR credit.*

## **FIN**

### **Finance**

#### **FIN 524: Asset Pricing**

This course will give students an overview of asset pricing theory, estimating asset pricing models, pricing options and other derivatives. Topics covered will include Consumption-Based Pricing Model and Discount Factors; Mean-Variance Frontier and Beta Presentations; Factor Pricing Models (Capital Asset Pricing Models and Arbitrage Pricing Theory); ) Specification

and testing of linear factor models; Hansen-Jagannathan bounds; Option pricing and Black-Scholes Formula; Term Structure of Interests Rate; Numerical methods for derivative pricing. Prerequisite: 36 credit MBA in Finance Student or MBA 502

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FIN 525: Portfolio Management**

This course will give students an overview of the basics of investing, portfolio management, and risk management, from the perspective of efficient markets theory. Topics covered will include the institutions of the modern financial system and the types of assets available for investment; models of risk, the risk-return tradeoff and utility; optimal portfolio choice; the Capital Asset Pricing Model; multifactor models of return; portfolio evaluation metrics; basic dynamic portfolio management strategies; the efficient markets hypothesis, and possible departures from market efficiency. Prerequisite: 36 credit MBA in Finance Student or MBA 502

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FIN 530: Derivatives**

The main focus of this course is in the area of financial derivatives. We will show managers how to use financial derivatives to manage their risk management issues and how firms meet their financial objectives utilizing financial derivatives. This course will also explain financial option models, which can be used to help firms maximize value by improving decisions relating to capital budgeting, capital structure, and most importantly risk management concepts. This course will deal with a number of related topics associated with financial derivatives, including forward contracts, futures contracts, option contracts, and interest rate, currency, and credit default swap contracts. Prerequisite: Enrolled in FNBMB or MBA 502

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FIN 536: Financial Management**

How managers should interface with accounting and finance departments and how firms meet their financial objectives. Financial tools and techniques, which can be used to help firms maximize value by improving decisions relating to capital budgeting, capital structure, and working capital management are explained. Related topics include multinational financial management, risk management, and mergers and acquisitions. Prerequisite: MBA 502 or FIN MS or 36 credit MBA in Finance Student

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FIN 539: Investment Analysis**

Modern investment and traditional approaches to investment valuation, selection and management. Modern investment theory, including asset pricing models and efficient market hypotheses are explained. Traditional approaches to stock and bond selection, including fundamental analysis and technical analysis, will be explained in detail.

Investment management strategies for both individual and institutional investors will be developed and discussed. Prerequisite: MBA 502 or FIN MS or 36 credit MBA in Finance Student

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FIN 540: Probability and Statistics for Finance**

A survey of probability theory and statistical techniques with applications to finance situations. Topics covered include regression; binomial, Poisson, normal, exponential, and chi square random variables; tests of hypotheses; confidence intervals; tests; and analysis of risk, variance, regression, and contingency tables. Prerequisite: MBA 502 or FIN MS or 36 credit MBA in Finance Student

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

#### **FIN 541: Bank Management**

The goal of the course is to introduce students to the banking industry and develop skills necessary to effectively manage a financial institution. Students will learn how to analyze bank performance, liquidity, and capital adequacy. Students will also learn how to measure various financial risks associated with financial intermediation, and how to manage those risks using asset-liability management techniques, financial derivatives, and other hedging tools. Prerequisite: MBA 502 or Admission to the MS in Finance or 36 credit MBA in Finance

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FIN 545: Capital Markets and Financial Institutions**

Financial institutions and capital markets form the basis of the financial system in our global economy. Capital markets are the conduits in which capital flows through financial institutions to a network of organized and over the counter markets. Students will learn how many of these markets work in tandem to propel our economy forward. Topics include money markets, foreign exchange markets, derivative markets, the banking industry and the business of banking. The role of money in the capital markets and a variety of financial products offered by financial institutions will be explained. Prerequisite: MBA 502 or FIN MS or 36 credit MBA in Finance Student

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FIN 547: Fundamentals of Fixed Income Analysis**

A concrete understanding of the fundamentals of fixed income security analysis. Study of the basics of bond analysis, such as the relationship between the price and yield of a bond, the sensitivity of a bond's price to changes in yield, and measuring the total return on a bond. We will analyze the determinants of interest rates and how different market participants interact. Trading strategies, evaluate their risk, and perform ex-post analyses will be discussed. Prerequisite: MBA 502 or 36 credit MBA in Finance Student

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FIN 549: Risk Management**

This course focuses on mathematical and statistical methods to measure financial risk and to hedge the risk using derivatives. Students study simulation methods to measure risk, numerical methods for portfolio optimization, and hedge the portfolio risk using futures and options. They will apply the stochastic process model with time-varying volatility to the risk management. Students will have a critical view of the classical market model and study various alternative probability models to capture the "black swan" event of the financial market. Finally, students will have an opportunity to develop their own risk management system using numerical software developing tools with current market data. Prerequisite: Co-requisite MBA 502 or Admission to the MS in Finance or 36 credit MBA in Finance

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FIN 552: Mergers & Acquisitions**

This course focuses on hands-on insights into the practice of corporate value creation in the form of mergers and acquisitions (M&As). The techniques and methodologies to be developed to effectively understand corporate valuation and make effective M&A decisions on the buy-side or on the sell-side are the discounted cash flow valuation, comparable companies' analysis, precedent transactions analysis, and leverage buyout (LBO) analyses and techniques. At the center of this course is to build financial modeling skills through extensive use of Excel program, which will require integrating specialized knowledge of various valuation methodologies, leveraged debt capital markets, corporate recapitalization and restructuring into mergers and acquisitions context. Prerequisite: MBA 502 or Admission to the MS in Finance or 36 credit MBA in Finance

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FIN 562: Data Analysis for Finance**

Recent innovation of information technology along with the fast growth of applications on the Internet have resulted in an explosion of financial data, new ways of data collection and storage, as well as additional opportunities for business and research based on the data. This course enables students to analyze financial data based on traditional financial models. The major topics include asset pricing, capital budgeting, risk management, pension fund management, portfolio analysis, and stock hedging. Students will learn (review) the models with a focus on their implementation using Microsoft Excel, Matlab, or other programming languages. In addition, the basic statistical models, such as regression, time series models and probability models will be used. "Big Data" (data mining) technology will be introduced with a focus on financial data analysis. The main topics include classification, clustering, association analysis and anomaly detection. The key objectives of this course are: (1) to review the classical financial models and statistical models; (2) to teach the concepts of data mining with a focus on financial applications; (3) to provide students extensive hands-on experience in applying the concepts in financial data applications. Prerequisite: MBA 502 or 36 credit MBA in Finance Student; FIN 540

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FIN 576: Real Estate Finance**

This course is not a lesson on how to get rich quick in real estate with no money down. It will be a study of the major aspects of real estate finance, user decision making and investment from the perspective of corporate, private, and public owners; investors; and users. Commercial properties will be emphasized. The course begins with an overview of the fundamentals of commercial real estate and builds on these concepts as we consider the forces that influence the cyclical, fragmented, and inherently local business of real estate. These foundation concepts are further considered in detail in a series of four case studies that will be completed by the students and discussed in class by the instructor. The course will expose students to current "real world" real estate finance, user decision making and investment situations. The course is case-based, and students will be challenged to think on their feet in class. Students will have the opportunity to develop their business presentation skills through case discussions and project presentations. Prerequisite: MBA 502 or 36 credit MBA in Finance Student

*3 credits, Letter graded (A, A-, B+, etc.)*

**FIN 578: Behavioral & Social Finance**

This course studies the concepts, evidence, and applications of behavioral and social finance theories to understand and improve individual and managerial financial decision-making and the outcomes for firms and markets. Topics include investors' wants, cognitive and emotional heuristics and errors, behavioral portfolio construction, nudging personal finance management, impacts of investor psychology and social interactions on financial markets, professional ethics, values and socially responsible investing, ESG, etc. The course integrates financial analysis and financial planning with Excel and coding using programs like Python. Prerequisite: Co-requisite MBA 502 or Admission to the MS in Finance or 36 credit MBA in Finance

*3 credits, Letter graded (A, A-, B+, etc.)*

**FIN 580: Financial Modeling**

This course focuses on performing a research project related to current issues in the financial market. Students are requested to make and join a group project. The topics of the research project must be related to quantitative analysis in finance, and the results must be quantitatively verified. To do this, probability models, time series models, stochastic process models, and simulation methods can be applied. To solve a complex system problem, students may need to use parallel computing, cloud computing, machine learning, and artificial intelligence. Solutions are necessary to be implemented by advanced programming languages, for instance Matlab, R, Python, Java, or C++. Prerequisite: Admission to the MS in Finance and completion of MBA 502, FIN 540, FIN 539, and FIN 541

*3 credits, Letter graded (A, A-, B+, etc.)*

## FLA

### Foreign Language Teacher Preparation

**FLA 505: Methods: Foreign Language**

An in-depth exploration of the methods and materials for the teaching of foreign languages, literatures, and cultures. Special attention is given to the theories of first and second language acquisition and to the techniques for teaching listening, speaking reading and writing skills. This course gives students the opportunity to conduct observations/field experiences in grade level (7-12) settings.

*3 credits, Letter graded (A, A-, B+, etc.)*

**FLA 506: Curriculum Development**

Drawing on theories of first and second language acquisition and research into the best practices of language teaching, this course trains future language teachers in the development of well-articulated language programs (grades 7-12). Students have the opportunity to enjoy clinical experiences in school settings. Special attention is given to the development of a professional teaching portfolio including lesson plans, assessment instruments, and technology-based activities.

*3 credits, Letter graded (A, A-, B+, etc.)*

**FLA 507: Critical Pedagogy**

This graduate seminar is intended to introduce the ideas, theories, and practices that together constitute the field known as critical pedagogy. Critical pedagogy assembles numerous forms of academic approaches to teaching and curriculum that are informed by critical social theory. As the educational arm of critical social theory, critical pedagogy engages educators in understanding the relationships among knowledge, ideology, and power. We will read works from several critical pedagogy theorists (Freire, Shor, Giroux, McClaren, Apple, hooks) to explore some of the key themes within critical pedagogy (relationship of education to power; issues of difference and pluralism; transformative education; the social construction of knowledge; dialogic relations in the classroom; teaching for social justice). Learning through collaborative inquiry, we will translate the theories in these readings into practice and will test ideas and concepts unique to teaching and learning "critical (second/foreign) language" in a school setting.

*3 credits, Letter graded (A, A-, B+, etc.)*

**FLA 549: Field Experience**

Observation, inquiry, and practice in foreign language education at the secondary level including 50 hours of documented visitations and observations at approved sites. Field experience writing logs are the basis of group discussion. S/U grading.

*1 credit, S/U grading*

**FLA 550: Field Experience**

Observation, inquiry, and practice in foreign language education at the secondary level including 50 hours of documented visitations and observations at approved sites. Field experience writing logs are the basis of group discussion. S/U grading.

*1 credit, S/U grading*

**FLA 551: Supervised Student Teaching 7-9****FLA 552: Supervised Student Teaching 10-12****FLA 554: Student Teaching Seminar**

Seminar on instructional planning and assessment in World Languages, grades 7-12, aligned with current state, national, and professional standards. Focus is on delivering proficiency-based instruction and meeting the needs of diverse learners. Variable credits (1-3 credits)

*1-3 credits, Letter graded (A, A-, B+, etc.)*

**FLA 570: Introduction to Media for Language Teaching**

Course open to non-D.A. students. Gives students an introduction to all of the technology used in teaching languages; audio, video, computer, and Internet. Emphasis is on hands-on use and practical applications. Fall or spring

*3 credits, Letter graded (A, A-, B+, etc.)*

**FLA 571: Foreign Language Technology and Education**

Course open to non-D.A. graduate students. Assumes knowledge of material taught in DLL/FLA 570. Addresses more globally and more theoretically the intersection between technology and languages. Issues of cognitive learning theory and educational psychology addressed. Offered as DLL 571 and FLA 571

Prerequisites: FLA 505 and FLA 506

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**FLA 581: Foreign Lang Teach Project (Ind. Study)**

Students enrolled in Track B of the MA program in European Languages (French, German, Italian or Russian) or the MA in Hispanic Languages complete an independent project in the area of Foreign Language Teaching. The content and scope of this project must be approved by the Director of Foreign Language Pedagogy. Possible projects include a fully developed professional teaching portfolio (in print and/or electronic version), an action research study or a classroom-based research study culminating in a publishable paper. Fall or spring

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

## FLM

### Film

**FLM 500: Introduction to Graduate Studies**



This seminar course will introduce graduate film students to each other, to graduate faculty across disciplines, and will encourage new collaborations and projects for development during the students' graduate careers. Film students will meet to discuss the role of each artist, with emphasis on the changing nature of collaboration and the expanding art form in today's film profession. Readings, written assignments and collaborative projects are required. 4 credits. Letter graded (A, A-, B+, etc.) Prerequisite: Permission of the Instructor. Southampton and Manhattan. Semesters Offered: Fall & Spring.

*3-4 credits, Letter graded (A, A-, B+, etc.)*

#### **FLM 501: Film Tools**

This course will give students an overview of production essentials; covering safety, basic movie-making equipment and basic editing. Student will spend time in the classroom and on set, shooting various exercises, paying special attention to set safety, proper handling of the gear, the ins and outs of a selection of cameras, sound equipment and lighting. In addition, the basics of cinematography and framing, audio techniques and basic set protocol will be covered. The course will cover the basics of non-linear editing; including: creating new projects, media management, sequence settings, importing, transcoding, sound, JKL cuts, titling, mixed file format editing, export settings and delivery.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FLM 505: Film Management I: Production Development**

Instruction and training in art direction and design which may include exploration of a particular approach, review of current techniques, experiments in style, hands-on exercised, intensive production periods, etc. The particular theme of the course will be announced in the course schedule. Beneficial for writers, directors, and producers. Suitable for film and television.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

#### **FLM 506: Film Management II: Literary Management**

In this course, students will be guided through a deeper dive examination of best-practices, a changing landscape, and strategies for marketing, distribution, financing, legal and post-production in film, television, & digital content. The class is structured as an independent study for students to workshop their ongoing individual projects and receive one-on-one mentoring from class instructors. Throughout the semester this course will also include provocative in-class conversations

with working industry professionals such as producers, agents, lawyers, financiers, and distributors. This is a highly interactive and practical application class where students will work throughout the semester individually and collaboratively on building an executable plan for one film, tv, or digital content project of their choosing in preparation for its creation and release.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **FLM 508: Editing I**

This course will focus on the editing process and how a film is shaped during editing. Tools of editing will be explored as well as the theory behind their use. Through film examples, articles, books and hands on lessons, students will learn the craft of editing. The language and purpose behind every cut will be examined. Working with cutting-edge digital editing software, the course will cover the basics of non-linear editing; including: creating new projects, media management, sequence settings, importing, transcoding, sound, JKL cuts, titling, mixed file format editing, export settings and delivery.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

#### **FLM 509: Cinematography I**

This course will focus on the fundamentals of camera, sound, safety, and proper use of basic production equipment. Students will be introduced to the tools necessary to shoot their short films, shooting various exercises in a classroom and on the set, including safety, proper handling of the gear, the ins-and-outs of a selection of cameras, sound equipment and lighting. In addition we will cover the basics of cinematography and framing, audio techniques and basic set protocol. This is the first step to properly capturing the stories students have to tell. Course takes place in the classroom and on the set.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **FLM 510: Film History I**

Film as text in the context of its time. A study of Film History with attention to specific topics in the lexicon, theories, movements and genres of the field. It may be repeated as an independent study with the permission of the instructor. 3 credits, Letter graded (A, A-, B+, etc.) May be repeated for credit. Semesters Offered: Spring.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **FLM 520: Film History II**

Course surveys films of a specific period or movement. May be repeated once. 3 credits, Letter graded (A, A-, B+, etc.)

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **FLM 523: Film in New York**

The course delves into a field survey of film and television offerings in New York City, festival by festival and organization by organization. Students will become acquainted with the status of film in New York, including, but not limited to The Film Society of Lincoln Center, The Tribeca Film Fest, New York Film Festival, New York Shorts Festival, IFC, Doc NYC, Women's International Film Festival, New York Women in Film and Television, New York Mayors Office of Film and Television, New York Governor's Office of Film and Television, and New York Production Alliance. Additionally, all students will serve as jurors on the SUNYWide Film Fest.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **FLM 525: Topics in Film**

Intensive studies of selected forms of film and filmmaking from various countries and periods, designed to supplement rather than repeat areas of study already undertaken in the curriculum. Topics may include producing, directing, writings in film, the ins-and-outs of financing, genre screenwriting, films without words, films in the noir tradition, the spaghetti western, among others. May be repeated for credit. Prerequisite: Permission of instructor. 1-3 credits, Letter graded (A, A-, B+, etc.). Semesters Offered: Fall and Spring.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **FLM 526: Topics in TV Writing**

A seminar for writers and filmmakers concentrating on one area of study or topic in Television. The particular theme of the course will be announced in the course schedule. Topics may include, among others, the showrunner, producing the web series, international TV, producing the comedy sketch, a survey of American television.

*1-4 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **FLM 530: Directed Readings in Film**

Students read and evaluate the literature on a topic of special interest under the supervision of a faculty member. What makes a good script? What makes a producible script? What makes a feature film, a television series, a made-for-tv movie, or a webisode. May be

repeated for credit. Prerequisite: Permission of instructor. 1-3 credits, Letter graded (A, A-, B+, etc.). Semesters Offered: Fall & Spring.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **FLM 536: Forms of TV Writing**

Regular submission, discussion, and analysis of students work in one or more contemporary areas of television writing. Topics may include writing for mini-series and limited-series, unscripted television, writing for documentary, writing for short form, writing the webisode, writing for international TV, writing the pilot, writing the spec, among others.

*1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **FLM 537: Production I**

In this course, writing, directing, editing and cinematography training will be synthesized, focused, and put into practice. Students work from the scripts developed in previous semester. In the first weeks, students review camera, sound, lighting, casting, scheduling, safety, and running a set, while preparing shot lists, story boards, call sheets, shooting schedules, talent agreements and location releases necessary to bring their visions to the screen. Then the production cycle begins: intense breakout sessions coupled with camera blocking prepare students for the rigors of a film shoot. To make the experience truly immersive, students crew on all productions, so expect to spend many days on set.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **FLM 550: Teaching Practicum**

Supervised student teaching of undergraduate courses accompanied by a seminar in methods and strategies of teaching film at the University level. An independent teaching project, in which the student works with a particular faculty member, may be substituted. 3 credits, Letter graded (A, A-, B+, etc.). Southampton and Manhattan. Semesters Offered: Fall & Spring.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **FLM 560: Acting Theory and Practice**

Course surveys the field of acting-its history, formal principles, primary techniques, and contemporary practice. Students develop course papers and, or projects in conjunction with advanced readings and instruction.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **FLM 575: Adaptation Workshop**

This course is an intense examination of a stage play, a work of fiction (novel, novella, short story, poem) or a work of non-fiction (memoir, autobiography, poem), with the object of preparing an adaptation for the screen. Valuable for writers, directors and producers. The course will study other text to screen adaptations and film versions. Students will submit an outline or rough draft of their new version at the end of the course. 3 credits, Letter graded (A, A-, B+, etc.). May be repeated for credit. Semesters Offered: Fall & Spring.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **FLM 576: Film Workshop**

The workshops are intensive classes in various aspects of the craft of film, including producing, directing, editing, cinematography, lighting design, sound design, screenwriting, directing, acting, scheduling, budgeting, writing/directing webisodes, writing, producing and directing within the Dogme tradition, and episodic television, sitcoms, dramas, mini-series, and distribution; together with lectures, readings, seminars, and panels featuring nationally distinguished artists.

These workshops encourage participation by visiting students, new theatre and film artists, established film artists, and teachers who will be admitted by application and may receive academic credit upon request. Graduate students may take any Film Workshop sponsored by the MFA program for academic credit. Study may occur in Southampton, Manhattan, or abroad. A submission of a workshop application, and permission of instructor are required. 1-6 Credits. Letter graded (A, A-, B+, etc.) May be repeated for credit. Semesters Offered:

*Fall, Spring, 1-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **FLM 591: Independent Project**

Special project allowing advanced individual work in an area of film study or practice under the supervision of a faculty member. Must be scheduled by arrangement with instructor. Should result in longer form screenplay, production package or film, episode, or webisode. Can include technical, trade, or business school study.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **FLM 608: Editing II**

Horror, comedy, drama and action. Four different genres, four different editing styles. This course will cover the styles used to edit the various film genres and why each

and every cut has a purpose. Focus on the tools of editing as well as editing theory. Through the analysis of film clips, class discussion, and hands on lessons, students will learn the fundamentals and the processes of reconstructing these styles. Working with editing software, students will have the opportunity to edit various scenes, which will range in style and tone. Student will learn to think critically about all aspects of filmmaking, including blocking, framing, locations and shot selection.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **FLM 609: Cinematography II**

This course will introduce you to the advanced cinema tools at your disposal. We will spend time in the classroom and on set, shooting various exercises, utilizing a wide variety of advanced camera/lighting and grip equipment. In addition to on-set exercises, we will study a variety of current and former cinematographers, analyzing their work from film to film.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **FLM 637: Production II**

The primary goal of this flexible workshop is to foster students' individual visions while expanding the scope of their production knowledge and experience. Participants should bring a draft of a 5-12 page script to the first class. Classes will focus on directors' preparation- both creative and practical. For the shoots, students will choose their collaborators and run their own sets. The final weeks of the class will be preparation for Dogme shoots.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **FLM 638: Directing I - Principles of Directing**

This course will focus on the analytical organizational and creative processes necessary to be a director. Topics include: visualizing your story, storyboarding, scene construction, shooting to the turn in the scene, shot lists, shoot schedules, framing, composition, script analysis and interpretation; visual interpretation (narrative, evocative image) and working with art directors, set designers, wardrobe, sound and light designers; casting, and the actor / director process. Preparation, leadership, scheduling. Students will gain a practical, hands-on understanding of the topics covered through exercises, various directing assignments, and a final project. 3 credits, Letter graded (A, A-, B+, etc.).

*3 credits, Letter graded (A, A-, B+, etc.)*

### **FLM 639: Directing II: Advanced Directing**

This course will build upon the work covered in Directing I and will focus on advanced problems in Directing, including advanced scene work, choreographing the action scene, directing within a style or period, directing with f/x, incorporating fx into scenes, alternative forms, and the challenges of contemporary film and/or filmmaking. Topics may change. Prerequisite: THR 638 or permission of instructor. 3 credits. Letter graded (A, A-, B+, etc.).

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **FLM 640: Film Design Workshop**

Advanced assignments in film design. May include understanding set design, sound design, light design, art direction, music supervision, and shooting within a style, period, genre, era. Prerequisite: Permission of instructor. 3 credits, Letter graded (A, A-B+, etc.).

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **FLM 650: Screenwriting Workshop I**

Students write, discuss and receive feedback on writing exercises, original scenes, and short or full-length screenplays, teleplays, episodic television, sit coms, long form dramas or webisodes. Advanced students may develop material for production. Prerequisite: Permission of instructor. 3 credits, Letter graded (A, A-, B+, etc.).

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **FLM 651: Screenwriting Workshop II**

Emphasis on a particular aspect or genre of screenwriting, including comedy, drama, noir, crime, dogme, period, action, writing within a high or low budget; character, dialogue, structure, and experimental forms. Emphasis also on workshoping whole drafts of longer form projects. Prerequisite: FLM 650 or permission of instructor. 3 credits. Letter graded (A, A-, B+, etc.).

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **FLM 652: Screenwriting Workshop III**

Advanced problems in writing of original screenplays for film, television, web and other media platforms. Emphasis on whole drafts and revision.

*3-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **FLM 660: Acting Workshop for Filmmakers**

Intensive study in acting in a particular approach or technique. Rehearsals outside of the scheduled class time may be required.

Prerequisite: Permission of instructor. 3 credits, Letter graded (A, A-, B+, etc.). May be repeated for credit.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **FLM 669: Advanced Tools**

In this hands-on workshop course, students will focus on five specific areas of film making...Advanced Cinematography, Line Producing, Script Supervising, Production Design and Sound Design. Each class will be led by a working professional, and at the conclusion of this course students will emerge with a greater understanding of each discipline.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **FLM 670: Directing Workshop**

Advanced training in directing, which may involve intensive production periods, experiments in style, exploration of a particular technique and approach, such as day for night, etc. May be repeated once for credit.

Prerequisite: Permission of Instructor.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **FLM 680: Art Direction Workshop**

Instruction and training in art direction and design which may include exploration of a particular approach, review of current techniques, experiments in style, hands-on exercised, intensive production periods, etc. The particular theme of the course will be announced in the course schedule. Beneficial for writers, directors, and producers. Suitable for film and television.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **FLM 690: Professional Internship**

A full-term internship at a production company or on a production. Students identify a Film company or artist whose work interests them. The student is expected to articulate his/her goals, research companies and inquire about internship opportunities at those institutions. A faculty advisor may help point students in the right direction; but is incumbent upon the student to do the research and secure an internship. Students then present a written proposal to the faculty advisor for approval. Students will also submit an internship description in the first month of work, then a journal or evaluation of their work experience.

Prerequisite: Permission of MFA Director. 3 credits. Letter graded (A, A-, B+, etc.).

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **FLM 691: MFA Project**

This is a long form produced project. All proposals for projects must be submitted in writing to the faculty supervisor and graduate program director for approval through FLM 692. Letter graded (A, A-, B+, etc.).

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **FLM 692: MFA Thesis Paper**

Independent study and research for M.F.A. students, on special topics related to the MFA Project, which may result in a screenplay, webisode, episodic series, documentary proposal or production package, realized in FLM 691. Letter graded (A, A-, B+, etc.).

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

## **FRN**

### **French**

#### **FRN 500: Techniques of Reading for Graduate Research**

Through intensive study of language structures and idiomatic usage, with extensive practice in written translation of literary and scholarly texts, candidates for advanced degrees are able to attain the proficiency level of the graduate French reading requirement. Several departments grant exemption from further examination for successful completion of this course. (Not for graduate students in French.)

*Fall or Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

#### **FRN 501: Contemporary Culture and Civilization**

Analysis of contemporary French civilization through the study of the development of its historical, cultural, political, and social characteristics. Designed for potential teachers of French at the college level as well as in secondary schools, this course will emphasize and trace the evolution of the character and institutions of contemporary France and French-speaking countries.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **FRN 502: French Civilization in Its Historical Perspective**

In this course, students study historical French civilization concentrating on those

features which have created France today and its current culture. Political and social developments are considered as well as major trends in the arts.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **FRN 507: Stylistics**

Stylistic theory and analysis. Contrastive stylistics French/English. Exploration of the connotative level of written message. Designed to develop and refine written expression in French and analysis of literary and non-literary texts.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **FRN 510: Phonetics**

The pronunciation of French with emphasis on intonation and articulation. Theory and practice of linguistic and phonetic factors of the sound system. Coursework includes phonetic transcriptions, oral and aural transcriptions, as well as pronunciation. The class is entirely conducted in French.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **FRN 511: Business French**

A course designed to provide efficiency in spoken and written business French with an emphasis on bilingual translation. This course will also familiarize students with French business domestically, in the context of the European Union, and in contrast to America. Issues of current importance as well as institutions will be studied. Students will also carry on individual projects such as comparing marketing strategies of an American company in the US and in France or profiling a major French company.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **FRN 513: Romance Linguistics**

This course examines the linguistic evolution of the Romance languages from the classical period through modern times. The synchronic grammars of Italian, French, and Spanish are examined.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **FRN 531: Studies in 17th-Century French Literature**

Analysis of some of the major literary genres of 17th-century French literature such as tragedy, and comedy, novels or poems, or focus on some of the major themes of 17th-century literature in general. , Mme de Lafayette, La Rochefoucauld, La Bruyère, etc. The class is entirely conducted in French.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **FRN 532: Seminar in 17th-Century French Literature**

Special topics in 17th-century French literature. Intensive reading and analysis of selected texts by authors such as Descartes, Pascal, La Fontaine, La Rochefoucauld, La Bruyère, Mme de Sevigné, and Mme de Lafayette, among others. Changing topic. The class is entirely conducted in French.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **FRN 541: Studies in 18th-Century French Literature**

A study of the major texts of the 18th-century expressing the struggle between absolutism and the emerging forces of Enlightenment, preromanticism. It may include the works of Montesquieu, Voltaire, Diderot, Rousseau, Beaumarchais, and Laclos, among others, as well as the works of lesser-known authors who also helped reshape the literary scene during that time

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **FRN 542: Seminar in 18th-Century French Literature**

Special topics in 18th-century literature, such as "Le roman initiatique," and "Eros in fiction," are studied through the works of major writers of the period as well as those of lesser-known figures, in particular women writers.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **FRN 552: Studies in 19th-Century French Literature**

Close reading of selected works by major novelists of the period, such as Balzac, Stendhal, Flaubert, Zola; themes such as Paris versus the provinces, money and decadence; or 19th-century poetry by Baudelaire, Mallarmé, Verlaine, and Rimbaud, with an introduction to some important critical approaches to these texts.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **FRN 561: Seminar in 20th-Century French Literature**

Special attention to a literary trend, a movement of ideas, or a single author of the first half of the century. Topics are considered

in parallel with the political and social contexts, and with other artistic mediums such as cinema, painting, or photography. Possible topics: Avant-garde & Surrealism, Existentialist writers, War Literature, Marcel Proust, Jacques Prévert, etc.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **FRN 562: Studies in 20th and 21st-Century Literatures**

Focused examination of contemporary French literary texts and recent Francophone writings of Belgium and Switzerland. Questions may address the limits of fiction and representation in the novel, the status of modern theater and poetry, the new impact of visual and technological devices, human relationships in a global world.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **FRN 564: Seminar in Francophone Literature**

Close examination of the literatures written in French of the Francophone world outside of France. This course will pose and explore questions such as: What is Francophone literature? What is the function of writing in French in a Francophone context? Attention is paid to the issue of critical approaches to these texts. Topics vary from year to year and may include texts from any of the French-speaking territories outside of France.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **FRN 570: Special Topics in French Literature**

Courses given in the past have covered a single author, French women writers, French poetry of 1664-1674 and other topics.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **FRN 571: Free Seminars**

Courses given in the past have covered a single author, genre, and other topics.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **FRN 581: Independent Individual Studies**

May be repeated for credit as the topic changes.

*Prerequisite: must be enrolled in a graduate program.*

Fall, 1-6 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

### FRN 591: Language Acquisition I

Elementary French I intended for graduate students from other programs.

1-4 credits, Letter graded (A, A-, B+, etc.)

### FRN 592: Language Acquisition II

Elementary French II intended for graduate students from other programs.

1-4 credits, Letter graded (A, A-, B+, etc.)

### FRN 593: Language Acquisition III

Intermediate and Advanced French intended for graduate students from other programs.

The requirements for the course will include a graduate-level component to be determined by the instructor. May be repeated for credit.

1-6 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

### FRN 595: Practicum in Teaching

Fall and Spring, 1-3 credits, S/U grading

May be repeated for credit.

### FRN 599: Thesis Research

Fall and Spring

1-6 credits, S/U grading

May be repeated for credit.

### FRN 800: Summer Research

May be repeated for credit.

## FSY

### Study Abroad

#### FSY 540: Study Abroad

May be repeated for credit.

#### FSY 582: OVERSEAS: GERMANY

May be repeated for credit.

#### FSY 588: Overseas: Spain

May be repeated for credit.

#### FSY 591: OVERSEAS KONSTANZ

May be repeated for credit.

#### FSY 592: OVERSEAS TUEBINGEN

May be repeated for credit.

#### FSY 594: OVERSEAS: ROME

May be repeated for credit.

#### FSY 595: OVERSEAS: PARIS

May be repeated for credit.

### FSY 597: Study Abroad: Japan Kyoto-Sangyo

May be repeated for credit.

## GEO

### Geosciences

#### GEO 500: Geosciences Research Seminar

Meetings in which first-year graduate students and undergraduates with senior standing learn about the research activities of the Geosciences faculty.

Fall, S/U grading

#### GEO 502: GIS for Geologists

A practical introduction to geographic information system software. Participants learn to use direct measurement and mathematical techniques to compute the location of features and gain practical experience in rendering imagery and tabular geographic data as layers on maps. The course consists of two three-hour sessions per week for the first five weeks of semester, which include fieldwork, lectures, demonstrations and software-based analysis of data.

This course meets with GEO 588 (*Geological Field Methods for Earth Science Teachers*) for the first five weeks of the semester. Students may not take GEO 502 and GEO 588 for credit.

Fall, 1 credit, Letter graded (A, A-, B+, etc.)

#### GEO 503: Mineral Equilibria

Covers the basics of the application of the principles of chemical thermodynamics to the resolution of geochemical and petrological problems. Begins with the first law and continues through phase transitions, properties of fluids, definitions of fugacity and activity of major and trace elements in fluids and molten solutions; configurational entropies; models quantifying nonideal mixing in solid solutions. Additional topics include interpretation of calorimetric studies and/or solubilities of minerals in aqueous solutions.

Prerequisites: Physical chemistry and thermodynamics, or permission of instructor  
Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)

#### GEO 504: Geology of the Turkana Basin

Students are introduced to the current perspectives on the origins and evolution of the Turkana Basin, Kenya. Students learn how to apply fundamental geological

concepts to the sediments and rock units to provide a foundation for the chronology and context for recorded events in human evolution. Emphasis is given to sedimentation, stratigraphy, volcanism, and tectonics, as they apply to local geology, including training in field methods. Modern terrestrial processes and landscape evolution are examined using features present in the Turkana Basin. Consideration is also given to broader geologic events spanning the Oligocene to the present. Geologic concepts are linked to modern and ancient environments, archaeology, and paleoanthropology in northern Kenya. It is a field-based course involving visits to important geological and fossil sites. Graded work includes fieldwork and lab assignments, independent research assignments, quizzes and a final exam. Semesters offered-Fall and Spring. Components- laboratory, lecture, and recitation.

3 credits, Letter graded (A, A-, B+, etc.)

#### GEO 505: Experimental Petrology Laboratory

The course is designed to give the student experience in some or all of the following techniques of experimental petrology: evacuated silica-glass tube experiments, one-atmosphere quenching experiments (with and without controlled atmospheres), 1- to 5- kbar hydrothermal systems (using oxygen buffers where necessary), gas-media experiments up to 7 kbar, and solid-media, piston-cylinder experiments.

Requirements: Completion of a project involving several of the above techniques; written report  
Spring, alternate years, 1 credit, Letter graded (A, A-, B+, etc.)

#### GEO 506: Theoretical Petrology

Theory of phase diagrams, Schreinemaker's rules, heterogeneous equilibria, experimental systems of petrologic interest, and properties of solutions.

Prerequisites: Metamorphic and igneous petrology and physical chemistry or thermodynamics; or permission of instructor  
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

#### GEO 507: Petrogenesis

Discussion of the origin and evolutionary history of selected types of igneous and metamorphic rocks by integrating the principles of heterogeneous phase equilibria, trace-element and isotopic geochemistry, crystal chemistry, and geologic occurrence. The laboratory component, GEO 527, must be taken concurrently; a common grade for both courses will be assigned. Fall

3 credits, Letter graded (A, A-, B+, etc.)

### **GEO 508: The Rock-Forming Minerals**

Study of the crystal chemistry, intracrystalline cation distribution (homogeneous equilibria) stability, and paragenesis of the rock-forming minerals. Special emphasis is placed on amphiboles, feldspars, micas, and pyroxenes.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 510: Dimensions of Global Change**

This course is designed to be an intense study in global climate change science. The emphasis will be on modern climate change however, by studying the contributions of paleoclimatology we can gain insight into how the climate system operates. To understand modern climate change and predictions, it is necessary to develop an understanding of natural climate forcing, natural variability and feedbacks in the climate systems. Adding to natural variation are the impacts of anthropogenic forcing. The course will examine the measured and predicted consequences of these anthropogenic forcing.

*Offered Fall and*

*Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 511: Computer Programming for the Geosciences**

An introduction to object-oriented programming in Java for geoscience students. Participants are required to develop interactive programs to serve as educational or research tools pertaining to topics within the geosciences. These programs, or applets, include a graphical user interface that enables users to control parameters and observe results. The applets are posted on the World Wide Web.

*Prerequisite: Geosciences graduate standing*  
*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 512: Structure and Properties of Materials**

An introductory course that will explore materials from the viewpoint of their structure and chemistry and how these affect applications. Different states of matter (crystals, quasicrystals, glasses, liquids) will be discussed and their similarities and differences, focusing on the crystalline state. Nanomaterials and their peculiarities in terms of structure and properties will also be considered. Particular attention will be paid to (1) Materials for energy and environment applications, (2) materials for technological applications, and (3) Earth and planet-forming materials.

3 credits, Letter graded (A, A-, B+, etc.)

### **GEO 513: GIS Fundamentals I**

This course provides the basic concepts underlying modern geographic information science and technology. Emphasis is placed on the principles of GIS for collecting, storing, characterizing, and maintaining data and computer-based techniques for processing and analyzing spatial data. The course includes three hours of lecture, in class exercises and homework projects each week. This is a computer based class with the majority of students work involving GIS computer software. Prerequisite: working knowledge of spreadsheet software

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

### **GEO 514: Introduction to Physical Hydrogeology**

Surface hydrology. Principles of groundwater flow. Well hydraulics. Geology of groundwater occurrence. Water quality and groundwater contamination. Hydrologic site evaluation.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 515: Geohydrology**

Dynamics of fluids in porous media. Fundamentals of physical hydrogeology. Quantitative analysis of regional groundwater system and well hydraulics. Introduction to numerical simulation techniques. Hydrodynamic dispersion and basic concepts of contaminant transport.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 517: Crystal Chemistry**

The structure/property/composition relationships in solids. An introduction to the common structure types and how they illustrate principles useful in understanding more complex solid-state materials. Applications of modern scattering techniques to the study of solids, particularly Earth materials, are also included.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 518: Carbonate Sediments**

An intensive study of the formation, deposition, lithification, and diagenesis of carbonate sediments. Lectures and seminars emphasize principles of carbonate deposition, facies relationships, and chemistry. Laboratories emphasize binocular and petrographic analysis of recent and ancient carbonates.

*Spring, alternate years, 4 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 519: Geochemistry of Natural Waters**

A comprehensive quantitative treatment of the processes controlling the chemistry of polluted and unpolluted surface and groundwaters.

Topics covered include thermodynamics and kinetics of water-rock interaction; mineral solubility; chemical speciation; redox reactions; adsorptions; carbonate chemistry; and speciation, mobility, and toxicity of metal ions. Based on a knowledge of these processes, the chemical composition of a wide variety of surface and groundwaters is interpreted. Water-quality criteria and their application are also discussed.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 520: Glacial Geology**

History of glaciation on earth, formation and dynamics of glaciers and ice sheets; processes of glacial erosion and deposition; and the nature of glacial sediments and landforms particularly relating to the development of Long Island.

*Prerequisite: Physical Geology*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 521: Isotope and Trace Element Geology**

Application of radiogenic isotopes and trace elements to the petrogenesis of igneous, metamorphic, and sedimentary systems including water-rock interaction in diagenetic and hydrothermal systems. Evaluation of radiogenetic techniques for determining the ages of rocks and minerals.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 522: Planetary Sciences**

The chemical, physical, and petrologic properties of meteorites are reviewed. These data and data for the moon and the terrestrial planets are used to form a picture of the origin, chemical evolution, and accretion of planetary material.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 523: Geodatabase and Design**

Concepts of geodatabase design and management in geographic information systems (GIS), SQL statements, geographic data types and functions, data entry, and techniques of geographic information structure applications.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **GEO 524: Organic Contaminant Hydrology**

There are a host of chemical, biological, and physical processes that affect the transport and fate of organic chemicals in natural waters. This course concerns understanding these processes and the structure-activity relationships available for predicting their rates. The major focus of this class is on contaminant hydrology of soil and aquifer environments, and includes the principles behind remediation and containment technologies. This course is offered as both MAR 524 and GEO 524.

*Prerequisite: GEO 526 or MAR 503 or permission of instructor*  
*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 525: GIS Fundamentals II**

GIS Fundamentals II will introduce the applied use of Geographic Information Systems (GIS) which is now used extensively in analytical studies. The course emphasizes the applications of GIS in solving real-world problems. Students are expected to gain an understanding of GIS theory, methodology and most importantly application. Students are also expected to demonstrate abilities of spatial thinking, spatial analysis, and be able to solve practical spatial problems utilizing a GIS.

*3 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **GEO 526: Low-Temperature Geochemistry**

Fundamental principles of chemical thermodynamics and kinetics, including isotope effects, as they pertain to geochemical processes occurring in surface and near-surface environments. Consideration is also given to mass transfer process and reaction pathways.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 527: Petrogenesis Laboratory**

Three hours of laboratory per week that corresponds to the content of GEO 507  
*1 credit, Letter graded (A, A-, B+, etc.)*

### **GEO 528: Carbonate Geochemistry**

Examination of the mineralogical and chemical characteristics of the rock-forming carbonates with emphasis on stabilities in the geological environments. Includes study of phase relations; trace and minor element chemistries; and mechanisms of growth, dissolution, and replacement. Use of current research techniques as applied to carbonate minerals.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 530: The Geology of Mars**

Overview of Mars as a planetary system. Evolution of the planet and its atmosphere through time. Detailed discussion of processes that have shaped the martian surface, including erosion, sedimentation, volcanism, impact cratering, physical and chemical weathering. Comparison of geologic processes on Mars and Earth. Discussion of past and future spacecraft missions to Mars. Three hours of lecture per week.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 531: Crystalline Solids**

Principles of symmetry, single-crystal, and powder X-ray diffraction techniques and elements of crystal structure determination are considered. Use of crystallographic data in the study of mineral systems. Laboratory in diffraction techniques includes extensive use of digital computers.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 532: Solid-State Geochemistry**

The application of crystallographic techniques to problems in mineral chemistry. Concepts of the crystalline state, order-disorder, atom radii, chemical bonding, atom coordination, solid solutions, and physical properties of minerals. Emphasis on silicate and sulfide crystal structures.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 533: Geochemistry of the Terrestrial Planets**

A brief overview of basic principles of geochemistry, including origin of the elements, geochemical and cosmochemical classification of the elements, and a geochemical perspective of the periodic table. This is followed by an examination of the compositions and chemical interactions among the major geochemical reservoirs of the terrestrial planets, including their cores, mantles, crusts, and where relevant, sedimentary shells.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 534: Concepts in Geomorphology**

Study of landforms and the processes that produce and modify them. Discussion and practice of field, laboratory, and remote sensing methods used to assess landscape evolution.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 535: Regional Structure and Tectonics**

Formation and development of continental crust in Phanerozoic mountain belts. The structure and origin of ocean crust, magmatic arcs, and continental margin sequences are studied using geophysical, geochemical, and geologic data from ancient and modern examples.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 540: Solid Earth Geophysics**

An overview of solid earth geophysics. Topics include earthquake and exploratory seismology, gravity, magnetics, geochronology, and heat flow. There is an emphasis on how all of these techniques shed light on the nature of the Earth's interior and dynamics.

*Prerequisite: Physical geology, undergraduate physics and calculus*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 542: Inverse Theory and Machine Learning in Earth Science**

Introduction to inverse theory and machine learning and their uses in solving various geological problems, with an emphasis on coding using python and related tools 3 credits, Letter graded (A, A-, B+, etc.)

*3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 543: Stratigraphy**

The history and practice of defining units layered rocks and interpreting their spatial relationships. Topics include the basis for the geologic time scale, lithostratigraphic versus chronostratigraphic units, biostratigraphy, magnetostratigraphy, facies patterns and Walther's law, subsurface stratigraphy, and the application of stratigraphy to geological problems. The laboratory component, GEO 563, must be taken concurrently; a common grade for both courses will be assigned. Spring Prerequisite: GEO 546 or undergraduate mineralogy and petrology

*3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 546: Mineralogy and Petrology**

An introduction to mineralogy and petrology, including crystallography, crystal chemistry, mineral identification, and the processes that govern the formation of igneous and metamorphic rocks. Three hours of lecture per week. The laboratory component, GEO 566, must be taken concurrently; a common grade for both courses will be assigned. Spring Prerequisite: Undergraduate physical geology and one year of undergraduate chemistry

*3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 547: Remote Sensing in Geosciences**

Comprehensive study of commonly used image analysis methods in earth, environmental and planetary sciences. Discussion of physical principles that are the basis for remote sensing techniques. Participants gain practical experience in geologic and environmental problem-solving using satellite imagery.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 549: Structural Geology**

Principles of structural geology, including the recognition and the mechanics crustal structural features. Topics include folding and faulting, stress and strain, and the nature of brittle and ductile lineations and foliations in the crust. Three hours of lecture per week. The laboratory component, GEO 569, must be taken concurrently; a common grade for both courses will be assigned. Spring Prerequisite: Undergraduate physical geology

*3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 550: Global Tectonics**

Geological, geochemical, and geophysical evidence related to the concepts of plate tectonics and mantle convection. Kinematics and dynamics of plate motions. Origin of first-order crustal structures of continents and ocean basins. Geochemical and thermal evolution of the Earth.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 551: Physics of the Earth I**

Study of the internal structure and properties of the Earth as revealed by field and laboratory investigations. Topics include the rotation and figure of the Earth, gravity anomalies, solid-earth tides, geomagnetism and paleomagnetism, electromagnetic induction, and heat flow and the Earth's present and past thermal states. May be taken independently of GEO 552.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 552: Physics of the Earth II**

Study of the Earth's structure and properties based on evidence from seismology and high-pressure geophysics. Topics include fundamental principles of elastic wave theory, body and surface wave propagation in layered media, earthquake source mechanisms, free oscillations of the Earth, and rheological properties of the Earth's interior. May be taken independently of GEO 551.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 556: Solid-State Geophysics**

Application of lattice dynamics and equations of state of solids to studies in high-pressure, high-temperature geophysics. Reviews experimental data from physical acoustics, static and shock wave compression, and theoretical results from finite strain and atomistic models.

*Prerequisites: GEO 551 and 552, or permission of instructor*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 562: Early Diagenesis of Marine Sediments**

The course treats qualitative and quantitative aspects of the early diagenesis of sediments. Topics include diffusion and adsorption of dissolved species; organic matter decomposition and storage; and diagenesis of clay materials, sulfur compounds, and calcium carbonates. The effects of bioturbation on sediment diagenesis are also discussed. This course is offered as both MAR 562 and GEO 562.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 563: Stratigraphy Laboratory**

Three hours of laboratory per week that corresponds to the content of GEO 543. Laboratory work emphasizes practical techniques in stratigraphy.

*1 credit, Letter graded (A, A-, B+, etc.)*

**GEO 566: Mineralogy and Petrology Laboratory**

Three hours of laboratory per week that corresponds to the content of GEO 546

*1 credit, Letter graded (A, A-, B+, etc.)*

**GEO 567: Sedimentary Rocks and Crustal Evolution**

An examination of major and trace elements and isotopic composition of terrigenous sedimentary rocks within a framework of tracing the composition and evolution of the continental crust. Emphasis is placed on interpreting sedimentary compositions in terms of provenance and sedimentary history (e.g., weathering, diagenesis, recycling). Relationships between sediment composition and tectonic setting is also examined.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 569: Structural Geology Laboratory**

Three hours of laboratory per week that corresponds to the content of GEO 549

*1 credit, Letter graded (A, A-, B+, etc.)*

**GEO 570: Earthquake Mechanics**

A survey of fundamental mechanics aspects of earthquake rupture; reviews concepts of fracture mechanics, elastodynamics, and experimental rock mechanics. Topics include state of stress in the lithosphere, theoretical models of earthquake instability, energetics of faulting, representation of dynamic elastic field generated by earthquakes, and relation of seismic signals to the kinematics and dynamics of seismic source.

*Prerequisite: GEO 552 or permission of instructor*

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 571: Mechanics of Geologic Materials**

Elastic, thermal, and anelastic properties of geological materials. The course emphasizes a thermodynamic characterization of these properties including irreversible thermodynamics and nonhydrostatic thermodynamics. Specific applications to the Earth's environment are discussed.

*Prerequisites: GEO 551, 552, or permission of instructor*

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 572: Advanced Seismology**

Course is intended to expose the student to topics that are at the forefront of current seismological research. Examples include wave propagation in heterogeneous media, earthquake source studies, tsunami generation, and seismic network data analysis.

*Prerequisite: GEO 552*

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 573: Physics of Rocks**

Fundamentals of the physical properties of rock in relation to seismology, hydrogeology, geophysical prospecting and geotechnical engineering. Topics include: composition, pore structure and fabric of rocks; elasticity, anelasticity and plasticity; seismic velocity and anisotropy; poroelasticity; electrical, magnetic and hydraulic transport properties.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

**GEO 581: Coastal Engineering Geology**

Concepts of the mechanics of earth materials and the physics of surficial processes with applications to the coastal environment and engineering. This course is also offered as mar 581.



*Prerequisites: Enrollment in MESP or OEN program or instructor*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 585: Directed Studies**

Special studies directed by various faculty members.

*Fall, Spring, Summer, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 587: Hydrogeology Capstone Project**

Students will complete an in-depth capstone report based on analysis of original, independent research conducted by the student on a faculty supervisor-approved topic in hydrogeology.

*S/U grading*

### **GEO 588: Geological Field Methods for Earth Science Teachers**

Geologic mapping techniques, geochemical analytical approach, and hydrological methodologies applied in the field to examples on Long Island. These approaches are designed for developing research projects for secondary students in earth science.

*Prerequisite: Permission of instructor*  
*Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 589: Research for Earth Science Teachers**

This course is intended to provide earth science teachers or students in the M.A.T. in Earth Science program an opportunity to obtain research experience. A written report is required.

*Prerequisite: Permission of instructor*  
*Summer, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 590: Research Project**

Independent research

*Fall, Spring, Summer, 1-12 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **GEO 599: Research**

Independent research for those students established in a research group.

*1-12 credits, S/U grading*  
*May be repeated for credit.*

### **GEO 600: Practicum in Teaching**

*Fall and Spring, 0-3 credits, S/U grading*  
*May be repeated for credit.*

### **GEO 603: Topics in Petrology**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **GEO 604: Topics in Planetary Science**

*May be repeated for credit.*

### **GEO 605: Topics in Sedimentary Geology**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **GEO 606: Topics in Geochronology**

Topics in Geochronology

*1-3 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated 1 times FOR credit.*

### **GEO 607: Topics in Geophysics**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **GEO 608: Topics Geochemistry**

Topics in Geochemistry

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **GEO 609: Topics in Mineralogy and Crystallography**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **GEO 696: Geoscience Colloquium**

A weekly series of research seminars presented by visiting scientists as well as by the faculty. Required every semester of all geoscience graduate students.

*Fall and Spring, S/U grading*  
*May be repeated for credit.*

### **GEO 697: Geoscience Seminar**

Presentation of preliminary research results and current research problems by students and faculty. Required every semester of all geoscience graduate students.

*Fall and Spring, S/U grading*  
*May be repeated for credit.*

### **GEO 698: Geoscience Special Seminar**

A weekly series of specialized seminars in which graduate students and faculty discuss specific topics within the subgroups of geology. Research is reviewed, and these are discussed.

*Fall and Spring, S/U grading*  
*May be repeated for credit.*

### **GEO 699: Dissertation Research on Campus**

Independent research for Ph.D. degree. Open only to candidates for the Ph.D. who have passed the preliminary examination.

*Prerequisite: Advancement to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.*

*Fall, Spring, and Summer, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **GEO 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading*  
*May be repeated for credit.*

### **GEO 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.*

*Fall, Spring, 1-9 credits, S/U grading*  
*May be repeated for credit.*

### **GEO 800: SUMMER RESEARCH**

*May be repeated for credit.*

## **GER**

### **Germanic Languages and Literature**

#### **GER 500: Intensive Reading German**

This course is designed for graduate students in other programs to understand German prose. Students learn the basic structures of German

grammar, acquire general and specialized vocabulary, and translate a variety of texts, including some from their academic areas of interest. In certain programs, successful completion of this course satisfies a language requirement, while in others it serves as preparation for their own foreign-language exam or testing procedure.

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 506: Advanced Stylistics**

Advanced stylistics and discourse analysis. Designed to deepen the advanced student's knowledge of the syntax, structure, and stylistic versatility of the German language.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 539: Contrastive Structures: German-English**

Contrastive study of the phonological, morphological, syntactic, and semantic structures of German and English.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 541: Literature of the Goethe Period**

A study of the literature and culture of Germany during Goethe's lifetime, 1749-1832.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 544: German Fiction**

Major authors of modern German fiction are read and discussed. Texts may include works from 19th and 20th century authors. The course may also focus on works by a single author.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 545: 20th-Century German Poetry**

Intensive reading and discussion of 20th-century German poetry, including works by Rilke, Trakl, Brecht, Benn, and Kirsch. The course may also focus on a single poet or movement in the 20th century.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 546: 20th-Century German Drama**

A survey of representative plays of the 20th century, including works by Hauptmann, Hofmannsthal, Kaiser, Sternheim, Toller, Fleisser, Horvath, and Brecht. The course may also focus on the works of a single dramatist.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 547: Special Author Studies Tutorial**

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **GER 548: Special Period Studies Tutorial**

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **GER 557: History of the German Language**

Proceeding from several characteristics of language in general and from the position of German within the Indo-European language family, this course addresses: the periodization of German language history; internal developments from Indo-European to modern German; the most important cultural events on the path of German from the tribal dialects to a unified language; and relations of borrowing between German and other languages. Texts from the different periods are examined for their linguistic features as well as for content.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 558: Middle High German**

An introduction to Middle High German grammar with representative reading from the Middle High German classics.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 562: Historical Germanic Linguistics**

An introduction to the principles and methods of historical linguistics as applied to problems in the Germanic branch of Indo-European (early tribal movements, attempts at dialect grouping, dialect geography, etc.). Part of the course will be devoted to readings in Gothic, Old Norse, and Old High German with a comparison of the morphologies of these languages.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 581: Independent Study**

*May be repeated for credit.*

#### **GER 591: Language Acquisition I**

Elementary German I intended for graduate students from other programs.

*1-4 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 592: Language Acquisition II**

Elementary German II intended for graduate students from other programs.

*1-4 credits, Letter graded (A, A-, B+, etc.)*

#### **GER 593: Language Acquisition III**

Intermediate and Advanced German intended for graduate students from other programs. The requirements for the course will include a graduate-level component to be determined by the instructor. May be repeated for credit.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **GER 595: Practicum in Teaching**

*Fall and Spring, 1-3 credits, S/U grading*

*May be repeated for credit.*

#### **GER 599: Thesis Research**

GER 599 Thesis Research. One-six credits. S/U grading. May be repeated for credit.

*1-6 credits,*

*May be repeated 6 times FOR credit.*

#### **GER 601: Special Author**

Tutorial to be arranged with appropriate staff member.

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **GER 602: Special Period**

Tutorial to be arranged with appropriate staff member.

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **GER 800: Summer Research**

## GRD

### The Graduate School

#### **GRD 500: Responsible Conduct of Research and Scholarship**

This course is designed to introduce students to the major issues in the ethics of research and scholarship. Using a combination of readings - written and web-based - videos, lectures, case discussion and other exercises, students will investigate the moral values intrinsic to research/scholarship/creative activity in their discipline and the professional and social values with which members of the discipline must comply. Each class will begin with an introductory lecture or video followed by discipline-based, small group discussions with the participation of faculty from the department or program from which the graduate students come.

*0-3 credits, S/U grading*

*May be repeated for credit.*

#### **GRD 510: Career Exploration with PhD Career Ladder Program**

GRD 510 engages Master's and doctoral students in the PhD Career Ladder Program, a peer-led framework for career exploration and preparation. Graduate students follow seven career development steps which correspond to the essential components of an Individual Development Plan (IDP). The steps include: self-assessment, career research, informational interviewing, skill identification and building, CV/resume crafting, networking, and goal setting. Each section is led by a graduate student peer leader. Students will cultivate their career preparedness and gain a framework that they can apply to any career goal, academic and non-academic, now and in the future. By the end of the course, students will have gained increased confidence in and preparation for seeking a career of interest and will have a set of actionable goals for next steps.

*0-1 credits, S/U grading*

### **GRD 520: Introduction to Science Policy for STEM**

Science, technology and innovation (STI) are ubiquitous part of life and we must understand these concepts in order to develop effective policies. This 1 credit hour course is designed to teach engineering and science graduated students the main concepts in science, technology and innovation policy.

*0-1 credits, S/U grading  
May be repeated for credit.*

### **GRD 550: CEAS Placeholder**

Placeholder course for students in special programs in CEAS. Specific programs designated by course topic.

*0-12 credits, S/U grading  
May be repeated for credit.*

### **GRD 600: Rigor and Reproducibility in Research**

A key backbone of the scientific method is the reproducibility of experimental observations. This means that results obtained by a specific study should be observed again if the experiment is repeated by the same or other researchers. Rigor in research is essential to ensure the reproducibility of results, as it results in the application of research methods that are robust and exclude bias. This course provides an overview of the general problems associated with ensuring research rigor and the reproducibility of results. Brief focused lectures are followed by in person, field-specific small group discussions and activities to facilitate discussions between faculty and students. Three sessions address issues of research rigor that are relevant across disciplines. Two additional sessions highlight

issues specific to research in the biomedical sciences.

*0-1 credits, S/U grading  
May be repeated for credit.*

### **GRD 697: Fundamentals of College Teaching**

This 10-week online course is an introduction to fundamental college teaching strategies applicable to many disciplines and careers. The first six weeks are asynchronous and self-paced, with two required modules and then a choice of two additional modules with content related to key topics in college teaching such as inclusive pedagogy, effective assessment, classroom management, and teaching online. The remaining 4 weeks are discussion-based with the option of two synchronous Zoom discussions or asynchronous VoiceThread discussions matched to asynchronous module topics, with the opportunity to share advice and teaching experiences with other graduate students as well as pose solutions to common scenarios you may encounter in college teaching. Assignments are short written reflections, multiple choice quizzes, and either Zoom or VoiceThread discussion participation.

*S/U grading*

### **GRD 700: Masters Completion**

Intended for international masters students that will complete all degree requirements and graduate during a summer or winter semester. This course is intended to help satisfy immigration requirements. All international students are advised to speak with one of the International Advisors prior to enrollment to ensure compliance with all immigration requirements.

*1 credit, S/U grading  
May be repeated for credit.*

### **GRD 800: Doctoral Completion**

Intended for all doctoral students that will complete all degree requirements and graduate during a summer or winter semester. This course is intended to help satisfy immigration requirements. All international students are advised to speak with one of the International Advisors prior to enrollment to ensure compliance with all immigration requirements. Please coordinate with your program regarding financial information.

*1 credit, S/U grading  
May be repeated for credit.*

## **GSS**

### **Geospatial Science**

#### **GSS 509: Digital Cartography**

Maps portray spatial relationships among selected phenomena of interest and increasingly are used for analysis and synthesis. Cartography is the knowledge associated with the art, science, and technology of maps. Digital computer cartography still follows the same fundamental principles and still requires a broad understanding of graphicacy as a language (as well as numeracy and literacy). This course will provide an introduction to cartographic principles, concepts, software and hardware necessary to produce good maps, especially in the context (and limitations) of geographic information systems (GIS).

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **GSS 513: GIS Fundamentals I**

This course provides the basic concepts underlying modern geographic information science and technology. Emphasis is placed on the principles of GIS for collecting, storing, characterizing, and maintaining data and computer-based techniques for processing and analyzing spatial data. The course includes three hours of lecture, in class exercises and homework projects each week. This is a computer based class with the majority of students work involving GIS computer software. Prerequisite: working knowledge of spreadsheet software

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

#### **GSS 517: Geospatial Narratives: Deep Mapping for Humanities and Social Sciences**

Building on formal methods in qualitative reasoning, spatial and temporal representation and geospatial science, this course will explore state-of-the-art methods for humanities and social sciences students to visualize and drill down data. Hands-on exercises of deep mapping will cover how to collect, analyze and visualize quantitative and qualitative data, spatial data, images, video, audio, and other representations of places and artifacts in humanities and social sciences. This course will also discuss models of reasoning about events, actions and changes that are spatially contextualized. Only GSS517 or GSS513/ GEO513 will count the Graduate Certificate.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **GSS 523: Geodatabase and Design**

Concepts of geodatabase design and management in geographic information systems (GIS), SQL statements, geographic data types and functions, data entry, and techniques of geographic information structure applications.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **GSS 525: GIS Fundamentals II**

GIS Fundamentals II will introduce the applied use of Geographic Information Systems (GIS) which is now used extensively in analytical studies. The course emphasizes the applications of GIS in solving real-world problems. Students are expected to gain an understanding of GIS theory, methodology and most importantly application. Students are also expected to demonstrate abilities of spatial thinking, spatial analysis, and be able to solve practical spatial problems utilizing a GIS.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **GSS 526: GIS Project Management**

This course will enable students to address issues unique to a GIS operation such as: identify implementation issues for a GIS project or program; be prepared to assist in decision making procedures that involve management; incorporate strategies for success in your workplace; understand some of the legal issues about the use of GIS data; and be aware of the GIS industry outlook for employment and education.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **GSS 550: Applied Spatial Analysis**

The specific focus is on spatial data analysis, such as the analysis of autocorrelation, principles of geostatistics and analysis methods that are relevant in the fields of public health, environmental/earth science and social science. An important aspect of the course is to gain hands-on experience in applying these techniques with GIS and spatial analytical software, and essential methodological and practical issues that are involved in sophisticated spatial analyses. 3 credits.

3 credits, Letter graded (A, A-, B+, etc.)

### **GSS 554: Geospatial Science for the Coastal Zone**

The use of spatial data is becoming increasingly critical in the decision management process and planning of the coastal zone. This course will use GIS and Remote sensing tools to collect and analyze data for intergrating into the management, planning, and monitoring of the coastal geomorphology and ecosystems. Offered in Fall.

3 credits, Letter graded (A, A-, B+, etc.)

### **GSS 555: GIS and Remote Sensing**

This course provides a basic overview of the technology by which aircraft and satellite data are produced and utilized in analyses to answer questions within a geographic context. Students will learn to identify sources of remotely sensed imagery appropriate for common applications; acquire, manipulate, and interpret aerial photographs and satellite imagery/data; and incorporate remote sensing data into Geographic Information Systems.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **GSS 570: Geospatial Narratives: Deep Mapping for Humanities and Sciences**

Course will present special interest topics or recent software enhancements in the rapidly developing field of Geospatial Science. The course will include a mixture of core geospatial techniques and recently released methodology. Course will include a diversity of Geospatial topics including discipline specific topics relevant to majors in physical sciences, social sciences, business and engineering.

1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **GSS 575: Geospatial Teaching Practicum**

The teaching practicum provides teaching experience, carried out under faculty supervision. Student will work with a faculty member as assistant in a regularly scheduled course and student will be assigned a specific role to assist in teaching the course. The student will meet with the instructor on a regular basis to discuss intellectual and pedagogical matters relating to the course.

0-3 credits, S/U grading  
May be repeated 3 times FOR credit.

### **GSS 587: Geospatial Research**

This course is intended to provide graduate students in the Geospatial Science program an opportunity to obtain research experience. A written report is required. Prerequisite: Permission of instructor 1-3 credits, Letter graded (A, A-, B+, etc.)

1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.

### **GSS 588: GIS Internship**

The GIS Internship is designed to provide students experience in the real workplace. Interns are expected to function as a GIS professional and work within the existing host facility structure or on a free standing project. Interns will complete assigned tasks by hosting facility such as GIS data entry, data retrieval, GPS field work, documentation, or general

GIS facility duties. These activities will be monitored by both a representative of the host facility and the instructor.

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

## **HAD**

### **Clinical Laboratory Sciences**

#### **HAD 506: Clinical Cytogenetics Internship**

Introduces the students to clinical cytogenetic techniques and standard operating procedures utilized in a clinical cytogenetic laboratory. Permission of department is required. Prerequisites: Admission to Undergraduate CLS Program; HAD 406; Program Consent Required

3-5 credits,  
May be repeated 2 times FOR credit.

#### **HAD 590: Independent Study/ Clinical Laboratory Sciences**

Proposals for special projects in clinical laboratory sciences must be submitted to the program director for approval prior to registration. Prerequisites: Admission to Undergraduate CLS Program; Program Consent Required

1-6 credits,  
May be repeated 3 times FOR credit.

## **HAL**

### **Athletic Training**

#### **HAL 510: Strength and Conditioning for the Healthcare Practitioner**

Designed to provide a comprehensive overview of strength and conditioning for the future or practicing healthcare practitioner. Emphasizes exercise sciences (including anatomy, exercise physiology, and biomechanics), nutrition, exercise technique, program design, organization, administration, testing, and evaluation. Prepares students for nationally- accredited Certified Strength and Conditioning Specialist (CSCS) certification exam. Open to non SHTM students Prerequisite: ANP 300, HAN 200 or Equivalent Anatomy Course; Instructor Consent Required

3 credits,

#### **HAL 515: Foundations of Athletic Training**

Introduces the student to athletic training and the role of the athletic trainer. Topics include the historical development of the

profession, concept of the sports medicine team, and injury documentation. Emphasizes strategies for injury prevention, assessment, and treatment. Focuses instruction on the recognition and management of medical emergencies, training and conditioning techniques, and the fabrication and application of taping, wrapping, supportive, and protective devices.

*4 credits,*

### **HAL 520: Principles of Physical Agents**

Introduces the use of therapeutic interventions to manage a variety of musculoskeletal conditions. Emphasizes an evidence-based practice approach to making sound clinical decisions for the use of therapeutic modalities. Topics include tissue response to injury, pain physiology, psychological response to injury, and therapeutic interventions for inflammatory and non-inflammatory conditions.

*3 credits,*

### **HAL 525: Evidence Based Practice**

Introduces concepts of evidence based practice (EBP) in athletic training. The student will learn how to obtain, process, examine, and appraise peer reviewed journal articles. The students will become a consumer of literature and form a foundation for clinical practice as well as identifying areas of interest for future research projects through literature searches and round table discussions of literature.

*1 credit,*

### **HAL 530: Critical Care**

This course will enable the student to evaluate and manage patients with acute conditions, including triaging conditions that are life threatening or otherwise emergent across all systems of the body. Students are required to have current certification in Basic Life Support CPR.

*4 credits,*

### **HAL 535: Clinical Diagnosis & Treatment I**

Focuses on the principles of clinical diagnosis and treatment of orthopedic injuries to the lower extremity. Emphasizes the components of the comprehensive orthopedic clinical evaluation and diagnosis including history, inspection, palpation, functional testing, special evaluation techniques, and the establishment and implementation of therapeutic interventions.

*5 credits,*

### **HAL 540: Clin Diagnosis & Treatment II**

Focuses on the principles of clinical diagnosis and treatment of orthopedic

injuries of the head, cervical spine, and upper extremity. Emphasizes the components of a comprehensive orthopedic clinical evaluation and diagnosis including history, inspection, palpation, functional testing, special evaluation techniques, and the establishment and implementation of therapeutic interventions.

Prerequisite: Year 1 Summer Courses

*5 credits,*

### **HAL 545: Clin Diagnosis & Treatment III**

Focuses on the principles of clinical diagnosis and treatment of orthopedic injuries of the thoracic and lumbosacral spine. Emphasizes the components of a comprehensive orthopedic clinical evaluation and diagnosis including history, inspection, palpation, functional testing, special evaluation techniques, and the establishment and implementation of therapeutic interventions. Prerequisite: Year 1 Fall Courses

*3 credits,*

### **HAL 550: Advanced Therapeutic Interventions**

Progression of previously learned therapeutic interventions. Emphasizes the use of therapeutic exercise and manual therapy techniques in order to rehabilitate patients from both surgical and non-surgical orthopedic conditions. Prerequisite: Year 1 Spring Courses

*5 credits,*

### **HAL 555: Healthcare Management for Athletic Training**

Provides students with the ability to analyze various issues, policies, and procedures encompassing the ethical administration of athletic training in a managed-care model. Includes US federal healthcare laws, legal liability, issues, personnel management, facility organization and design, equipment maintenance, budgeting, record keeping, health care services, informatics, counseling, and public relations. Exposes students to principles that enhance their networking, professional development, and personal branding skills. Prerequisite: Year 1 Spring Courses

*3 credits,*

### **HAL 560: Nutrition And Supplement Use for Sport Performance**

Provides an understanding of basic nutrition science as well as the use of supplements to enhance athletic performance. Students will become familiar with the principles of diet planning, food labeling, biological functions and food sources of primary nutrients, energy balance, weight management

and physical activity; the role of nutrition in chronic disease development; nutrition throughout the life cycle and current nutrition-based controversies. Reviews the advantages and disadvantages to using dietary supplements. Addresses scientific research on recommended dosage and potential side effects. Addresses both the needs of competitive athletes; and everyday needs and concerns. Upon completion of this course, students should be able to evaluate and make recommendations about diet plans, dietary supplements, as well as maintaining a healthy lifestyle. Focuses on the analysis of needs of various athletes to determine if specific supplements should be recommended to improve performance. Prerequisite: Year 2 Fall Courses

*3 credits,*

### **HAL 565: Research Design for Athletic Training**

Presents research design and related methods commonly used to contribute to the evidence-based practice of athletic training. Provides the necessary tools for students to process and apply the skills needed to develop independent research studies. Includes literature searches, appraising scientific literature, formulating a research question or hypothesis, and selecting appropriate research designs and methods. Presents information in the context of protecting human subject and health information based on the policies and procedures of the Committee on Research Involving Human Subjects (CORIHS) and IACUC. Prerequisite: Year 1 Fall Courses

*2 credits,*

### **HAL 570: Research Methods for Athletic Training**

This course introduces the student to research in athletic training. The student will learn about the research process, read, examine, and comprehend peer reviewed journal articles. The student will begin assembling a research topic related to athletic training through the development of a research question and the composition of a literature review and methodology based on their proposed topic. Prerequisite: Year 1 Spring Courses

*2 credits,*

### **HAL 572: Research Seminar II**

Culmination of the athletic training program's research curriculum. Upon receiving IRB approval, students will recruit subjects and collect data to answer their research questions. The goal of this course is to complete the proposed research projects and develop a publishable manuscript and a poster that can

be presented at a state, regional, or national conference. Prerequisite: Year 2 Fall Courses  
*1 credit,*

#### **HAL 575: General Medical Conditions**

Provides a working knowledge of the pathophysiology and management of common diseases and other medical disorders or disabilities as they relate to athletes and the physically active. Prerequisite: Year 2 Summer Courses

*4 credits,*

#### **HAL 581: Athletic Training Clinical I**

This course provides the student with their first clinical experience. The student will be supervised by a preceptor at all times during their clinical experience. The student will practice patient care and professional skills and behaviors on a daily basis. Emphasis is placed on topics related to the student's previous areas of classroom study (foundations of athletic training, principles of physical agents, evidence-based practice, lower extremity evaluation, diagnosis, and therapeutic intervention) and immediate incorporation of concurrent classroom topics (upper extremity evaluation, diagnosis, and therapeutic intervention, critical care). Prerequisite: Year 1 Summer Courses

*7 credits,*

#### **HAL 582: Athletic Training Clinical II**

This course offers assignments in clinical settings related to the student's area of study (Principles of Physical Agents, Clinical Diagnosis and Treatment I & II, Critical Care). This course will give the student the opportunity to observe and integrate skills under the supervision of a preceptor. The student will practice comprehensive patient care and professional skills and behaviors on a daily basis in preparation for independent clinical practice upon graduation. Prerequisite: Year 1 Fall Courses

*7 credits,*

#### **HAL 583: Athletic Training Clinical III**

This course provides the student with their third clinical experience. This clinical experience will be full-time (a minimum of 35 hours per week). The student will be supervised by a preceptor at all times during their clinical experience. The student will practice comprehensive patient care and professional skills and behaviors on a daily basis in preparation for independent clinical practice upon graduation. Prerequisite: Year two Summer I courses

*3-5 credits,*

#### **HAL 584: Athletic Training Clinical IV**

This course provides the student with their fourth clinical experience. The student will be supervised by a preceptor at all times during their clinical experience. The student will practice comprehensive patient care and professional skills and behaviors on a daily basis in preparation for independent clinical practice upon graduation. Prerequisite: Year 2 Summer Courses

*7 credits,*

#### **HAL 585: Athletic Training Clinical V**

This course provides the student with their fifth clinical experience. This clinical experience will be full-time (a minimum of 35 hours per week). The student will be supervised by a preceptor at all times during their clinical experience. The student will practice comprehensive patient care and professional skills and behaviors on a daily basis in preparation for independent clinical practice upon graduation. Prerequisite: Year 2 Fall Courses

*7 credits,*

#### **HAL 586: General Medical Clinical**

This course provides the student with general medical clinical experience through rotations with health care providers in different settings. The student will be supervised by a preceptor at all times during their clinical experience. The student will practice comprehensive patient care and professional skills and behaviors on a daily basis in preparation for independent clinical practice upon graduation. Prerequisite: Year 2 Fall Courses

*1 credit,*

#### **HAL 599: Clinical Continuation**

Clinical continuation course for athletic training students only.

*S/F graded*

*May be repeated for credit.*

## **HAO**

### **Occupational Therapy**

#### **HAO 500: Functional Neuroscience**

Presents an integrated approach to the general principles of organization and function of the autonomic, peripheral and central nervous systems. Presents these principles in a systems approach to neuroscience. The anatomy of a system will be followed with its physiology, pathophysiology relation to human function and clinical relevance to the occupational therapist. Clinical topics will include neurological testing, control of posture

and balance, pain, muscle tone and spasticity, feedback versus feed-forward control, reflex versus voluntary control, control of reaching and locomotion, perception, and learning.

Prerequisite: HAO 519, HAO 561

*4 credits,*

#### **HAO 504: Introduction to the Historical and Contemporary Practices of Occupational Therapy**

Introduces occupational therapy students to the values and philosophies that influenced the development of the profession, and those that continue to influence current practices. Explores conceptual foundations, ideas, evidence, and resources that allow learners to begin developing applied skills and clinical reasoning skills to support clients in achieving greater participation in the occupations they want and need. The goal of the course is to have learners develop beginning skills for conducting contemporary occupational therapy practices.

*3 credits,*

#### **HAO 505: Foundations in Occupational Therapy**

Provides a conceptual foundation for occupational therapy theory and practice. Instructs students on the concepts of occupation, activity, purposeful activity and participation. Through lecture and laboratory sessions, students will experience working with the concepts they are learning. Examines the philosophical base of the profession, and explores the meaning and diversity of the frames of reference in contemporary occupational therapy practice. Emphasizes the centrality of occupation in health and wellness, through balance in performance areas and contexts. Explores the impact of disability, disease, and injury on the person, their family and society. Students will learn how to break down and analyze activities for their performance components, as well as how to grade and adapt activities for therapeutic purposes. Group discussions on social and political systems will focus on how they influence the delivery of health care services. Introduces the impact of culture on treatment and health practices. Explores the concept of theory development, and how theories, models of practice and frames of reference impact occupational therapy evaluation/treatment.

*3 credits,*

#### **HAO 506: Life Span Growth and Development for Occupational Therapy**

Provides students with a knowledge of developmental theories and factors influencing the normal developmental process. Developmental norms and sequences are

examined with emphasis on physical (sensory and motor), cognitive, and psychosocial tasks. Discusses cultural and environmental influences on development. The coursework covers prenatal, child, adolescent, and adult development utilizing many frames of references from occupational therapy points of view regarding development. Prerequisites: HAO 504, HAO 561

*3 credits,*

### **HAO 507: Clinical Conditions in Occupational Therapy**

Addresses clinical diagnoses, symptomatology, and prognosis of many major clinical conditions commonly encountered in current practice. Emphasize the impact of disease on individual physical, cognitive and emotional function and on families and society. Case studies will be utilized within this course to enable students to relate major theories and frames of reference to treatment approaches for common diagnoses and medical conditions. The course is intended to help build a foundation for subsequent occupational therapy theory and practice courses and to provide a foundation for Fieldwork II experiences. Prerequisites: HAO 505; HAO 519; HAO 561

*2 credits,*

### **HAO 508: Theories of Adult Rehabilitation**

This is the first part of a two part course. Provides entry-level knowledge and attitudes necessary to effectively work as an occupational therapist with the adult population in multiple settings to support occupational performance and quality of life. Discusses and evaluates the core concepts of the occupational therapy and physical disabilities environment. Students will be able to define the role of the occupational therapist as well as the impact of a multidisciplinary team on their role as a team member and within the continuum of care of adults while applying evidence based practice. Prerequisites: HAO 505; HAO 507; HAO 519; HAO 561

*2 credits,*

### **HAO 509: Occupational Therapy Theory and Practice in Pediatrics**

Presents occupational therapy theories, assessments, and treatment processes as they pertain to the pediatric population. Integrates several of the predominant models in current practice with material from previous and concurrent coursework. Covers abnormal development, acute and chronic medical conditions, their effect on the CNS, orthopedic and musculoskeletal systems.. Reviews major

causes of disability, the etiology and prognoses. Discusses the impact on the family and cultural implications. Students learn about selecting age and developmental stage appropriate evaluations, treatment techniques/procedures. Students enhance their activity analysis skills, assessment, treatment planning, documentation skills, and professional interaction through laboratory, class assignments, and fieldwork. Prerequisite: HAO 505; HAO 507; HAO 519; HAO 561

*4 credits,*

### **HAO 517: Universal Design**

Focuses on adapting the environment to improve the client's quality of life. Examines the therapist's ability to help the patient reintegrate into society. Covers Americans with Disabilities Act; mobility (power and manual); seating/positioning systems; adapted toys; augmentative communication systems; computer access; environmental control units; independent living aids; and vocational adaptations. Provides foundation and knowledge of ergonomic, work hardening, functional capacity evaluations, and vocational programs. Exposes students to different occupational therapy work settings and employment, awareness of federal regulations for work-related programs, and certification requirements for this emerging practice area. The lab sessions offer practical applications of principles discussed in lectures. Prerequisite: Second Year Summer and Fall Courses

*3 credits,*

### **HAO 519: Kinesiology for Occupational Therapy**

Kinesiology is the study of human motion. Designed to establish a working knowledge of biomechanical principles as well as detailed understanding of the osteokinematics and arthokinematics of the various joints of the body. Students will be able to apply their knowledge of biomechanics into real life functional applications for a variety of occupations. The course consists of both lecture and laboratory sessions. Laboratory sessions provide the student with practical applications of principles discussed in lecture. In addition, the laboratory sessions will allow the student to become proficient in the areas of surface anatomy and palpation, manual muscle testing, and goniometry. The student will study normal and pathological movement, including its impact on function. Prerequisite: HAO 561

*4 credits,*

### **HAO 520: Substance Abuse and Occupational Therapy**

This course addresses physiological, sociological, and psychological effects of

substance abuse on the abuser and his/her environment. Presents drug classifications, along with effects and withdrawal symptoms. Discusses treatment models, philosophies, and methods. Students will learn how to design both individual and group interventions. Explores in detail the occupational therapists role in the evaluation and treatment of substance abuse across the life-span and across disabilities. Reviews the use of 12-step programs and alternative treatment models, as will prevention programs, such as smoking cessation. Requires Internet Explorer 10, 9, or 8; Firefox; Chrome; Windows 8, 7, Vista or XP; Mac OS X 10.6, 10.7 and 10.8; or Safari 5.1 and 6. Prerequisites: HAO 504; HAO 505, HAO 506, HAO 507; HAO 523.

*2 credits,*

### **HAO 522: Assessment and Treatment of Adult Rehabilitation**

This is the second part of a two part course. Learning activities focus on the evaluation and treatment of adults with physical disabilities. Examines injury, illness, disease and the effect on occupational performance in the areas of work, self-care and leisure. Occupational therapy theories and practice are learned, including frames of reference, evaluation/assessments, treatment interventions, selection of age-appropriate occupation-based activities, and activity analysis are explored. Students will have the opportunity to further refine their documentation and clinical reasoning skills through written and verbal assignments and apply evidence based practices. Prerequisites: HAO 500; HAO 505, HAO 507, HAO 508; HAO 519; HAO 522; HAO 561

*3 credits,*

### **HAO 523: Assessment and Intervention of Psychosocial Issues**

Explores the psychosocial aspects of disability as they affect the function of the individual, the family and the community. Lectures and presentations will be related to the recognition of psychosocial problems and how they can be better understood, minimized, or eliminated. Provision of mental health services across all levels of care will be delineated. Multicultural factors will be discussed as they relate to mental illness and the recovery process. The course exposes the occupational therapy student to the DSM-V and the pharmacology of major mental illnesses. Psychosocial theories guiding assessment and intervention will be thoroughly discussed. Interviewing skills are demonstrated and practiced in the lab sessions. The use of group theories, the structure and function of groups in treatment, the analysis of group treatment and group activities and the therapeutic use of self are the

focus in laboratory and lectures. Students will be introduced to and given the opportunity to practice a variety of assessments utilized in psychosocial occupational therapy practice. This course is to provide the student with the knowledge, skills, and attitudes necessary to function as an occupational therapist in a psychosocial/mental health treatment setting. Prerequisite: HAO 504

*4 credits,*

### **HAO 524: Assessment & Interventions of the Upper Extremities**

Presents fundamental upper extremity therapy topics and provides a foundation for clinical reasoning and treatment approaches. Include anatomy; common pathologies; orthotics; evaluation; and treatment. Introduces students to upper extremity orthotics including the design; biomechanical principles; function; use; care; and patient education. Enables the occupational therapy student to gain an understanding of various physical agents currently used in the rehabilitation practices. Prerequisites: HAO 500, HAO 507, HAO 508, HAO 519; HAO 522.

*3 credits,*

### **HAO 525: Vision, Perception, and Cognition**

Focuses on principles and techniques for the rehabilitation of visuo-cognitive dysfunction. Presents the theoretical rationale and specific skills needed to evaluate and treat a wide range of visual, perceptual and cognitive performance components. Includes a systematic bottom up approach to the evaluation of the adult patient with visuo-cognitive dysfunction. Explores a variety of treatment approaches and specific treatment techniques that can improve functional performance and outcomes, drawing from both the neurosciences and Occupational Therapy frames of reference. Emphasizes clinical reasoning and the use of both remediation and compensatory strategies within the framework of Occupational Therapy practice. Prerequisites: HAO 500; HAO 505; HAO 507; HAO 508; HAO 561

*2 credits,*

### **HAO 526: Gerontology and Occupational Therapy**

Focuses on the role of occupational therapy with the aged within geriatric rehabilitation settings (in-patient, out-patient and home care); long-term care programs; wellness and safety programs; hospice; community based programs (socialization, day treatment, adult day care programs), and alternative housing environments. Addresses the aging process and its physiological, sociological,

and psychological effects, with attention to heterogeneity and older person's strengths and capabilities. Presents common impairments and disabilities and rehabilitation needs of older persons. Students will develop and demonstrate skills in evaluation, treatment planning and therapeutic adaptation, documentation, and discharge planning (including collaborative client and family education), and demonstrate knowledge of assistive devices, equipment, and technology/ environmental modifications to support community living and to improve the quality of life of older persons. Addresses the importance of evidence-based practice, including occupational therapy, life-long learning and professional development, the benefits of collaborative OT -OTA partnerships and the relationships between policy, legislation and practice. Include aging and gender issues, successful aging, and community and home safety. Provides a conceptual framework for the study of gerontology as it relates to occupational therapy and develops the skills and knowledge to understand major issues in theory, research, and practice related to the older adult. Prerequisites: HAO 505, HAO 507, HAO 508, HAO 522

*3 credits,*

### **HAO 530: Community, Occupation and Health**

Presents the importance of occupation as a precursor to health, and of occupational therapy as a health promoting profession. Examines the theories and applications of occupational science through a review of the professional literature and class discussion. This occupational perspective of health will be the foundation for each student's design of a community-based practice program. Reviews social theories, socio-cultural and socio-political trends that impact the individual's health status and the delivery of health care services. Offers experience in designing/ administering needs assessments in the community, and in organizing outcome data. Prerequisite: Successful completion of all prior coursework.

*4 credits,*

### **HAO 534: The Occupational Therapy Manager**

Assists the learner in creating a business plan for an occupational therapy service. Teaches skills involved in setting up a business, being a manager of people, budgets, and services, using evidence to guide management, and how to manage for change. Prerequisites: Successful completion of all prior coursework.

*3 credits,*

### **HAO 540: Prosthetics & Orthotics**

Provides the theoretical, psychomotor and practical skills of orthotics and upper extremity prosthetics that are necessary for current practice. Utilizes lecture, discussion and laboratories to teach the design, biomechanical principles, fit, function, use, care and patient education involved with upper extremity orthotics. Students are introduced to upper and lower extremity prosthetic devices. Prerequisites: HAO 500; HAO 507, HAO 508; HAO 519; HAO 522; HAO 524.

*2 credits,*

### **HAO 549: Introduction to Research for Occupational Therapy**

Description: Provides a foundation for future professional and scholarly activities and stresses the importance of research for informed practice decisions. Presents basic research concepts and statistical applications for the research process. Presents methods to review and critique published, peer-reviewed research, identify research topics of interest, and initiate the literature review process. Provides tools needed to critique commonly used assessment tools in occupational therapy and to use and interpret standardized scores. Requires the CORIHS human subjects research training. Emphasizes professional writing skills for publications and professional presentations. Explores current research methodologies used in occupational therapy to facilitate beginning research skills. Prerequisite: Successful completion of all prior coursework.

*3 credits,*

### **HAO 551: Research Design and Methods for OT**

Provides students beginning research and critical inquiry skills through learning current occupational therapy related research methods and by the design of research grant proposals. Students gain fundamental critical inquiry and writing skills necessary to identify appropriate funding sources and write grant proposals for research and program development. Students learn to design qualitative research projects and analyze qualitative data. Prerequisite: HAO 549

*3 credits,*

### **HAO 561: Functional Anatomy Review**

Provides an anatomical review of all bodily systems in order for students to acquire a basic working knowledge of the functional structure of the human body. Provides foundational knowledge for all other courses in the Occupational Therapy Program. Students will apply knowledge learned to formulate



hypotheses about occupational dysfunction associated with abnormalities within systems. Utilizes critiques of research to expand on knowledge from lecture and lab.

*4 credits,*

### **HAO 562: Principles of Instruction**

Identifies issues facing health professions educators and application of knowledge of key education and behavior theories for occupational therapy practice. Explores commonly used instructional methods and applies these methods to a variety of teaching/learning situations found in occupational therapy education. Explores standardized tools to measure literacy, design of patient education materials for a specific population, and provision of health education information in a community setting. Prerequisite: Successful completion of all prior coursework.

*3 credits,*

### **HAO 570: Global Communities, Occupations and Health**

Explores innovative, non-traditional and emerging areas of occupational therapy practice. Students meet and dialog with occupational therapy practitioners and/or other health care professionals who have developed private practices, are consultants, and are involved in emerging areas of practice. Presents timely articles concerning health care trends and non-traditional/emerging practice areas. Articulates global social issues and occupational needs for a variety of global populations. Builds upon student's prior knowledge and coursework and integrates AOTA's Standards of Practice, Core Values and Attitudes of OT, and AOTA's Code of Ethics, with attention to current and potential OT/OTA partnerships in community and non-traditional settings. Prerequisite: Successful completion of all prior coursework.

*2 credits,*

### **HAO 573: Professional Behaviors I**

Introduces professional behaviors, including basic communication and documentation skills, with a focus on expectations of fieldwork sites. Students will learn the concept of reflective practice, and how to use a reflective journal. Introduces the professional portfolio as a means to document clinical competence. Examines the nature of the supervisory process with strategies to maximize the use of clinical and administrative supervision. Explores cultural competency and the scope of diversity in health care. Emphasizes the importance of life-long learning through continuing education and other methods. Includes lectures, presentations, role-plays and other exercises to achieve

learning objectives. Prerequisite: Year One Summer and Fall Courses

*1.5 credits,*

### **HAO 574: Professional Behaviors II**

Builds on previously learned material covered in Professional Behaviors I. Students will work on more advanced documentation and communication skills required for entry-level practice. Provides opportunity to discuss professional behavior expectations from their clinical fieldwork assignments. Use of the reflective journal to enhance professional development, and the continuation of the professional portfolio will assist students in developing and documenting their clinical competence. Explores the supervisory process in greater detail, in the context of its use for personal and professional growth. Discusses the role of the occupational therapy assistant as a colleague and collaborator. Continues to emphasize the importance of life-long learning. Lectures, role-plays, presentations and experiential activities will be used to achieve learning outcomes. Prerequisite: Year Two Summer and Fall Courses

*1 credit,*

### **HAO 575: Professional Transitional Seminar**

Discusses issues related to transition of student to entry-level practitioner role. Presents information on licensure, certification exam preparation, NBCOT certification, AOTA specialty examinations, models of supervision, mentoring, job search strategies, marketing skills, malpractice, continuing competency, professional organizations, networking and career goal planning. Prerequisite: Successful completion of all prior coursework.

*2 credits,*

### **HAO 580: Special Topics in Occupational Therapy**

Offers students the opportunity to explore and expand knowledge and skills in a practice area of specific interest. Prerequisite: Successful completion of all prior coursework.

*2 credits,*

### **HAO 585: Disability Studies and Occupational Therapy**

Introduces a social model of disability and explores the ethical and psychological issues faced by people with disabilities across their lifespan. Presents historical analysis, healthcare discourse, and cultural critique to understand the evolution of health practice, cultural beliefs and social structures influencing the treatments, services, and opportunities available to people

with disabilities in the United States and internationally. Offers students a multi-layered understanding of the issues faced by people with disabilities and their families. Includes assigned readings, films, guest speakers, site visits, and one-on-one interactions with people with disabilities. Prerequisite: Successful completion of all prior coursework.

*2 credits,*

### **HAO 586: Fieldwork Level IA**

The first of three introductory level clinical experiences. Offers the opportunity to identify symptomatology, observe treatment interventions and formulate treatment plans in a psychosocial practice setting. Promotes effective communication skills used with patients and professionals. Uses reflective journals to monitor development of professional behaviors and skills. Prerequisite: HAO 504; HAO 505; HAO 506; HAO 507; HAO 523

*1 credit,*

### **HAO 587: Fieldwork Level IB**

This is the second of three introductory level clinical experiences. It provides students with the opportunity to identify symptomatology, observe treatment interventions, and formulate treatment plans in an adult physical disabilities setting. It is designed to promote effective communication skills used with patients and professionals. Reflective practice journals will be used to monitor professional behaviors and skills. Prerequisites: HAO 508, HAO 586.

*1 credit,*

### **HAO 588: Fieldwork Level I C**

The third of three introductory level clinical experiences. Offers the opportunity to identify symptomatology, observe treatment interventions and formulate treatment plans in a pediatric practice setting. Promotes effective communication skills used with patients and professionals. Uses reflective journals to monitor development of professional behaviors and skills. Prerequisites: HAO 586, HAO 587

*1 credit,*

### **HAO 590: Independent Study in Occupational Therapy**

Students develop and/or implement their research projects under the mentorship of the course instructor and a faculty advisor who has expertise in their chosen topic. Literature reviews are completed and the project is prepared in a format appropriate for professional publication or presentation.

*2 credits,*

*May be repeated 3 times FOR credit.*

**HAO 593: Case Studies**

This clinical reasoning seminar focuses on the synthesis of all clinical and academic coursework in formulating a comprehensive plan of care. Emphasis is placed on students responding spontaneously to case presentations in class, much as they would be expected to do in the clinical setting. Prerequisite: Successful completion of all prior coursework.

2 credits,

**HAO 595: Service Learning and Capstone Project**

Incorporates in-depth theoretical and practical knowledge for maximum integration of service and classroom work. Includes discussion, journals, essays and other reflective writing methods. Explores reflection, action skill building, and examination of theory and practice of citizenship as applied through community involvement. Students provide 30 hours of service learning. A scholarly project will be the culminating activity for the program. Students will present outcomes of their service learning project in poster format. Prerequisite: HAO 597 and successful completion of all prior coursework

4 credits,

**HAO 596: Fieldwork Level IIA**

Fieldwork IIA is an in-depth clinical experience in the delivery of occupational therapy services. According to AOTA guidelines, this fieldwork is designed to promote clinical reasoning and reflective practice; transmit values and beliefs that enable the application of ethics related to the profession; enable the student to communicate and model professionalism as a developmental process and career responsibility; and develop and expand a repertoire of occupational therapy assessments and interventions related to human occupation and performance. This first of two level II fieldwork experiences exposes the student to a variety of clinical conditions in a specific practice area for 12 weeks on a full time basis. Prerequisite: Successful completion of all prior coursework.

12 credits, S/F graded

**HAO 597: Fieldwork IIB**

This second clinical fieldwork experience provides the occupational therapy student with opportunities to apply the knowledge and skills learned thus far in the curriculum. Students will be assigned to a fieldwork site for 12 weeks on a full time basis in a particular area of practice. Prerequisite: HAO 596

12 credits, S/F graded

**HAO 599: Fieldwork Continuation**

This course is for occupational therapy students continuing with Fieldwork.

S/F graded

May be repeated for credit.

**HAO 600: Foundations and Theory in Occupational Therapy**

This course provides students with an understanding of the core principles of occupational therapy using the Occupational Therapy Practice Framework. The primary theories, models, and frames of reference that guide occupational therapy practice are introduced and applied using problem-based learning to facilitate future clinical courses.

3 credits,

**HAO 601: Group Process, Client Communication, and Therapeutic Use of Self**

This course teaches basic group and individual client-therapist interaction skills including methods of establishing rapport, giving feedback and employing therapeutic use of self. Students use frames of reference and practice models to design client-centered groups, write group protocols, analyze activities, implement specific group techniques and evaluate progress of self and group members. Prerequisites: All prior coursework must be completed

2 credits,

**HAO 602: Occupational Therapy Task & Contextual Analysis**

This course teaches students the process of activity analysis related to tasks and contexts. Students will analyze how body structures, body function, and client factors can support or hinder occupational performance. In addition, the students will develop the skills to analyze the various contextual features that can impact occupational performance. Prerequisites: All prior coursework must be completed

2 credits,

**HAO 603: Occupations Across the Lifespan**

The course provides students with knowledge of developmental theories and factors influencing the normal developmental process. Developmental norms and sequences are examined with emphasis on physical (sensory and motor), cognitive, and psychosocial tasks. Cultural and environmental influences on development are also discussed. The coursework covers prenatal, child, adolescent, and adult development. Prerequisites: All prior coursework must be completed

2 credits,

**HAO 610: Functional Human Anatomy**

This course provides an anatomical review of all body systems so that students can acquire a basic working knowledge of the functional structure of the human body. This knowledge is foundational for all other courses in the Occupational Therapy Program. Students will apply this knowledge of anatomy to formulate hypotheses about occupational dysfunction associated with abnormalities within the body's systems. Students will apply anatomical concepts discussed in class to occupational therapy case study examples and will critique and appraise research papers related to anatomical concepts discussed in lecture and lab.

4 credits,

**HAO 611: Functional Neuroscience**

This course describes the role of the nervous system in normal movement, cognition, and emotional functioning across the life span. It builds the foundation for professional theory and practice courses by providing neuroscience knowledge related to motor, sensory, and cognitive systems in order to understand movement and function, relate it to occupational performance deficits in the physical and cognitive domains, and to understand selected pathological conditions. The course presents an integrated approach to the general principles of organization and function of the autonomic, peripheral and central nervous systems. These principles will be presented in a systems approach to Neuroscience. The anatomy of a system will be followed with its physiology, pathophysiology, relation to human function, and clinical relevance to the occupational therapist. Clinical topics will include neurological testing, control of posture and balance, pain, muscle tone and spasticity, feedback versus feed-forward control, reflex versus voluntary control, control of reaching and locomotion, perception, and learning. Prerequisites: All prior coursework must be completed

3 credits,

**HAO 612: Movement for Occupational Performance**

This course is designed to establish a basis of biomechanical principles as well as detailed understanding of the osteokinematics and arthrokinematics of the various joints of the body. Normal and pathological movement is analyzed in relation to the impact on occupational performance. Prerequisites: All prior coursework must be completed

4 credits,

**HAO 613: Conditions in Occupational Therapy**

This first-year occupational therapy course will address clinical diagnoses, symptomatology, and prognosis of many major clinical conditions commonly encountered in current practice. In addition, there will be an emphasis on the impact of disease on individual physical, cognitive and emotional function and on families and society. Case studies will be utilized within this course to enable students to relate major theories and frames of reference to treatment approaches for common diagnoses and medical conditions. Prerequisites: All prior coursework must be completed

*2 credits,*

**HAO 620: Assessment and Intervention in Mental Health**

This course will explore the psychosocial aspects of disability as they affect the function of the individual, the family, and the community. Lectures and presentations will be related to the recognition of psychosocial problems and how they can be better understood, minimized, or eliminated. The provision of mental health services across all levels of care will be delineated. Multicultural factors will be discussed as they relate to mental illness and the recovery process. The course exposes the occupational therapy student to the Diagnostic and Statistical Manual of Mental Disorders (5th edition) (DSM-V) and the pharmacology of major mental illnesses. Psychosocial theories guiding assessment and intervention will be thoroughly discussed. Interviewing skills are demonstrated and practiced in the lab sessions. The use of group theories, the structure and function of groups in treatment, the analysis of group treatment and group activities, and the therapeutic use of self are the focus of laboratory and lectures. Students will be introduced to and given the opportunity to practice a variety of assessments utilized in psychosocial occupational therapy practice. This course is to provide the student with the knowledge, skills, and attitudes necessary to function as an occupational therapist in a psychosocial/ mental health treatment setting. Prerequisites: All prior coursework must be completed

*4 credits,*

**HAO 621: Assessment and Intervention in Physical Rehabilitation**

The course focuses on occupational therapy and physical disabilities as they pertain to the adult population. Injury, illness, and disease and the effect on the functioning of the individual in self-care, work, and leisure are explored. It provides students with

knowledge, laboratory experiences, and a framework to provide services to adults with physical dysfunction. This course addresses occupational therapy values, theory and practice, including frames of reference, evaluation, treatment planning, and a selection of age-appropriate occupations to support occupational performance, occupational analysis, and discharge planning. Students are provided with opportunities to demonstrate development of entry level documentation skills (evaluation, treatment planning, progress notes, discharge planning) and experiences to develop oral communication skills in preparation for fieldwork. The course is designed with laboratory sessions providing students with varied opportunities to develop an entry level knowledge base and broad-based clinical skills to successfully complete Fieldwork Level I and II experiences with a variety of clients in multiple types of traditional or community-based settings. Prerequisites: All prior coursework must be completed

*4 credits,*

**HAO 622: Assessment & Intervention in Young Children**

This course will provide an overview of occupational therapy in pediatrics, emphasizing the child from birth to five years of age and their families in the context of the environment, and culture. It will also present occupational therapy theories, assessments, and treatment processes as they pertain to current pediatric practice. This course will also analyze the predominant models of current practice and integrate effective treatment interventions. Abnormal development, acute and chronic medical conditions, and their resulting effects on the central nervous system, orthopedic and musculoskeletal systems will be addressed. Students will select occupation-based activities while adapting age and developmentally appropriate evaluations and treatment intervention strategies. The course material will utilize principles and methods of evaluation to include clinical reasoning, critical thinking, and evidence-based practices. Prerequisites: All prior coursework must be completed

*3 credits,*

**HAO 623: Assessment and Intervention in School-Based Practice**

This course presents occupational therapy theories, assessments, and treatment processes as they pertain to current pediatric practice for children and adolescents in the school-based setting. The predominant models of current pediatric practice with evidence-based treatment interventions are introduced

to the student. Emphasized in the course are abnormal development, acute and chronic medical conditions and their resulting effects on the central nervous system, orthopedic and musculoskeletal systems. The course also reviews major causes of disability, the etiology and prognosis and the impact on the family system and cultural implications. Students learn to select and adapt age and developmental stage appropriate evaluation and treatment intervention strategies. Finally, the students will learn how to analyze occupation-based activities for school aged individuals. Prerequisites: All prior coursework must be completed

*3 credits,*

**HAO 624: Assessment and Intervention in Substance Abuse Treatment**

This course addresses the physiological, sociological, and psychological effects of substance abuse on the abuser and his/her environment. Drug classifications will be presented, along with effects and withdrawal symptoms. Treatment models, philosophies, and methods are discussed. Students will learn how to design both individual and group interventions. The occupational therapist's role in the evaluation and treatment of substance abuse across the life-span and across disabilities will be explored and discussed in detail. The use of 12-step programs and alternative treatment models will be reviewed, as will prevention programs, such as smoking cessation. Prerequisites: All prior coursework must be completed

*2 credits,*

**HAO 625: Physical Agent Modalities**

This course presents physical agent modalities utilized as an adjunct to occupational therapy treatment. Modalities include therapeutic applications of thermotherapy, cryotherapy, ultrasound, paraffin, transcutaneous electrical nerve stimulation (TENS), and functional electrical stimulation (FES). The student will have the opportunity to practice the application of each modality on their peers. The physiological effects of physical agent modalities and their clinical uses and precautions/contraindications are addressed. Prerequisites: All prior coursework must be completed

*1 credit,*

**HAO 626: Assessment and Intervention of the Older Adult**

This course focuses on the role of occupational therapy with older adults in a variety of rehabilitative settings (inpatient, short term rehabilitation, home care, and outpatient),

long-term care, community-based programs (health and wellness, fall prevention), alternative housing environments, and hospice. The aging process and its effects are explored, as are common impairments and rehabilitation needs of elders. Students also learn psychosocial and environmental influences on the heterogeneous aging experience of elders, with attention to supporting autonomy and the older person's strengths in any context. Course lectures and activities address evidence-based practice, policy, and legislative issues that affect older adults, with topics including interpersonal relationships, assistive devices and equipment, community mobility, and aging in place. Applying this knowledge, students will develop and demonstrate entry-level skills in evaluation, treatment planning and delivery, documentation, and discharge planning (including collaborative client and family education) of older adults. Finally, this course is designed with laboratory sessions to provide students with varied opportunities to demonstrate knowledge to enhance the occupational participation, performance, and quality of life of older persons. Prerequisites: All prior coursework must be completed

*3 credits,*

#### **HAO 627: Technological Applications in Occupational Therapy**

The course centers on adapting the environment to improve the client's quality of life and enable societal reintegration. Areas covered include the Americans with Disabilities Act, mobility (power and manual), seating/positioning systems, adapted toys, augmentative communication systems, computer access, environmental control units, independent living aids, and vocational adaptations. The students analyze and integrate concepts of aging in place, functional capacity evaluations, and ergonomics. In addition, the students will be exposed to the different kinds of work settings that occupational therapists are employed in, become aware of federal regulations for work-related programs, and the certification requirements for this emerging practice area. The course material will include virtual environments, electronic medical records and telehealth technology as it relates to assistive technology, Functional Capacity Evaluations (FEC), aging in place, and work programs. Practical application of the principles discussed in lecture will be available during the course. Prerequisites: All prior coursework must be completed

*3 credits,*

#### **HAO 628: Contemporary and Emerging Practices in Occupational Therapy**

The course explores the delivery of occupational therapy services in emerging areas of practice. It provides students with knowledge of alternative models of service delivery and occupational therapy roles in care coordination, consulting, and case management. Students will learn about and discuss interprofessional role development and delineation. Further, they will build on their prior knowledge of the scope of occupational therapy to gain an understanding of ethical practice, malpractice and liability concerns, insurance reimbursement, and licensure statutes related to emerging practice areas. Students will participate in the process of identifying opportunities for occupational therapy's expansion via contemporary, nontraditional, and emerging practice areas, and will explore opportunities for their advanced doctoral capstone experiences. This course will prepare students to communicate and advocate for occupational therapy practice via various mechanisms and across audiences including potential funders, policy makers, the local/regional public, and interprofessional colleagues. Prerequisites: All prior coursework must be completed

*3 credits,*

#### **HAO 629: Wellness and Health Promotion in Occupational Therapy**

This course discusses the role of occupational therapy in wellness and health promotion. Students examine theories and evidence-based occupational therapy practice of health promotion and disease prevention for well and at-risk populations. Also explored is how occupation and lifestyle impact wellness, health, participation, and the prevention of disease and dysfunction in individuals, groups, and populations. Models of health promotion will be discussed and applied to demonstrate knowledge of how environmental contexts and epidemiological factors impact population health and welfare. This course prepares students to design and evaluate health promotion and wellness programs and to advocate for health promotion and wellness in their future practice settings and their own lives. Prerequisites: All prior coursework must be completed

*3 credits,*

#### **HAO 630: Global to Community Practice in Occupational Therapy**

This course presents the importance of occupation as a precursor to health, and of occupational therapy as a health promoting profession. Theories and applications of occupational science will be examined through a review of the professional literature and class discussion. This course provides students

with an occupational perspective of health that will be the foundation for a community-based practice program. The course will also review social theories, sociocultural and sociopolitical trends that impact the individual's health status and the delivery of health care services. The student will demonstrate their depth of understanding through the design and presentation of an evidence-based, theoretically grounded, culturally, and temporally situated, community program. Prerequisites: All prior coursework must be completed

*2 credits,*

#### **HAO 631: Professional Behaviors**

In this course, the students work on documentation and communication skills for entry-level practice. Each student has the opportunity to discuss professional behavior expectations from their clinical fieldwork assignments. Reflective journaling is used to enhance professional development and to assist students in developing and documenting their clinical competence. The supervisory process is explored in detail, in the context of its use for personal and professional growth. The role of the occupational therapy assistant and other healthcare professionals, as both colleagues and collaborators, is discussed. The importance of life-long learning and advocacy is emphasized. Prerequisites: All prior coursework must be completed

*2 credits,*

#### **HAO 650: Evidence Based Practice in Occupational Therapy**

This course will provide students with knowledge on how to conduct literature searches, collect and analyze information to address a well-developed, clear, specific, answerable clinical question as the first step in the development of evidence-based practice. The students will use the literature to identify, assess, and discuss the value of implementing the treatment evidence. Prerequisites: All prior coursework must be completed

*2 credits,*

#### **HAO 651: Introduction to Research Approaches and Designs**

This course provides a foundation for future professional and scholarly activities. The importance of research for evidence-based practice is highlighted. Students learn research concepts and qualitative, quantitative, and mixed-methods research. Instruction in how to review and critique published, peer-reviewed research, identify research topics of interest, and initiate the literature review process is presented to the student. Tools needed to critique commonly used assessment tools in

occupational therapy and to use and interpret standardized scores are included in the course. Students are required to have training in research ethics, such as "Responsible Conduct of Research" and "Protection of Human Subjects in Research". Professional writing skills, which include writing grant proposals, research protocol development, and research presentations are also introduced in this course. Prerequisites: All prior coursework must be completed

2 credits,

### **HAO 652: Statistics in Occupational Therapy Research**

Presents fundamentals of statistics and data analysis. Topics include descriptive statistics, statistical inference, tests for experimental comparisons, correlation, regression, and nonparametric tests. Students learn to use available computer programs for data management and statistical analysis. Discusses validity and reliability of various statistical techniques. Prerequisites: All prior coursework must be completed

2 credits,

### **HAO 660: Healthcare Policy & Advocacy in Occupational Therapy**

This course provides students with an overview of trends in health care delivery systems and policymaking in the 21st century. A range of topics is included: health care systems; health policy and advocacy; outpatient and primary care; long-term care; medical technology; determinants of health and health disparities; and health services for special populations, among other current topics. The student will evaluate the human impact of health care policy and articulate the need for and process of advocacy for populations and individual clients. In addition, the student will examine and articulate the distinct value of occupational therapy within the changing healthcare system and understand how occupational therapy functions within different funding mechanisms. Prerequisites: All prior coursework must be completed

2 credits,

### **HAO 661: Management and Business Fundamentals in Occupational Therapy**

This course is designed to utilize lectures and activities to assist the learner in creating a business plan for an OT service. In the course of this process the student will learn skills involved in setting up a business, being a manager of people, budgets, and services, using evidence to guide management, and how to manage for change. This is a hybrid course that will consist of both online coursework, lectures and discussions along with on-site

activities. Prerequisites: All prior coursework must be completed

2 credits,

### **HAO 662: Visionary Leadership in Emerging Practice**

This course explores innovative, non-traditional and emerging areas of occupational therapy practice. Students meet and dialog with occupational therapy practitioners and/or other health care professionals who have developed private practices, are consultants, and are involved in emerging areas of practice. Students use timely articles concerning health care trends and non-traditional/emerging practice areas to create a potential IPE event for a community. Builds upon student's prior knowledge and coursework and integrates American Occupational Therapy Association (AOTA)'s Standards of Practice, Core Values and Attitudes of OT, and AOTA's Code of Ethics, with attention to current and potential OT/OTA partnerships in community and non-traditional settings. Prerequisites: All prior coursework must be completed

2 credits,

### **HAO 680: FW IA- Mental Health**

This course is the first of three introductory level I clinical experiences and offers the student the opportunity to identify symptomatology, observe treatment interventions, and formulate treatment plans in a psychosocial practice setting. In addition, the student will have opportunities to observe effective communication skills used with patients and professionals. This course will also promote the development of professional behaviors and skills by the student. Prerequisites: All prior coursework must be completed

1 credit,

### **HAO 681: Fieldwork IB- Physical Disabilities**

The course is the second of three introductory level clinical experiences. It offers the student the opportunity to identify symptomatology, observe treatment interventions and formulate treatment plans in a physical disabilities practice setting. The student will be exposed to effective communication skills used with patients and professionals. The use of reflective journals to monitor development of professional behaviors and skills will enhance the students' growth. Prerequisites: All prior coursework must be completed

1 credit,

### **HAO 682: Fieldwork IC- Pediatrics**

This course is the third of three introductory level clinical experiences and offers the student the opportunity to identify symptomatology, observe treatment interventions, and formulate treatment plans in a pediatric practice setting. In addition, the student will have opportunities to observe effective communication skills used with patients and professionals. This course will also promote the development of professional behaviors and skills by the student. Prerequisites: All prior coursework must be completed

1 credit,

### **HAO 683: Fieldwork IIA**

Fieldwork IIA is an in-depth clinical experience in the delivery of occupational therapy services. According to AOTA guidelines, this fieldwork is designed to promote clinical reasoning and reflective practice; transmit values and beliefs that enable the application of ethics related to the profession; enable the student to communicate and model professionalism as a developmental process and career responsibility; and develop and expand a repertoire of occupational therapy assessments and interventions related to human occupation and performance. This is the first of two-level II fieldwork experiences that expose the student to a variety of clinical conditions in a specific practice area for 12 weeks on a full-time basis. Prerequisites: All prior coursework must be completed

12 credits,

### **HAO 684: Fieldwork IIB**

Fieldwork IIB is an in-depth clinical experience in the delivery of occupational therapy services. According to AOTA guidelines, this fieldwork is designed to promote clinical reasoning and reflective practice; transmit values and beliefs that enable the application of ethics related to the profession; enable the student to communicate and model professionalism as a developmental process and career responsibility; and develop and expand a repertoire of occupational therapy assessments and interventions related to human occupation and performance. This is the second of two-Level II fieldwork experiences that expose the student to a variety of clinical conditions in a specific practice area for 12 weeks on a full-time basis. Prerequisites: All prior coursework must be completed

12 credits,

### **HAO 690: Capstone Project Proposal**

This course is the first of the capstone sequence and will prepare students for their Capstone Residency and Project. Students will

explore their interest area(s) for their residency and identify relevant projects. Students will create a plan for development of their capstone with clear learning objectives that demonstrate a focus on in-depth knowledge. Prerequisites: All prior coursework must be completed

*2 credits,*

### **HAO 691: Capstone Residency**

The full-time, 14-week doctoral capstone experience is the second course in the doctoral capstone sequence. The capstone residency enables students to achieve specialized skills in one or more of the following areas: clinical practice skills, research skills, administration, leadership, program and/or policy development, advocacy, education, theory development, or other innovative practice. Under the supervision of an expert mentor, students will execute their doctoral capstone plan established in HAO 690 by meeting the individualized objectives and completing a relevant culminating capstone project. Prerequisites: All prior coursework must be completed

*14 credits,*

### **HAO 692: Capstone Project Completion and Dissemination**

This course will conclude the occupational therapy doctoral capstone sequence. Students will complete, present, and disseminate their capstone projects. Prerequisites: All prior coursework must be completed

*2 credits,*

## **HAP**

### **Physician Assistant**

#### **HAP 501: Community Health and Service Learning for Physician Assistant**

Provides opportunities for PA students to learn and reinforce medical knowledge and skills through service to local and international communities. Learning methods will enhance the acquisition of clinical skills, cultural competencies and expand knowledge of community resources for underserved populations. Open to entry-level PA students only.

*2 credits,*

#### **HAP 504: Professional Practice Issues**

Provides information critical to understanding the development and organization of the physician assistant profession in the United States. Explores the dynamics of PA practice, including such issues as responsibilities to patients and the public, professional

regulation and involvement, team care, cultural diversity, and developing trends in PA practice. Encourages the exploration, critiques, and evaluation of professional practice issues related to the quality, delivery and cost-effectiveness of our nation's health care system. Open to entry-level PA students only.

*2 credits,*

#### **HAP 509: Integrative Systems Physiology**

Introduces students to human integrative systems physiology. Includes exposure to physiological control systems, emphasizes in detail each organ system and how homeostasis is maintained. Includes membrane, muscle, central and peripheral nervous system, cardiovascular, respiratory, renal, gastrointestinal, and endocrine physiology. Presents material and incorporates select examples of pathophysiology to emphasize relevance of material. Students will solidify an understanding of the structures and functions across all systems in the human body under normal conditions and select pathophysiology. Knowledge gained of normal function will be applied towards making predictions about physiologic function in response to disease states. Students are expected to gain a cumulative understanding of physiologic function and are challenged to apply this knowledge towards problem solving and interpreting physiologic scenarios. Open to entry-level PA students only.

*4 credits,*

#### **HAP 510: Clinical Laboratory Medicine**

Presents fundamental principles of laboratory medicines. Strengthens the student's ability to select, perform and interpret the results of basic clinical laboratory procedures to aid in formulating a preliminary diagnosis and management plan. The course is offered after students have acquired a foundation in human physiology and anatomy. Open to entry-level PA students only.

*3 credits,*

#### **HAP 512: Principles of Clinical Pharmacology**

Physician assistant students will learn to rationally and safely prescribe pharmaceuticals for patients in a variety of clinical settings. Emphasizes the integration of pharmacologic principles and properties with the clinical uses of the most commonly prescribed medications and provides an opportunity for students to deepen understanding and application of knowledge in the setting of patient clinical cases. Reinforces and integrates course information with content learned during

the Clinical Medicine courses of the PA curriculum. Open to entry-level PA students only.

*6 credits,*

#### **HAP 514: The Problem Oriented Medical Record-History and Physical Examination**

The course provides students with an organized, sequential approach to the history and physical examination. Students will be able to perform both complete and directed histories and physical examinations and accurately document their findings. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information. Open to entry level PA students only.

*5 credits,*

#### **HAP 516: Problem Based Learning (PBL)**

Provides students with the opportunity to develop critical thinking and problem solving skills in a seminar, small group environment. Students will learn to connect the knowledge and attitudes developed in behavioral, basic and clinical science courses and apply it to patient care. Increases student capacity to seek and apply knowledge as individual problem solvers and members of a health care team. Open to entry level PA students only.

*1 credit, S/F graded*

#### **HAP 518: Medical Director Presentation Rounds**

Provides students with feedback on oral presentations derived from patient history and physical examinations completed by students. Evaluations are based on student's ability to critique an incomplete history and physical, identify issues that require further discussion in the HPI and physical exam, write a complete problem list, and document an assessment and plan. Open to entry level PA students only.

*S/F graded*

*May be repeated 2 times FOR credit.*

#### **HAP 521: Clinical Medicine I**

Focuses on mastery of the knowledge, skills, and attitudes necessary to construct a comprehensive patient database and management plan. Students are introduced to, and become proficient in, medical interviewing and performing a physical examination. Emphasizes the process of synthesizing data to formulate a diagnostic plan through learning activities such as lectures, small group process, problem based learning, case studies, and clinical skills laboratories. Teaches data gathering and recording in the

problem oriented medical record format. The diagnostic process is taught in an organ systems (or medical subspecialty) approach. Students learn to recognize and manage physical and mental health problems. Students are encouraged to think critically as an integral part of developing a logical, sequential and humanistic approach to their patient responsibilities and mastering medical information. The ultimate goal of these clinical medicine courses is to insure that students are optimally prepared to participate in the delivery of high quality medical care in both an in-patient and out-patient setting. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information. Open to entry-level PA students only.

5 credits,

### **HAP 522: Clinical Medicine II**

Focuses on mastery of the knowledge, skills, and attitudes necessary to construct a comprehensive patient database and management plan. Students are introduced to, and become proficient in, medical interviewing and performing a physical examination. Emphasizes the process of synthesizing data to formulate a diagnostic plan through learning activities such as lectures, small group process, problem based learning, case studies, and clinical skills laboratories. Data gathering and recording are taught in the problem oriented medical record format. The diagnostic process is taught in an organ systems (or medical subspecialty) approach. Students learn to both recognize and manage physical and mental health problems. Students are encouraged to think critically as an integral part of developing a logical, sequential and humanistic approach to their patient responsibilities and mastering medical information. The ultimate goal of these clinical medicine courses is to insure that students are optimally prepared to participate in the delivery of high quality medical care in both an in-patient and out-patient setting. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information. Prerequisite: HAP 521 (minimum grade of B-). Open to entry-level PA students only.

7 credits,

### **HAP 523: Clinical Medicine III**

Focuses on mastery of the knowledge, skills, and attitudes necessary to construct a comprehensive patient database and management plan. Students are introduced to, and become proficient in, medical interviewing and performing a physical examination. Emphasizes the process of synthesizing

data to formulate a diagnostic plan through learning activities such as lectures, small group process, problem based learning, case studies, and clinical skills laboratories. Data gathering and recording are taught in the problem oriented medical record format. The diagnostic process is taught in an organ systems (or medical subspecialty) approach. Students learn to recognize and manage physical and mental health problems. Students are encouraged to think critically as an integral part of developing a logical, sequential and humanistic approach to their patient responsibilities and mastering medical information. The ultimate goal of these clinical medicine courses is to insure that students are optimally prepared to participate in the delivery of high quality medical care in both an in-patient and out-patient setting. Prerequisite: HAP 522 (minimum grade of B-). Open to entry-level PA students only.

6 credits,

### **HAP 524: Clinical Medicine IV**

Focuses on mastery of the knowledge, skills, and attitude necessary to construct a comprehensive patient database and management plan. Students become proficient in utilizing the history and physical information as they begin to synthesize data to formulate a diagnostic plan. This is emphasized through learning activities such as lectures, small group process, case studies, and clinical skills laboratories. The diagnostic process is taught in an organ systems approach. Students learn to both recognize and manage physical and mental health problems. Students are encouraged to think critically as an integral part of developing a logical, sequential and humanistic approach to their patient responsibilities and mastering medical information. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information. Prerequisite: HAP 523 (minimum grade of B-). Open to entry-level PA students only.

9 credits,

### **HAP 528: Genitourinary, Sexual and Reproductive Health**

A comprehensive introduction to obstetrics and gynecology (OB/GYN), female and male genitourinary system (GU) and human sexuality. Students will learn about structures, function, evaluation and treatments of the various diseases and conditions. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information. Open to entry level PA students only.

4 credits,

### **HAP 532: Diagnostic Imaging**

Provides an overview of common diagnostic imaging modalities and their indications, limitations, benefits and potential risks. Students learn how to utilize plain radiographs and other imaging studies in the diagnosis of disease with an emphasis on recognition of normal findings and their comparison to the abnormalities found in disease processes. Open to entry-level PA students only.

2 credits,

### **HAP 534: Introduction to Clinical Psychiatry**

Presents key principles of psychiatric evaluation and interviewing to include the mental status exam. Focuses on psychiatric problems seen in primary care, introduces the differential diagnosis and treatment of major psychiatric disorders such as anxiety, personality and mood disorders, psychosis, substance abuse, and somatoform disorders. Fosters an awareness of social patterns that exert an impact on mental functioning. Open to entry-level PA students only.

3 credits,

### **HAP 545: Ethics and Health Care for Physician Assistants**

Provides an overview of ethics in health care in a rapidly changing society. Teaches students to approach ethical dilemmas using theoretical frameworks and decision making processes. Explores ethical issues surrounding health care reform and public health policy and includes distribution of resources and rationing of services. Introduces students to the ethical perspectives of euthanasia, reproduction, transplants, genetics, research on human subjects, pediatrics, cloning, stem cells and mental health through case studies. Reviews classic cases in health care ethics and their shaping of health policy. Discusses patient education and the Physician Assistant professional codes of ethics and standards. Open to entry-level PA students only.

3 credits,

### **HAP 549: Clinical Skills for the Physician Assistant Student**

The clinical skills course provides the physician assistant student with an overview of common clinical procedural skills and their indications, limitations, benefits and potential risks. Students are taught how to perform a number of commonly performed clinical procedures. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information. Open to entry level PA students only.

1 credit, S/F graded

**HAP 551: Research Design and Evidence-Based Medicine**

Provides students with basic knowledge and skills needed to formulate research questions and hypotheses, develop research protocols, critically evaluate and analyze scientific and medical journals, and to conduct computerized searches and literature reviews. Describes principals of Evidence-Based Medicine and emphasizes various types of clinical questions and tools available to answer them. By the end of this course, the student will choose a proposed topic for their capstone project. Open to entry-level PA students only.

2 credits,

**HAP 561: Master's Project I**

Students will work with a faculty mentor to develop a clinical question and perform an initial literature search on a topic of interest. Topics should be well-focused and may include psychological, economic or ethical issues in health care as well as diagnostic or treatment-related questions. Following review by a faculty mentor, the student will submit summaries of selected articles as well as a outline. Open to entry-level PA students only. Prerequisite: HAP 551

1 credit,

**HAP 562: Masters Project II**

Students will work with their faculty mentor to refine a clinical question and revise the presentation outline and article summaries submitted at the end of HAP 561. Emphasis will be placed on thoroughness of the literature search and clarity of the presentation. By completion of this course, students should have the presentation in its final form, and have developed a draft of a final paper. Open to entry-level PA students only. Prerequisite: 561

1 credit,

**HAP 563: Masters Project III**

Students will revise the presentation submitted at the end of HAP 562 with input from their faculty mentor, who will guide them in developing a concise, professional-appearing product, suitable for presentation at a professional conference. Students will present this to the faculty and other members of the class, and will be evaluated on the content, visual, and oral components of their work. Students will also complete and submit their final paper. Open to entry-level PA students only. Prerequisite: HAP 562

1 credit,

**HAP 570: Internal Medicine Clerkship**

Provides practical clinical experience in caring for adult hospitalized patients on a

medical service. Strengthens the student's skills in developing a comprehensive database with regard to a wide variety of common inpatient medical problems, stressing mastery of cognitive and affective information that enables the student to recognize normal and assess deviation from normal, and effectively consult and refer. Exposure to out-patient care is often included. Students learn to address personal and social issues that influence the care of the medical patient. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information. Prerequisite: Successful completion of preclinical year courses.

5 credits,

**HAP 571: Obstetrics and Gynecology Clerkship**

Provides students with practical clinical experience in the differential diagnosis, evaluation, management, and consultation and referral for normal and abnormal conditions in obstetrics and gynecology. Students will gain skills in obtaining patient histories, physical diagnosis and medical decision making through exposure to a broad base of patients with a wide variety of personal and social issues that influence patient care. Prerequisite: Successful completion of preclinical year courses.

5 credits,

**HAP 572: General Surgery Clerkship**

Provides students with practical clinical experience in the evaluation and management of surgical patients. Through exposure to a broad base of surgical patients, students will master the knowledge, attitudes and skills necessary to obtain focused patient histories and physical exams, construct a differential diagnosis, make sound medical decisions, and effectively consult and refer. Students will learn to address a variety of personal and social issues that influence the care of the surgical patient. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information. Prerequisite: Successful completion of preclinical year courses.

5 credits,

**HAP 574: Emergency Medicine Clerkship**

Provides students with practical clinical experience in the medical care of acutely ill or injured patients. Students will enhance skills in obtaining focused patient histories, performing focused physical examinations, mastering emergency medical management and decision making, and effective consultation and referral. Emphasis is placed on student recognition of

life threatening situations and the response to such situations. Students will learn to address a wide variety of personal and social issues that influence the care of the emergency medical patient. Prerequisite: Successful completion of preclinical year courses.

5 credits,

**HAP 575: Psychiatry Clerkship**

Provides students with practical experience in the recognition, evaluation and management of patients with mental illness. Through clinical interaction with mental health patients and workers, students will develop an understanding of the biological and psychosocial factors that influence a variety of psychiatric conditions, and effectively consult with other professionals and refer patients to the support services that are required to optimize the care of the psychiatric patient. Students will learn to address a wide variety of personal and social issues that influence the care of this patient population. Prerequisite: Successful completion of preclinical year courses.

4 credits,

**HAP 576: Medicine Preceptorship**

Provides students with practical clinical experience working with the ambulatory medical patient. This preceptorship augments and develops directed data collection skills emphasizing a wide range of primary care medical problems and their management. Cognitive and affective skills that enable the student to recognize normal and assess abnormal findings and effectively consult and refer are a key aspect of learning during this experience. Students will learn to address a wide variety of personal and social issues that influence the care of the medical patient. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information. Prerequisite: Successful completion of preclinical year courses.

5 credits,

**HAP 577: Pediatric Preceptorship**

Provides students with practical clinical experience working with ambulatory pediatric patients. Through exposure to a wide variety of primary care pediatric problems, students will develop directed data collection and patient management skills and learn how to effectively consult and refer. The preceptorship stresses those cognitive and affective skills that enable the student to recognize normal findings and assess abnormal findings. Students will learn to address a wide variety of personal and social issues that influence the care of the pediatric patient.



5 credits,

### HAP 579: Geriatrics Clerkship

Provides students with practical clinical experience in working with elderly patients. Augments and strengthens students' skills in developing a thorough database and enhances student understanding of when to request a consultation or make a referral. Students work with a wide variety of common geriatric problems and learn how to appropriately modify their management approach to the indications, limitations, and methodology of diagnostic procedures and therapeutic regimens in the elderly. Students will also learn to address a wide variety of personal and social issues that influence the care of the geriatric patient. Prerequisite: Successful completion of preclinical year courses.

5 credits,

### HAP 580: Orthopedic Clerkship

Provides students with practical experience in the care of patients with musculoskeletal disorders and acute injuries in the primary care setting. Students will develop the knowledge, attitudes and skills necessary to obtain directed patient histories, perform focused physical exams, make sound clinical decisions, and effectively consult and refer through exposure to patients with a wide variety of orthopedic problems. Students will learn to address a wide variety of personal and social issues that influence the care of the orthopedic patient. Prerequisite: Successful completion of preclinical year courses.

4 credits,

### HAP 581: Clinical Elective

Provides students with the opportunity to explore an area of medical or surgical practice beyond basic required rotations. Students are encouraged to choose an area of emerging importance in health care and PA practice and/or a potential employment setting. This elective clerkship further augments and develops patient management skills in the chosen medical or surgical discipline and must be selected in consultation with the student's program faculty advisor. Students will learn to address a wide variety of personal and social issues that influence the care of many patients. Prerequisite: Successful completion of preclinical year courses.

4 credits,

### HAP 599: Clinical Continuation

This course is for physician assistant students continuing with clinical.

S/F graded

May be repeated for credit.

## HAS

### Allied Health

#### HAS 500: SHTM Advanced Standing

Place holder credits for Health Technology and Management students.

0-9 credits, S/F graded

May be repeated 3 times FOR credit.

#### HAS 561: Spanish for Healthcare Professionals

This course combines an overview of intermediate-level Spanish grammar with vocabulary and cultural elements relevant to the healthcare field. Intended for health professional students. Prerequisite: At least 2 semesters of college level Spanish or 2 years of high school Spanish. Please contact the instructor if you are not sure about your proficiency level.

1 credit,

#### HAS 590: Independent Study

Independent study proposals in health sciences. Must have the approval of the Research and Directed Study Committee of the School of Health Professions prior to registration.

0-6 credits,

#### HAS 591: Independent Readings

Supplementary specialized readings for graduate students under faculty supervision. Topics include but are not limited to: community and public health, mental health, health policy, health care management, health care ethics, gerontology, patient education and health economics and policy. Approval must be obtained from the Research and Directed Study Committee of the School of Health Technology and Management prior to registration.

1-3 credits,

#### HAS 592: Special Topics

Presents a comprehensive look at specific aspects of health policy from all relevant perspectives. Synergizes scientific, legislative and ethical points of view and how their relationship to policy formulation and implementation. Students will expand skills to effectively articulate details of the policy and develop an educated position on it. Dynamic discussion, essay writing and debate will be utilized to gauge information comprehension and opinion development.

3 credits,

May be repeated 2 times FOR credit.

#### HAS 599: Maintenance of Matriculation

This course is for students who are maintaining matriculation while engaging in consultation with faculty regarding completion of courses and/or master's project. Students will be graded S/F.

0-3 credits, S/F graded

May be repeated for credit.

## HAX

### Health and Rehabilitation Sciences

#### HAX 600: Doctoral Seminar

Provides a venue for faculty and doctoral students to discuss all aspects of their research. Researchers will present different branches of translational science and discuss linkage between research agendas. Provides opportunity for data to be viewed and analyzed by investigators with different perspectives and tools for analysis. Offered in the

Fall, S/U grading

May be repeated for credit.

#### HAX 602: Frameworks, Models and Classification Systems in Health and Rehabilitation Sciences

Examines the dynamic interaction between health, disability, and community and contextual factors as identified using different frameworks and models. These frameworks and models will be expounded to recognize the influence of each solely and collectively in terms of health and rehabilitation research, disability studies, and behavioral and community health research. Explores parallels and divergences in approaches with particular attention to analyzing how students in varied concentrations can work together to engage in meaningful translational research within the domains of historical and present-day society and research paradigms.

3 credits,

#### HAX 605: Research Ethics

Presents a broad overview of research ethics and regulation. Conveys the moral bases of scientific ethics, the historical evolution of social science and biomedical research ethics, and the development, implementation and limitations of U.S. human subjects regulations. Includes ethics and morality in science; science in society; scientific integrity; misconduct; whistle blowing; conflicts of interest; collegiality; publication and authorship; peer review; history and development of human experimentation ethics and regulations (HHS, FDA);

Institutional Review Boards; informed consent, waivers, vulnerable populations; privacy and confidentiality of records; epidemiology; and research using animal subjects.

3 credits,

### **HAX 620: Rehabilitation and Disability**

Introduces the Science of Rehabilitation and the Science of Disability. Presents models of rehabilitation and disability research and discusses controversies and commonalities between these areas. Forms the groundwork of future coursework in rehabilitation and movement sciences.

3 credits,

### **HAX 626: Outcome Measurement in Rehabilitation Research**

Introduces outcome measures relating to impairments, functional limitations and disability, general health status, and patient/client satisfaction. These outcome measures are used to guide research outcomes. Explores measurement properties and discusses strategies to appropriately assess and select various outcome measurement scales. Critical appraisal of the literature will provide the basis for making research methodological decisions regarding selection of the most effective outcome measures.

3 credits,

*May be repeated for credit.*

### **HAX 629: Evidence Based Pediatric Rehabilitation Research**

Provides students an opportunity to develop an overview of issues related to the health of America's children and adolescents. Emphasizes chronic disease and disability, nutrition, fitness, educational accommodations, and trends in long term health services and health policy. Explores the growing need for evidence based practice and outcomes assessment necessary for the development of strategies for optimal function of children with disease/disability and their families. Students will review and analyze evidence for interventions for a specific pathology/disability.

3 credits,

*May be repeated for credit.*

### **HAX 630: Exercise Physiology and Physical Activity**

Provides key elements of exercise physiology and instructs students in measurement techniques for the assessment of exercise capacity and physical activity. Reviews normal physiology of the cardiopulmonary system and presents normal immediate response to exercise, and long-term effects of exercise in

the healthy individual. Explores foodstuffs for energy production, metabolic pathways for production of ATP, and energy systems used in aerobic and anaerobic activities. Principles of physical activity assessment and body composition and examines qualitative and quantitative measurement techniques across the lifespan and in disability. Assimilates, via lab manual, literature reviews of articles addressing measurement.

3 credits,

*May be repeated for credit.*

### **HAX 631: Electro/Neurophysiology: Topics for Rehabilitation Research**

Introduces basic methodology of clinical electrodiagnostic measures of EEG, EMG, nerve conduction velocity studies (NCV), H-reflex and evoked potentials. Interpretation of these measures provides access to the physiological basis of disability in peripheral or central nerve damage and potentials for recovery. Examines the interventions using peripheral and central electrical stimulation modalities on muscle, bone, cardiovascular and autonomic systems. Includes lab activities of selected modalities such as E-stim, FES, TMS, EEG, EMG, NCV, and H-reflex.

3 credits,

*May be repeated for credit.*

### **HAX 632: Teaching and Learning**

This course will introduce students to adult learning principles and strategies for effective teaching of cognitive psychomotor and affective skills and behaviors in academia. Individual teaching/learning philosophical orientations, characteristics of the adult learner, learning styles, self-directed learning, and reflective practice will be explored.

3 credits,

*May be repeated for credit.*

### **HAX 634: Motor Learning and Motor Control**

This course will introduce the various theories underlying human motor control. Students will actively synthesize and analyze current theory and research related to motor control and skill acquisition through examination of relevant literature. This course places emphasis on determining the implications of this work for future research, educational and/or clinical practice. Includes early and contemporary theory, skill acquisition facilitation, practice, feedback, transfer of training, modeling, part vs whole training, imagery, implicit learning, explicit learning and memory systems.

3 credits,

*May be repeated for credit.*

### **HAX 635: Biomechanics and Movement I**

Introduces students to principles and interrelationships of biomechanics and movement. Includes physical biomechanics of the extremities as a foundation from which to apply biomechanical principles. Involves learning to use mathematical approaches to solving static problems and lay the groundwork for solving dynamic biomechanical problems. Reinforces biomechanical theoretical concepts and mathematical models with lab experiments that involve the manipulation of 3D kinematic, kinetic and EMG data

3 credits,

*May be repeated for credit.*

### **HAX 636: Biomechanics of the Musculoskeletal System and Movement II**

Provides advanced concepts of kinetics in the field of biomechanics. Explores biomechanical concepts during lecture and reinforces those applications with associated lab experiments. Provides viscoelastic characteristics of biological tissues as a foundation applied to human motion. Includes mathematical models of the musculoskeletal system and analysis of the dynamics of human motion. Collection and analysis of gait and other movement kinematics, kinetics and muscle activation by electromyography (EMG) are components of lab activities.

3 credits,

*May be repeated for credit.*

### **HAX 637: Orthopedic and Anatomical Principles I**

Provides advanced concepts of orthopedics and anatomy. Focuses on best evidence of examination, evaluation, diagnosis, prognosis, and procedures used for a variety of orthopedic conditions of the spine and pelvis. Requires active engagement in problem solving by identifying research problems, searching for evidence, and evaluating and synthesizing the evidence to answer research questions. Includes examination of select advanced procedures and principles to enhance research investigations.

3 credits,

*May be repeated for credit.*

### **HAX 638: Orthopedic and Anatomical Principles II**

Continues and expands on advanced concepts of orthopedic interventional research. Focuses on best evidence of examination, evaluation, diagnosis, prognosis, and intervention of orthopedic conditions of the extremities.

Requires active engagement in problem solving by identifying research problems, searching for evidence, and evaluating and synthesizing the evidence to answer research questions. Student directed pilot study will incorporate knowledge of select advanced techniques and technologies.

*3 credits,*

*May be repeated for credit.*

### **HAX 639: Technology and Medical Imaging in Rehabilitation**

Examines a range of medical imaging techniques available for use and interpretation in rehabilitation research. Includes radiographs, fluoroscopy, MRI, fMRI, CT, qCT, MEG, TMS and diagnostic US. Synthesizes the technologies and their limitations, the methods of capture and interpretation. Reviews evidence supporting or refuting the sensitivity of these techniques in determining outcomes in rehabilitation.

*3 credits,*

*May be repeated for credit.*

### **HAX 640: Community Health and Community Based Participatory Research**

Provides an overview of critical issues in conducting research in community settings including models of community-based services. Covers the general principles of community-based participatory research, and practical and ethical issues in collaborating with communities, quantitative and qualitative techniques used in community-based participatory research, evaluations, and interventions. Prerequisite: 24 credits of HAXPH core courses or Permission of Instructor

*3 credits,*

### **HAX 641: Community Mental Health**

Explores the policies and programs that address mental health needs of individuals with a community health focus. Students will apply models of behavior and health to explore topics of mental health including stigma, marginalization, self-determination. Discusses challenges to service provision. Focuses on the ethics of research with this population as a central theme.

*3 credits,*

### **HAX 642: Participation and Health in Pediatric and Educational Settings**

Explores policies and programs that inform pediatric services and community based research. Focuses on pediatric programs that influence health and community participation. Includes programs that support health,

wellness, and community participation as well as those influenced by the Individuals with Disabilities Education Improvement Act (IDEA) that supports children with disabilities from Birth to 21 years. Prerequisites: 24 credits of HAX core courses or permission of Instructor.

*3 credits,*

### **HAX 643: Healthcare Systems and Policy Analysis**

Provides students with an overview of the US healthcare system and major health policy challenges we face. Explores the history and state of the US healthcare system, and circumstances that have given rise to current problems such as employer-based health insurance, challenges in access to and quality of care, and the rising costs associated with the US healthcare model. Discusses ways to improve upon the system, importantly including the Affordable Care Act, and how this legislation was enacted with close attention paid to the policymaking process, roles of political actors, and the importance of policy analysis.

*3 credits,*

*May be repeated for credit.*

### **HAX 644: Ethics, Health Disparities and Social Justice**

Examines aspects of inequality and health status as an injustice within the context of ethical theories (utilitarian, libertarian, deontological, equalitarian). Determines the influence on case studies of health disparities and inequalities. Discusses cases such as global and U.S. racial, class and gender disparities and in developing countries. Presents ethical issues relative to different methods of measuring health inequalities and related policies.

*3 credits,*

*May be repeated for credit.*

### **HAX 645: Organizational Theory, Management and Leadership**

Examines theoretical and conceptual framework for understanding leadership and management styles of health and human services organizations and how they operate in a broader community. Identifies and applies strategic models to analyze organizational problems, organizational behaviors and processes, formulate strategic solutions, and make sound decisions. This knowledge is critical for the behavioral and community health field to understand how individuals influence and are influenced by organizations.

*3 credits,*

*May be repeated for credit.*

### **HAX 646: Social Behavior and Community Health Change**

Examines the nature of the behavior that takes place within social systems and how to effectuate change in these systems. Analysis of behavior and possibilities for change will be placed in the context of health and public health questions and will draw upon theories of organizational behavior, leadership, and mechanisms for action.

*3 credits,*

*May be repeated for credit.*

### **HAX 647: Policies and Ethics in Behavioral and Community Health**

Explores health care policies of the US health care system and the influence on public health and programs in behavior and community health. Includes access and utilization of health care, barriers to care, prevention programs, and health disparities and ethics. Addresses the perspectives of the consumer, provider and the institution.

*3 credits,*

### **HAX 653: Research Methods: Design and Statistics**

This course presents process and skills needed to develop independent research studies, including but not limited to, formulating a research question or hypothesis, conducting literature searches, critically appraising scientific literature, and selecting appropriate research designs and methods. This information will be presented in the context of protecting human subjects and health information based on the policies and procedures of the Committee on Research Involving Human Subjects (CORIHS) and IACUC.

*3 credits,*

*May be repeated for credit.*

### **HAX 656: Qualitative Research**

Students will learn the basic principles and techniques of effective analysis and interpretation of the merits of qualitative data. Examines how qualitative research captures complex phenomena that span the international classification of function (ICF) and impact on quality of life, illness/injury experience and recovery. Students will learn the strengths and limitations of qualitative analysis and how it complements quantitative analysis. Emphasizes several methods to represent data, such as the mixed method approach, and students will apply a range of analysis techniques through research exercises.

*3 credits,*

*May be repeated for credit.*

**HAX 663: Disability, Occupation and Community**

Inspired by disability justice social movements in the US and abroad, this course presents politically engaged critical approaches to disability that intersect community organizations, the arts and academic fields including occupational therapy, disability studies and anthropology. Broader than a medical category, disability identity recognizes the political and economic dimensions of disability inequity as it related to other forms of inequality and disadvantage. Themes include all permutations of the concept of occupy; disability justice/decolonization; [participation and training for collaborations; marginalization and minoritization; technology; struggle, creativity, and change.

3 credits,

**HAX 664: Conceptual Foundations of Disability Studies 1890s-1990s**

Present conceptual foundations of disability studies beginning with the 19th and early 20th century theories and scholarships. Theorists from the 1960s and 1970s who influenced the theoretical development of the new field of disability studies will be discussed. The course will explore foundational disability studies scholarship of the 1980s and 1990s as the field established itself first in the social sciences and then the humanities.

3 credits,

**HAX 665: Disability, Participation and Justice**

Explores concepts of "Participation" and "Justice" as they relate to disability experience. Introduces research strategies, participatory methods and methodologies for disability studies research in the applied social and health sciences. Discusses ethical issues in disability research and what it means to disabled people in daily life. Examines social analysis, healthcare discourse, and research on the evolution of healthcare practices, cultural beliefs, and social structures influencing the treatments, services, and opportunities available to disabled people in the United States and internationally.

3 credits,

*May be repeated 1 times FOR credit.*

**HAX 667: Disability Studies Language, Narrative and Rhetoric**

Focuses on how language and rhetoric frame how disability is perceived, experienced, and treated. Included critical and rhetorical analysis of professional discourses as well as personal disability narratives and memoirs. The society for Disability Studies,

an interdisciplinary organization, says in its mission statement, disability is a key aspect of human experience. So is language. This course explores the interdisciplinary nature of disability studies and the roles language and rhetoric play in representations of disability. Some questions to be explored include: In what ways do clinical or professional discourses and personal narratives reveal experience of power and powerlessness? How is the bodily experience of disability described in professional contexts as compared to personal narratives? How does description and perception influence the practice of professionals and quality of life for people with disabilities? What assumptions about disability are revealed through rhetorical analysis? These questions will frame our attention to representations of disability in a variety of texts: academic, professional, literary, clinical, personal, and visual. Not to be taken for credit with ESL 592

3 credits,

**HAX 668: Emerging Topics in Disability Studies**

Focuses on the intersections of disability with other emerging area studies such as gender, class, sexuality, race and global studies. Encompass study of different emerging disciplinary areas of disability studies in the social sciences, health sciences, humanities, business, and technology. Explores the connections between disability activism, art, and scholarship in the 21 century. Traces emerging regional distinctions in disability studies research and scholarship, especially between Northern and Southern Countries

3 credits,

*May be repeated for credit.*

**HAX 669: Disability and Health in Local and Global Contexts**

Critically examines the experiences of people with disabilities in a local and global context and examines the connections between the two contexts. Utilizes policy documents, ethnographies, memoirs, program evaluations, and multi-media and provides the tools to critically evaluate local and global disability experiences as well as programs and interventions.

3 credits,

**HAX 690: Independent Study in Health and Rehabilitation Sciences**

Independent study proposals in health and rehabilitation sciences. Approval of independent study proposal and credit hours required prior to registration.

1-3 credits,

*May be repeated for credit.*

**HAX 693: Directed Readings**

Provides faculty directed readings and guided discussion to synthesize selected content related to the current course curriculum and/or to the students' research interests. Through the guided readings, the students will learn foundational and advanced theoretical constructs that will be important underpinnings of their future studies and doctoral research. Specifically, studies may focus in the concentration areas of rehabilitation and movement science, disability studies or behavioral and community health. A critical analysis of readings may include theoretical constructs, methodologies, and/or interpretation of results. The course will include analytical writings and a summative paper.

3 credits,

*May be repeated for credit.*

**HAX 699: Dissertation Research On Campus**

Dissertation research under direction of advisor. Prerequisite: Advancement to candidacy (G5). Major portion of research must take place on SBU campus.

1-9 credits, S/U grading

*May be repeated for credit.*

**HAX 700: Dissertation Research Off Campus- Domestic**

Dissertation research under direction of an advisor. Prerequisite: Advancement to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

1-9 credits, S/U grading

*May be repeated for credit.*

**HAX 701: Dissertation Research Off Campus International**

Dissertation research under direction of an advisor. Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by the second week of classes.

The charge will only be removed if other plan is deemed comparable. All international students must receive clearance from an International Advisor.

*1-9 credits, S/U grading  
May be repeated for credit.*

### **HAX 800: Summer Research**

Prerequisite: Pre-approved participation in health rehabilitation sciences (HAX) department activity. S/U Grading. May be repeated for credit.

*May be repeated for credit.*

## **HAY**

### **Physical Therapy**

#### **HAY 500: Neuroscience for Physical Therapy**

Presents an integrated approach to the general principles of organization and function of the autonomic, peripheral and central nervous system. Presents principles in a systems approach to neuroscience. Follows the anatomy of a system, its physiology, pathophysiology and clinical relevance to the physical therapist. Introduces clinical topics as they relate to neuroscience including neurological testing; control of posture and balance; pain; muscle tone and spasticity; feedback versus feedforward control; reflex versus voluntary control; control of reaching and locomotion; perception and learning. Engages students in discussions identifying variant and invariant characteristics from one system to another and how systems work. Prerequisites: First Year Summer Courses

*4 credits,*

#### **HAY 501: Growth and Development Across the Life Span**

Provides students with foundational knowledge of typical human development. Examines developmental sequences with emphasis on biophysical changes, motor skills, cognition, and psychosocial issues across the lifespan. Discusses the impact of social, cultural, and environmental differences on typical development. Integrates didactic information with observation experiences in order to prepare them for future coursework that requires application of these skills to the atypical population. Prerequisites: First Year Courses

*3 credits,*

#### **HAY 502: Psychosocial Aspects of Disability**

Examines the psychological and social factors that directly or indirectly affect an

individual with a disability. Topics include identification of pre-morbid factors that contribute to the adjustment or responses to disability; impact of disability on family roles; the effects of pain on the individual; the influence of culture and spirituality on individual and family expectations of the health care system; and the economic, sexual, and societal aspects of disability. Explores the interactions of the individual with disability within the community. Focuses on concerns of the individual beyond physical rehabilitation. Topics include mental health disorders; motivation and adherence; humor in medicine; terminal illness; substance abuse; eating disorders; self-injurious behavior; and interpersonal abuse. Emphasizes the utilization of psychosocial information in the establishment of the plan of care for patients across the life span. Prerequisite: Second Year Fall Courses

*2 credits,*

#### **HAY 504: Neurological Physical Therapy I**

The first of a three course series designed to prepare second year physical therapy students to evaluate and treat patients with neurological dysfunction during their clinical experiences. Prepares students to examine, assess, and establish problem lists for individuals with various neurological disorders. Examines fundamental testing and assessment skills for sensation, musculoskeletal function, tone, reflexes, coordination, motor control, balance, postural stability, and function. Students will gain experience choosing appropriate outcome measures and gain competence in performing these measures. Justification for clinical decisions will be highlighted throughout. Prerequisites: First Year Courses

*2 credits,*

#### **HAY 505: Neurological Physical Therapy II**

The second of a three course series designed to prepare second year physical therapy students to evaluate and treat patients with neurological dysfunction during their clinical experiences. Fundamental assessment skills will include: PNF, bed mobility and trunk control, advanced gait, and motor control of the extremities. Introduces various treatment approaches and integrates approaches to create a comprehensive and patient-centered plan of care. Skills will be developed through role playing, videotape analyses, and clinical patient experiences. Lab experiences will require written and verbal justification for student clinical decisions. Prerequisites: Second year summer courses

*2 credits,*

#### **HAY 506: Neurological Physical Therapy III**

The last of a series of three courses designed to prepare second year physical therapy students to evaluate and treat patients with neurological dysfunction during their clinical experiences. Offers continued practice and synthesis of examination data during the evaluation process, however, major emphasis is to develop and implement appropriate intervention strategies based on the best available evidence for people with neurological or neuromuscular disorders. Prerequisites: Second Year Fall Courses

*4.5 credits,*

#### **HAY 507: Orthopedic Physical Therapy I**

The first of three courses within the musculoskeletal sequence. Explores neuromusculoskeletal concepts within the patient/client management model. Introduces orthopedic physical therapy practice emphasizes clinical decision-making and problem solving through on-going hypothesis generation and testing. Provides content that students will apply to paper cases as they establish goals, organize subjective and objective exams, and practice screening skills. Information that is obtained during typical physical therapy exams is utilized in discussions to practice the evaluation process including ruling out red flags, identifying yellow flags, establishing a physical therapy diagnosis, developing a problem list, and generating an intervention plan. Prerequisites: First Year Courses

*2 credits,*

#### **HAY 508: Orthopedic Physical Therapy III**

The last of three courses within the musculoskeletal sequence. Explores neuromusculoskeletal concepts within the patient/client management model. Orthopedic physical therapy practice of the upper extremities and spine is explored with an emphasis on clinical decision-making and problem solving through ongoing hypothesis generation and testing. Asked to apply content to paper cases and establish goals, organize subjective and objective exams, and practice screening skills. Information that is obtained during typical physical therapy exams is utilized in discussions to practice the evaluation and intervention process including ruling out red flags, identifying yellow flags, establishing a physical therapy diagnosis, developing a problem list, generating and implementing an intervention plan. Prerequisite: Second Year Fall Courses

4 credits,

### **HAY 509: Pediatric Physical Therapy**

Emphasizes the study of atypical movement patterns in children. Presents developmental and long-term effects of neuromuscular and musculoskeletal dysfunction as they relate to movement. Students learn examination and interventions for subtle and complex movement dysfunctions resulting from a variety of musculoskeletal and neuromuscular diagnoses, conditions, and syndromes including but not limited to preterm birth, torticollis, developmental hip dysplasia, OBPI, cerebral palsy, Down syndrome, autism, developmental coordination disorder (DCD), Spina Bifida and Duchenne Muscular Dystrophy. Explores strategies for working with children presenting at the opposite ends of functional abilities (severe/multiple vs minimal handicapping conditions). Addresses the role of the physical therapist during transitions between delivery settings. Prerequisite: Second Year Fall Courses

4.5 credits,

### **HAY 512: Prosthetics and Orthotics in Physical Therapy**

Provides a theoretical knowledge base as a framework for clinical intervention when providing treatment using orthotic and/or prosthetic devices for clients across the lifespan who present with amputations, diabetes, neurological disorders, and pathokinesiological deficits of the musculoskeletal system. Presents course materials that reinforces course work from earlier basic science courses. Students will be expected to recall pertinent content from previous courses, apply that information in a clinically relevant manner, and critically solve problems covering client examination, evaluation, diagnosis, and treatment when presented with a variety of clinical scenarios. Prerequisites: First Year Fall Courses

3 credits,

### **HAY 513: Orthopedic Physical Therapy II**

The second of three courses within the musculoskeletal sequence. Explores neuromusculoskeletal concepts within the patient/client management model. Evaluation skills are sharpened as clinical decision-making and differential physical therapy diagnosis, prognosis and intervention are introduced in the framework of neuromusculoskeletal dysfunction. These general skills are then applied to various neuromusculoskeletal dysfunctions of the lower extremity. Functional anatomy, including the

osteokinematics, arthrokinematics, myology and neurology of the lower extremity are explored as they relate to surgical and non-surgical neuromusculoskeletal conditions. Prerequisites: Second Year Summer Courses  
2 credits,

### **HAY 515: Foundations of Kinesiology**

Explores the essential topics of Kinesiology and establishes a basis for future study of applied kinesiology. Introduces the study of normal human movement including topics such as movement description, muscle function, and biomechanics.

1 credit,

### **HAY 517: Exercise Physiology**

Provides a general background in exercise physiology. Topics include an introduction to energy systems and how they are recruited during different forms of exercise; an introduction to cardiopulmonary physiology and the response to exercise challenge; and the monitoring of cardiorespiratory and temperature vitals. Students will be expected to gain a general understanding of skeletal muscle physiology and recruitment, describe aerobic and anaerobic training effects, and understand exercise stress testing and prescription. Prerequisites: First Year Summer Courses

1 credit,

### **HAY 518: Foundations of Exercise and Movement in PT**

Presents an introduction to the fundamental principles of strength and flexibility. Fundamentals of muscle and connective tissue function from microstructure to macrostructure are considered in health and dysfunctional states through the life span. These basic principles will be expanded to explore the concept of myofascial mobility, extensibility and length. Explores muscle function including strength, muscle endurance, power, and control throughout the trunk and extremities. Students will combine the skills learned in Kinesiology with those learned in this course to begin the process of examination, evaluation and designing intervention programs for the movement dysfunction. Prerequisites: First Year Summer Courses

3.5 credits,

### **HAY 519: Kinesiology**

Explores the kinetics and kinematics of normal, purposeful human movement. Integrates knowledge of human anatomy, physiology and biomechanics as it applies to movement of the extremities and spinal column. Includes evaluation procedures such

as manual muscle testing, measurement of joint range of motion, and gait assessment. Direct patient contact is scheduled. Prerequisites: First Year Summer Courses  
4.5 credits,

### **HAY 524: Health, Wellness and Prevention in Physical Therapy**

Presents issues related to promotion of health and wellness and concepts of integrative, complementary and preventive medicine. Examines and integrates general fitness, nutrition and complementary medicine into exercise prescriptions for the following chronic diseases and conditions: cardiovascular disease; endocrinology and metabolic disorders; pulmonary disease; oncology; disorders of the bones and joints; spinal cord injury; stroke; depression; and intellectual disability. Based upon the findings of screens and individual client goals, students will develop, implement and assess the effectiveness of an individualized wellness program. Prerequisites: Second Year Courses  
2 credits,

### **HAY 525: Advanced Therapeutic Exercise**

Provides students with the opportunity to apply and analyze therapeutic exercise techniques in order to formulate exercise programs for diverse patient and client populations. Students will be encouraged to discuss and build upon their knowledge of basic therapeutic techniques attained from previous coursework and clinical training experiences. Advanced techniques will be demonstrated and practiced in lab. Students will evaluate, set goals, develop therapeutic exercise programs and measure outcomes. Issues regarding frequency, intensity and duration of treatment will be discussed throughout the course. Prerequisites: Second Year Courses

3 credits,

### **HAY 526: Clinical Medicine and Pharmacology I**

Provides a foundation in medicine and differential diagnosis. Introduces the concepts of the International Classification of Functioning, Disability and Health (ICF), the Patient/Client Management Model and outcomes management that guide the process of clinical decision-making. Integrates principles of pharmacology, medical imaging and laboratory diagnostic testing to facilitate safe and effective patient management. Familiarizes students with medical terminology and abbreviations for efficient and effective chart review and documentation. Common health conditions will be explored, focusing on epidemiology,

pathophysiology, histology, as well as primary and secondary clinical characteristics. Discusses medical and surgical management and integration to formulate appropriate physical therapy interventions, precautions and contraindications related to each common health condition. Prerequisites: First Year Summer Courses

*4.5 credits,*

### **HAY 527: Foundations of Patient Care**

Emphasizes patient care in the acute care environment. Prepares students for functional mobility training for patients in all settings. Applies the laws of physics to body mechanics in order to safely and effectively assist patients with bedside functional mobility training. Prepares students to effectively guard patients during ambulation and engage in gait training with assistive devices. Students will perform initial evaluations, create physical therapy plans of care, and use vital signs and lab data to guide clinical decision making. Engages students in simulation-based learning experiences and integrated clinical experiences with patients of varying diagnoses and complexity to prepare them for their first clinical education experience. Prerequisite: First Year Fall Courses

*4 credits,*

### **HAY 528: Clinical Medicine and Pharmacology II**

Continues to build a critical foundation for Clinical Education I and the remainder of the professional curriculum by establishing a foundation in medicine and differential diagnosis. Students are expected to utilize the concepts of evidence-based practice, the ICF model of disablement, and the Patient/Client Management Model as frameworks for clinical decision-making. In-depth exploration of frequently encountered health conditions across the life span will be the continuing format. Presents epidemiology, pathophysiology, etiology, clinical characteristics with subsequent medical, pharmacological and surgical management of each health condition. Students will continue to build a repertoire of medical terminology, medical abbreviations and clinical outcome measures to promote efficient and effective chart review and documentation. Prerequisites: First Year Fall Courses

*5 credits,*

### **HAY 534: Motor Learning and Motor Control**

Establishes a context for the major explanatory concepts applied to the issues of coordination and skill and learning. Foundational material from Neuroscience will support the application

and theory addressed throughout the course. Uses academic rationalization and cognitive processing philosophies to develop and refine intellectual processes. Students learn from historical perspectives of motor control to develop skills necessary to pose and solve problems, to infer, to hypothesize, and to locate needed resources for theoretically sound clinical judgments. Students read original research papers and current literature pertaining to motor learning, motor programs and dynamic pattern theory. Student will analyze papers examining loss of function related to disease or injury. Prerequisite: First Year Fall Classes

*3 credits,*

### **HAY 543: Integumentary and Vascular Physical Therapy**

Presents principles of skin anatomy and physiology, normal and abnormal wound healing, and the anatomy and role of both peripheral vascular system and lymphatic systems. Discusses physical therapy assessment and interventions. Includes focused practice in myofascial mobility and extensibility, lymphedema management, wound assessment, debridement, wound dressing choices, and other available modalities. Engages students in practical skills during interactive lab sessions to demonstrate competence and integrate information in a clinically relevant manner to provide a framework for future safe and effective intervention with clients. Prerequisite: First Year Fall Courses

*2 credits,*

### **HAY 544: Biophysical Agents in Physical Therapy**

Introduces various physical, mechanical and electrotherapeutic biophysical agents. Covers the role of such agents in the management of impairments and pathology involving the musculoskeletal, neuromuscular, cardiopulmonary, and integumentary systems. Explores evidence-based informed decision making for each of these agents through the analysis of appropriate literature. Prerequisites: First Year Summer Courses

*3 credits,*

### **HAY 545: Ethics and Health Care for Physical Therapists**

Provides an overview of the ethics of health care in a rapidly changing society. Explores ethical issues surrounding health care changes and public health policy. Includes an overview of ethics within patient education and discusses the professional code of ethics and standards. Students will learn how to approach ethical dilemmas using theoretical frameworks

and decision-making processes. Introduces the student to the ethics within physical therapy and other health care professions through the use of case studies. Includes a review of classic cases in health care ethics, involving issues such as euthanasia and organ transplants from an ethical, legal and historical perspective. Prerequisites: Second Year Courses

*2 credits,*

### **HAY 552: Research Methods for Physical Therapists**

First of three courses designed to prepare students to search for and critically appraise scientific literature as well as understand the fundamentals of research methods, design, and statistics. Includes principles of evidence based practice, use of electronic data bases to search for evidence, research and measurement reliability and validity, research design, descriptive statistics, statistical inference, tests for experimental comparison, correlation, regression, and nonparametric tests. Addresses the relationship between statistics and research design by introducing relevant research articles in the healthcare field. Prerequisites: First Year Fall Courses

*3 credits,*

### **HAY 557: Introduction to Evidence Based Practice**

Second of three courses that introduce the concepts of evidence informed decision making by exploring the evidence based practice (EBP) model and the five steps of the EBP process. Builds upon the integration of research concepts that allow for the critical analysis of varying levels of research literature. Review of physical therapy literature will be used as a tool to integrate critical inquiry skills, depth of knowledge, and related clinical significance. Prerequisite: Second Year Fall Courses

*1.5 credits,*

### **HAY 558: Evidence Based Practice Seminar**

Final of three courses that explore a broad spectrum of research literature examining physical therapy practice. Literature will be used as a tool to integrate student's critical inquiry skills and depth of knowledge. Students judge the strength of the evidence of each paper and draw conclusions regarding its clinical significance. When lacking evidence, challenges student to suggest ways to strengthen the current evidence. Prerequisites: Second Year Courses

*1-3 credits,*

*May be repeated 3 times FOR credit.*

**HAY 560: Professional Practice I: Foundations**

First of two courses regarding the developing physical therapy professional. Discusses historical, ethical and legal foundations and current and emerging issues affecting change within the profession. Introduces the format and function of the APTA at the national and state levels. Examines the roles and responsibilities of the physical therapist, the physical therapist assistant and the physical therapist aide in the present healthcare environment. Explores dynamics of professional interactions with patients, families and other healthcare providers.

*1.5 credits,*

**HAY 561: Professional Practice II: Clinical Education**

Taught concurrently with theoretical and practical coursework in the curriculum to prepare the students for their first clinical experience. Offered before HAY 595 Clinical Education I to prepare students for patient and caregiver instruction and to provide students with knowledge of the roles and responsibilities of the student and the clinical instructor within the healthcare environment. Examines different learning and teaching styles and their effect on the learning environment. The fundamentals of teaching as they apply to patient education, professional in-services, and clinical education are presented and practiced. Students are introduced to aspects of verbal and nonverbal communication, with opportunity to work in small groups for application of these principles. Preparation for the first clinical education experience, specifically clinical site and academic program expectations, professional behavior, and student responsibilities, are discussed in detail. Prerequisites: Second Year Summer Courses

*1.5 credits,*

**HAY 580: Practicum**

A limited number of students may enroll in 3-6 credits of independent study in research, education, clinical practice, or management/administration. Each practicum project is uniquely designed to meet the needs of the student. Mentored by faculty with expertise in the area of study. Acceptable projects must include design, implementation and analysis phases. 3-6 credits by permission of the Program Director.

*3-6 credits,*

*May be repeated 3 times FOR credit.*

**HAY 589: Case Studies I**

Integrates material from prior coursework and focuses on development of communication skills during physical therapy interactions with patients and other members of the interdisciplinary team. Students will engage in simulation-based learning experiences to help them develop their communication skills related to building relationships, opening a discussion, gathering information, understanding the patient perspective, sharing information, reaching agreement, providing closure, demonstrating empathy, and communicating accurate information. Students will also develop their skills related to self-reflection and feedback. Prerequisites: First Year Courses

*S/F graded*

**HAY 590: Case Studies II**

Integrates material from prior coursework and requires students to hypothesize mechanisms of injury to develop an evidence-based evaluation plan for patients with orthopedic dysfunction. Students will engage in simulation-based learning experiences to help them understand the relationship between pathophysiology and signs and symptoms, choose and perform appropriate assessments, evaluate clinical data, determine a differential diagnosis, respond to changes in patient status, and make appropriate recommendations for interventions for patients with orthopedic dysfunction. Prerequisites: Second Year Fall Courses

*1 credit, S/F graded*

**HAY 595: Clinical Education I**

An eight-week full time clinical experience course and the first of four clinical experiences in the curriculum. Allows the student to apply and integrate the academic knowledge, skills, and professional behavior acquired in the curriculum. Students are expected to demonstrate advanced beginner to intermediate level competency in all categories of the Clinical Performance Instrument (CPI) at the conclusion of the course. A licensed physical therapist, with a minimum of one year clinical experience, will provide close supervision and guidance during the learning experience. Prerequisites: All coursework prior to HAY 595.

*8 credits, S/F graded*

*May be repeated 1 times FOR credit.*

**HAY 602: Issues in Health Care Administration**

Provides a theoretical basis of successful management principles, as well as practical implementation strategies for these principles as they apply to the field of physical therapy. Emphasizes the basic management principles of planning, organizing, leadership,

and controlling/coordination; marketing theory; business plan development; change management, total quality management/continuous quality improvement; regulatory agency and public policy impact; enhancement and maintenance of quality care including outcome analysis; emerging health care reimbursement models; and consulting approaches. Prerequisites: Second Year Courses

*1-3 credits,*

*May be repeated 3 times FOR credit.*

**HAY 620: Cardiopulmonary Physical Therapy I**

Introduces students to the interpretation of data from various diagnostic tests commonly encountered in patients with cardiac and/or pulmonary dysfunction. Engages classroom and laboratory activities designed to promote clinical decision making skills regarding the titration of exercise and the development of physical therapy interventions, including airway clearance techniques. Concentrates on the psychomotor skills needed to treat this patient population and the clinical reasoning skills required to ensure patient safety and improve patient outcomes. Prerequisites: Summer Year 2 Courses

*2 credits,*

**HAY 621: Cardiopulmonary Physical Therapy II**

Integrates material from prior coursework and utilizes information to develop an evidence-based total plan of care for patients with cardiac and/or pulmonary dysfunction. Students engage in simulation-based learning experiences to help understand the relationship between pathophysiology and signs and symptoms; choose and perform appropriate assessments; evaluate clinical data; design and perform physical therapy interventions; respond to changes in patient status; and make appropriate recommendations for equipment and community programs for patients with cardiac and/or pulmonary dysfunction. Prerequisites: Summer Year 3 courses.

*2 credits,*

**HAY 692: Clinical Education II**

A nine-week full time clinical experience course and the second of four clinical experiences in the curriculum. Allows the student to apply and integrate the academic knowledge, skills, and professional behavior acquired in the curriculum. Students are expected to demonstrate intermediate level competency in all categories of the Clinical Performance Instrument (CPI) at the conclusion of the course. A licensed physical therapist, with a minimum of one year clinical



experience, will provide close supervision and guidance during the learning experience. Pre-requisites: All coursework prior to HAY 692.

*9 credits, S/F graded*

### **HAY 693: Clinical Education III**

An eight-week full time clinical experience course and the third of four clinical experiences in the curriculum. Allows the student to apply and integrate the academic knowledge, skills, and professional behavior acquired in the curriculum. Students are expected to demonstrate intermediate level competency in all categories of the Clinical Performance Instrument (CPI) at the conclusion of the course. A licensed physical therapist, with a minimum of one year clinical experience, will provide close supervision and guidance during the learning experience. Pre-requisites: All coursework prior to HAY 693.

*8 credits, S/F graded*

### **HAY 694: Clinical Education IV**

A full time ten-week clinical experience course and the final clinical experience in the curriculum. Allows the student to apply and integrate the academic knowledge, skills, and professional behavior acquired in the curriculum. Students are expected to demonstrate entry level competency in all categories of the Clinical Performance Instrument (CPI) at the conclusion of the course. A licensed physical therapist, with a minimum of one year clinical experience, will provide close supervision and guidance during the learning experience. Pre-requisites: All coursework prior to the HAY 694.

*8-12 credits, S/F graded*

### **HAY 699: Clinical Continuation**

This course is for physical therapy students continuing with clinical.

*S/F graded*

*May be repeated for credit.*

## **HBA**

### **Anatomical Sciences**

#### **HBA 521: Gross Anatomy of Head, Neck, and Trunk**

Tutorial laboratories with emphasis on dissections of the human head, neck, and trunk.

*8 credits, Letter graded (A, A-, B+, etc.)*

#### **HBA 531: Nervous System**

This course provides an integrative overview of the structure and function of the mammalian nervous system with an emphasis on the

human brain, the cranial nerves and the neurobiology relevant to the oral cavity. It begins with a series of lectures centered on cellular foundations, basic principles of cell signaling/neurophysiology and nervous system development. The major structures of the central and peripheral nervous system and their functions are also introduced. These sessions build foundations for more in-depth investigations at systems levels; sensory, motor, higher order, homeostatic and cranial systems are emphasized. For most topics, basic principles are reinforced using clinical examples from different dental disciplines and the interactive lectures are complemented and extended in student working group sessions that use the primary literature, case-based problem solving and other forms of active learning to solidify learning and make clinical connections. This course represents a coordinated teaching effort from the Departments of Neurobiology and Behavior, and Anesthesiology.

*8 credits, S/F graded*

#### **HBA 540: Human Anatomy for Physical Therapists**

A lecture and laboratory course that includes dissections of the entire human body. The course is organized in three modules: (1) thorax and abdomen, (2) head and neck, including neuroanatomy, and (3) limbs. It covers regional and conceptual information on the gross anatomy of all organ systems in the human body. There is a lab fee associated with this course.

*Summer, 5 credits, Letter graded (A, A-, B+, etc.)*

#### **HBA 541: Evolutionary Anatomy**

A lecture and laboratory with emphasis on dissection of the entire human body. Includes functional and comparative anatomy with special emphasis on the musculoskeletal morphology of humans and higher primates. This course is offered as both DPA 541 and HBA 541. There is a lab fee associated with this course. 8 credits, Letter graded (A, A-, B+, etc.)

*8 credits, Letter graded (A, A-, B+, etc.)*

#### **HBA 542: Advanced Human Anatomy for Physical Therapists**

Regional approach to the gross anatomy of the lower limb for physical therapy graduate students (DPT). The course is presented in conjunction with HYA519, Kinesiology for Physical Therapists. This module will offer an expanded view of the functional anatomy and arthrology of the hip, thigh, leg and foot. Labs will be three hours, one day per week. Enrollment will be limited to DPT students.

*Fall, S/U grading*

#### **HBA 550: Vertebrate Evolution**

Survey of the fossil record of vertebrate evolution. The course emphasizes the origin, phylogeny, comparative and functional morphology, biogeography, and paleontology of vertebrate animals. Laboratory included. The lectures and laboratories will utilize an extensive collection of comparative anatomical material, fossil casts, and slides.

*Spring, alternate years, 4 credits, Letter graded (A, A-, B+, etc.)*

#### **HBA 551: Phylogenetic Systematics, Biogeography and Comparative Methods**

This course will provide students with a familiarity in the practical application of modern phylogenetic methods and the use of phylogenies in framing evolutionary hypotheses. The course will have both a lecture and laboratory component with lectures including in-class discussions of assigned readings. Lab exercises will be devoted to hands-on experience with available software for phylogenetic and comparative methods. Comparative methods examined will include a focus on historical biogeography as well as ancestral state reconstruction, rates of evolution and diversification, and analysis of adaptation and key innovations.

*Spring, 4 credits, Letter graded (A, A-, B+, etc.)*

#### **HBA 560: Regional Anatomy for non-Healthcare students**

A lecture and laboratory course that includes dissections of the entire human body covering regional and conceptual information on the gross anatomy of all organ systems in the human body. In the Fall, this course is presented in conjunction with The Body Course (MED 500A); in the Summer, it is presented in conjunction with Advanced Regional Anatomy for Physical Therapists and for Physician Assistants (HBA 540 and 561). There is a lab fee associated with this course. This course is not for students in a Healthcare Professional Program. Prerequisite: Permission of Instructor

*Fall, Summer, 3-8 credits, Letter graded (A, A-, B+, etc.)*

#### **HBA 561: Human Gross Anatomy for Physician Assistants**

A lecture and laboratory course that includes dissections of the entire human body. The course is organized in three modules: (1) thorax and abdomen; (2) head and neck, including neuroanatomy; and (3) limbs. It covers regional and conceptual information on

the gross anatomy of all organ systems in the human body. There is a lab fee associated with this course.

*Summer, 5 credits, Letter graded (A, A-, B+, etc.)*

### **HBA 563: Aspects of Animal Mechanics**

An introduction to biomechanics. Covers free body mechanics and kinetics as applied to vertebrate locomotion. Considers the structure and physiology of muscle as it relates to adaptations of the musculoskeletal system. This course is offered as both HBA 563 and DPA 563. Prerequisites: Introductory physics and biology or permission of instructor.

*Spring, odd years, 2 credits, Letter graded (A, A-, B+, etc.)*

### **HBA 564: Primate Evolution**

The taxonomic relationships and evolutionary history of primates as documented by their fossil record and structural and chemical evidence. Emphasis on primates prior to the origin of the human lineage. This course is offered as ANT 564, DPA 564 and HBA 564. 4 credits, Letter graded (A, A-, B+, etc.)

*4 credits, Letter graded (A, A-, B+, etc.)*

### **HBA 565: Human Evolution**

A survey of the fossil record of hominid evolution through the Pliocene and Pleistocene with emphasis on the morphological structure and function of locomotor, masticatory, and neural systems. Includes utilization of comparative anatomical material and an extensive cast collection. This course is offered as ANT 565, DPA 565 and HBA 565. 4 credits, Letter graded (A, A-, B+, etc.)

*4 credits, Letter graded (A, A-, B+, etc.)*

### **HBA 566: Studies in Functional Morphology**

Introduction to the theory and methods of functional morphology. Various methods of analysis and the application of experimental techniques such as electromyography or bone strain analysis are discussed as they pertain to the understanding of the interaction between form and function. Special emphasis is placed on the analysis of human and nonhuman primate morphology, and the application of this analysis to interpretation of the fossil evidence for human and nonhuman primate evolution. This course is offered as both HBA 566 and DPA 566.

*Prerequisite: Permission of instructor.*

*Spring, even years, 2 credits, Letter graded (A, A-, B+, etc.)*

### **HBA 582: Comparative Primate Anatomy**

The comparative anatomy of living primates. Laboratory dissection with emphasis on relating structural diversity to behavior and biomechanics. This course is offered as both HBA 582 and DPA 582. 4 credits, Letter graded (A, A-, B+, etc.)

*4 credits, Letter graded (A, A-, B+, etc.)*

### **HBA 590: Projects in Anatomical Sciences**

Individual research projects on anatomical sciences topics closely supervised by faculty members to be carried out in staff research laboratories.

*Fall and Spring, 1-6 credits, S/U grading  
May be repeated 4 times FOR credit.*

### **HBA 690: Graduate Seminar**

Seminars by graduate students on current literature in the areas of the anatomical sciences.

*Fall and Spring, 1-2 credits, S/U grading  
May be repeated 3 times FOR credit.*

### **HBA 692: Advanced Topics in Anatomical Sciences Literature**

Tutorial readings in anatomical sciences with periodic conferences, reports and examinations arranged with the instructor.

*Fall and Spring, 1-4 credits, S/U grading  
May be repeated for credit.*

### **HBA 695: Practicum in Teaching**

Practical instruction in the teaching of anatomical sciences carried out under faculty supervision. 1-4 credits, S/U grading

*1-4 credits, S/U grading  
May be repeated for credit.*

### **HBA 699: Dissertation Research on Campus**

Original investigation under supervision of thesis adviser and committee.

*Fall, Spring, and Summer, 1-9 credits, S/U grading  
May be repeated for credit.*

### **HBA 700: Dissertation Research off Campus - Domestic**

Prerequisite(s): Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **HBA 701: Dissertation Research off Campus - International**

Prerequisite(s): Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **HBA 800: Full-Time Summer Research**

Full-time laboratory research projects supervised by staff members. 0 credit, S/U grading

*S/U grading  
May be repeated for credit.*

## **HBC**

### **Biochemistry**

#### **HBC 531: Molecular Foundations of Medicine**

An integrated course covering the important aspects of biochemistry, cell biology, human and molecular genetics, and histology. Includes lectures, small group conferences and laboratories and stresses the clinical relevance of the basic science material.

*8 credits, Letter graded (A, A-, B+, etc.)*

## **HBH**

### **Pharmacology**

#### **HBH 501: Principles of Pharmacology**

Basic principles and mechanism of drug distribution, absorption, metabolism and elimination. Principles of chemical carcinogenesis and tumor promotion. Autonomic, Smooth Muscle and CNS Pharmacology. Pharmacology of specific drugs of historical interest including alcohol, antibiotics, aspirin, nicotine and morphine. Review of anticoagulants & thrombolytic agents, antiparasitic, and drugs for the

treatment of allergic conditions and gout. Includes discussion of specific cases taken from clinical practice and a presentation based on a set of selected readings. Crosslisted with BCP 401

*Fall, 4 credits, Letter graded (A, A-, B+, etc.)*

### **HBH 502: Advanced Principles of Pharmacology**

Advanced concepts of drug metabolism, pharmacokinetics, biochemical and molecular mechanisms of drug action and drug resistance in human disease states. Toxicological agents and environmental pollutants. The pharmacology of autotoxins, anti-inflammatories, immunosuppressants and anti-asthmatics. Rational drug design and drug receptor interactions using computer molecular modeling techniques. Includes discussion of specific cases taken from clinical practice and a presentation based on a set of selected readings. Cross-listed with BCP 402

*Spring, 4 credits, Letter graded (A, A-, B+, etc.)*

### **HBH 505: Pharmacology to Pharmacy: Practical Clinical Aspects for Non-Clinicians (Didactic)**

This course, to be offered exclusively online, is designed for students interested in health care (either basic medical science-oriented or clinical). The class introduces many aspects of clinical pharmacology, but is geared toward non-clinicians. Clinical Vignettes and case discussions will be presented. Several medical procedures will be first described and then demonstrated. Understanding these procedures will be integral to appreciating the vignettes and clinical case discussions. The multidisciplinary course faculty will include physicians, scientists, educators, nurses and pharmacists. Enrolled students will have the opportunity to ask questions directly through online chats.

*0-3 credits, S/U grading*

### **HBH 506: Graduate Pharmacology Colloquium**

Research seminars in pharmacology and toxicology presented by faculty and distinguished scientists from academic and industrial institutions. A 1 hr. Journal Club/ Discussion Session precedes seminar to review a reference paper relevant to the research concepts to be presented. Students are expected to develop an understanding of the scientific principles given in the colloquium. Students are required to give a formal presentation. Co-scheduled with BCP 406. Offered

*Spring, 2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

### **HBH 510: Practical Clinical Exposure for Translational Basic Scientists Hospital Clinical Rotations-Physician**

Course faculty will arrange two, two-week-long rotations (four weeks total). The following services are committed to participate: Anesthesiology-students will be offered opportunities in operating room (OR) observation; pre-admission patient evaluations; pain management clinic; and others depending upon availability. Internal Medicine-students will be offered opportunities in the medical intensive care unit (MICU); coronary care unit (CCU); medical oncology; and others depending upon availability. Others depending upon availability. Student will be expected to spend 3-4 hours daily in their assigned clinical activities (15-20 hours weekly; 60-80 hours for the course). In addition, they will be asked to participate in special medical exercises arranged for them on an ad hoc basis by course faculty, both in the hospital pharmacy and elsewhere. Finally all students will attend weekly case conferences, 2hr each for all 4 weeks. At these conferences, students will be asked to prepare and present two clinical cases, based on two of the patients they have seen on their clinical rotations. It is expected that each student will be responsible for at least two presentations during the four-week course. Presentations will be graded by course faculty, S (satisfactory) or U (unsatisfactory). The final grade for the course, also S or U, will be determined both by these grades as well as by overall attendance at all course activities.

*0-3 credits, S/U grading*

*May be repeated for credit.*

### **HBH 522: Biology of Cancer**

A short course with the emphasis on cancer as a disease of man. Lectures address human cancer as seen by the clinician and as basic research relates to human disease. This course provides students with a link between courses in cell and molecular biology and the application of this basic information to tumor management. Offered as HBH 522 and HBM 522. Offered Spring 2 credits, Letter graded (A, A-, B+, etc.)

*2 credits, Letter graded (A, A-, B+, etc.)*

### **HBH 531: Pharmacology-Dental**

Basic principles that underlie actions of drugs on physiological processes with particular reference to their therapeutic and toxic actions. For medical and dental students. Prerequisites: Physiology, biochemistry, permission of

instructor and admission to Graduate Health Sciences Center Program. Modules 4-6, 5 credits, Letter graded (A, A-, B+, etc.)

### **HBH 545: Biochemical Laboratory Techniques**

Introduces theoretical principles and experimental techniques used in modern biochemical research. Lectures and homework assignments explore topics in basic molecular and cellular techniques. Prerequisites: Admission to Health Sciences Center program.

*Fall, 1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **HBH 546: Biochemical Laboratory Techniques**

Continuation of HBH545. Lectures and demonstrations present topics in chromatography, mass spectrometry, protein sequencing, sedimentation, electrophoresis, ligand binding, basic pharmacological methods and statistical analysis of data. Includes procedures for the safe handling of toxic chemicals and radioisotopes. Prerequisites: Permission of instructor, admission to graduate Health Sciences Center program.

*Spring, 1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **HBH 549: Legal & Regulatory Issues in Clinical Research combined with Ethics & Professionalism in Clin. Rsrch.**

Some of the sessions are part of the SBU course on Responsible Conduct of Research and Scholarship (RCRS, formerly known as GRD 500). During the course, major contemporary issues in legal and regulatory arenas associated with scientific research are discussed. The course introduces students to the history behind the regulations that safeguard human subjects, and educates students in detail about their responsibilities as clinical investigators. Using an interactive case based format the topics covered include: justification for human research and reasonable balance of risk versus benefits; the use of animals in research; informed consent; the ethical challenges of clinical research; ethical concerns associated with genetic testing and screening; research in minors and adults of questionable capacity to consent; conflict of interest; investigator responsibilities with regard to fulfilling government regulation; scientific fraud and whistle blowing; the scientific community and mentoring; authorship and attribution; special populations and inclusion of minorities; and emergency research-related special requirements.

*1 credit,*

### **HBH 550: Statistics in Life Sciences**

This course covers statistical concepts and issues in the life sciences. Basic algebra is assumed as a prerequisite. Topics covered include: descriptive statistics, foundation of statistical inference, sampling distribution, point estimate and confidence interval, comparison of independent and paired samples, analysis of categorical data, correlation, ANOVA, linear regression, and nonparametric test.

*1 credit, S/U grading  
May be repeated for credit.*

### **HBH 560: Proposal Preparation in Regulatory Biology**

A literature-based course focusing on major research areas in molecular and biochemical pharmacology. The first part of the course will expose students to a series of examples of recent grant proposals. The second part of the course will feature student presentations of their research proposals. Due to the coordination of this course with the Qualifying Exam, registration is limited to Pharmacology graduate students.

*Fall and Spring, 2 credits, S/U grading  
May be repeated 2 times FOR credit.*

### **HBH 580: Selected Topics in Pharmacology**

Student seminars and readings on topics arranged through consultation with staff.

*0-1 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **HBH 585: Advanced Structural Biology/Structural Methods in Drug Discovery**

This course is designed for students that want to gain theoretical and practical experience in macromolecular structure determination through NMR spectroscopy and/or X-ray crystallography. The course is organized into two modules: NMR spectroscopy and X-ray crystallography. Students may elect to take one or both modules. Emphasis will be placed on practical aspects of structural determination, including sample preparation, data collection and processing. In each of the modules, students will be guided through a complete structural determination project. A final project report per module will be required. Familiarity with Linux is desirable. Students are encouraged to contact instructors prior to enrolling. Crosslisted as BSB580 and HBH585.

*Spring, 0-4 credits, S/U grading*

### **HBH 590: Pharmacology Seminars**

Advanced research seminars by staff and visiting lecturers.

*Prerequisites: Full-time pharmacology graduate status  
Fall and Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

### **HBH 599: Graduate Research in Pharmacological Sciences**

Original research projects under faculty supervision.

*Prerequisites: Full-time pharmacology graduate status  
Fall, Spring, and Summer, 0-12 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **HBH 601: Practicum in Teaching Pharmacology**

Practical experience and instruction in the teaching of pharmacology carried out under faculty orientation and supervision.

*Prerequisites: Full-time pharmacology graduate status  
Fall and Spring, 0-1 credits, S/U grading  
May be repeated 5 times FOR credit.*

### **HBH 631: Graduate Pharmacology I**

Basic principles of pharmacology will be discussed including pharmacokinetics and pharmacodynamics in both normal and various disease states. Major problems in human pharmacology will be considered including obesity, diabetes, hypertension and heart failure. Underlying physiology as well as pathophysiologic background will be presented. Drug design and development will be discussed from both scientific and socio-economic perspectives.

*Prerequisites: Graduate Biochemistry, Physiology HBY 561 or consent of instructor.  
Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **HBH 632: Graduate Pharmacology II**

This course introduces second-year graduate students to chemotherapy agents used to combat bacterial and viral infections as well as cancers. The course develops a detailed understanding of the strategies involved in identifying drug targets in these two diverse therapeutic settings. The antibacterial lectures emphasize the problem of drug resistance and the need to develop new agents to combat resistant organisms. The anti-cancer lectures begin with a comprehensive analysis of the molecular basis of cellular transformation leading to neoplastic disease. Lectures on cancer therapy emphasize the contrast between conventional cytotoxic chemotherapy and novel therapeutic approaches guided by recent developments in cancer research. Novel computational biology and structural

biology approaches are featured throughout the course. Each student is expected to make two formal journal-club style presentations during the course and to actively participate in group discussion. Prerequisites: Graduate biochemistry, BMO 520; Molecular Genetics, MCB 503; Graduate Cell Biology BCD 656; Graduate Pharmacology I, HBH 631 Offered in Fall and Spring terms, Every Year, 3 credits, ABCF Grading

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **HBH 633: Quantitative Methods in Pharmacology**

This course introduces second-year graduate students to the quantitative approaches that underlie modern research in Pharmacology. Students will be exposed to tools and techniques that are widely applied in different fields of biomedical research. Students will receive an introduction to the command line, coding and statistics, and learn to apply these tools to pharmacokinetic compartmental analysis, molecular modeling, image analysis, structural biology, biological big data analysis and genomics. Students will be actively engaged in data analysis and will be expected to participate in group discussion.

*3 credits,*

### **HBH 655: Neuropharmacology**

An advanced course for graduate students interested in developing an understanding of neuropharmacology and research on this topic. Following a general introduction to the nerve cell structure, synaptic and chemical transmission, three themes receptors, receptors as channels, and G-protein-coupled receptors are developed. Recent advances in cell and molecular biology provide the framework for instruction and discussion. This course is offered as both HBH 655 and BNB 655. Prerequisite: Admission to Graduate Health Sciences Center Program.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HBH 656: Cell Biology**

Introduction to the structural and functional organization of cells and tissues and to the way structure relates to function. Particular emphasis is placed on nuclear and chromosomal structure, signal transduction, protein translocation, the cytoskeleton and the extracellular matrix. The interaction of cellular structures and components and their regulation is stressed as is the organization and interaction of cells in tissues. The course is comparative and includes examples of cells and tissues from vertebrates, invertebrates, plants, and prokaryotic systems. Prerequisite:

matriculation in graduate program or permission of instructor.

*Spring, 3-4 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **HBH 699: Dissertation Research in Campus**

Original investigation undertaken as part of the Ph.D. program under supervision of thesis adviser and committee. Prerequisite: Advancement to candidacy (G5); permission of thesis advisor. Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Prerequisite: Full-time pharmacology graduate status*

*Fall, Spring, and Summer, 0-9 credits, S/U grading*

*May be repeated for credit.*

### **HBH 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Prerequisite: Full-time pharmacology graduate status*

*Fall, Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **HBH 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must receive clearance from an International Advisor.*

*Fall, Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **HBH 800: Full-Time Summer Research**

Full-time laboratory research projects supervised by staff members. Summer Term.

Prerequisites: Full-time pharmacology graduate status.

*S/U grading*

*May be repeated for credit.*

## **HBI**

### **Radiation Oncology**

#### **HBI 599: Graduate Research in Radiation Oncology Medical Physics**

Original research projects under the faculty supervision in areas of medical physics relating to radiation oncology.

*1-8 credits, Letter graded (A, A-, B+, etc.)*

## **HBM**

### **Molecular Genetics and Microbiology**

#### **HBM 503: Molecular Genetics**

Introduces the classical work and current developments in lower and higher genetic systems. Covers gene structure and regulation in prokaryotic and eukaryotic organisms, mutational analysis and mapping, transposable elements, and biological DNA transfer mechanisms. Bacteriophage as well as lower and higher eukaryotic systems are used to illustrate aspects of molecular genetic structure and function. This course is offered as both MCB 503 and HBM 503. Prerequisite: matriculation in graduate program or permission of instructor

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **HBM 509: Experimental Microbiology and Immunology**

An introduction to modern microbiological research. The selection of laboratories is made in consultation with the student's advisory committee. By taking part in ongoing projects the student will learn experimental procedures and techniques and become acquainted with research opportunities in the department.

*Prerequisites: Matriculation in a graduate program and permission of the graduate studies director and the lab director*

*Fall, 1-8 credits, S/U grading*

#### **HBM 510: Experimental Microbiology and Immunology: Lab II**

An introduction to modern microbiological research. The selection of laboratories is made in consultation with the student's advisory committee. By taking part in ongoing projects the student will learn experimental procedures

and techniques and become acquainted with research opportunities in the department.

*Prerequisites: Matriculation in a graduate program and permission of the graduate studies director and the lab director*  
*Spring, 1-8 credits, S/U grading*

#### **HBM 522: Biology of Cancer**

A short course with the emphasis on cancer as a disease of man. Lectures address human cancer as seen by the clinician and as basic research relates to human disease. This course provides students with a link between courses in cell and molecular biology and the application of this basic information to tumor management. Offered as HBH 522 and HBM 522. Offered Spring

*2 credits, Letter graded (A, A-, B+, etc.)*

#### **HBM 533: Immunology**

Principles of immunology for graduate students in the biological sciences, including definition of antigens and antibodies, specificity of the immune response, immunoglobulin structure, the genetics of immunoglobulin synthesis, cellular cooperation in the immune response, hypersensitivity, tolerance immunogenetics. Open to advanced undergraduates.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **HBM 599: Graduate Research in Microbiology and Immunology**

Original investigations under faculty supervision.

*Prerequisite: Permission of instructor*  
*Fall and Spring, 1-9 credits, S/U grading*  
*May be repeated for credit.*

#### **HBM 640: Molecular Mechanisms of Microbial Pathogenesis**

This course covers the principles and molecular mechanisms of pathogenesis of a selected group of the best understood viral and bacterial pathogens. A major focus of the course relates to pathogen modification of host extracellular and intracellular signaling events, as well as pathogen-host interactions pertaining to the innate, humoral and cellular responses to infection. The material is presented by invited lecturers who are leaders in their fields. This course is directed to graduate students, post-doctorate and medical fellows, and advanced medical students, who are contemplating careers in infectious disease research. Prerequisite: HBM, BMO 503 and BMO 520

*3-4 credits, Letter graded (A, A-, B+, etc.)*

#### **HBM 691: Readings in Microbiology and Immunology Literature**

Readings in microbiology literature covering areas of molecular biology and genetics.

*Prerequisite: Permission of instructor.*

*Fall, 1 credit, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

### **HBM 692: Experimental Methods in Microbiology and Immunology**

The goal of this course is to introduce students to the rationale underlying the wide array of new methods in biology, as well as to promote the critical analysis of scientific literature.

Lectures will be given about various scientific methods and approaches, and journal articles relating to the concepts introduced will be assigned. A separate discussion section will be held to review and critique the articles, to be led by the students.

*1 credit, Letter graded (A, A-, B+, etc.)*

### **HBM 693: Research Proposal Preparation in Molecular Genetics and Immunology**

A course, based upon the literature in molecular genetics and microbiology, to instruct students in scientific writing and the preparation of research proposals. The course will be organized in three parts. In the first section of the course, students will become familiar with the components of the research proposal and will read and evaluate proposals written by the training faculty. Lectures given by the course co-directors will cover the basics of scientific writing, research proposal preparation and the problems and concerns commonly voiced by reviewers of research proposals. In the second section, students will develop two short proposals in the area of molecular genetics and microbiology that are unrelated to their graduate research. One of these short proposals will be selected for development into a full proposal. In the third section, students will develop and write the full proposal. The students' skills in proposal preparation will be enhanced by critiquing the short and full proposals presented by other students in the second and third sections of the course. Offered

*Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### **HBM 696: Professional Development in Microbiology and Immunology**

In a joint credit-bearing course, 12 students (at the advanced Bachelor and beginning Master level) from three partner institutions will develop a 360 degree view of six different pandemics that occurred in human history. Tuberculosis, Influenza, Dengue, SARS/ Covid 19, HIV, antimicrobial resistance. Each pandemic will be covered by one expert who also serves as a mentor for the

students. Expert-mentors will be recruited from the partners' networks. Six international student pairs will each explore one pandemic and compare its consequences as well as measures taken against them in different parts of the world. In addition, students will gain insights into public health institutions (WHO, CDC, RKI etc.). Students will get different perspectives on pandemics, which are of global concern, while measures against them are usually taken on a national level.

*0-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **HBM 697: Pandemics in Human History**

In a joint credit-bearing course, 12 students from three partner institutions will develop a 360°-view of six different pandemics that occurred in human history: Tuberculosis, Influenza, Dengue, SARS/Covid 19, HIV, antimicrobial resistance. Each pandemic will be covered by one expert who also serves as a mentor for the students. Expert-mentors will be recruited from the partners' networks. Six international student pairs will each explore one pandemic and compare its consequences as well as measures taken against them in different parts of the world. In addition, students will gain insights into public health institutions (WHO, CDC, RKI etc.). Students will get different perspectives on pandemics, which are of global concern, while measures against them are usually taken on a national level.

*1-2 credits, Letter graded (A, A-, B+, etc.)*

### **HBM 699: Dissertation Research in Microbiology and Immunology**

For the student who has been advanced to candidacy (G5); permission of dissertation advisor.

*Fall, Spring, and Summer, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **HBM 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, Summer, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **HBM 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take

place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.*

*Fall, Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **HBM 800: Full-Time Summer Research**

Full-time laboratory research projects supervised by staff members.

*0-1 credits, S/U grading*

*May be repeated for credit.*

## **HBP**

### **Pathology**

#### **HBP 511: Pathobiology for Graduate Health Care Practitioners**

For graduate students who have obtained primary health care baccalaureate degrees through the case study approach. Covers the underlying principles of modern experimental pathology. Focuses on the clinical aspects of the body system, including relevant underlying biochemistry, structure, or pathophysiology at the organ, tissue, cell or molecular level.

*Prerequisites: Undergraduate degree, health care experience, biochemistry or cell biology, anatomy and microbiology.*

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **HBP 556: Laboratory Medicine**

A four-week full-time (6 hr, day) course dealing with clinical laboratory decision making and the basis for the laboratory evaluation of human evaluation of human disease. Didactic and practical presentations by interdepartmental faculty. Intended principally for senior medical students, but also for advanced microbiology or biochemistry students interested in clinical applications.

*Prerequisite: Permission of instructor.*

*Spring, 6 credits, Letter graded (A, A-, B+, etc.)*

#### **HBP 590: Seminars in Immunology**

A series of monthly seminars focusing on research in progress by the participants, current journal articles in the field of immunobiology, and prepared reviews of specified areas in the general field.

*Prerequisite: MCB Graduate Students Fall and Spring, 1 credit, S/U grading May be repeated for credit.*

### **HBP 622: Clinical Pathologic Correlations: Gross Pathology**

Correlative exercises in clinical pathology and human gross anatomic pathology including surgical biopsy material. Open to students in medical sciences.

*Prerequisites: Systems pathology and general pathology course. Permission of instructor. Fall, 1-3 credits, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

### **HBP 691: Journal Club in Pathology**

Provides students with a forum for acquiring skills involved in the critical analysis and presentation of scientific data by active participation in seminars of major topics in cellular and molecular pathology, and critical discussion of selected topics with presentation of papers from the literature.

*Prerequisite: MCB Graduate Student Fall and Spring, 1 credit, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

### **HBP 966: Hematology Conference**

Teaches a given aspect of hematology, oncology or immunology. Staff from medicine, pathology, and nuclear medicine participate, and usually presents a case to introduce the subject. Various teaching aids, such as review of pathological material, are used. Primarily for health sciences professionals.

*1-3 credits, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

### **HBP 967: Tumor Conference**

Considers problems in the management of patients with a malignancy and recommendations for a course of therapy for each patient including a review of a particular aspect of cancer treatment or natural history in depth. Functions as the link between the hospital and the Eastern Oncology Cooperative Group. Primarily for health science professionals.

*1-3 credits, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

### **HBP 968: Advanced Clinical Pathologic Correlations: Gross Pathology**

Postgraduate correlative exercises in human gross pathologic anatomy that emphasize the gross pathologic basis for altered function and clinical manifestations of disease. Open to physicians and others with advanced degrees in medical sciences.

*1-3 credits, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

### **HBP 969: Anatomical and Surgical Pathology for Residents in Pathology**

To provide practical and clinical experience in tissue pathology. During the four week elective the student is given the opportunity to participate in all aspects of autopsies as well as gross and microscopic examination of surgical specimens. There is ongoing review of general and organ system pathology to reinforce structural-functional correlations. This elective is selected by students who plan a career in pathology as a "hands-on" introduction to the specialty. The elective is also chosen by others, particularly individuals who will enter radiology, and who seek to correlate radiographic and pathologic anatomy. Students who are sufficiently interested and motivated may become involved in relatively independent work-up of selected cases. Primarily for health sciences professionals.

*1-3 credits, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

### **HBP 971: Renal Clinicopathologic Correlations**

A case-oriented, postgraduate course in renal biopsy interpretation and its relationship to patient management.

*1 credit, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

## **HB Y**

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### **Physiology and Biophysics**

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#### **HB Y 500: Short Term Research Projects in Physiology and Biophysics**

Short term research project (rotation) under the supervision of a staff member.

*Prerequisite: Must be a Graduate Students in the Dept. of Physiology & Biophysics. Spring, 1-12 credits, Letter graded (A, A-, B+, etc.) May be repeated 4 times FOR credit.*

#### **HB Y 501: Physiology**

Introduces normal function of human tissues and organs and their regulation by nervous and endocrine systems. Emphasizes the organization and function of physiological control systems and the maintenance of a constant internal environment. Enrollment

restricted to fully matriculated graduate students, with permission of instructor. Only Fall.

*4 credits, Letter graded (A, A-, B+, etc.)*

#### **HB Y 530: Cellular Physiology and Biophysics**

Cellular structure and function. Topics include ion channels, excitability, transport, energetics and metabolism, contraction, secretion, and communication within and between cells. Emphasizes quantitative analysis of cellular processes.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

#### **HB Y 531: Medical Physiology**

A graduate-level introduction to the physiology of the organ systems with ultrastructural correlations. Ultrastructural correlations are demonstrated in a laboratory setting using histological preparations in conjunction with electron micrographs illustrating the relevant ultrastructure needed to understand the normal functioning of tissues and organs. The physiology of the major organ systems is addressed in a lecture format with the emphasis on problem solving. Relevant clinical correlations are addressed at the end of each block in so far as they illustrate how symptoms and signs of disease result from disordered physiology. Organ Systems addresses the structure and function of the cardiovascular, respiratory, renal, gastrointestinal, endocrine, skeletal, reproductive, and integumentary systems. Prerequisites: Admission to medical or dental school and permission of instructor. Only Spring.

*8 credits, Letter graded (A, A-, B+, etc.)*

#### **HB Y 554: Principles of Neuroscience**

The aim of this course is to highlight and create an understanding as to how the human nervous system operates.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HB Y 557: Advanced Physiology**

This course is designed to introduce students to integrative approaches in biomedical research. Emphasis will be placed on the primary physiological concepts of control, communication, signal processing, metabolism and replication. Prerequisites: Systems Physiology, Biochemistry and Permission of Instructor.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **HB Y 561: Statistical Analysis of Physiological Data**

Statistical methods useful in analyzing common types of physiological data. Topics include probability, data distributions, hypothesis testing with parametric and non-parametric methods, ANOVA, regression and correlation, and power analysis. Emphasis is on experimental design and appropriate, efficient use of statistical software.

*Offered*

*Spring, 1 credit, Letter graded (A, A-, B+, etc.)*

### **HBY 562: Model-based Analysis of Physiological Data**

The analysis of common biochemical and physiological data by non-linear regression of data models and biophysical models of physiological and biochemical processes. Examples include binding kinetics, compartmental mass transfer and spectral analysis.

*Prerequisite: Permission of instructor, HBY 561*

*Fall, 1 credit, Letter graded (A, A-, B+, etc.)*

### **HBY 564: Experimental Techniques in Systems Physiology**

A series of lectures and laboratory exercises designed to introduce students to in vivo experimental techniques used in systems physiology. Emphasis will be placed on the ethical use of rodents in biomedical research and the measurement of physiological variables. Data acquisition and analysis procedures used in cardiovascular, respiratory, neural, and renal physiology will also be covered. Only

*2 credits, Letter graded (A, A-, B+, etc.)*

### **HBY 570: Student Journal Club**

Graduate student presentation on a selected topic with faculty consultation.

*1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **HBY 590: Special Topics in Physiology and Biophysics**

Students seminars on topics to be arranged through consultation with faculty members. Prerequisite: Permission of instructor.

*Offered*

*Fall and Spring, 1 credit, S/U grading*

*May be repeated for credit.*

### **HBY 591: Physiology and Biophysics Research**

Original investigation under the supervision of a staff member.

*1-12 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **HBY 690: Seminar in Physiology and Biophysics**

Seminars and discussions on major topics in physiology and biophysics by students, staff, and visiting scientists. Prerequisite: Permission of instructor

*0-1 credits, S/U grading*

*May be repeated for credit.*

### **HBY 695: Practicum in Teaching in Physiology and Biophysics**

Practical experience and instruction in the teaching of physiology and biophysics carried out under faculty orientation and supervision.

*1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **HBY 699: Dissertation Research on Campus**

Original (thesis) research undertaken with the supervision of a member of the staff. Prerequisite: Advancement to candidacy (G5); permission of thesis advisor. Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*1-9 credits, S/U grading*

*May be repeated for credit.*

### **HBY 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*1-9 credits, S/U grading*

*May be repeated for credit.*

### **HBY 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed.

*1-9 credits, S/U grading*

*May be repeated for credit.*

### **HBY 800: Full-Time Summer Research**

Full-time laboratory research projects supervised by staff members.

*S/U grading*

*May be repeated for credit.*

## **HCB**

### **Medical Humanities, Compassionate Care & Bioethics**

#### **HCB 501: Compassionate Care, Medical Humanities, and the Illness Experience**

This course will introduce students to major interpretations of the illness experience, to several classical biographical and autobiographical accounts of illness, and to the important dynamic of compassionate care in the healing relationship. The patient-as-person will be emphasized throughout, as well as the ways in which respect for and empathy toward the patient impacts diagnostic accuracy, patient adherence, and patient and professional satisfaction. Some emotional dynamics of the illness experience will be addressed, such as hope, through the work of eminent physician-writers such as Jerome Groopman, MD. The dynamics of medical mistakes and forgiveness will be explored through psychiatrist Aaron Lazarre's influential writings on effective medical apologies. Some philosophical and metaphysical aspects of personhood and self-identity will be introduced.

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **HCB 502: Landmark Cases in Bioethics**

What is a life worth living? How do we decide, and who decides, when to use medical technologies such as incubators, ventilators, transplants and reproductive technologies? This is an intensive introduction to some of the cases in medical ethics that have changed the ways that we are born, cared for, and die in American hospitals. Examples of topics include: vaccination and public health; eugenics and human subjects research ethics; the right of privacy and health care; end-of-life planning and treatment; women's bodies and fetal rights; disability rights; religious beliefs and health care; triage and allocation of scarce resources; mental illness and individual rights; global clinical trials; and, bioethics and culture.

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **HCB 503: Traditions and Values in Bioethical Conflicts**

This course serves as an introduction to Western moral and religious traditions and to the positions about killing, saving, and



enhancing that these traditions have informed. It explores the interface between religion and biomedical ethics and then delves into specific issues in health care in light of more general normative concerns such as justice, love, autonomy and rights, utilitarianism, self-sacrifice, gender, virtue, and community. The issues with which the course deals address the plights of real people, in the concrete, who come from particular backgrounds and whose set of values may make them sometimes recalcitrant to possibilities that technology has made (or is just now making) available.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 504: Special Topic in Biotechnology**

Just because we can do it, does this mean that we should do it? This course takes a focused look at controversial practices in health care settings, such as organ donation and enhancements, which have been (and are continuing to be) made available with the advancement of technology. Ought we to regard that which technology makes available as uncontroversially good? If not, why not? What sorts of new issues regarding distributive justice, autonomy, utility, and compassion are ours to consider carefully because of the changing world in which we live?

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 510: Literature, Compassion, and Medical Care**

How does literature help us understand the nature of human illness and suffering? Can written works of art, ancient and contemporary, that depict moments of compassion and compassionate acts lay bare the moral, spiritual, psychological, and physical reality of suffering? There is a long association between literature and medicine, from the viewpoint of physician-writers, such as Anton Chekhov and William Carlos Williams, whose literary skills have eclipsed their medical backgrounds. Sherlock Holmes and Doctor Watson were the creations of a physician-writer, Arthur Conan Doyle. Physicians portrayed in literature, such as Dr. Bernard Rieux, in Albert Camus *The Plague*, have also explored the relationship between patient and doctor, the nature of healing. This semester-long course will study these relationships through reading of poetry, drama, fiction, memoir, and essay and reflect on the nature of suffering, the intrinsic human need for compassion, and the implications for health and healing.

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 511: Bioethics, Disability & Community**

Most people will experience disability at some point in their lives, and for some it will shape their social, personal, family, educational, and employment experiences. Viewpoints on disabilities which have emerged in policy and the broader culture have been explicitly challenged by emerging communities of people with disabilities who seek to speak for themselves and claim full inclusion in society. In this context, bioethicists and disability scholars have found points of both common cause and stark disagreement over issues such as neonatal and end-of-life care, the value and values inherent medical decisions and their outcomes. These bioethical debates occur in the context of debates over the rights of individuals with disabilities to self-determination, accommodations for work and schooling, and the potential for people with disabilities to make unique contributions because of--rather than despite--their disabilities. This course will consider major debates in bioethics in light of recent scholarship in disability studies, drawing on perspectives from philosophy, literature and narrative, history, and sociology.

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 512: Altruism and Bioethics**

What is altruism, and what are its evolutionary roots as a moral dynamic? What impact does altruistic action have on the human agent? Does it impact flourishing and health? When is it experienced as overwhelming by medical professionals? Where does altruism fit within medical and nursing professionalism? How is it related to compassionate care? What about the duty to treat in time of epidemic, auto-experimentation, pro-bono medical treatment, high-risk provision of healthcare in time of conflict, healthcare activism, and the commitment to the patient's good as a guiding professional ideal? How does the practitioner strike a balance between the care of patients and the care of the nearest and dearest or the care of the self? How does altruism correlate with pro-social behavior, happiness, and health?

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 513: Disease and Society**

What is disease? How do the beliefs, politics, and economies of particular societies shape how diseases are defined, experienced, and treated? In this seminar, students will explore these questions by analyzing historical documents, scientific reports, and historical scholarship. We will look at disease from

multiple perspectives as a biological process, clinical entity, population phenomenon, historical actor, and personal experience. We will pay special attention to how diseases have been recognized, diagnosed, named, classified and counted in different times, places, cultures, and settings based on different environmental and social conditions, medical ideas, diagnostic technologies, and available treatments. The course will begin with a review of major approaches to understanding the manifold relationships between disease and society. The remainder of the course will view disease and society relationships through the lens of specific issues, such as epidemic disease, consumption and affluence, globalization, and risk.

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 514: Global Bioethics**

Bioethics is an American invention. Ideas about medicine and morality, of course, go back to antiquity and are documented as medical ethics in Europe, medical morality in China, and under many other names in cultures around the world. Recently, the process of globalization of ideas, medical practices, clinical trials, and migration of patients has led to clashes of culture around issues such as the appropriate standards and control groups for clinical trials, organ transplantation, brain death, and end-of-life care. Issues of religion, morality, public policy, disability rights and policy, and health system structure and payment all shape how particular societies decide to manage divisive issues such as the beginning and end of life. This course will draw on a growing literature on global and transnational cases, policies, and traditions in the ethics of health, public health, and health care.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 515: Health Policy, History & Ethics**

Who gets sick? Who gets health care, what kind, and in what setting? This course covers the major health policy issues of the United States today, including the health status of the U.S. as a whole, the social and economic determinants of health, the role of personal and public health services in affecting health, the organization and financing of health services, and the multiple factors affecting health policies. We will explore the evolution of the US health care system in the past century, and debates about rights to health care or lack thereof, health disparities, conflicts of interest, and the ethics of health policy and practice.

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 516: Ethical Issues in Human Reproduction**

New technologies have modified human reproduction in numerous ways, raising profound questions about the moral status of human life and the nature of parental and sibling obligations. This course will investigate the values that attach to different relationships, both familial and general. It will cover questions around the treatment of infertility, surrogate mothering, the commodification of the body, and the elevated expectations of familial obligations that correspond to new reproductive technologies.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 517: The Problem of Evil: Philosophical, Biological, and Social Dimensions**

What is the nature of evil? Can it be the result of brain malfunction, something that is genetically predetermined? Or, is evil something which is part of or at least necessary to know the good? Alternatively, is evil an arbitrary designation, a perspective from which we can wrest ourselves given the right sort of reinvention? In this class, we shall address the problem of evil from scientific, social-scientific, and philosophical perspectives, using fiction and non-fictional sources. Examples of medical evil, such as the Nazi doctors or Tuskegee, can be introduced as case studies.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 518: Empirical Bioethics**

The formal study of bioethics attempts to define ethical courses of action in a world ever increasing in complexity. But in day to day practice, ethical outcomes are expressed through the individual decisions and resulting actions--of human agents. How do individuals form these judgments? How do people become motivated to engage in behaviors that are designed to benefit someone else? We will explore current scientific approaches to these questions with several areas of emphasis, including a) the neuroscience of compassionate care and altruism, b) cognitive and neuroscientific approaches to understanding judgment and decision making in ethical domains, and c) empirical approaches to quantifying the effects of ethically based policy decisions.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 519: Public Health Law**

This course is a survey of legal and policy issues that have special relevance for public health professionals. Topics may vary, but typically will include many of the following: structure of the U.S. legal system; power of state and federal governments in matters affecting health care; governmental power and the right to privacy; constitutional issues in social welfare benefits; governmental regulation of health care providers and payers; the scope and discretion of administrative agencies in health care; the antitrust laws; the fraud and abuse laws; and negligence in the delivery and financing of health care. The course is taught primarily by Socratic method.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 520: Bioethics and Film**

Film and television, both fiction and nonfiction, capture man of the human tragedies, challenges, and possibilities that are debated in bioethics books, articles, newspapers, on hospital ethics committees, and in daily clinical care. This course will explore themes of birth, death, hope, fear, faith, finitude and resource allocation through watching, analyzing, and reading about bioethics issues in visual media. The course will draw on material from philosophical ethics to history, health policy, and film criticism to place these issues and their portrayals in context.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 521: Clinical Ethics Practicum**

As difficult as settling abstract ethical issues in medicine may be, the delivery of ethical care presents its own set of difficulties. This course aims to introduce students to the practices hospitals employ to ensure the care they deliver meets the relevant legal and moral requirements. At the end of this course, students will have been exposed to many basic, and some advanced, aspects of clinical ethics theory and practice. They will be able to identify, describe, and analyze ethical dilemmas in clinical cases, and will develop an appreciation for the complexity and multi-disciplinary nature of ethical dilemmas in clinical medicine and will be able to apply what they have learned to assess ethical, social, and legal aspects of cases.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 522: The Role of Virtue Ethics in Medicine**

Aristotle's Nicomachean Ethics and the role of virtue ethics are central to many religious traditions including Buddhism, Christianity,

Confucianism, and the philosophical traditions. Key virtues include honesty, courage, generosity, prudence, justice, compassion, benevolence, loyalty, and hospitality. This course explores the real and potential role of virtue on the development of virtuous physicians. The course's texts offer two diametrically opposed views on the role of virtue in medicine, i.e., one is that virtue can be channeled into the training of medical professionals, whereas the other is that bioethics has extracted virtue from medicine. Through readings, documentaries, dialogue and active leadership of sessions by students, the course will interrogate the claims as well as possibilities for a role of virtue in medicine.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HCB 523: Special Topics in Medical Humanities**

As with all multidisciplinary pursuits, the medical humanities project is characterized by an ongoing negotiation among its practitioners over methods, scope and goals. This course will examine, in detail, one of the latest debates within the field.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **HCB 524: Special Topics in Bioethics**

Bioethicists are frequently asked to consider the ethical ramifications of new research findings and emerging technologies as they arise. This course will examine one such issue in close detail.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 3 times FOR credit.*

### **HCB 597: Independent Study (Permission Only)**

*May be repeated 4 times FOR credit.*

### **HCB 598: Independent Study**

*3 Credits, ABCF Grading  
0-4 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **HCB 599: Special Projects Capstone Course**

This course, to be offered in the second (spring) semester, is designed to satisfy the special projects requirement of our program. The first part of the course will be devoted to readings and discussions that further illuminate the methodologies of the interdisciplinary field of medical humanities, compassionate care, and bioethics. Students will develop an appreciation for the standards of high quality scholarship and research through review of carefully selected readings. This will prepare them for the second part of the course, where

they pursue and present their own research based on the existing literature. This capstone course will be highly collaborative, entail substantial peer review, and be organized around the development of significant student projects which are intended to represent the beginnings of publishable papers. Our entire faculty will be involved in these projects according to their specific areas of expertise.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

## HDO

### Oral Biology and Pathology

#### HDO 500: Biology of the Oral Mineralized Tissues

This course deals with the basic chemistry, crystallography, ultrastructure, and metabolism of the calcium phosphates involved in the formation and physiological and pathological resorption of the various mineralized tissues found in or associated with the oral cavity (enamel, dentin, cementum, bone). Ectopic calculus formation will be examined.

Prerequisites: HDO 560, 561, 562, and 563 or their equivalent. Fall and Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

#### HDO 510: Salivary Metabolism and Secretion

Consideration is given to the normal and abnormal structure and function of the glandular systems found in the oral cavity. The composition, regulation, and functions of the secretions from the major and minor salivary glands will receive particular attention.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### HDO 520: Oral Microbial Systems

Consideration is given to the structural composition, metabolism, and environmental relationships of the bacterial systems formed on and in association with the oral hard and soft tissues. Specific and mixed bacterial populations, such as those resident on extra-oral mucosal surfaces and the skin and their role in oral disease will be dealt with. Prerequisite: HDO 560, 561, 562, and 563 or their equivalent. Fall and Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

#### HDO 530: Molecular Biology and Pathology of the Periodontium

This course deals with the ultrastructure and biochemical composition of the periodontal tissues, remodeling of the extracellular matrix with an emphasis on the role of metalloproteinases; the microbial interrelations with the organic and inorganic components

of the periodontal tissues, the biochemical dynamics of gingival inflammation and wound healing, and the metabolic processes responsible for the composition and flow of gingival crevicular fluid. Prerequisites: HDO 560, 561 and 563 or their equivalent. Fall and Spring. Please note that this may be taken twice for a total of 4 credits.

*2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

#### HDO 531: Normal and Reparative Tissue Development in the Oral Cavity

This course includes a series of lectures and student-led discussions dealing with specific oral tissues, biologic mineralization, osseointegration, hard and soft tissue development, and tissue regeneration. The molecular aspects leading to oral cancer and osteonecrosis will also be presented and discussed.

*2 credits, Letter graded (A, A-, B+, etc.)*

#### HDO 532: Host-Parasite Interaction

This course includes a series of lectures and student-led discussions dealing with specific oral tissues, growth factors, cytokines, prostaglandins, biologic mineralization and wound healing. The biology of the immune system and phagocytic cells is presented, including the relationship of nutrition to inflammation and oral health. The microbiology of the oral cavity in health and disease as well as oral mucosal infections is presented as the basis of the understanding of immuno-pathobiology of dental caries and periodontal disease. The oral manifestations of pharmacologic agents are reviewed in terms of both their immunologic and non-immunologic mechanisms of pathology. Finally, antimicrobial chemotherapy and principles of infection control are reviewed in terms of clinical practice of dentistry.

*2 credits, Letter graded (A, A-, B+, etc.)*

#### HDO 533: Regional Anatomy, Orofacial Neuroscience and Pain Control

This course includes a series of lectures and discussions dealing with head and neck gross anatomy and microanatomy and biochemistry of orofacial pain. It will provide an in-depth understanding of the underlying neuroanatomy and biochemical events leading to the perception of acute and chronic orofacial pain.

*2 credits, Letter graded (A, A-, B+, etc.)*

#### HDO 534: Research Design and Biostatistics

This course aims to improve the understanding of basic research methods and statistical

concepts and principles and introduce some fundamental statistical tools, in the context of oral health research. The first part of this course covers basic assumptions and concepts of clinical and biomedical research, research methodologies, critical thinking, and evidence based dentistry. Residents will develop the skills needed to recognize the quality of the scientific evidence and the quality of various publications, the ability to conduct an evidence-based analysis of the literature, and the ability to present an evidence-based presentation on a controversial topic related to dentistry. The components of a research proposal and the basic elements of compliance will be discussed. The second part of the course covers concepts from statistics such as: summarizing, organizing, and presenting different types of sample data; simple probability; discrete and continuous probability distributions such as the Binomial and Normal distributions; the mean and variance of a probability distribution; sampling distributions; hypothesis testing; statistical significance; confidence intervals; non-parametric techniques; ANOVA; correlation and regression; categorical data analysis, tests for proportions, and Chi-Squared tests. Students will apply the techniques learned in class on a given data set, where they will analyze the data and perform statistical testing. The third part of the course students will discuss and evaluate the statistical methods used in relevant papers as well as in proposed students projects.

*1 credit, S/U grading*

#### HDO 535: Epithelial Keratinization and Differentiation

The course examines the growth and differentiation of stratified squamous epithelia. Particular emphasis is placed on molecular events involved in the differentiation program. Consideration is also given to mechanisms involved in oral and cutaneous disorders.

Prerequisites: Permission of instructor required; HBP 531 suggested; students must have had a background in cellular biochemistry molecular biology.

*Fall and Spring, 2 credits, Letter graded (A, A-, B+, etc.)*

#### HDO 541: Principles of Mucosal Immunology

The mucosal immune system is essentially the primary site of interaction between invading pathogens and the immune system. The overall aim of this graduate course is to facilitate a deeper understanding of the fundamentals of the immune system at mucosal surfaces. It will provide a broad overview of several core mucosal immunology topics and has been

designed for graduate students and post-docs who have recently entered the field. This class will provide in-depth analysis of the structural features that distinguish the mucosal immune system from the peripheral immune system. Features of innate and adaptive immunity as they relate to mucosal immune responses will also be covered. As well as delivering in depth lectures on relevant and emerging topics the course will engage participants in interactive discussions on topics in an informal setting. The course content is based on the "Principles of Mucosal Immunology" textbook.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HDO 550: Oral Diagnostics and Therapeutic Technology, Lectures and Laboratory Techniques**

Recent advances in the use and development of research technology for the early diagnosis and treatment monitoring of oral and systemic disease. Special attention is paid to the principles of technology transfer including patents and patenting; searching of on-line databases is a key component. The course includes relationships of dry mouth to salivary physiology, diabetes, and drug medications; salivary film measurements, wetting of oral surfaces, viscoelasticity and lubricity; the use of the Periotron and enzyme assays for the diagnosis of gingivitis and periodontal disease; instrumentation used in sensitive teeth measurement and evaluation of treatment effectiveness using oral compositions and iontophoresis; oral candidiasis and denture stomatitis and early detection and causes of dental caries; oral malodor measurements including use of the Halimeter and its use in the formulation of oral compositions. Application to clinical practice and clinical studies is covered.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HDO 560: Oral Biology and Pathology I**

The first of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy and pathology of the various systems that constitute the oral apparatus. Covers the embryological development of the face and oral cavity and the biology and pathology of the oral mineralized tissues. Prerequisites: Undergraduate degree in basic science; permission of instructor. Fall and Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HDO 561: Oral Biology and Pathology II**

The second of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy and pathology of the various systems

that constitute the oral apparatus. Covers the biology and pathology of the periodontal structures and the microbiology of the oral cavity. Prerequisites: Undergraduate degree in basic science; permission of instructor. Fall and Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HDO 562: Oral Biology and Pathology III**

This course is the third of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy, and pathology of the various systems that constitute the oral apparatus. The course consists of the following two units of instruction; (1) the biology and pathology of the salivary glands and their products and (2) the biology and pathology of the periodontal structures, Prerequisites: Undergraduate degree in basic science and permission of instructor Fall and Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HDO 563: Oral Biology and Pathology IV**

This course is the last of four comprehensive courses on molecular structure, biochemical and physiological function, developmental anatomy and pathology of the various systems that constitute the oral apparatus. Covers the biology and pathology of the oral sensory systems and the biology and pathology of oral motor systems. Prerequisites: Undergraduate degree in basic science and permission of instructor. Admission to Graduate Health Sciences Center Program.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HDO 590: Research Projects in Oral Biology and Pathology**

Individual laboratory projects closely supervised by faculty members to be carried out in their research laboratories.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **HDO 599: Graduate Research**

Original investigations undertaken with supervision of a faculty member.

*1-12 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **HDO 690: Oral Biology and Pathology Seminar**

Research seminars by students, staff, and visiting scientists which may include review of current literature and presentation of student research. Prerequisite: Enrollment in the MS or PhD program in Oral Biology and Pathology.

Fall and Spring. 1 credit, Letter graded (S/U) May be repeated for credit.

*1 credit,*

*May be repeated for credit.*

### **HDO 695: Oral Biology and Pathology Teaching Practicum**

Practice instruction in the teaching of oral biology and pathology at the undergraduate level carried out under faculty orientation and supervision.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HDO 699: Thesis Research Oral Biology and Pathology**

Dissertation Research, Prerequisite: Advancement to Candidacy Passing,

*Fall, Spring, and Summer, 1-9 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **HDO 704: Translational Oral Biology**

Covers the biochemical, physiological, microbiological and electronic principles involved in a variety of techniques used as aids in the diagnosis of oral diseases.

*Letter graded (A, A-, B+, etc.)*

### **HDO 706: Oral Facial Genetics**

Focuses on the utilization, preparation and analysis of basic human genetics in clinical situations. Covers genetic disorders of the craniofacial complex and dentistry for the multiple handicapped patient. 30 course hours Prerequisite: HD 501 or permission of instructor

*Letter graded (A, A-, B+, etc.)*

### **HDO 805: Summer Research**

SUMMER RESEARCH

*S/U grading*

*May be repeated for credit.*

## **HDS**

### **Oral and Maxillofacial Surgery**

#### **HDS 702: Oral Pathology**

Covers the clinical and histopathologic manifestations of acquired, inherited and neoplastic diseases of the human oral cavity. Includes benign and malignant tumors of bone, odontogenic and non-odontogenic cysts and tumors, mucosal and salivary gland diseases, and oral manifestations of systemic diseases. 62 course hours Prerequisites: HDO 601

*3 credits, Letter graded (A, A-, B+, etc.)*

# HHA

## Applied Health Informatics

### HHA 500: Health Care Delivery Systems

This course will focus on historic and current issues that impact the US healthcare delivery system with a primary focus on how health care is delivered, organized, governed, and financed. Special emphasis on how these concepts impact health care in the United States (US): current health policy and reform; social determinants of health; the interrelated concepts of access, quality, and cost; meaningful use; and more recent focus on value.

*3 credits,*

### HHA 501: Hlth Info Esstls: Standards and Interoperability

This course provides broad but significant immersion into the field of biomedical and health informatics with a special emphasis on the following topics: the clinical flow of data (acquisition, use, and storage of information in healthcare), biomedical research, informatics and public health, decision and cognitive science. Electronic health records, personal health records, personalized medicine, imaging, telemedicine, concepts of meaningful use, Health Information Technology for Economic and Clinical Health (HITECH), and American Recovery and Reinvestment Act (ARRA) are also explored.

*3 credits,*

### HHA 502: Health Information Systems and HIT Essentials

Provides broad but significant immersion into the fields of health information systems and health information technology (HIT). Emphasizes systems analysis, clinical decision-support, integrated networking and distributed computing technologies, telemedicine applications, mobile applications, cloud computing, architecture and infrastructures, and database and systems administration.

*3 credits,*

### HHA 503: HC Cybersec: Regulations, Confidentiality, Privacy

This course provides foundational knowledge in the laws, regulations, policies, and procedures related to the confidentiality, privacy, and security on all levels of health-related information and infrastructures. Special emphasis on will be on the following: interoperability, The Health Insurance Portability and Accountability Act (HIPAA),

Health Information Technology for Economic and Clinical Health (HITECH) Act, Privacy Rule and Security Standards, Code Set Rules, meaningful use, and information technology (IT) security forensics.

*3 credits,*

### HHA 504: Cloud Computing Health Informatic Professionals

This course will introduce open source cloud computing to a general audience along with the skills necessary to securely deploy applications and websites to the cloud. In this class, students will have the opportunity to learn about a wide variety of topics related to cloud computing that include the command line, Linux operating systems, open source software development, setting up servers and Linux, Apache, MySQL, and PHP (LAMP) stacks via docker, using GitHub, best practices for security, and the Domain Name System. No prior developer experience is necessary.

*3 credits,*

### HHA 505: Healthcare Leadership and Management Essentials

This course provides broad but significant immersion in organizational change, leadership, organizational behavior, project management, and change management. There is an emphasis on the following: healthcare project life-cycle, theoretical and applied strategies of managing change, communication and group dynamics, systems thinking, and strategic planning.

*3 credits,*

### HHA 506: Research Design and Methodology for the Health Informatics Professionals

This course provides an in-depth overview of quantitative, qualitative, and mixed methods research designs and methodologies. Students will analyze and evaluate the strengths and limitations of methods research designs and methodologies most appropriate to the practice of health informatics. This course emphasizes critical review and techniques of applied research and evaluation. Upon course completion, attendees will understand how to: (1) design and analyze clinical research protocols, (2) comply with best practices for study conduct, data management, and regulations, and, (3) apply the principles and practices underlying ethical and reproducible research.

*3 credits,*

### HHA 507: Data Science for Health Care: Python and R

This course introduces the student to the emerging field of data science through the presentation of basic math and statistics principles, an introduction to the computer tools and software commonly used to perform the data analytics, and a general overview of the machine learning techniques commonly applied to datasets for knowledge discovery within health care. The students will identify a dataset for a final project that will require them to perform preparation, cleaning, simple visualization, and analysis of the data with such tools as Python and R. Understanding the varied nature of data, their acquisition and preliminary analysis provides the requisite skills to succeed in further study and application of the data science field within healthcare.

*3 credits,*

### HHA 530: Clinical Decision Making and Process Improvement

Provides in-depth immersion into the knowledge and skills required to implement effective clinical decision making systems and participate in the development of clinical process improvements that support effective, efficient, safe, timely, equitable, and patient-centered care. Summer and Fall courses. Prerequisites: Summer and Fall courses including HHA 500, HHA 501, HHA 502, HHA 503, HHA 504, HHA 505, HHA 506, and HHA 507.

*4 credits,*

### HHA 531: Health Information Systems

Provides in-depth immersion into the knowledge and skills required to participate in the development or selection of an information system for clinicians; prepare clinicians prior to implementation and support them during implementation and ongoing operation of clinical information system; and evaluate the effectiveness of a system in meeting clinical needs. Summer and Fall courses. Prerequisites: Summer and Fall courses including HHA 500, HHA 501, HHA 502, HHA 503, HHA 504, HHA 505, HHA 506, and HHA 507.

*4 credits,*

### HHA 532: Leading and Managing Clinical Information Systems Change

Provides in-depth immersion into the knowledge and skills required to lead, manage change, and promote adoption associated with implementing clinical information systems. Summer and Fall courses. Prerequisites: Summer and Fall courses including HHA 500, HHA 501, HHA 502, HHA 503, HHA 504, HHA 505, HHA 506, and HHA 507.

*4 credits,*

**HHA 550: Applied Healthcare Analytics**

Focuses on the design and implementation of analytics to aide in the evaluation of health in populations. Explores the role of the health care analyst and analytics in the improvement of healthcare delivery and outcomes. Consists of on-line lectures, videos, and hand on assignments with data set sand analytic models. Prerequisites: Summer and Fall Courses. Prerequisites: HHA 500, HHA 501, HHA 502, HHA 503, HHA 504, HHA 505, HHA 506, and HHA 507. Department permission required.

4 credits,

**HHA 551: Artificial Intelligence and Emerging Technologies in Healthcare**

This course will focus on the application of artificial intelligence and emerging technologies in healthcare, as well as the technologies that are utilized to extract, process, and manipulate data in cloud environments. This course will consist of discussions, lectures, and hands-on use of analytical tools for analysis and data extraction. Prerequisites: Summer and Fall Courses. Prerequisites: HHA 500, HHA 501, HHA 502, HHA 503, HHA 504, HHA 505, HHA 506, and HHA 507. Department permission required.

4 credits,

**HHA 552: Healthcare Data Visualization**

Focuses on techniques and tools for designing and implementing effective visual representations of healthcare data. Students will learn how to analyze, parse, and represent quantitative and text data visually, and how to present data that is clutter free, engaging and easy to comprehend. Hands-on course utilizes Tableau as a presentation platform for the designing and building of data visualizations. Students will learn to express findings, answer questions, and to drive data supported decisions in healthcare. Consists of three weeks of campus lecture, twelve weeks of hand-on use of data visualization tools, assignments, lectures, and on-line discussions. Prerequisites: HHA 500, HHA 501, HHA 502, HHA 503, HHA 504, HHA 505, HHA 506, and HHA 507. Department permission required.

4 credits,

**HHA 586: Specialization Practicum I**

This is the first course in a two-part experiential learning sequence designed to provide significant hands-on immersion into health informatics. This 180-hour practicum is a progressive experiential learning experience.

6 credits,

**HHA 588: Specialization Practicum II**

This is the second and final course in a two-part experiential learning sequence designed to provide significant hands-on immersion into health informatics. This second 180-hour practicum is a progressive experiential learning experience that builds on the first experience.

6 credits,

**HHA 590: Quality Improvement Project I**

This is the first course in a two-part sequence. Under faculty supervision, students are given the opportunity to demonstrate integration, synthesis, and application of their knowledge and skills by identifying a real-world health informatics problem and researching best practices that can be utilized to create a solution. A majority of the course work will be completed independently.

6 credits,

**HHA 592: Quality Improvement Project II**

This is the second course in a two-part sequence designed to give the student the opportunity to demonstrate mastery of the knowledge and skills acquired in the program. Students will build upon the work in HHA 590 to design a health informatics solution for a real-world problem. Under faculty mentorship, students will work independently, but will be required to meet synchronously in small groups during the last week of the semester for presentations. Students are also required to engage in a rigorous peer-review of other students' progress throughout the semester.

6 credits,

**HHA 599: Practicum Continuation**

This course is for Applied Health Informatics students continuing with Practicum.

S/F graded

## HHM

### Medical Molecular Biology

**HHM 500: Fundamentals of Molecular Biology Techniques**

Covers main techniques used in molecular biology, including direct and amplified nucleic acid-based methods. Emphasizes basic principles behind each test, interpretation of results, advantages and limitations of each methods, and type of specimen required for each test. Addresses the importance of quality control, biosafety and proper decontamination

procedures to ensure accurate data for proper patient diagnosis.

3 credits,

**HHM 510: Advanced Molecular Biology Laboratory**

This 15-week laboratory course consists of a 6-hour weekly lab, during which the students perform hands-on activities covering the main molecular biology techniques used for the diagnosis of infectious and genetic diseases, determination of cancer markers, and forensic testing. Techniques include nucleic acid isolation, purification and quantification, DNA separation, amplification and sequencing.

Prerequisite: HHM 500

3 credits,

**HHM 511: Application of Molecular Biology in Diagnostics**

Introduces the applications of molecular biology techniques in diagnostics of various diseases. The students will learn the molecular mechanisms underlying infection by microorganisms, genetically inherited diseases as well as cancer, and how molecular techniques can help with the diagnosis and prognosis of these diseases. Addresses the advantages and limitations of different techniques available, as well as the importance of quality control. Prerequisite: HHM 500

3 credits,

**HHM 516: Application of Molecular Biology in Research**

Focuses on various applications of molecular biology techniques in both basic and translational medical research. High emphasis will be placed on the understanding of the molecular pathways involved in various diseases, including cancer, genetically inherited diseases and infection by microorganisms. The students will learn how the power of molecular genetic analysis is used to identify, isolate and characterize genes that cause and contribute to the etiology of human diseases. Explains how various molecular biology techniques can be applied to diagnose diseases and to develop potential therapeutics. Discusses the advantages and limitations of different techniques, as well as the importance of quality control. Prerequisite: HHM 500, 510, 511

3 credits,

**HHM 520: Flow Cytometry Laboratory**

This laboratory course consists of 30 hours of hands-on activities, and covers the main techniques used in the flow cytometry laboratory. This laboratory will be given once weekly, on weekends or weeknights. Students

will perform numerous immunophenotyping techniques, including stem cell quantitation, hematologic and non-hematologic neoplasms, minimal residual disease, fetal hemoglobin and cell functional assays. Students will learn how to do quality assurance and instrumentation maintenance, and will gain hands-on experience with the application software used by flow cytometers. Prerequisite: HHM 500, 510, 511 Co-requisite: HHM 521

*1 credit,*

### **HHM 521: Flow Cytometry Methods and Applications**

Introduces students to the applications of flow cytometry techniques and their applications in the diagnosis and prognosis of human diseases including leukemia and lymphoma, primary immunodeficiency diseases, Human Immunodeficiency Virus (HIV) infection detection of paroxysmal nocturnal hemoglobinuria, cytometry clinical transplantation, leukocyte functional assays, cell apoptosis, CD34 positive stem cell enumeration, immunologic dysfunction, and DNA and cell proliferation measurements in cancer cells. Prerequisite: HHM 500, 510, 511 Co-Requisite: HHM 520

*2 credits,*

### **HHM 531: Cytogenetics Methodology and Applications**

Focuses on the impact of chromosome abnormalities on the diagnosis, prognosis and treatment of cytogenetic syndromes. Covers basic cytogenetic concepts and laboratory techniques required for the detection of various diseases, including sex chromosome abnormalities, the fragile X syndrome, and structural and numerical chromosome abnormalities, with special emphasis on the mechanisms underlying these syndromes. Prerequisite: HHM 500, 510, 511, 516, 520, 521, 540, 545

*2 credits,*

### **HHM 540: Laboratory Operations in Molecular Biology**

Covers the main principles of laboratory standards used in the molecular diagnostics, including pre- and post-analytical operations, test result documentation, quality assurance and quality control. Considers the importance of safety, regulation and standards. Prerequisite: HHM 500, 510, 511, 516, 520, 521

*2 credits,*

### **HHM 545: Ethics in the Laboratory**

Reviews professional guidelines for ethical conduct and approaches to ethical dilemmas

for laboratory scientists. Explores ethical issues, including responsible research conduct, good laboratory practice, and research with human subjects. Discusses ethical principles in genetics and genetic engineering; advance directives, confidentiality, informed consent, patient rights, and Health Insurance Portability and Accountability Act of 1996 (HIPAA). All aspects of this class will be presented and discussed via a distance learning format using Blackboard. Prerequisite: HHM 500, 510, 511, 516, 520, 521

*2 credits,*

### **HHM 551: Research Methods and Scientific Writing**

Introduces students to the basic concepts of biomedical research. Emphasizes critical evaluation of published scientific literature, and how to plan, design and conduct a research study. Presents the proper use of the different statistical methods required to analyze research data. Teaches students how to communicate effectively as scientists by writing high quality scientific papers, giving oral presentations, and putting together a research proposal. The students will apply these concepts to their own writing. Prerequisite: HHM 500, 510, 511, 516, 520, 521, 540, 545

*3 credits,*

### **HHM 570: Journal Club on Medical Molecular Biology**

Students participate in critical analysis of scientific journal articles from a diverse set of topics related to the field of molecular biology including molecular diagnostics, molecular microbiology, cancer research, genetically inherited diseases and genomics, among others. In each session, a student presents the essential information of the paper including background, significance, hypothesis, experimental methods, results and conclusions by means of a narrated Powerpoint presentation. Following the presentation, the rest of the class discuss and analyze the content of the paper in an online discussion forum. Prerequisite: HHM 500, 510, 511, 516, 520, 521, 540, 545

*1 credit,*

### **HHM 581: Clinical Practicum in Molecular Diagnostics**

This is a two week fulltime practicum in a Clinical Molecular Diagnostics lab designed to give students supervised practical application of what was learned in classes. The students will be provided with on-the-job training while experiencing the work environment in a clinical diagnostic laboratory. Prerequisite: HHM fall year two courses.

*2 credits,*

### **HHM 583: Clinical Practicum in Flow Cytometry**

This is a two week fulltime practicum in a Clinical Flow Cytometry lab designed to give students supervised practical application of what was learned in classes. The students will be provided with on-the-job training while experiencing the work environment in a clinical diagnostic laboratory. This will be repeatable course, for additional course credits. Prerequisite: HHM fall year two courses.

*2 credits,*

### **HHM 585: Clinical Practicum in Cytogenetics**

This is a two week fulltime practicum in a cytogenetics diagnostics lab designed to give students supervised practical application of what was learned in classes. The students will be provided with on-the-job training while experiencing the work environment in a clinical diagnostic laboratory. Prerequisite: HHM fall year two courses.

*2 credits,*

### **HHM 596: Capstone Project in Medical Molecular Biology**

Culminating experience designed to for students to choose a topic of interest within the area of molecular diagnostics, flow cytometry, or cytogenetics and further investigate it by means of a systemic literature review. Topics can be problems identified during clinical practice or learned in classes. Students will need to develop a comprehensive proposal that will be reviewed by faculty. Prerequisite: HHM fall year two courses.

*2 credits,*

## **HHS**

### **Speech-Language Pathology**

#### **HHS 510: Aphasia and Related Disorders**

Provides current theory and practice in the identification, assessment, and intervention of aphasia in adults. Includes the anatomy, neuropathology and the cognitive and communication characteristics associated with different types of aphasias and Right Hemisphere Syndrome. Covers evidence-based practices in the assessment and intervention, multicultural issues during service delivery, patient and family education, and client advocacy. Students will learn how to translate research into clinical practice.

*3 credits,*

**HHS 511: Cognitive Communication Disorders**

Provides information about the assessment and intervention of cognitive communication disorders, including traumatic brain injury, primary progressive aphasia and dementia. Discusses evaluating and treating cognition, including attention, memory and executive function skills. Discusses evidence based practice for assessment and intervention with a focus on The World Health Organization's International Classification of Functioning, Disability, and Health model. Opportunities will be available for interprofessional practice and discussion about multicultural service delivery, partner/family education and challenges that clinicians face in today's healthcare system.

*1 credit,*

**HHS 512: Neuroscience in Communication Sciences and Disorders**

Covers the neuroanatomy and neurophysiology of the speech, language, hearing, and swallowing mechanism. This intensive neuroscience course includes neuroanatomical dissections, lectures, and clinical problem solving. Requires students to conduct a cranial nerve exam examining the cranial nerves responsible for speech and swallowing with a client diagnosed with a communication or swallowing disorder. Uses team-based and problem-based learning in the classroom to help students apply their theoretical knowledge into clinical practice.

*3 credits,*

**HHS 513: Adult Dysphagia**

Examines the anatomy and physiology of normal and disordered swallowing in the adult population. Includes assessment and intervention of swallowing disorders; etiologies of swallowing disorders; working with tracheotomy/ventilator dependent populations; ethical considerations; documentation; insurance coverage; importance of client advocacy; and education of family and other professionals. Students will refine their skills through case scenarios, role-playing situations, interprofessional education and interprofessional practice. Prerequisites: Completion of Year One Fall Courses

*3 credits,*

**HHS 514: Neuromotor Speech Disorders**

Covers the etiology, assessment and intervention of motor speech disorders secondary to developmental or acquired central and/or peripheral damage to the nervous

system of adults and children. Includes the identification and differentiation of various motor speech disorders secondary to neurological injury. Discusses best practice in assessment and intervention with an emphasis on evidence-based practice, ethical case studies, functional treatment outcomes, importance of interprofessional education, and client advocacy. Students will observe in the ALS team clinic at Stony Brook University Hospital.

*3 credits,*

**HHS 520: Preschool Child Language Disorders**

Examines the theories of language development, evidence-based practice assessment and intervention of language delays/disorders in preschool children, multicultural service delivery, treatment advocacy and outreach, designing intervention plans, establishing and maintaining collaborative relationships, and the role of family in the intervention process. Students will apply their theoretical knowledge to clinical practice by eliciting a language sample from a preschool child.

*3 credits,*

**HHS 521: Speech Sound Disorders**

Covers articulation and phonological development, theories of development, and disorders in children. Discusses best practice in assessment and intervention with an emphasis on evidence-based practice, language difference versus disorder, multicultural issues in service delivery, and phonological awareness. Students will apply theory into clinical practice by completing a speech sample assignment with a child diagnosed with a speech sound disorder.

*3 credits,*

**HHS 522: Early Intervention in Speech-Language Pathology**

Includes information about the normal development of feeding/oral-motor skills and its relation to overall motor development. Discusses feeding, craniofacial syndromes and disorders. Students will observe a session at the Cleft Palate - Craniofacial Center. Discusses information about clinical practice in early intervention, caregiver training, multicultural issues in service delivery, and counseling of families. Includes discussion about evidence-based practice approaches to assessment and intervention of children who are medically fragile and how to best facilitate communication and feeding with these children.

*3 credits,*

**HHS 523: Language and Literacy Disorders in School-Age Children and Adolescents**

Provides an overview about school-age and adolescent language and literacy disorders. Covers models of language and reading development. Discusses evidence-based practice assessment and intervention of oral and written language disorders in school-age children and adolescents, multicultural service delivery, treatment advocacy and outreach, designing intervention plans accounting for Common State Core Standards and Response to Intervention (RTI), and providing therapy services to children in schools. Students will apply their theoretical knowledge to clinical practice by eliciting narrative samples from a school-age child.

*3 credits,*

**HHS 524: Autism and Social Communication Disorders**

Reviews current research about speech-language, cognitive, and social communication aspects of Autism Spectrum Disorders. Discusses possible theories of ASD, the diagnostic criteria used to identify these children, best practices in assessment and intervention. Focuses on the role of families in the assessment and intervention process, using effective intervention strategies, and collaborative and interdisciplinary models of service delivery for children diagnosed with Autism and social communication disorders.

*2 credits,*

**HHS 526: Foundations of Teaching English Language Arts to Bilingual Language Learners**

Provides the students with an understanding of methods of teaching English language arts to bilingual English language learners, including literacy for meeting the State learning standards for students. This is a required course for students who wish to obtain a Bilingual Extension in any registered and approved Base Certification Program. There is a requirement of 25 hours of field experience dedicated to observations and paraprofessional authentic activities.

*3 credits,*

**HHS 530: Voice and Resonance Disorders & Instrumentation**

Provides a thorough understanding of physical, physiological and pedagogical principles in understanding professional and nonprofessional impaired voice production in children and adults. Discusses vocal anatomy, voice classification, and use of instrumentation for assessment and intervention. Provides



information about evidence-based practices in assessment and intervention, multicultural issues, and client advocacy. Students will integrate their theoretical skills with clinical practice by engaging in real life scenarios and case studies.

*3 credits,*

### **HHS 531: Fluency Disorders**

Provides the theoretical knowledge about the nature and possible etiologies of fluency disorders, and evidence-based practice assessment and intervention in the preschool, school-age, adolescent and adult populations. Emphasizes working with family and friends of persons who stutter. At the culmination of the course, students will complete a diagnostic evaluation and an intervention plan of a person with a fluency disorders.

*2 credits,*

### **HHS 532: Aural Rehabilitation**

Provides information and strategies for aural habilitation/rehabilitation with children and adults. Topics include hearing aids, cochlear implants, assistive technology, speech reading, auditory training, listening skills impacted by hearing loss, deafness, auditory processing disorders and communication strategies and counseling techniques. Students will develop an intervention plan based on communication skills and needs of the individual and learn about collaborating as part of multidisciplinary teams.

*2 credits,*

### **HHS 533: Augmentative and Alternative Communication**

Examines the design, selection, and use of augmentative and alternative methods of communication. Addresses the populations for which they are appropriate, and issues related to the prevention, assessment and intervention of persons using augmentative and alternative methods and devices, client advocacy, and service delivery models. Students will also learn about incorporating evidence-based practices and multicultural services delivery in assessment and intervention.

*2 credits,*

### **HHS 536: Seminar in Medical Speech-Language Pathology**

Prepares students to provide evidence-based practice assessment and intervention with patients in a medical setting. Students will apply ethical and professional practice skills during problem-based and team-based case studies. Topics include: identifying the role of the SLP as a member of the rehabilitation team in healthcare, identifying pertinent

background information and applying the information in making decisions about the patient's communication and swallowing function, creating functional treatment plans, and interprofessional education and practice. Students will also participate in neurology grand rounds.

*1 credit,*

### **HHS 537: Seminar in Professional, Ethical and Multicultural Issues in Communication Sciences and Disorders**

Covers an overview of the policies of the graduate program in Speech-Language Pathology and current issues and procedures related to the clinical practice of speech-language pathology. Topics include knowledge and skills related to professional ethics, SLPs in different work settings, documentation, confidentiality, mandatory reporting of abuse, regulations and requirements for professional practice, cultural considerations for studying, assessing and treating communication and swallowing disorders in culturally and linguistically diverse (CLD) populations, knowledge and skills related to certification and licensure, employment seeking skills, cultural linguistic diversity, clinical fellowship, and information about ASHA and its role in the profession.

*2 credits,*

### **HHS 539: Seminar in Counseling**

Provides an overview about counseling in speech-language pathology, specifically in interdisciplinary and collaborative healthcare and educational settings. Covers the role of the speech-language pathologist in the counseling process, contemporary counseling issues, models of counseling, multicultural issues and advocacy during prevention and wellness, screening, assessment and treatment in different service areas. Incorporates case studies and team-based learning.

*1 credit,*

### **HHS 540: Foundations of Clinical Practice**

Provides the students with a thorough understanding of the assessment and therapy principles, methods and procedures in speech-language pathology. Topics include Health Insurance Portability and Accountability Act (HIPPA), universal precautions, CALIPSO, writing behavioral objectives, session plans, progress notes, individual and group therapy, data accountability and recording, and teaching strategies. Students will attain 25 hours of supervised clinical observation if they did not attain at the undergraduate level. Corequisite: HHS 581

*2 credits,*

### **HHS 542: Clinical Concepts in Audiology**

Provides knowledge and skills necessary to perform the responsibilities as outlined in the scope of practice of the speech-language pathologist. Discusses pure tone screenings, otoscopic inspection, tympanometry screening, listening checks for hearing aids, multicultural screening considerations, and counseling patient/family.

*2 credits,*

### **HHS 544: Diagnostics in Speech-Language Pathology**

Covers principles and methods of evidence-based practice assessment of a variety of communication and swallowing disorders across the lifespan. Includes analyzing and interpreting testing data, designing functional intervention plans based on the results, reporting assessment results to clients, family, and other professionals working in educational and health related fields, teaching students to be critical consumers of assessment materials, client advocacy and outreach, and professional ethics and practice. Students will engage in team-based and problem-based learning experiences. Students will acquire experience writing the different sections of a diagnostic report. Corequisite: HHS This course is taken concurrently with HHS 587

*2 credits,*

### **HHS 546: Speech Language Pathology in Schools**

Covers the role of the speech-language pathologist in the school setting, models of service delivery, historical and legal foundations of education, scheduling, individualized education planning, multicultural service delivery, importance of collaboration and consultation, Common Core Standards, managing the educational environment to maximize communication opportunities, and communication with family and professionals. Describes models and theories of typical and atypical growth and behavior across age groups, and philosophies that provide the foundation for research-based special education practice.

*3 credits,*

### **HHS 551: Research Methods and Resources in Communication Sciences and Disorders**

Teaches students to be critical consumers of different types of research in the field of communication sciences and disorders. Topics include research designs; accessing and assessing articles in journals; using Refworks;

creating an annotated bibliography; ethics in research; Institutional Review Board; Evidence-Based Practice in communication disorders; HIPAA; and constructing a presentation/professional poster. Students will be required to write a research proposal including a research question, theoretical position, supportive literature review, and methodology.

*2 credits,*

### **HHS 572: Speech and Language Pathology in the Schools Clinical**

Required clinical/seminar for students pursuing their TSSLD certification. Students will complete 150 clock hours of supervised clinical practice in a school setting. Seminar will meet once weekly and allow students to discuss evidence-based practice assessment and intervention in the school setting, models of service delivery, multicultural diversity, advocacy and outreach, classroom management, NYS Standards, educating family, collaboration with professionals, and reflect about their clinical experiences.

*4 credits,*

### **HHS 574: Speech and Language Pathology in the Schools Bilingual Clinical**

Required clinical/seminar for students pursuing their Bilingual Extension certification. Students are required to complete 150 clock hours (50 hours with bilingual population) of supervised clinical practice in a bilingual school setting. There will be a seminar which will meet once weekly and allow students to discuss evidence-based practice assessment and intervention in the school setting, models of service delivery, multicultural diversity, advocacy and outreach, classroom management, NYS Standards, educating family, collaboration with professionals, and reflect about their clinical experiences

*4 credits,*

### **HHS 581: Clinical I**

Integrates information learned in concurrent speech-language pathology courses through real-life clinical experiences, classroom discussions and clinical simulations with other allied health professionals. Clinical clock hours will be obtained for real-life experiences and clinical simulations. Students will complete an evidence-based practice presentation to faculty and peers at the culmination of this course. Corequisite: HHS 540 Foundations of Clinical Practice

### **HHS 582: Clinical II**

Integrates information learned in previous and concurrent speech-language pathology courses through real-life clinical experiences and classroom discussions. Students will provide prevention, and evidence-based practice assessment and intervention services with adults and children. Clinical clock hours will be obtained for real-life experiences at clinical sites affiliated with Stony Brook University. Students will complete an evidence-based practice presentation to faculty and peers at the culmination of this course. Prerequisites: HHS 540 and HHS 581 (with a minimum grade of B)

*1 credit,*

### **HHS 583: Clinical III**

Integrates information learned in previous and concurrent speech-language pathology courses through real-life clinical experiences and classroom discussions. Students will provide prevention and evidence-based practice assessment and intervention services with children and adults. Clinical clock hours will be obtained for real-life experiences at an outside placement. Students will complete an evidence-based practice presentation to faculty and peers at the culmination of this course. Prerequisites: HHS 540, HHS 581, HHS 582 (with a minimum grade of B)

*1.5 credits,*

### **HHS 584: Clinical IV**

Integrates information learned in previous and concurrent speech-language pathology courses through real-life clinical experiences and classroom discussions. Students will provide prevention, and evidence-based practice assessment and intervention services with children or adults. Clinical clock hours will be obtained for real-life experiences at an outside placement. Students will complete and evidence-based practice presentation to faculty and peers at the culmination of this course. Prerequisites: HHS 540, HHS 581, HHS 582, and HHS 583 (with a minimum grade of B).

*3 credits,*

### **HHS 585: Clinical V**

Integrates information learned in previous and concurrent speech-language pathology courses through real-life clinical experiences and classroom discussions. Students will provide prevention and evidence-based practice assessment and intervention services with children or adults. Clinical clock hours will be obtained for real-life experiences at an outside placement. Students will complete an evidence-based practice presentation to faculty and peers at the culmination of this course. Prerequisites: HHS 540, HHS 581, HHS 582, and HHS 583 (with a minimum grade

of B). NOTE: This course required clinical for students not completing the TSSLD or TSSLD with Bilingual Extension. Foundations of Clinical Practice, Clinical I, Clinical II, Clinical III, and Clinical IV are pre-requisites for this course.

*3 credits,*

### **HHS 586: Audiology Clinical**

Provides practical skills necessary to perform the responsibilities as outlined in the scope of practice of the speech-language pathologist. Students will gain hands-on experience performing pure tone screenings, otoscopic inspection, tympanometry screenings, listening checks for hearing aids, and making referrals to audiologists. Corequisite: HHS 542

### **HHS 587: Diagnostics in Speech-Language Pathology Clinical**

Students will provide evidence-based practice assessment with children and adults diagnosed with communication and swallowing disorders. Students will be selecting and administering evaluation procedures, adapting evaluation procedures, interpreting and synthesizing information to determine diagnoses, considering multicultural service delivery and treatment advocacy and outreach, designing intervention plans, establishing and maintain collaborative relationships, making appropriate referrals and recommendations, providing counseling and education to patients/family and other professionals, writing diagnostic reports, and adhering to the ASHA Code of Ethics. Corequisite: HHS 544

### **HHS 594: Capstone Project in Speech-Language Pathology and Praxis Examination Preparation**

This hybrid course will cover the nine ASHA areas of specialty, including speech sound disorders; child language/literacy disorder; adult language/neurological disorders; voice disorders; fluency disorders; augmentative and alternative communication; dysphagia; research methods; and cultural aspects of communication disorders. Discusses basic human communication; audiology/hearing; counseling; professional issues; and research. Provides necessary tools to prepare and present a professional poster illustrating students' research study. Students will write a research paper summarizing their capstone project for submission to a journal or for a professional presentation.

*2 credits,*

### **HHS 599: Clinical Continuation**

Clinical continuation course for speech-language pathology students only.

*S/F graded*  
*May be repeated for credit.*

### **HHS 599: Clinical Continuation**

This course is for speech-language pathology students continuing with fieldwork.

*S/F graded*  
*May be repeated for credit.*

## **HIS**

### **History**

#### **HIS 500: Historiography**

Introduction to historiography through reading and writing about interpretations of history, historical methods, and major historians. Term paper on historian of choice.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 501: Early Modern Europe Seminar: 1450-1789**

Field seminar in early modern European history, 1450-1789. Surveys the major historical problems and interpretations from the Renaissance to the coming of the French Revolution.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 502: Introduction to Late Modern Europe**

Field seminar in late modern European history, 1789-1945. Surveys the major historical problems and interpretations from the French Revolution through the Second World War.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 516: Theme Seminars on Empire, Modernity, and Globalization**

*May be repeated for credit.*

#### **HIS 517: Theme Seminars on Empire, Modernity, and Globalization**

*May be repeated for credit.*

#### **HIS 521: Introduction to United States History to the Civil War**

Field seminar in U.S. history from the founding of the British colonies to the beginning of the Civil War. Surveys the major topics and interpretations. Required for M.A. students in U.S. history.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 522: Introduction to United States History Since the Civil War**

Field seminar in U.S. history from the Civil War to the Cold War. Surveys the major interpretations.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 524: Core Seminar: History, Theory and Practice**

Introduction to the theory, practice and writing of history through the reading of theoretical and historical texts and the writing of a research paper. This course meets over the entire academic year, for 3 credits per semester, and is mandatory for all new Ph.D. students. Students entering with an M.A. take it at the discretion of their advisor.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 525: Core Seminar: History, Theory and Practice**

Introduction to the theory, practice and writing of history through the reading of theoretical and historical texts and the writing of a research paper. This course meets over the entire academic year, for 3 credits per semester, and is mandatory for all new Ph.D. students. Students entering with an M.A. take it at the discretion of their advisor.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 526: Core Seminar: History Theory and Practice**

Introduction to the theory, practice and writing of history through the reading of theoretical and historical texts and the writing of a research paper. This course meets over the entire academic year, for 3 credits per semester, and is mandatory for all new Ph.D. students. Students entering with an M.A. take it at the discretion of their advisor.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 527: Core Seminar: History, Theory and Practice**

Introduction to the theory, practice and writing of history through the reading of theoretical and historical texts and the writing of a research paper. This course meets over the entire academic year, for 3 credits per semester, and is mandatory for all new Ph.D. students. Students entering with an M.A. take it at the discretion of their advisor.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 532: Theme Seminar: Gender, Religion and Modernity**

*May be repeated 5 times FOR credit.*

#### **HIS 535: Theme Seminars on Gender, Sexuality and Reproduction**

*May be repeated for credit.*

#### **HIS 540: The Black Power Movement**

This course examines the Black Power Movement. Stokely Carmichael's call for

"Black Power!" broke through the commotion of everyday politics during 1966's Meredith March Against Fear. Soon after, and for the next decade, Black Power galvanized African American politics, engendering radical movements for social, political, and cultural transformation that impacted blacks in the United States and beyond. An emerging historiography traces the roots of Black Power in the postwar black freedom movement, finding cultural and political touchstones for future Black Power activism among civil rights renegade, trade unionists, and black nationalists. We will examine works produced during the Black Power era and new scholarship to analyze the Black Power Movement's legacy in the politics and culture of African Americans. Permission of advisor is required. This course is offered as both HIS 540 and AFS 540.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 541: Introduction to Colonial Latin American History**

Field seminar in colonial Latin American history. Surveys major historical problems and debates from the colonial period through the wars for independence. Required for M.A. in Latin American history.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 542: Modern Latin American History Seminar**

Field seminar in modern Latin American history. Surveys major historical problems and debates from the post-independence period to the present. This course is offered as both CEG 517 and HIS 542.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HIS 543: Theme Seminars on Gender, Sexuality, and Reproduction**

*May be repeated for credit.*

#### **HIS 550: Modern Africa**

This course interrogates how historians define the modern age through the history of Sub-Saharan Africa from the fifteenth century to the present, a period that began with Africa at the center of exchanges in cultural, material, and human commodities. Topics to be explored include Trans-Saharan, Atlantic, Indian Ocean, and regional cultural and economic systems, slave trade and abolition, the rise of "legitimate commerce," new African mercantile and laboring classes, European conquest and militarization, anti-colonial and Pan-African movements, and the nation-state and its problems in post-colonial Africa. The course will also pay attention to the theoretical and methodological apparatuses Africanists

have used to challenge conventional narratives in which African histories are absent or seen as aberrant. Topics will include critical approaches to slavery, including Africanist responses to the idea of slavery as "social death", fictive and other forms of kinship, the concept of "wealth in persons," gendered social identities and hierarchies, the invention and construction of tradition, resistance, and the colonization of consciousness. Semesters Offered: No fixed semester Grading: ABCF  
3 credits, Letter graded (A, A-, B+, etc.)

**HIS 552: Theme Seminar: Mass Media and Journalism in International Perspectives**

*May be repeated for credit.*

**HIS 553: Theme Seminars on Nation, State and Civil Society**

Topics vary by semester.

3 credits,

*Offered Fall and/or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 3 times FOR credit.*

**HIS 554: Theme Seminars on Nation, State, and Civil Society**

*May be repeated for credit.*

**HIS 555: Theme Seminars on Nation, State, and Civil Society**

*May be repeated for credit.*

**HIS 557: Oral History: Ethics and Craft**

In this seminar, students will read and discuss oral history theory, debates, and developments, as well as academic and crossover scholarship that relies heavily on oral history as a methodology and/or source base. We will explore the questions: How do we treat oral histories critically as a source and method? What are the ethics and legalities of good oral history gathering, practice, and preservation? How do we deal with issues of subjectivity, memory that shifts with age and time, and our personal relationships with our interviewees? What are the advantages of different formats of recording and archiving an oral history (textual, audio, and audiovisual)? And finally, how do we craft powerful historical writing that integrates oral interviews smoothly? Seminar participants, depending on MA or PhD level, will choose a final project of either a 15-30 page research paper related to their field of interest that integrates an oral history (or histories) they have conducted themselves; or a 20-30 minute high-quality podcast with accompanying website page and transcription featuring at least one oral history subject. Prerequisite: enrollment in a

History graduate program, or with permission of instructor for graduate students outside of History.

3 credits, Letter graded (A, A-, B+, etc.)

**HIS 562: Modern African History and/or Asian History Seminar**

Field seminar in modern African history. Surveys major topics such as nationalism, anticolonial movements, and modernization.

3 credits, Letter graded (A, A-, B+, etc.)

*May be repeated 2 times FOR credit.*

**HIS 563: Introduction to South Asian History**

Surveys major topics such as nationalism, anticolonial movements, legacies of British imperialism, and modernization.

3 credits, Letter graded (A, A-, B+, etc.)

**HIS 564: Introduction to Chinese History**

Field seminar in modern Chinese history. Surveys major historical topics from modernization to revolution to reform and sociocultural change. For MA, MAT, PhD students.

3 credits, Letter graded (A, A-, B+, etc.)

**HIS 565: Introduction to Japanese History**

Field Seminar in Modern Japanese History surveys major historical topics from reform and modernization to imperialism and postwar reconstruction. For MA, MAT, PhD students.

3 credits, Letter graded (A, A-, B+, etc.)

**HIS 570: Theme Seminars in Environment, Science and Health**

Spring

*May be repeated for credit.*

**HIS 571: Theme Seminars in Environment, Science and Health**

Spring

*May be repeated for credit.*

**HIS 572: Theme Seminars in Environment, Science and Health**

Spring

*May be repeated for credit.*

**HIS 581: Supervised Teaching**

Teaching practicum that usually accompanies a student's assistantship.

3 credits, S/U grading

*May be repeated for credit.*

**HIS 582: Teaching Practicum**

Practicum in teaching methods for new assistants. (MA. Workshop required deleted from the curriculum)

3 credits, S/U grading

**HIS 584: Directed Readings for M.A. Candidates**

Specialized tutorials based on contractual relationship between individual student and faculty. Required for M.A. students.

1-3 credits, S/U grading

*May be repeated for credit.*

**HIS 585: Directed Readings for M.A. Candidates**

Specialized tutorials based on contractual relationship between individual student and faculty. Required for M.A. students.

1-3 credits, S/U grading

*May be repeated for credit.*

**HIS 586: Directed Readings for M.A. Candidates**

Specialized tutorials based on contractual relationship between individual student and faculty. Required for M.A. students.

1-3 credits, S/U grading

*May be repeated for credit.*

**HIS 587: Teaching Practicum I: American Controversies**

HIS 587: Teaching Practicum I: Controversies in American History

*HIS 588: Teaching Practicum II:*

*Controversies in American History*

*Offered Fall every year, 1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**HIS 588: Teaching Practicum II: American Controversies**

HIS 587: Teaching Practicum I: Controversies in American History

*HIS 588: Teaching Practicum II:*

*Controversies in American History*

*Spring, 2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

**HIS 595: Reading Colloquium in Women's History**

A topics course dealing with such subjects as women in social movements, the place of gender in particular historical circumstances, imperialism and woman, changing views of sexuality, or relations between family policies and other political programs. This course offered as both HIS 595 and WST 595.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**HIS 601: Research Seminars on Social and Cultural History**

*May be repeated for credit.*

**HIS 603: Research Seminar on Social and Cultural History****HIS 615: Research Seminars on Empire, Modernity, and Globalization****HIS 616: Research Seminars on Social and Cultural History****HIS 617: Research Seminars on Empire, Modernity, and Globalization****HIS 622: Migration, Diaspora and Transnationalism****HIS 623: Research Seminars on Ethnicity and Migration****HIS 631: Research Seminar: The Social History of Medicine and Health****HIS 632: Research Seminars on Gender and Sexuality****HIS 633: Research Seminars on Gender and Sexuality****HIS 634: Research Seminars on Gender and Sexuality****HIS 652: Research Seminar: Oral History: Methodology and Theory**

Topics vary by semester.

*3 credits, S/U grading*

*May be repeated 3 times FOR credit.*

**HIS 653: Research Seminars on Nation, State, and Civil Society****HIS 654: Research Seminars on Nation, State, and Civil Society****HIS 655: Research Seminars on Nation, State, and Civil Society****HIS 682: Directed Readings for Ph.D. Candidates**

Specialized tutorials based on contractual relationship between individual student and faculty member.

*1-18 credits, S/U grading*

*May be repeated for credit.*

**HIS 684: Directed Readings for Ph.D. Candidates**

Specialized tutorials based on contractual relationship between individual student and faculty member.

*1-18 credits, S/U grading*

*May be repeated for credit.*

**HIS 685: Directed Readings for Ph.D. Candidates**

Specialized tutorials based on contractual relationship between individual student and faculty member.

*1-9 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**HIS 686: Directed Readings for Ph.D. Candidates**

Specialized tutorials based on contractual relationship between individual student and faculty member.

*1-18 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**HIS 695: Dissertation Prospectus Workshop for Ph.D. Candidates**

Required of all Ph.D. candidates in order to prepare a dissertation prospectus. This seminar should be completed either before or in the same semester as the qualifying examination.

*Offered once each year, 3 credits, S/U grading*

**HIS 699: Dissertation Research on Campus**

Dissertation research under direction of advisor.

*Prerequisite: Advancement to candidacy (G5).*

*Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.*

*Fall, Spring, and Summer, 1-9 credits, S/U grading*

*May be repeated for credit.*

**HIS 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

**HIS 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor. Fall, Spring, 1-9 credits, S/U grading May be repeated for credit.*

**HIS 800: FULL TIME SUMMER RES**

*May be repeated for credit.*

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**HMP**

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**Psychiatry**

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**HMP 575: Appl Clin Neuropsych**

*May be repeated for credit.*

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**HND**

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**Nursing (D.N.P.)**

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**HND 598: School of Nursing Enrollment of Course Work**

For students who need to enroll in course work before they attend the orientation

*0-12 credits, S/U grading*

**HND 612: Theories of Applied Science**

This course will explore the theoretical and scientific foundations for scholarly doctoral level practice. This course emphasizes the application of theory-based practice models, quality improvement, and implementation frameworks that guide the translation of evidence into practice toward improving population health outcomes.

*3 credits,*

*May be repeated 2 times FOR credit.*

**HND 615: Genomics**

This course will explore the role of genetic factors in the, causation, treatment, and prevention of human disease. Emphasis will be placed on translation of genetic discoveries into interventions which improve health outcomes.

3 credits,  
May be repeated 2 times FOR credit.

### **HND 625: Health Care Policy and Social Justice**

This course will explore the interface among federal, state and local governments, from a historical to a contemporary perspective, relative to social determinants of health.

Emphasis will be placed on correlating components of healthcare to health policy, fiscal implications, access to care, and delivery of care.

3 credits,  
May be repeated 2 times FOR credit.

### **HND 635: Biostatistics**

This course will provide knowledge of statistical approaches used in health research and epidemiology. Emphasis will be placed on applying statistical methods to critically evaluate evidence used in clinical decision making.

3 credits,  
May be repeated 2 times FOR credit.

### **HND 640: Epidemiology and Population Health**

This course will focus on the study of epidemiological, biostatistical, and environmental data as they relate to evidence-based practice, injury and disease prevention, and improvement of population health outcomes.

3 credits,  
May be repeated 2 times FOR credit.

### **HND 645: Large Data Analyses**

This course will provide an overview of real-world and healthcare data sets available at the federal, state, and local levels. Emphasis will be placed on the query of large data sets and developing analytical methods to answer research questions.

3 credits,  
May be repeated 2 times FOR credit.

### **HND 647: Doctoral Seminar in Evidence-based Practice**

This course will emphasize development of doctoral-level academic skills essential for establishing the scientific foundation of nursing practice and scholarship, and culminate in comprehensive review of select literature. Practice experiences will provide opportunities to acquire these and other competencies.

4 credits,  
May be repeated 2 times FOR credit.

### **HND 650: Systems Theory**

This course will provide knowledge and opportunities for identifying responsibilities inherent in the leadership role, opportunities for change, and strategies to improve and enhance health care delivery from a systems perspective.

3 credits,  
May be repeated 2 times FOR credit.

### **HND 655: DNP Synthesis I**

This course will emphasize methodology, and culminate in development of a proposal for a comprehensive doctoral-level project which seeks to advance health outcomes. Practice experiences will provide opportunities to acquire these and other competencies.

5 credits,  
May be repeated 2 times FOR credit.

### **HND 665: DNP Synthesis II**

This course will emphasize data collection and measurement, and culminate in the analysis of data from a comprehensive doctoral-level project which seeks to advance health outcomes. Practice experiences will provide opportunities to acquire these and other competencies. Required prerequisite: HND 655.

6 credits,  
May be repeated 2 times FOR credit.

### **HND 670: Independent Studies**

This elective course provides an opportunity to use advanced critical thinking and investigative skills to develop or refine specific competencies that support the advancement of human health. Except for extraordinary circumstances, Independent Studies cannot replace courses for a degree. Prerequisite: By permission of faculty.

0-4 credits,  
May be repeated 2 times FOR credit.

### **HND 675: DNP Synthesis III**

This course will emphasize scholarly presentation, and culminate in the synthesis and dissemination of results from a comprehensive doctoral-level project which seeks to advance health outcomes. Practice experiences will provide opportunities to acquire these and other competencies. Required prerequisite: HND 665.

6 credits,  
May be repeated 2 times FOR credit.

### **HND 682: Doctor of Nursing Practice (DNP) Continuing Coursework**

This elective course provides an opportunity to achieve program-essential requirements following a course-disrupting circumstance that is beyond the student's control

0-6 credits, S/U grading  
May be repeated 2 times FOR credit.

## **HNG**

### **Nursing Master and Post Master's Certificate**

#### **HNG 501: Primary Care**

The student explores and analyzes common health problems as experienced by women from young adulthood through old age. Optimum client outcomes are emphasized in the development of client specific management plans. The clinical components of primary care are practiced in women's health care settings. An emphasis is placed on application of evidence-based screening guidelines. Prerequisite: HNG 540 and HNG 588; Co-Requisite: HNG 515

3 credits,  
May be repeated 2 times FOR credit.

#### **HNG 506: Evidence-based Health and Wellness of the Contemporary College Student**

This interdisciplinary course focuses on understanding the health and wellness continuum of the contemporary college student, identifying the at risk student, and examining models for intervention and student support. Concepts including developmental theory, health beliefs and culture will be explored in relation to topics such as health maintenance, mental health substance abuse, violence, and the needs of the student with cognitive and physical disabilities.

2 credits,  
May be repeated 2 times FOR credit.

#### **HNG 507: Parenting: Anticipatory Guidance**

This course critically examines issues, knowledge and skills which facilitate optimal parent/child health outcomes. Concepts from humanities, health related and nursing sciences provide a knowledge based for parenting and parent education. Anticipatory guidance, as a therapeutic nursing intervention, will be the focus of the course.

2 credits,  
May be repeated 2 times FOR credit.

#### **HNG 508: Adv Theory & Clin Prac Acute Care Pediatric Nrsng I**

This is the third clinical course in pediatric advanced nursing practice and the first with a focus on acute care. Emphasis is placed on development of competencies needed to meet the health care needs of children and families with complex, acute, critical and

chronic illnesses across pediatric populations. Precepted clinical experiences will expose students to assessment, diagnoses and management of pediatric patient conditions commonly found in acute and critical care environments. Prerequisite: HNG 528

4 credits,

May be repeated 2 times FOR credit.

### **HNG 509: Adv Theory & Clin Prac Acute Care Adult/Ger Nrsng I**

This is the third clinical course focused on adult-gerontology advanced nursing practice and the first with a focus on acute care. Emphasis is placed on development of competencies needed to provide services ranging from disease prevention to acute and critical care. Didactic and clinical coursework will focus on management of acute, critical and complex illnesses across the entire adult age spectrum. Pre-Requisite: HNG 529

5 credits,

May be repeated 2 times FOR credit.

### **HNG 513: Advanced Health Assessment of the Neonate and Infant**

This course will be centered on assessment of physical, behavioral and cognitive development of the neonate and infant within the context of their family and environment. Emphasis will be placed on the development of diagnostic reasoning and clinical decision making skills as essential components of the advanced practice role.

3 credits,

May be repeated 2 times FOR credit.

### **HNG 514: Advanced Theory and Clinical Practice in Perinatal Women's Health I**

This is the first of four sequential courses focusing on advanced nursing practice specializing in perinatal/women's health throughout the life span focusing on gynecological health. Analytical thinking and clinical decision making within collaborative practice will be implemented so that therapeutic nursing interventions result in desired outcomes in the ambulatory care of women. Nursing theory and research for health promotion and management of women within the context of a multicultural society will be addressed. Realistic problems within a collaborative practice will be explored and developed to facilitate acquisition of skills in reasoning, problem solving, decision making and critical reflections relevant to the specialization of Perinatal Women's Health.

4 credits,

May be repeated 2 times FOR credit.

### **HNG 515: Advanced Health Assessment**

Provides diagnostic reasoning and a regional approach to physical exam in the health assessment process. Functional health patterns and biomedical models constitute the theoretical framework.

3 credits,

May be repeated 2 times FOR credit.

### **HNG 517: Advanced Theory and Clinical Practice in Psychiatric/Mental Health I**

Provides a theoretical and conceptual foundation for the advanced practice of Psychiatric/Mental Health Nursing. The concept of mental health is based upon a comprehensive understanding of human interaction with the environment through a synthesis of arts, sciences, humanities and life experience. Emphasis will be placed on the importance theory plays in defining knowledge necessary to assess human behavior, diagnose illness and to implement and evaluate treatment related to psychopathology.

Prerequisite: HNG 515, HNG 540, HNG 551, HNG 588

4 credits,

May be repeated 2 times FOR credit.

### **HNG 518: Advanced Theory and Clinical Practice in Pediatric Nursing Across the Continuum I**

The focus of this course is the development of critical thinking and clinical decision making as essential components of the advanced practice role. The major emphasis will be on analyzing and exploring common primary health problems of infants, children, and adolescents and developing optimum client outcomes that promote cost-effective, quality health care within the context of a multicultural society. Health assessments will integrate the concepts, theories, and principles underlying advanced assessment, diagnosis, and management of common health problems of infants, children, and adolescents within the context of their families and communities. Knowledge of related health sciences, nursing theories, and research are drawn upon to further develop the framework for the advanced practice role. Prerequisite: HNG 525

4 credits,

May be repeated 2 times FOR credit.

### **HNG 519: Advanced Theory and Clinical Practice in Adult-Gerontology Nursing Across the Continuum I**

This course focuses on clinical problem solving and decision making skills essential to

assessing and diagnosing health status, health risks, illness and functional/dysfunctional health patterns of adults and their families. Resources, strengths and limitations are used as a basis to collaborate with adult patient families and/or other health care providers to plan therapeutic interventions to promote, maintain or restore health. Prerequisite: HNG 515, 540, and 588

4 credits,

May be repeated 2 times FOR credit.

### **HNG 520: Pediatric Pathophysiology**

The course is designed to provide the graduate student preparing for an advanced practice role with a broad knowledge base of the physiological and pathophysiological changes that occur during the maturational process from conception through childhood. Emphasis will be placed on the maintenance of wellness and prevention of illness through nursing interventions, perinatal education, and anticipatory guidance.

3 credits,

May be repeated 2 times FOR credit.

### **HNG 522: Advanced Topics in Fetal and Neonatal Pathophysiology**

This course is designed to provide the graduate student preparing for an advanced practice role in neonatal health with a broad knowledge base of the physiological and pathophysiological changes that occur during the developmental process from conception through infancy. Emphasis will be placed on the development wellness and prevention of illness through nursing interventions, perinatal education, and anticipatory guidance.

2 credits,

May be repeated 2 times FOR credit.

### **HNG 524: Advanced Theory and Clinical Practice in Perinatal Women's Health II**

This is the second of four clinical courses that will prepare the student to provide primary care to women during the childbearing years. The conceptual frameworks of wellness, health promotion and disease prevention, and the effective use of communication strategies in documentation, patient education and advocacy will be emphasized. This course develops the paradigm of family-centered, community-based health care, which respects multicultural traditions and lifestyle variations. Students are prepared for the advanced practice role of the Perinatal Women's Health Nurse Practitioner role in the provision of care to women from preconception through the prenatal, intrapartum, postpartum phase of childbearing. The normal neonate and

breastfeeding content is also included in this course.

*4 credits,*

*May be repeated 2 times FOR credit.*

### **HNG 525: Advanced Health Assessment Child Health**

This course is designed to enable the student to refine and further develop clinical decision making skills while conducting health assessment of infants, children, and adolescents. Emphasis will be placed on assessment of the child's physical, emotional and cognitive development within the context of the family and environment.

*3 credits,*

*May be repeated 2 times FOR credit.*

### **HNG 527: Advanced Theory and Clinical Practice in Psychiatric/Mental Health Nursing II**

This is the second of four sequential clinical core courses for advanced practice in psychiatric mental health nursing. This course is designed to provide the knowledge and skills inherent in the diagnosis of mental disorders as related to etiology, psychopathology, practice and research. A variety of treatment models that provide a foundation for psychotherapeutic interventions will be explored, analyzed and applied to meet the needs of a complex and culturally diverse society. Prerequisite: HNG 517

*4 credits,*

*May be repeated 2 times FOR credit.*

### **HNG 528: Advanced Theory and Clinical Practice in Pediatric Nursing Across the Continuum II**

This is the second of four sequential courses designed to expand and integrate concepts, theories and principles underlying advanced assessment, diagnosis and management of common health problems of children within the context of their families and communities. This course prepares students for the advanced practice role of the pediatric nurse practitioner/clinical nurse specialist in an environment conducive to analytic skills, clinical decision making and reflections on practice in a multicultural society. Clinical and evidence based research is drawn upon to further develop the framework for the advanced practice role. Prerequisites: HNG 518

*4 credits,*

*May be repeated 2 times FOR credit.*

### **HNG 529: Advanced Theory and Clinical Practice in Adult-Gerontology Nursing Across the Continuum II**

This is the second of four sequential courses designed to develop advanced clinical decision making skills in diagnosing, treating and managing a patient/family with health problems and dysfunctional patterns. Therapeutic interventions are planned to promote health, treat illness, manage chronic disease and limit disabilities by enhancing problem solving and self care abilities of adults and their families. The implementation and evaluation components of managed care are emphasized. Prerequisites: HNG 519.

*5 credits,*

*May be repeated 2 times FOR credit.*

### **HNG 534: Advanced Theory and Clinical Practice in Perinatal Women's Health Nursing III**

This is the third of four sequential clinical courses designed to integrate nursing theory and research into the health promotion and management of the high risk perinatal family within the context of a multicultural society. Emphasis is placed on the prevention and early detection of reproductive risk, therapeutic nursing intervention and communication necessary to improve the quality of perinatal outcomes. The nursing process is utilized to manage high risk reproductive and perinatal complications.

*5 credits,*

*May be repeated 2 times FOR credit.*

### **HNG 537: Advanced Theory and Clinical Practice in Psychiatric/Mental Health Nursing III**

Provides the knowledge and skills in the nursing diagnosis and therapeutic nursing interventions of mental disorders in special populations in a multicultural society. The variety of therapeutic roles for the Nurse Practitioner in Psychiatric/Mental Health nursing will be analyzed to provide a framework for advanced practice. Prerequisite: HNG 527

*5 credits,*

*May be repeated 2 times FOR credit.*

### **HNG 538: Advanced Theory and Clinical Practice in Primary Care Pediatric Nursing I**

This is the third of four sequential courses and is designed to provide knowledge and analytical skills to meet the health care needs of children and families with chronic and or medically fragile conditions in a complex and culturally diverse society. There will be precepted clinicals that expose students to clinical decision making in collaborative practice environments. Health care management will be linked with evidence based clinical research findings that promote

optimal health care for children and families within complex interrelated health care systems. Pre-requisites: HNG 528

*5 credits,*

*May be repeated 2 times FOR credit.*

### **HNG 539: Advanced Theory and Clinical Practice in Primary Care Adult-Gerontology Nursing I**

This is the third of four sequential courses designed to develop advanced clinical decision making skills in diagnosing, treating and managing a patient/family with health problems and dysfunctional patterns. Emphasizes coordination, consultation, and interaction components of case management to promote, maintain and/or restore health in groups of adult patients in primary care settings. Clinical research is drawn upon to further develop the framework for the advanced practice role. Pre-requisites: HNG 529

*5 credits,*

*May be repeated 2 times FOR credit.*

### **HNG 540: Clinical Pharmacology**

The course focuses on the knowledge and application of advanced pharmacotherapeutic principles related to the health needs of patients throughout the lifespan. Emphasis will be placed on pharmacodynamics, patient response to therapeutic regimens, and management. Regulatory requirements pertaining to prescribing practices are included.

*3 credits,*

*May be repeated 2 times FOR credit.*

### **HNG 541: Nursing Research and Evidence-Based Practice I**

This course is an introduction to the process of evidence-based practice. Research will be examined as the scientific foundation for nursing. An emphasis will be placed on understanding research methods and strategies to evaluate results for use in evidence-based practice. The steps of the evidence-based practice process will provide the framework for the course. Published nursing research studies will be evaluated according to principles of evidence-based practice for applicability and clinical feasibility.

*3 credits,*

*May be repeated 2 times FOR credit.*

### **HNG 542: Neonatal Clinical Pharmacology**

The course is centered on pharmacotherapeutic management of selected neonatal conditions with major emphasis on the development of diagnostic reasoning and clinical decision



making skills as essential components of the advanced practice role. Learners will explore and analyze pharmacologic issues relevant to the neonate and infant in the intensive care and primary care settings as well as potential consequences of maternal drug therapy on the fetus. Currency in knowledge of the principles of clinical and basic pharmacology is an essential prerequisite of this course.

3 credits,

May be repeated 2 times FOR credit.

### **HNG 543: Nursing Research and Evidence-Based Practice II**

This is the second of two courses designed to examine research in relation to evidence-based practice and health care outcomes. Models and methods of evidence-based practice will be examined. A focus will be placed on critical appraisal of nursing research and clinical guidelines for applicability to practice. Identification, review of evidence, and recommendations for improving health care outcomes will be emphasized.

3 credits,

May be repeated 2 times FOR credit.

### **HNG 545: Advanced Psychiatric Health Assessment and Diagnostic Reasoning**

This course is designed to provide a conceptual foundation to promote analytical skills and clinical decision making in the diagnosis of mental health disorders throughout the lifespan within the context of a multicultural society.

2 credits,

May be repeated 2 times FOR credit.

### **HNG 547: Advanced Theory and Clinical Practice in Psychiatric/Mental Health Nursing IV**

This is the culminating course of the four sequential advanced clinical courses. It is designed to provide students with the opportunity to implement and evaluate the role of the nurse practitioner within the nursing discipline in a specialty area of their choice. Emphasis will be placed on integration of the advanced nursing practice role, nursing research, and the leadership component in the clinical specialization. Concepts of clinical practice as they relate to the specialty area in a culturally diverse society will be explored and analyzed so that therapeutic nursing interventions are linked with patient outcomes. Students will be expected to implement their role as advanced nurse practitioner, terminate and evaluate the experience. Prerequisites: HNG 537

5 credits,

May be repeated 2 times FOR credit.

### **HNG 548: Advanced Theory and Clinical Practice in Primary Care Pediatric Nursing II**

This is the last of a series of four courses designed to provide students an opportunity to evaluate critically the role of the Pediatric Nurse Practitioner and Clinical Nurse Specialist in the care of children and their families. Care will be taken to integrate advanced nursing practice, leadership, management, research and expert clinical practice in diagnosing, treating and managing children with particular healthcare needs. Concepts of clinical practice will be related to outcome based research. Prerequisite: HNG 538

4 credits,

May be repeated 2 times FOR credit.

### **HNG 549: Advanced Theory and Clinical Practice in Primary Care Adult-Gerontology Nursing II**

A capstone experience for students to be mentored by faculty in experiencing full enactment of the roles and functions of the NP. Students identify the patient populations with whom they plan to practice, negotiate for placement in a self selected practice setting, implement the roles and functions of NP, and evaluate the terminal experience in advanced practice in adult health care. Prerequisites: HNG 539

5 credits,

May be repeated 2 times FOR credit.

### **HNG 551: Psychopharmacology**

This course will center on pharmacotherapeutic management of selected psychiatric conditions. Students will explore and analyze pharmacologic issues relevant to the psychiatric client in ambulatory, acute care and chronic care settings.

2 credits,

May be repeated 2 times FOR credit.

### **HNG 554: Advanced Theory and Clinical Practice in Perinatal Women's Health Nursing IV**

This is the culminating nursing practicum course designed to provide students with the opportunity to implement and critically evaluate the role of the nurse practitioner in women's health. Emphasis will be placed on the integration of advanced nursing practice, research, and leadership/management concepts in the clinical specialization. Issues in clinical practice related to the specialty area will be explored as well as the effect of therapeutic nursing interventions on patient/family outcomes.

4 credits,

May be repeated 2 times FOR credit.

### **HNG 555: Professional Issues in Midwifery Practice**

The course will focus on professional organizations for nurse-midwifery practice and provides an opportunity for professional socialization and responsibility. This course provides a culminating review of all clinical aspects of nurse midwifery practice and standards. An emphasis on the mastery of core competencies and standards of practice of the ACNM will be integrated throughout the course. Co-requisite: HNG 587

1 credit,

May be repeated 2 times FOR credit.

### **HNG 557: Clinical Perspectives of Pathophysiology/Neurophysiology**

This course is based on the core concepts in Neurophysiology which are integral to the clinical practice of advanced psychiatric mental health nurses. A major focus involves understanding the neurophysiological theories of major psychiatric/mental health disorders, neurological assessment.

3 credits,

May be repeated 2 times FOR credit.

### **HNG 558: Adv Thry & Clin Prac Acute Care Pediatric Nrsng II**

This is the fourth and culminating clinical course advanced in pediatric acute care advanced nursing practice. This course is designed to provide students opportunities to integrate advanced nursing practice, leadership, management and research with expert clinical practice in diagnosing, treating and managing children with complex acute, chronic, and critical healthcare needs. Precepted clinical experiences will expose students to clinical decision making in acute and critical care settings. Pre-Requisite: HNG 508

4 credits,

May be repeated 2 times FOR credit.

### **HNG 559: Adv Thry & Clin Prac Acute Care Adult/Gero Nrsng II**

This is the fourth and culminating clinical course in adult-gerontology acute care advanced nursing practice. Emphasis is placed on advanced clinical skills in diagnosing, treating, and managing adult-gerontology clients in acute and complex care settings. Development of evidence-based practice, clinical acute, reasoning skills and ethical decision making will be integrated into didactic and clinical coursework, clinical simulation, and clinical immersions with expert practitioners. Pre-Requisite: HNG 509

5 credits,  
May be repeated 2 times FOR credit.

### **HNG 560: Sexual Health across the Lifespan**

This course will provide the skills to assess, coordinate, consult, promote, maintain and/or restore sexual health in diverse patient populations. Emphasis is placed on risk reduction and the promotion of sexual well-being.

3 credits,  
May be repeated 2 times FOR credit.

### **HNG 561: Clinical Immersion: Graduate**

The focus of this course is to expand, deepen, or enrich advanced practice skills relevant to area of clinical specialization. Learning opportunities, in clinical and simulated settings, will promote integration of advanced practice competencies, leadership, and practice inquiry. Emphasis will be placed on self-directed and precepted learning experiences, in-depth clinical skill building and decision-making, continuity of care, and interprofessional collaboration.

1-5 credits,  
May be repeated for credit.

### **HNG 564: Adv Thry Cln Pract Perinatal/ Neonatal Health Nursing I:Primary Care Concepts**

This course focuses on the advanced health assessment skills required to provide primary care to high-risk infants and their families within the context of a pluralistic society. The biological and psychosocial aspects are studied as a basis for nursing practice. Emphasis is placed on the role of the neonatal nurse practitioner in improvising the provision of primary care and follow-up services to high-risk infants with the purpose of decreasing mortality and morbidity rates and improving the quality of life for these infants after discharged from the intensive care nurse.

3 credits,  
May be repeated 2 times FOR credit.

### **HNG 565: Adv Thry Cln Pract in Neonatal Health Nursing II:Primary Care High Risk Infant**

This course focuses on the advanced health assessment skills required to provide primary care to high risk infants and their families within the context of a pluralistic society. The biological and psychosocial aspects are studied as a basis for nursing practice. Emphasis is placed on the role of the neonatal nurse practitioner in improvising the provision of primary care and follow-up services to high risk infants with the purpose of decreasing mortality and morbidity rates and improving

the quality of life for these infants after discharged from the intensive care nursery.

6 credits,

### **HNG 567: Evidence-Based Pract: Promoting Mentl Hlth Wellness**

This course explores the current evidence surrounding societal mental health wellness. Students will select a topic of exploration and use the steps of evidence-based practice in the development of solutions to improve mental health outcomes throughout the lifespan. Prerequisites: HNG 515, HNG 588, HNG 540, HNG 541

2 credits,  
May be repeated 2 times FOR credit.

### **HNG 568: The Addicted Client: Strategies for Nursing Assessment and Intervention**

This course is designed to provide a theoretical and conceptual foundation needed to address clients with a broad range of substance abuse and addiction patterns on the health-illness continuum. It utilizes concepts from a number of nursing specialties in data collection, diagnosis, planning, intervention and evaluation through the case study method. The critical evaluation of socio-cultural beliefs, values and attitudes toward the addicted client will also be explored.

2 credits,  
May be repeated 2 times FOR credit.

### **HNG 569: Advanced Theory & Clinical Practice Peri/Neonatal Hlth Nrsng II:Childbearing Family/High Risk Infant**

This is one of four sequential courses designed to focus on advanced assessment of the childbearing family. All components of this comprehensive assessment are integral to the development of differential diagnoses and management plans for high risk neonates and their families and will form the foundation for clinical decision-making required in the advanced practice role of the neonatal nurse practitioner. Parenting and the needs of the family in the context of a pluralistic society are emphasized.

5 credits,  
May be repeated 2 times FOR credit.

### **HNG 570: Independent Studies**

The focus of this course is self-directed study in the analysis, examination and critique of a specialty area of interest in advanced practice.

1-6 credits,  
May be repeated 2 times FOR credit.

### **HNG 572: Advanced Theory and Clinical Practice in Family Health Nursing I**

This is the first of four sequential clinical courses that focus on advanced nursing practice specializing in primary family health care. The major emphasis is on the development of clinical reasoning and critical thinking as essential components of the advanced practice role in family health nursing. An epidemiologic and body systems approach to common problems in primary health care will be applied along the health continuum. Optimal client outcomes within the context of a multicultural society will be explored. Prerequisites: HNG 515, HNG 540, HNG 588

4 credits,  
May be repeated 2 times FOR credit.

### **HNG 573: Advanced Theory and Clinical Practice in Family Health II**

This is the second of four sequential clinical courses. The major emphasis is on clinical decision making and critical thinking as essential components of the advanced practice role. This course focuses on advanced nursing practice specializing in the primary health care for the pediatric patient. The major emphasis will be on analyzing and exploring common problems in primary health care for pediatric patient and throughout a health continuum and developing optimum client outcomes within the context of multicultural society. Prerequisite: HNG 572

5 credits,  
May be repeated 2 times FOR credit.

### **HNG 574: Advanced Theory and Clinical Practice in Family Health Nursing III**

This is the third course of four sequential advanced clinical courses. Coordination, consultation and interaction components of case management are emphasized to promote, maintain, and, or restore health in families in primary care settings. Prereq: HNG 573

5 credits,  
May be repeated 2 times FOR credit.

### **HNG 575: Advanced Theory and Clinical Practice in Family Health Nursing IV**

This is the fourth of four sequential clinical courses that focus on advanced nursing practice in family health, women's health and gender related care. The major emphasis is on clinical decision making and critical thinking as essential components of the advanced practice role. An epidemiologic and body systems approach to common

problems in primary, health care of women from adolescence through the advanced years will be applied. Optimal individual and family outcomes within the context of a diverse society will be explored. Prerequisite: HNG 574

5 credits,  
May be repeated 2 times FOR credit.

### **HNG 577: Families: Theories and Interventions for Advanced Nursing Practice**

This course is designed to provide a theoretical and conceptual framework for the NP in developing therapeutic interventions for individuals and their families. Adult and adolescent developmental theories, the major family theories and crisis intervention theory are examined. Selected family typologies are used to illustrate theoretical concepts. Emphasis is placed on assessment, interventions and development of referral resources.

3 credits,  
May be repeated 2 times FOR credit.

### **HNG 578: Advanced Theory & Clinical Practice in Perinatal/Neonatal Health Nursing III: High Risk Neonate I**

This is one of four sequential advanced theory and clinical practice courses in the neonatal nurse practitioner program. Emphasis is placed on the development of diagnostic reasoning and clinical decision making skills as essential components of the advanced practice role in providing care to high risk infants and their families in the acute care setting. Nursing theory and research for health promotion and management of the neonate and family within the context of a pluralistic society will be explored. Prerequisites: HNG 513, HNG 522, and HNG 542

6 credits,  
May be repeated 2 times FOR credit.

### **HNG 579: Advanced Theory & Clinical Practice in Perinatal/Neonatal Health Nursing IV: High Risk Neonate II**

This is the last of four sequential advanced theory and clinical practice courses in the neonatal nurse practitioner program. Emphasis is placed on the development of diagnostic reasoning and clinical decision making skills as essential components of the advanced practice role in providing care to high risk infants and their families in the acute care setting. The role of the neonatal nurse practitioner in improving the provision of care to high risk infants with the purpose of decreasing mortality and morbidity rates and improving their quality of life is explored. Parenting and the needs of the family in the

context of a pluralistic society are stressed. Prerequisite: HNG 578

6 credits,  
May be repeated 2 times FOR credit.

### **HNG 580: Adv Skills, Technologies & Clin Dec-Making Acte Cre**

This course incorporates assessment, implementation, evaluation of advanced skills and technologies, and clinical decision making in the management of acutely ill patients. Recognition of client presentations requiring use of technology using evidence-based criteria will be addressed. Ethical, legal and psychological aspects, including the impact of technology on the client, family and health care system will be incorporated. An introduction to invasive interventions and diagnostic device application and interpretation will be facilitated through advanced skill labs and simulated experiences. Co-Requisites: HNG 508 or HNG 558; or HNG 509 or HNG 559

3 credits,  
May be repeated 2 times FOR credit.

### **HNG 581: Midwifery I**

This is the first of four sequential courses, each containing the didactic content associated with the clinical practice of midwifery. Conceptual frameworks of wellness, health promotion, and disease prevention will be utilized. The course is designed to foster the effective use of communication strategies in documentation, client education, and patient advocacy. Effective coordination of care, integration of evidence-based practice, and the application of bioethical principles of care are emphasized. An introduction to clinical decision making, diagnosis, and the management of gynecologic and antenatal patients will be emphasized. This course develops the paradigm of family-centered, community-based health care, which respects multicultural traditions. Pre-requisites: HNG 501, HNG 515, HNG 540, and HNG 588

4 credits,  
May be repeated 2 times FOR credit.

### **HNG 582: Continuing Course Work**

Continuing Course Work  
0-5 credits, S/U grading  
May be repeated 5 times FOR credit.

### **HNG 585: Midwifery II**

This is the second of four sequential courses which builds upon the foundational concepts of clinical practice in midwifery. The focus of this course is to provide a comprehensive understanding of gynecology, maternal and fetal physiology, and antenatal care. The conceptual frameworks of health promotion,

disease prevention are reinforced. The use of communication strategies and documentation principles are emphasized. This course furthers understanding of family-centered, community-based, multicultural care across the lifespan. Pre-requisites: HNG 581

4 credits,  
May be repeated 2 times FOR credit.

### **HNG 586: Midwifery III**

This course emphasizes the normalcy of labor and birth as a physiologic and developmental process and prepares students to assume responsibility for management of care of the woman and fetus during the intrapartum period. The use of conceptual frameworks of wellness, health promotion and disease prevention will be emphasized. Communication and collaborative strategies will be emphasized to build upon the strengths of families and communities and minimize technological intervention. Prerequisite: HNG 585

5 credits,  
May be repeated 2 times FOR credit.

### **HNG 587: Midwifery IV**

This is the fourth in a sequence of courses designed to prepare the midwife for clinical practice. The organizing framework of this course is continuity of care, emphasizing family centered, community-based health care and the normalcy of birth and recovery. Prerequisites: HNG 586

5 credits,  
May be repeated 2 times FOR credit.

### **HNG 588: Clinical Pathophysiology Across the Lifespan**

This course focuses on pathophysiology and disruptions in normal body functioning for individuals across the lifespan. In depth theoretical and clinical principles of diseases resulting from genetic, environmental, and stress related causes are included. Emphasis is placed on regulatory and compensatory mechanisms as they relate to disease states.

3 credits,  
May be repeated 2 times FOR credit.

### **HNG 599: Therapeutic Touch**

Therapeutic touch assessment skills will be taught so that the practitioner may use therapeutic touch clinically to assist in reduction of pain and anxiety, promote relaxation and facilitate the body's natural restorative process.

1 credit,

# HNH

## Nursing Leadership

### HNH 501: Health Illness in a Cross Cultural Perspective

This course examines the role of history and culture in healing and medicine. The consideration and utilization of cultural practices and beliefs when designing health education programs will be stressed.

3 credits,

May be repeated 2 times FOR credit.

### HNH 503: Organizational Leadership and Role Transformation

This course focuses on the knowledge and skills needed to understand the economies of care, business principles, and how to work within and affect change in systems. It will also prepare students to conceptualize a new advanced practice role in the discipline of nursing. Leadership, including theory, leadership styles, contemporary approaches and strategies, will be explored.

3 credits,

May be repeated 2 times FOR credit.

### HNH 504: Quality Improvement, Safety and Healthcare Technologies

As a foundational course for graduate level nurses, this course prepares students to apply quality improvement methods and analyze information to affect safety and quality of care and to improve patient outcomes. The use of current and emerging technologies to support safety, quality and value based care and quality across diverse settings will be emphasized.

3 credits,

May be repeated 2 times FOR credit.

### HNH 505: Health Care Policy and Advocacy

This course examines how policies shape the structure and financing of health care, influence social determinants of health, and affect health outcomes. Participation in the development and implementation of institutional, local, state, and federal policy will be an expectation of this course. The role of nurse as advocate for vulnerable populations, the profession, and health-promoting policies will be explored.

2 credits,

May be repeated 2 times FOR credit.

### HNH 510: Facilitating Adult Learning

This course focuses on the role and perspective changes in adulthood. Concepts of self and maturity, learning theories, cognition, creativity, interests, attitudes and motivation will be explored. Issues, strategies and methods for facilitating adult learning will be

emphasized. Theory is considered in relation to nursing education.

3 credits,

May be repeated 2 times FOR credit.

### HNH 511: Curriculum Design , Implementation and Evaluation in Nursing Education

This course focuses on issues in design of curriculum content, organization, and planning toward a practical approach to curriculum development. Application of theory to the development and implementation of curriculum from the point of view of the practice discipline of nursing will be emphasized. Problems, issues and procedures involved in designing and implementing evaluation studies will be discussed. Theory and methods of measurement and evaluation and their application to practice will be emphasized.

3 credits,

May be repeated 2 times FOR credit.

### HNH 512: Advanced Teaching Strategies

This course emphasizes the role of the teaching-learning process in clinical and academic nursing education through development of innovative instructional designs and processes. Issues such as feminism, creativity in clinical teaching, and the impact of economic and social trends on reality-based nursing will be discussed. A variety of teaching methods will be explored including simulation, virtual learning, social media and relevant and innovative instructional technologies.

3 credits,

May be repeated 2 times FOR credit.

### HNH 513: Advanced Theory and Practice in Nursing Education I

This course focuses on graduate level clinical practice content and experiences related to the role of the nurse educator. This population-focused practicum will include student placement with an expert nurse clinician to develop proficiency in a focused area of clinical practice. Students will choose a population foci and complete 75 direct care hours during this precepted clinical experience. Increased knowledge in a specialized area of practice will provide a clinical foundation for academic and/or clinical nursing education. Prerequisites: HNG 515, HNG 540, and HNG 588.

3 credits,

May be repeated 2 times FOR credit.

### HNH 514: Advanced Theory and Practice in Nursing Education II

This is the second of three sequential courses focused on providing guided learning experiences in nursing education. Students will acquire knowledge, skills and values in the aspects of nursing education related to teaching and learning, assessment of the learner, instructional design, curriculum development, delivery, and evaluation. Role transition and experiential learning related to academic or clinical nursing education will be a central focus of this course. Observation and experience related to academic or clinical nursing education will be emphasized. The student will be expected to complete 90 hours with a nurse educator. Prerequisite: HNH 513

4 credits,

May be repeated 2 times FOR credit.

### HNH 515: Advanced Theory and Practice in Nursing Education III

This is the third of three sequential courses focused on providing guided learning experiences in nursing education. Students will select aspects of nursing education related to the role of nurse educator as leader and change agent. Scholarship activities begun in HNH 514 will conclude in HNH 515. Professional role responsibilities, including administrative functions, committee work and interdisciplinary efforts will be emphasized. Experiential learning related to academic and clinical nursing education will be emphasized. The student will be expected to complete 90 hours with a nurse educator. Prerequisites: HNH 514

4 credits,

May be repeated 2 times FOR credit.

### HNH 530: Communication and Relationship Management

This course focuses on issues in communication, relationship building, behaviors that influence others, diversity and shared decision making. Theories of interpersonal communication and professional relationship development will be emphasized. Problems, issues and procedures in relationship building will be discussed. Inter-professional collaboration will be stressed. A variety of leadership theories will be used to articulate the importance of effective oral and written communications in relation to leadership in relationship management.

3 credits,

May be repeated 2 times FOR credit.

### HNH 531: Business Skills for Nurse Leaders

This course focuses on issues in resource management, strategic management and marketing in the health care environment. Focus will be on developing a strategic plan

for the health care environment in which the student works. Marketing strategies will be explored. Discussions on labor relations in relation to professional issues in collective bargaining will be emphasized. Problems, issues and procedures involved in resource management will be discussed.

*3 credits,*

*May be repeated 2 times FOR credit.*

### **HNH 532: Finance and Economics in Nursing Leadership**

This course provides an introduction to financial management for planning, operation, and evaluation of the economic performance of an organization. The course will focus on budgeting, healthcare reimbursement, cost/benefit analysis and the integration of leadership and management functions into fiscal planning. The student will investigate concepts and principles necessary for the management of fiscal resources.

*3 credits,*

*May be repeated 2 times FOR credit.*

### **HNH 533: Legal/Ethical/Regulatory Issues in Nursing Leadership**

This course is designed to provide the knowledge and skills necessary to integrate legal, ethical and regulatory requirements into a variety of health care settings. Principles and processes of patient and employee safety will also be emphasized. Students will investigate concepts and principles necessary for ethical decision making, patient advocacy, and employee rights under law.

*3 credits,*

*May be repeated 2 times FOR credit.*

### **HNH 534: Advanced Leadership Seminar**

This course is the capstone course and will focus on the role of the nurse leader. Emphasis will be on role formation, dimensions of leadership roles, identification of individual and group leadership attributes, knowledge and skills required to fulfill the role and approaches to leadership. Students will develop and conduct self-assessments and create a professional development plan.

*3 credits,*

*May be repeated 2 times FOR credit.*

### **HNH 540: Advanced Theory and Practice in Nursing Leadership I**

This is the first of two sequential courses designed to provide learning experiences with a nurse leader. Students will integrate advanced knowledge and skills related to organizational theory and financial/human resource management. The student will use

data-driven decision making and creative leadership skills to build a positive practice environment as well as develop analytical skills to assess and forecast trends in nursing leadership. Inter-professional collaboration will be emphasized. Field experiences of 90 hours are required and may include preceptorship by a nurse leader and financial officer in a health care system.

*4 credits,*

*May be repeated 2 times FOR credit.*

### **HNH 541: Advanced Theory and Practice in Nursing Leadership II**

This is the second of two sequential courses designed to provide learning experiences with a nurse leader. This course builds on knowledge of organizational leadership and quality improvement. The student will integrate advanced knowledge and skills into practical applications in the role of nurse leader. Students will further explore the leadership role through current relevant research to enhance their ability to strategize entrepreneurial relationships, develop creative solutions to financial constraints and evaluate infrastructure and technology. Project management will be emphasized. Students will be required to seek experiences with health care leaders involved in project management. Field experiences of 90 hours are required. Prerequisites: HNH 532 and HNH 540

*3 credits,*

*May be repeated 2 times FOR credit.*

### **HNH 580: Health Coping Skills Training for Health Care**

Treatment approaches for many chronic illnesses consist of pharmacological and non-pharmacological interventions. Often patients need to take an active role in their care in order to best manage symptoms associated with chronic illness. Coping Skills Training (CST) is a psychotherapeutic approach that aims to solve problems concerning dysfunctional emotions, behaviors and cognitions through a goal-oriented, systematic procedure. The theoretical foundations that underpin CST will be explored through guided readings. A combination of cognitive and behavioral therapeutic interventions will be introduced and practiced with the goal of applying the skills to practice in order to help people change negative thought patterns, beliefs, and behaviors so they can manage symptoms and enjoy more productive, less stressful lives. Students will learn to deliver CST using a standardized manual of coping skills. Rationale for each skill, demonstration, role playing and skills feedback will be the teaching/learning strategies for this course. Instructor feedback and supervision of home

practice audio recordings of simulated skill sessions will enhance student proficiency in skill acquisition.

*3 credits,*

### **HNH 590: Nursing and Numbers: Budgeting and Benchmarking for Nurses**

This course is designed to provide nurse leaders with an overview of the budget development process. Various types of budgets will be discussed with a focus on variance assessments, analysis, and benchmarking.

*2 credits,*

## **HPA**

### **Health Administration**

#### **HPA 507: Health Systems Performance**

This course introduces students to the system that we have developed to deliver health care in the United States, with international comparisons. The topics include the organization and financing of health care systems, access to health care including health insurance, regulation and policy issues, and the health care workforce.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HPA 508: Human Resources Management in the Health Sector**

Explores the key and active role played by human resources in health services organizations. Introduces students to the role of the human resources function and to the challenges that health care managers and leaders will face. Emphasizes strategic human resources, talent management, performance management, the role of the regulatory environment in human resources and making the connection between financial and non-financial rewards and workforce management. The course also identifies issues between management and the labor force.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HPA 510: Health Finance and Accounting**

Provides broad but significant immersion into the requisite core knowledge and skills of financial management and accounting in the healthcare sector. Emphasis will include but not be limited to managerial and financial accounting, fiscal analysis, fiscal planning, and fiscal reporting. Decision making with regard to capital budgets and expenditures are reviewed.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPA 520: Health Governance and Organizational Analysis**

Provides students with immersion into the study of organizational behavior, integrated with the study of organizational theory, to develop evidence-based approaches to analyze, manage, and lead change within healthcare organizations. Emphasis on groups and teams, diversity and cultural competence, individual attitudes and perceptions, communication, organizational change, cognitive processes, leadership, power and influence, stress and well-being, conflict management, decision making and negotiation skills, motivation, and strategies to improve employee and organizational success.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPA 523: Social & Behavioral Determinants of Health**

This course introduces students to the social determinants of health as one of the drivers of population health. Consistent with public health tradition, health is discussed from an ecological perspective, and the course presents current knowledge about the multiple determinants of population health including socioeconomic status, the physical environment, medical care, individual behavior, and genetics and the interaction of these factors. Also covered is the measurement of population health, sources of data, and methods for assessing population health improvements.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPA 527: Health Economics and Policy**

This course will provide students with a comprehensive view of the reasons behind the rapid rise in medical expenditures in the United States over nearly four decades, and the measures that have been proposed to address this problem. This course will cover the following topics: the demand and supply of medical care; the dynamics of competition in the health care industry; the role of government in medical care; general understanding of health care institutions, including Medicare, Medicaid, managed care, hospital and physician behavior, and pharmaceutical markets; and health care reform.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPA 529: Fundamentals of Healthcare Management**

This course provides students with an overview of concepts and issues related to healthcare leadership. Through the examination of management topics and healthcare situations, the student will

explore the skills and knowledge needed to be successful in a diverse healthcare environment. Topics include healthcare leadership, organizational design as it relates to the uniqueness of healthcare organizations, managing professionals, and supervisory to mid-level management.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPA 530: Health Operations Management**

This online course explores the terminology and tools for identifying and applying appropriate operations management (OM), decision analysis (DA) and operations research (OR) techniques to problems in healthcare. Students will receive exposure to OM, DA and OR techniques in order to have practical experience solving problems in planning, scheduling, resource allocation, procedural decisions, and measurement of health care processes.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPA 536: Health Law and Compliance**

This course will provide students with a comprehensive view of the reasons behind the rapid rise in medical expenditures in the United States over nearly four decades, and the measures that have been proposed to address this problem. This course will cover the following topics: the demand and supply of medical care; the dynamics of competition in the health care industry; the role of government in medical care; general understanding of health care institutions, including Medicare, Medicaid, managed care, hospital and physician behavior, and pharmaceutical markets; and health care reform.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPA 541: Health Strategic Planning and Management**

Explores the fundamentals of strategic planning and leadership in the health sector. Emphasizes mission, vision, values, creating business plans and conducting strengths, weaknesses, opportunities and threats (SWOT) analyses. Explores the impact of leadership style on the strategic planning process.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPA 542: Capstone**

Explores the key characteristics of successful health leaders, including the values that guide personal and professional behavior through the lens of an interactive capstone research project. Prerequisite: Permission of the department.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPA 564: Health Quality and Information Systems Management**

Explores two critical components of healthcare administration through a split module format, dedicating seven weeks per topic and one week exploring the synergies between both topics. The first module will explore information systems management and the second module will explore healthcare quality and performance improvement concepts. The Information Systems Management module will discuss how healthcare decision-making and management are increasingly driven and dependent upon information. The sheer diversity of the information required by the healthcare enterprise surpasses the information needs of almost any other type of organization. Healthcare managers at every level of the organization are forced to be information managers. The Quality and Performance Improvement module will explore healthcare quality management methodologies and examine the impact on healthcare productivity, quality and patient safety. Students will understand and utilize the concepts of performance improvement and continuous process improvement to improve product and service quality and competitiveness. Students will understand the history of quality improvement in healthcare and how quality concepts may be applied to improve clinical outcomes, patient safety, patient satisfaction, financial outcomes and employee and physician satisfaction. An emphasis will be placed on the critical importance of data analytics to monitor performance improvement activities. CQI and lean strategies are introduced to students as well.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPA 575: Long-Term Care in the Health Sector**

Explores management techniques and standard practices in long-term care in the health sector. Emphasizes skilled nursing, home care, assisted living, adult day care, home health care and senior retirement communities. Provides direction and insight for understanding industry certification.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPA 576: Aging and Health**

An overview of topics relevant to the physical and psycho-social health of older adults and the policy and structural systems that affect aging/older adults in the United States. Specific topics include demographics of aging in the US, attitudes towards older adults and aging, physiological and pathological changes as humans age, health promotion/disease prevention, health care delivery settings

and structures, health insurance (including Medicare and Medicaid), aging in place, home health care, innovative models in healthy aging (US and internationally), and ethical/legal issues relevant to older adults.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPA 580: Integrative Experience**

This course provides a 100-hour field placement that provides students with opportunities to gain practical health management experience in the health services field. Field placements strive to integrate real-world experience in administration and management of health services by enhancing health administrative skills under the direction, mentorship or supervision of a knowledgeable preceptor in an environment that promotes learning. Students will complete aspects of the health management integrative experience on site in individual practicum placement settings. In addition to the field placement and under supervision of a faculty member, students will maintain and submit weekly logs of their activity and attend three synchronous sessions that will allow reflection, synthesis, and professional development based upon the individual experiences of students.

Prerequisite: Permission of the department.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPA 585: Introduction to Biostatistics & Epidemiology**

This course is an introduction to biostatistics and epidemiology. In the first half of the course students will be introduced to the principles and methods of epidemiology. The second half focuses on the statistical methods used throughout the health sciences. At the end of the course students will be able to interpret epidemiological studies and have a basic understanding of the statistical methods these studies employ.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPA 586: Health Management Professionalism and Ethics**

Explores professionalism and ethics in the field of health management. Facilitates the application and integration of health management competencies gained in year one of coursework to realistic case studies using interdisciplinary team based methods. Students will continue to enhance communication skills, skills that encourage functional interdisciplinary teamwork and will develop presentation skills, problem solving skills, networking strategies, professional etiquette and have the opportunity to engage in professional development activities.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPA 599: Physician Practice Management**

Explores the essential components of physician practice management including the structure and organization of solo practice and group practices. Includes operating and administrative issues, information management, health informatics, patient care systems, corporate compliance, physician credentialing, finance and management reporting, risk management, operations, practice valuation, marketing and planning, leadership, compensation, governance, billing, coding, medical malpractice, collections, reimbursement mechanisms, human resource management, physician compensation and quality of care. Explores the factors influencing physician practices, physician-hospital relationships, leadership and governance.

*3 credits, Letter graded (A, A-, B+, etc.)*

## **HPD**

### **Population Health and Clinical Outcomes Research**

#### **HPD 519: Systematic Review of the Literature**

This introductory course will provide students with an understanding of the process used to perform systematic review, as well as provide a "hands on" experience. Each student will perform a systematic review of the literature for their own pre-defined research question of interest. As part of the systematic literature review process, students will learn how to focus their research question; to search the literature to identify relevant studies; to appraise the quality and select studies; and to summarize studies as well as to synthesize their results in context of their original research question raised. To receive a grade for this course, moreover, a scholarly product (e.g., manuscript or letter to the editor) must be submitted to a peer-reviewed journal.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **HPD 521: Introduction to Clinical Research**

This seminar series course provides a broad-based introduction to the fields of population health and clinical science research. This course will prepare participants to become critical consumers of the peer-reviewed literature. Class lectures will cover a wide range of topics, which include: framing a research question, formulating a research hypothesis, evaluating the peer-reviewed literature, exploring study design options,

conducting human subjects' research ethically/responsibly, selecting clinical outcomes, and evaluating analytical alternatives. Offered in *Summer, 1 credit, Letter graded (A, A-, B+, etc.)*

### **HPD 601: Human Subjects: Ethics and Responsible Conduct of Research**

This introductory course incorporates three components focused upon identifying: 1) the ethical principles associated with human subjects research; 2) the primary tenets of responsible conduct of research; 3) academic career planning. This course provides a philosophical basis for current research ethics practices, identifies outstanding ethical issues and controversies in clinical and translational science and research, and provides students with knowledge and access to resources such that they may address the ethical challenges that may arise most effectively. The course provides a more in-depth exploration of the ethics and responsible conduct of clinical and translational science research that can supplement current mandated training in the area. ABCF grading

*1 credit, Letter graded (A, A-, B+, etc.)*

### **HPD 605: Introductory Seminar on Doctoral Studies in Population Health and Clinical Outcomes**

This is an introductory doctoral level 3-credit seminar for all incoming PhD students in Population Health and Clinical Outcomes. This course will help students understand what earning a PhD entails, opportunities that exist after earning a PhD, typical PhD-level work activities, and beginning the process of academic writing. Students should already be thinking about what their dissertation will be about, and we will build off of that throughout the course.

*3 credits, S/U grading*

### **HPD 619: Independent Study**

Intensive reading under supervision of one or more instructors, of material not covered in the formal curriculum, or execution of a research project under the supervision of one or more faculty members. Generally a written deliverable (e.g. manuscript) will be required. Instructor consent required.

*0-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **HPD 650: Seminar Series: Clinical Applications of Molecular Medicine**

This course will provide an overview of the field of molecular medicine, with a focus on cutting edge technologies related to the current and future clinical applications to improve

early detection, to enhance diagnostic testing, to monitor treatments, and to counsel patients on their prognosis. As applied to clinical patient care questions, the specific molecular medicine topics discussed will include: DNA, RNA, proteomics, and chromosome assays. Pending the specific lecturers and topics coordinated, students will be introduced to a broad range of biomarkers for disease such as cancer, pulmonary/heart diseases, autism, and immune-related disease challenges. An emphasis will be placed in this course on learning how molecular markers can be applied in a clinical setting to augment the patient and provider decision-making process. (NOTE: Students should have an introductory knowledge of cellular and molecular development biology. ABCF Grading

*1 credit, Letter graded (A, A-, B+, etc.)*

#### **HPD 664: Clinical Trials**

This course introduces the design, conduct, and analysis of clinical trials. Topics include types of clinical trials, study design, treatment allocation, randomization and stratification, quality control, sample size requirements, patient consent, and interpretation of results.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HPD 665: Clinical Outcomes Research**

This course will provide an overview of the field of clinical outcomes assessment. The specific topics covered include: risk factors identification, clinical outcomes selection, risk adjustment methods, patient safety monitoring, and provider-based quality improvement performance reporting. Students will be introduced to a broad range of clinical outcomes including (but not limited to) short-term mortality, treatment-related morbidity, health-related quality of life, condition-specific metrics, patient satisfaction, health plan member satisfaction, utility theory, and cost-effectiveness analysis. An emphasis will be placed in this course is placed on learning how clinical outcomes research can provide a data-driven approach to influence patient, provider, program, and policy decisions.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HPD 673: Longitudinal Data Analysis**

This course covers the theory and application of univariate and multivariable techniques appropriate for longitudinal data. Students will be exposed to both theory and application addressing repeated measures challenges.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HPD 674: Statistical Methods in Clinical Outcomes and Health Services Research**

Clinical outcomes research frequently involves the analysis of nonexperimental retrospective databases. Such databases pose a number of statistical challenges, due to their nonexperimental design and various data limitations. This course will review and discuss multivariate methods in clinical outcomes research, focusing on specific issues involved in building and interpreting these models. These issues include causal inference, selection bias, measurement error, missing data problems, multicollinearity, and serial correlation. Clinical outcomes and health services research studies will be reviewed and discussed to illustrate these statistical issues and how they have been addressed in published research. Students will be asked to review and evaluate clinical outcomes and health services research papers, and present their reviews for discussion in class.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HPD 681: Advanced Social Determinants of Health**

This course will build on the prior HPH 523 and further examine the current evidence supporting an association between social determinants (e.g., socioeconomic status, physical living conditions, individual characteristics, social support, etc) and health. Students will review and critically examine the current literature on the social determinants of population health with the goal of identifying gaps in this literature which may be filled by future research. Concepts relating to the social determinants of health - e.g., identification of current priority areas, theoretical frameworks and perspectives, intervention, research methodology, etc, will be addressed as each comes up in the context of the reviewed journal article. Using publicly available data sets, students will choose a research topic related to an identified gap in the current research on the social determinants of health, propose a project to examine this topic or need which can be accomplished using publicly available data sets, conduct the analysis and write up their project in a format suitable for submission for publication. Offered

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **HPD 682: Statistical Methods in Clinical Outcomes Research**

The purpose of the course is to familiarize students with some major topics in clinical outcomes research, the statistical models commonly employed, and statistical problems that need to be overcome. Specific topics of interest may include: risk factor analysis; static models; risk factor/disease progression analysis; dynamic models; survival analysis

(including multivariable survival analysis); volume-outcomes research; and forecasting models. Statistical techniques and challenges will be discussed within the context of each research topic as they arise. By the end of this course, students should be broadly familiar with these issues, and should be able to evaluate published clinical outcomes research in terms of the appropriateness of models chosen and how well the statistical problems have been addressed, and the reliability of the results. Prerequisites: HPH 507 Biostatistics II or equivalent course. ABCF Grading

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HPD 685: Research in Population Health and Clinical Science.**

This course will introduce students to health services and clinical outcomes research methods and applications of these approaches. The course will begin with an overview of key statistical methods, outcomes measurement issues, and methods for assessing the economic value of clinical treatments. The second part of the course will consider specific applications of health services and clinical outcomes research from a review and critique of published studies. Students will present and critique these studies together with the instructor. Specific areas of applications will include: Estimating the Production of Health Hospital Volume and Clinical Outcomes Estimating Clinical Outcomes with Patient-Level Data Racial and Ethnic Disparities and Medical Treatments Electronic Medical Records and Clinical Outcomes Cost Effectiveness Applications

*1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **HPD 686: Mentored Research Project in Population Health and Clinical Outcomes Research**

Supervised research experience.

*0-9 credits,*

*May be repeated for credit.*

#### **HPD 687: Advanced Research Seminar**

The main purpose of this course is to familiarize students with empirical research methods via presentation and critiques of published research and work in progress. By presenting and discussing actual research that employs various statistical and other research methods, students will deepen their understanding of research intent and design, methodology and technique, format and presentation, and data management and analysis. This will reinforce their understanding of these methods learned in previous coursework.

*3 credits, Letter graded (A, A-, B+, etc.)*



**HPD 692: Practicum in Teaching I**

In this course, students will have the opportunity to examine, and plan for, the teaching component of the professor role. We will use a combination of strategies including lectures, discussions, small group activities, and interviews of exceptional teachers and departmental chairs to explore philosophical and practical issues related to course preparation, delivery, and evaluation. At the completion of the course, students will have a teaching portfolio that will have two basic components: a detailed set of plans for a specific course and a statement of their teaching philosophy. This will be an intensive hands on course that will require supportive and cooperative behaviors by all.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**HPD 693: Practicum in Teaching II**

The course is a supervised teaching experience with the Master of Public Health program.

*3 credits, S/U grading*

**HPD 694: Grant Writing**

This course will assist students in synthesizing basic public health knowledge through completion of a grant writing experience. Students will be introduced to the process of writing grant proposals, developing budgets, professional networking, publishing in the scientific literature, and planning for their future careers as public health professionals and academics. Students will also present their own individual research projects, write their own grant proposal, and do a career mapping exercise.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPD 699: Dissertation Research On Campus**

This course is normally taken by advanced PhD students when they conduct research towards their theses. Only PhD students who have been advanced to candidacy (G5 status) can take this course. Students who have the G3 and G4 status and participate in a research project with their advisor can register for HPD 619 Independent Study. Prerequisite: Must be advanced to candidacy (G5); permission of instructor S/U grading, may be repeated for credit

*0-9 credits, S/U grading  
May be repeated for credit.*

## HPH

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### Public Health

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**HPH 500: Contemporary Issues in Public Health**

This course provides an introduction to the field of public health that aims to develop an appreciation of the unique and important mission of public health; an understanding of the history, values, ethics, mission, and goals of public health; and knowledge about how public health functions today including the organization, financing, policies, and practices of public health. Students will be expected to think critically about whether public health has achieved its mission in today's world and how the profession might develop in the future. Prerequisite: Admission to Graduate Public Health Program or Department Consent.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 501: Introduction to the Research Process**

This course provides an overview of the research process including formulation of a research problem, conceptualization of the research design, construction of the instrument for data collection, selection of a sample, collection of data, and writing a research report. Topics include how to identify a research question and, correspondingly, how to formulate a clear, concise hypothesis or set of hypotheses; reasons and procedures for reviewing the literature; overview of observational and interventional research designs; review of measurement theory, types of scales, and commonly used measures in public health-related research; data collection methods including survey and qualitative methods; and the ethical conduct of research. Through the introduction of these topics, the course provides a general background for individuals who are interested in learning the fundamentals of how to prepare a research proposal. Prerequisite: Admission to Graduate Public Health Program or Department Consent.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 506: Biostatistics I**

This is the first of a sequence of two-semester courses with the aim to provide students and researchers in public health with an introduction to the principles of public health informatics and statistical methods with their application in biomedical and public health research. The course will provide necessary knowledge and skills to perform various data management tasks to create and manage data sets using SAS with basic proficiency. The course will also introduce summarizing and exploring data, probability theory, discrete and continuous probability distributions, populations and samples, sampling distributions and statistical inference,

hypothesis testing, one-sample and two-sample comparisons.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 507: Biostatistics II**

"This is the second of the two-semester courses intended to provide students and researchers in public health with an introduction to the principles of public health informatics and statistical methods and their application in biomedical and public health research. The course will provide necessary knowledge and skills to perform various data management tasks to create and manage data sets using SAS with intermediate proficiency. The course builds upon the foundations of its prerequisite, Biostatistics I, with progressively more advanced instruction in analysis of variance, association and correlation, linear regression, and logistic regression. Prerequisite: HPH 506

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 508: Health Systems Performance**

This course introduces students to the system that we have developed to deliver health care in the United States, with international comparisons. The topics include the organization and financing of health care systems, access to health care including health insurance, regulation and policy issues, and the health care workforce. Prerequisite: Admission to Graduate Public Health Program or Department Consent

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 510: Infectious Disease Epidemiology**

This course is an introduction to the characteristics of infectious disease and dynamics of transmission. Major goals of the course are for students to understand the theoretical basis of pathogen transmission; to identify factors that determine patterns of disease spread within populations; and to identify populations at risk. The course will demonstrate how an understanding of epidemiological characteristics facilitates disease prevention and control, with broader implications for public health.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 514: Epidemiology for Public Health**

This course presents basic epidemiologic concepts used to study health and disease in populations. It provides an overview of the major causes of morbidity and mortality, including methods of measurement (e.g., incidence, prevalence). Observational and experimental epidemiologic studies will be described and their advantages and

disadvantages compared. The course aims for students to begin developing the skills needed to evaluate data, interpret reports, design, and conduct studies. Students will be introduced to the various areas of epidemiologic studies, including cancer, molecular/genetic, environmental, occupational, social and behavioral, and infectious disease surveillance. The course comprises both lectures and small group seminars for in-depth discussions of previously assigned topics. Prerequisites: Admission to Graduate Public Health Program or Department Consent; HPH 506.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 516: Environmental and Occupational Health**

This course is designed to provide the fundamentals of environmental and occupational health and to educate students on issues related to major environmental and occupational concerns. It will provide a forum for the discussion of local and national environmental and occupational public health issues. The content of the course will focus on major pollutants, their detection, impact on health, and principles of remediation. Using various teaching techniques, students will be exposed to current environmental and occupational topics and approaches to prevention and treatment. The course will emphasize the most recent research in the field. Prerequisite: Admission to Graduate Public Health Program or Department Consent

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 519: Independent Study**

Intensive reading, under supervision of one or more instructors, of material not covered in the formal curriculum, or execution of a research project under the supervision of one or more faculty members. Permission of MPH Academic Coordinator is required. Prerequisite: Admission to Graduate Public Health Program or Department Consent

*0-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 5 times FOR credit.*

### **HPH 521: Introduction to Clinical Research**

This introductory seminar series provides a broad-based overview of clinical science research methods, as well as guidance for critically reviewing the peer-reviewed literature. Class lectures, exercises, and interactive small group sessions will cover framing a research question, formulating a research hypothesis, critically appraising the literature, exploring study design options, conducting research ethically and responsibly, selecting clinical outcomes, and evaluating analytical alternatives. Students enrolled in the

Master of Public Health degree program can not use this course (earn credit) to their degree requirements.

*1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated 3 times FOR credit.*

### **HPH 522: Race, Racism, and Health**

This course introduces students to race and racism as a determinants of health. We explore the historical notions of race, how race impacts health, and how racism impacts the health of different populations. Also covered is how race and discrimination are measured, critical race theory and public health interventions to address racial disparities. Some background in statistics and research methods is required in order to fully understand the course material.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 523: Social and Behavioral Determinants of Health**

This course introduces students to population health as one of the organizing concepts in public health and the orientation that differentiates public health from medicine. Consistent with public health tradition, health is discussed from an ecological perspective, and the course presents current knowledge about the multiple determinants of population health including socioeconomic status, the physical environment, medical care, individual behavior, and genetics and the interaction of these factors. Also covered is the measurement of population health, sources of data and methods for assessing population health improvements. Prerequisite: Admission to Graduate Public Health Program or Department Consent

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 525: Fundamentals of Program Planning**

This course introduces students to the scope of public health program planning and analysis. This includes the major health behavior theories that are used in population health research and practice, public health program planning and budgeting, and public health program evaluation.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 531: Women and Gender Minorities' Population Health**

This course introduces students to the barriers faced in improving population health and reducing health disparities for women and gender minorities. From hysteria to atypical presentations of cardiac disease, women have historically been excluded from medical research. Consequently, women have been seen and treated as the default

male with differences only in hormones and reproductive organs, too difficult to study. We will explore the definitions of sex and gender, representation in medical research, how these identities are asked and recorded in data collection, sex as a non-binary categorical variable, and how this affects research conclusions and public health recommendations. This course will go beyond the common understanding of Women's Health as reproductive health, towards gaining an understanding of how phenotypic gender, gender identity, bias, sexism, and transphobia affect individual and population health through erasure and inability to create evidence-based guidelines. The effects of political and public health policies on health recommendations and disparities will be covered at length, drawing from work and theories in: sociology, medical history, psychology, political science and law, and biostatistics.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 532: Chronic Diseases**

This course will cover substantive and methodological issues in the epidemiology of chronic diseases, including cancer, and cardiovascular, chronic respiratory and neurodegenerative diseases. Students will be presented with examples of descriptive and analytical epidemiology studies in each of these areas; aspects such as disease registration and its contribution to epidemiology research, estimates of attributable fractions, and preventive strategies will be also addressed. The course will include considerations about causality for chronic diseases, including issues of validity in epidemiology studies as well as integration of evidence across studies and disciplines.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 533: Disability and Public Health**

Disability and Public health will expose students to the healthcare and sociocultural challenges experienced by people with disabilities, including health disparities, unequal access to employment, education, transportation, and community participation. The course will address matters of public and social policy that have been implemented to alleviate disparities experienced by people with disabilities. The course will include gaps that are still in existence, as well as what we, as public health officials, can do to address these existing gaps.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 534: Spatial Analysis: Health Applications**

This course is an intermediate level graduate course in the application of spatial methods

for analyzing environmental exposure and disease data. Students with backgrounds in epidemiology, public health, environmental health, biostatistics, community health, biology, sociology, psychology, marine and atmospheric sciences, geosciences, demography, and geography are particularly encouraged to participate. Although the course will focus on examples related to human health, graduate students in other disciplines will find the course useful for specific and appropriately defined research purposes. Techniques for spatially analyzing point patterns and aggregated data in polygons will be introduced, including autocorrelation, clustering analysis, geostatistical smoothing, and approaches for spatial regression. Consideration of space-time variability will also be covered. This course includes theoretical elements so that the student will learn to appreciate strengths and weaknesses of different spatial approaches. Prior course in GIS or equivalent, as determined by consent from the instructor required. Students need a foundational knowledge of Geographic Information Systems (GIS) software. This requirement can be met by completing GSS 313: GIS Design and Application I (if available), by completing other Introduction to GIS courses at Stony Brook or elsewhere, or by self-teaching using the following book: *Getting to Know ArcGIS Desktop* by Tim Ormsby, Eileen Napoleon, and Robert Burke. Prerequisite: Admission to Graduate Public Health Program or Department Consent  
*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 535: Clinical and Community Preventive Medicine**

This course prepares residents to transition from the role of learners to practitioners of preventive medicine. Didactic lectures emphasize clinical preventive medicine, which entails mastering the science of preventive medicine practice, grounded in the evidence-based clinical preventive services guidelines as developed by the United States Preventive Services Task Force (USPSTF) [i.e. screenings, behavioral counseling, and chemoprophylaxis/preventive medications], while case-based simulated sessions provide an opportunity to become skilled in the art of preventive medicine practice, built upon the principles of lifestyle medicine, motivational intervention, brief action planning and other evidence-based strategies for health behavior change. The work of the preventive medicine physician in public health, referred to as community preventive medicine or community medicine, is also covered in this course, including the Community Preventive Services (CPSTF) guidelines, to help prepare residents

for the medical practice of prevention in the public health domain. The role of the preventive medicine physician in the seamless integration and effective collaboration between clinical medicine and public health is emphasized where appropriate. Prerequisite: Admission to Graduate Public Health Program or Department Consent  
*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 535: Population Mental Health in the 21st Century: Climate Change, Trauma, and Disparities**

In this course, we'll cover mental health threats, including collective traumas like natural disasters and climate change. We'll explore disparities, social determinants, and the mental-physical health link. With a public health view, we'll strategize population-level interventions for well-being.  
*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 536: Public Health Management of Disasters**

This course introduces students to the challenges public health professionals face when managing disasters, ranging from infectious outbreaks to man-made crises. It covers the essential skills needed to prepare for, respond to, and manage public health emergencies at the local, state, and federal levels. The course emphasizes the infrastructure required to handle disasters, which is established well before an emergency occurs. Key topics include the phases of emergency preparedness, common terminology and protocols from the National Response Plan, and an overview of the Incident Command System with a focus on resource management. Students will also learn about the epidemiology involved in infectious disease outbreaks. In addition to theoretical concepts, the course incorporates practical elements such as case studies of historical disasters, critiqued by public health experts, and interactive exercises that foster interdisciplinary collaboration in addressing simulated challenges. Students will also engage with current public health professionals from the Suffolk County Department of Health, who manage local disaster response efforts.  
*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 537: Introduction to Climate Solutions and Health**

What are the public health implications of climate change? Which populations are most vulnerable? How can public health professionals intervene to prevent or reduce harm? In this course, we will explore the significant health impacts of climate change

and develop the skills necessary to understand climate forecasts, estimate health risks, identify at-risk populations, and design interventions to help communities adapt. Climate change will affect various groups, including outdoor workers, the home-bound, children, and the elderly, across both high-income and low- to middle-income countries. We will study these health challenges from the perspectives of diverse stakeholders and emphasize a multidisciplinary approach to addressing climate-related health issues. An effective public health response to climate change requires cross-disciplinary skills, including the ability to critically assess scientific data, identify vulnerable populations, engage with stakeholders, and collaborate across fields to promote health in a shifting environment. A key component of this course is a project focused on climate vulnerability and mitigation, conducted in partnership with a local government or non-governmental organization.  
*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 542: Introduction to Global Health**

This course will provide an introduction to the field of global health and challenge students to think about how a global perspective could enhance their future practice. The course is designed for MD and MPH students, and is open to students from related graduate programs with instructor permission. This course will explore core concepts in global health, including its definition and origin; how to measure the global burden of disease; recent progress and current challenges; social inequalities in health; health systems; and global stakeholders. It will also apply such concepts to major global health topics, with lectures focused on such areas as HIV/AIDS, child health and immunization, chronic disease epidemiology and sexual violence.  
*2 credits, S/F graded*

### **HPH 549: Public Health Law**

This course is a survey of legal and policy issues that have special relevance for public health professionals. Topics may vary, but typically will include many of the following: structure of the U.S. legal system; power of state governments in matters affecting health care; governmental power and the right to privacy; constitutional issues in social welfare benefits; governmental regulation of health care providers and payers; the scope and discretion of administrative agencies in health care; the antitrust laws; the fraud and abuse laws; and negligence in the delivery and financing of health care. Prerequisite: Admission to Graduate Public Health Program.  
*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 550: Theories of Health Behavior and Communication**

In this survey theory course, students learn about the major health behavior and health communication theories that are used in population health research and practice. Rather than simply cataloguing each theory in turn, this course takes a constant, comparative, approach to the learning of theories, in which theories are dissected to their core elements and compared to each other in order to understand the points of convergence and divergence among them. The goal in taking this comparative approach is application: by knowing the core elements of various theories, students will more easily be able to choose appropriate theories to explain population health problems of interest and consider the design of interventions that are appropriate to achieve improvements in the educational, behavioral and environmental factors that may contribute to the problem. In addition to covering traditional individual-level behavior change and health communication theories, this course will focus on social change and systems theories, challenging students to think about the role of social context and systems on health behavior and health communication to achieve population health improvements. Finally, after learning about commonly-used theories in the field of public health, students will learn about and critique theories that are less-commonly used (such as new and emerging theories in the literature) and have important implications for future research, practice, and further theory development and testing among populations. Prerequisite: Admission to Graduate Public Health Program or Department Consent

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 551: Practice of Health Communications**

This course provides an overview of health communication. The course will introduce theories concerning health communication, and build on such to provide practical approaches to interpersonal and organizational health communication, risk communication, and media campaigns. Students will learn to collect, organize, and convey information effectively to different audiences important to public health initiatives. Throughout, the course will emphasize how health literacy and cultural beliefs influence effective communication, and students will be challenged to develop communication tools (e.g., social marketing campaigns, presentations, op-eds) optimized for a specific population. Prerequisite: Admission to Graduate Public Health Program or Department Consent

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 552: Planning and Implementing Community Health Initiatives**

In this course, students learn how to develop theoretically-informed and evidence-based community health initiatives. Over the course of the semester, students work on developing their own culturally-competent community health initiatives, each of which is targeted at a particular population with a specific health need. Each student learns how to assess community needs and assets using a variety of methods, elaborate an initiative's theory of change through use of logic model, design theoretically-informed intervention activities appropriate to the needs/assets identified, create a budget and organizational structure, and engage key stakeholders at every facet of development and implementation of the community health initiative. Students work together in the same small group over the course of the semester to get/give feedback and hone their individual projects. Through this intense group work, students both (1) learn how to apply course concepts to several particular community health problems and (2) gain skills for working in teams on community health initiative planning and implementation. Prerequisite: Admission to Graduate Public Health Program or Department Consent; HPH 550.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 553: Advanced Evaluation of Community Health Initiatives**

This course prepares students to plan, implement, and utilize an evaluation of a community health initiative. Basic principles and practices of evaluation are addressed, including identifying the goals of a community health initiative; designing an evaluation plan that can determine if the initiative's goals are achieved; implementing an evaluation plan; interacting with stakeholders; and using evaluation results to improve performance. Prerequisite: Admission to Graduate Public Health Program or Department Consent; HPH 525

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 554: Principles of Health Education & Promotion**

This course aims to provide students with the historical, theoretical, and philosophical foundations of health education and promotion. Students will be given the tools to work with community and patient populations. Students will be equipped with the knowledge, skills, and attitudes to raise people's health awareness, as well as the tools needed to teach people how to reduce their risk of

disease and promote health. All students will be required to design a health education and promotion program using the knowledge and skills learned in the course. Prerequisite: Admission to Graduate Public Health Program or Department Consent

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 555: Global Health and Demography**

This course introduces students to the basic theory and methods employed in the study of demography and global health. This course will provide an introduction to the field of global health and challenge students to think about how a global perspective could impact their future public health practice. The students will also learn about sources of demographic data, patterns in global fertility and mortality, and the demographic transition. Prerequisite: Admission to Graduate Public Health Program or Department Consent

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 559: Advanced Research Methods**

This course will provide students with an in-depth review of principles of public health research methods. Emphasis will be placed on conceptualization of research questions, evaluation of research design, sample size, and issues related to potential threats to validity within a public/applied setting. Additionally, students will become familiar with how to evaluate methods used in published literature and to design their own research projects. Course topics will include how to obtain secondary data, sample size calculation, risk adjustment, bias, confounding, and interaction. The instructor will work with students as they develop their own analytic project proposals. Students will be expected to implement their proposed research in HPH 560 Advanced Biostatistics in the following semester. Prerequisite: Admission to Graduate Public Health Program or Department Consent; HPH 507 and HPH 501

*3 credits, Letter graded (A, A-, B+, etc.)*

**HPH 560: Applied Biostatistics**

Students learn to formulate a scientific question in terms of a statistical model, leading to objective and quantitative answers. Topics may include analysis of variance, regression, including details of data-analytic techniques and implications for study design, measures of association, 2x2 tables, stratification, matched pairs, logistic regression, model building, analysis of rates, and survival data analysis using proportional hazards models. The course stresses applications in epidemiology, and other areas of public health research. Prerequisite: Admission to Graduate Public

Health Program or Department Consent; HPH 507 and HPH 559.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 562: Population Health Analytics**

The Population Health Analytics course provides students with the methodological and analytical skills required for competent evidence-based decision-making regarding population health improvement projects. Beginning with a review of current methods and an introduction to emerging methods for the generation and analysis of health data, such as precision medicine/big data, telemedicine/digital health, and spatial analysis/hotspotting, the course covers the major elements required for the evidence-based pursuit of population health goals. In particular, hands-on training is provided on how to synthesize evidence, via comprehensive systematic review methodologies, in the following 4 aspects of evidence-based decision-making: effectiveness, efficiency, feasibility, and appropriateness/meaningfulness. In addition, students will learn how to retrieve and summarize information about population health from major public health information systems in the U.S. Lectures and labs are aimed at developing hands-on skills for the management and analysis of health data using SPSS and other relevant statistical software programs, such as Open Meta Analyst (OMA) and the System for the Unified Management, Assessment and Review of Information (SUMARI). Prerequisite: Admission to Graduate Public Health Program or Department Consent; HPH 501 and HPH 506

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 564: Qualitative Methods**

In this course, students learn about the logic, theory, and methods of qualitative research within population health and related fields (e.g., social welfare, nursing, medicine, sociology, and psychology). The course begins with an introduction to the epistemological and ontological underpinnings of qualitative inquiry, with special attention to how these factors affect the types of research questions often asked (and answered) by qualitative researchers. Students then learn the nuts-and-bolts of qualitative research design and data collection through review of existing qualitative studies and hands-on application. Homework and in-class exercises over the course of the semester give students practice in (a) designing a feasible qualitative research study, and (b) collecting three kinds of qualitative data: participant observation, in-depth interviews, and focus groups. The course concludes with an overview of steps

for data analysis, including coding, memo-writing, and triangulation. Emphasized throughout the course are methodological issues germane to qualitative (and quantitative) research: reflexivity of the researcher, appropriate treatment of human subjects, and obtaining quality data. Prerequisite: Admission to Graduate Public Health Program or Department Consent; HPH 501

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 566: Clinical Trials**

This course introduces the design, conduct, and analysis of clinical trials. Topics will include types of clinical trials, study design, treatment allocation, randomization and stratification, quality control, sample size requirements, patient consent, and interpretation of results.

*2 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 575: Public Health Internship**

This course is an applied internship in a public, not-for-profit, or private sector organization that provides a public health service. Students will gain practical public health skills through a semester long internship. The student will work in the organization and prepares a weekly journal of activities, as well as a paper at the conclusion of the course, applying program knowledge to the internship activities. Graduate Graded and may be repeated for credit. MPH Academic Coordinator consent required. Prerequisite: Admission to Graduate Public Health Program and Department Consent

*0-12 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **HPH 580: Practicum**

The Practicum is a planned experience in a supervised and evaluated public health-related practice setting. A journal of fieldwork and a project, with a written report, are required. Students will be expected to demonstrate their "capacity to organize, analyze, interpret and communicate knowledge in an applied manner." Health departments, as well as a variety of other local organizations, offer a wide array of potential sites for the Practicum experience. Permission of MPH Academic Coordinator is required. Prerequisite: Admission to Graduate Public Health Program and Department Consent

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 581: Capstone**

This course will assist students in synthesizing basic public health knowledge through completion of several competency-driven learning experiences. Most core and

concentration course work must be completed before the student can participate in Capstone. Students will be introduced to the process of writing grant proposals and developing budgets, professional networking with non-academic community partners, publishing in the scientific literature; communicating practice-based projects in both oral and poster presentation formats, and planning for their future careers as public health professionals. They will self-assess their own conflict styles and apply negotiation and mediation skills to address community and/or organizational challenges, and reflect on their conflict styles when considering case studies. Students will also engage in inter-professional education learning activities to improve their understanding and communication of their roles, values/ethics, and how to work effectively as part of an inter-professional team. Students will apply systems thinking to a case study to create a logic model that demonstrates the complex systems involved in a population health issue. Lastly, they will present their own work as part of their Practicum to fellow students, and discuss career plans. Permission of MPH Academic Coordinator is required. Prerequisite: Admission to Graduate Public Health Program and Department Consent

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HPH 590: Research Practicum**

The goal of Research Practicum is to mentor students to successfully complete their research requirements. Expectations are that students will register for Research Practicum for three consecutive semesters. The Research Practicum is a planned experience with expectations identified each semester in conjunction with a research mentor and faculty supervisor. A practicum proposal, analysis report, and final deliverable (NIH proposal, Foundation proposal, or peer reviewed publication) are required.

*0-9 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **HPH 599: Maintenance of Matriculation**

This course is for students who are maintaining matriculation while engaging in consultation with faculty regarding completion of courses and/or master's project. Students will be graded S/F. Prerequisite: Admission to Graduate Public Health Program and Department Consent

*0-3 credits, S/F graded  
May be repeated for credit.*

# HSC

## HSC Introduction and Electives

### HSC 500: Health, Sciences and Society

Interdisciplinary course for HSC students (Nursing, Social Welfare, Dental Medicine, Health Technology and Management, Medicine and Public Health). Topics include communication, health economics, scope of practice, ethics, law, policy, public health and medical informatics.

3 credits,

## HWC

### Social Work

#### HWC 596A: Community Learning and Professional Preparation Year I Part A

This first part of a required two-part course will provide foundational knowledge, values and skills to prepare the student as a social work professional. Topics covered in this course include professional pathways, areas of practice, advocacy and communication skills, and other topics specific to the students' social work education. Attendance is required at two full-day events at the Stony Brook campus per academic year. Dates will be posted at the beginning of the Fall term. Students graded S/U. (0.5 credit, G1 status. Co requisite HWC 509)

S/U grading

#### HWC 596B: Community Learning and Professional Preparation Year I Part B

This second part of a required two-part course will provide foundational knowledge, values and skills to prepare the student as a social work professional. Topics covered in this course include professional pathways, areas of practice, advocacy and communication skills, and other topics specific to the students' social work education. Attendance is required at two full-day events at the Stony Brook campus per academic year. Dates will be posted at the beginning of the Fall term. Students graded S/U. (0.5 credit, G1 status. Co requisite HWC 509)

S/U grading

#### HWC 597A: Community Learning and Professional Preparation Year II Part A

This first part of a required two-part course will provide advanced knowledge, values and skills to prepare the student as a Social Worker for entry into the profession. Topics covered in this course include professional pathways, licensure, advanced advocacy and professional communication skills, and other topics specific to the students' social work specialization. Attendance is required at two full-day events

at the Stony Brook campus per academic year. Dates will be posted at the beginning of the Fall term. Students graded S/U. (0.5 credit, G2 status.

S/U grading

#### HWC 597B: Community Learning and Professional Preparation Year II Part B

This second part of a required two-part course will provide advanced knowledge, values and skills to prepare the student as a Social Worker for entry into the profession. Topics covered in this course include professional pathways, licensure, advanced advocacy and professional communication skills, and other topics specific to the students' social work specialization.

Attendance is required at two full-day events at the Stony Brook campus per academic year. Dates will be posted at the beginning of the Fall term. Students graded S/U. (0.5 credit, G2 status. Co requisite depending on specialization- HWC 534 (for FYT) or HWC 564 (for IH) or HWC 570 (for CPSA)

S/U grading

#### HWC 500: Practicum Education I

Placement in practice settings under supervision of a licensed M.S.W. Students will be graded S/F. Corequisite: HWC 513.

4-6 credits, S/F graded

#### HWC 501: Practicum Education II

A continuation of HWC 500. Students will be graded S/F. Corequisite: HWC 514. Prerequisites: HWC 500 and 513.

4-6 credits, S/F graded

#### HWC 502: Practicum Education III

Placement in advanced social work practice settings. Supervision provided by a licensed M.S.W. Students will be graded S/F.

4-6 credits, S/F graded

#### HWC 503: Practicum Education IV

A continuation of HWC 502. Students will be graded S/F. Corequisite depending on specialization- HWC 571 (CPPSA), HWC 532 (FYT), HWC 565 (IH). Prerequisites: HWC 502

4-6 credits, S/F graded

#### HWC 504: Human Behavior and the Social Environment: Critical Applications of Social Work Theory

This course applies a multi-theoretical and critical approach to social inquiry in the examination of complex theories, metaperspectives, and knowledge about individuals, families, groups, organizations, institutions and urban, suburban, and rural communities. The course encourages

students to maintain a view of people and their environments as heterogeneous and sociohistorically embedded, as well as adaptable and resilient. Throughout the course, special consideration is given to social and cultural diversity. Students will develop a multi-dimensional (e.g., social, psychological and cultural) understanding of human behavior as applied to contemporary issues in social work practice. Class meets two hours in-class and one hour of instructor directed assignments.

3 credits, Letter graded (A, A-, B+, etc.)

#### HWC 505: Integrating Seminar

This course extends the work covered in HBSE, by applying human behavior theory to social work practice situations. Students will integrate knowledge and skills acquired in social work practice, social justice, policy, field education and research courses to social and clinical issues across diverse topics. Class activities include experiential assignments and project based learning. This course prepares students to practice in interdisciplinary environments. Class meets two hours in-class and one hour of instructor directed assignments. Prerequisite: HWC 504

3 credits, Letter graded (A, A-, B+, etc.)

#### HWC 506: Human Rights & SW; Tools for Clinical Prac & Advcy

The goals of social work are intertwined with the premise that the realization of universal human rights are essential to a just and ordered society. This class stresses the need for social workers to use a human rights framework for practice, especially in our interconnected global economy. Human rights can help link micro practice to macro practice and connect the varying roles of the social worker. This class will highlight timely issues such as human trafficking and environmental justice. This class will provide students with advanced clinical practice skills rooted in human rights as well as advocacy strategies needed to create policy based on human rights.

3 credits, Letter graded (A, A-, B+, etc.)

#### HWC 509: Foundations of Social Justice: Challenging Oppression

This course explores the meaning of social justice within the context of political economy, human nature, and health policy. Examination will include the relation of historical implications within contemporary discourse. This course will analyze the foundations of power, privilege, and prejudice in the United States through the lens of social work ethos that values human rights, equality, respect, and health for all. Emphasis will be placed on the identification of social injustice, challenging

institutional oppression, and the creation of effective methods to empower marginalized and oppressed populations. Class meets two hours in-class and one hour of instructor directed assignments. Corequisite: HWC 596A.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 510: Social Policy and Social Determinants**

This course builds upon the Foundations of Social Justice: Challenging Oppression course through the discussion and exploration of social policies, social determinants of health, and contemporary & historical social movements that have arisen to challenge oppression. This course utilizes frameworks for social policy analysis while addressing continuing dilemmas in policy development. Experiential learning and beyond-the-classroom experiences introduce students to the processes and dynamics of social movements, social change, and their effects on social policy. Class meets two hours in-class and one hour of instructor directed assignments. Prerequisite: HWC 509

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 511: Research I**

Research I, is the first part of a two-semester course sequence designed to prepare social work students to engage in research informed social work practice and practice informed social work research and evaluation. The first semester (HWC511) provides an overview of the research process from both quantitative and qualitative perspectives and examines how a critical approach to research may form the basis of evidence-based social work practice and client empowerment. The course goes on to examine those elements of the research process that are common to all methodologies: the ethical conduct of research; literature searches and reviews; development of research questions and hypotheses; measurement; and sampling procedures. Quantitative data analysis is introduced in the form of univariate/descriptive statistics. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 512: Research II**

Research II is the second part of a two-semester course sequence designed to prepare social work students to engage in research informed social work practice and practice informed social work research and evaluation. The second semester (HWC512) follows-up on the first by examining specific data collection methods (experiments; surveys; interviews; focus groups; ethnographies; etc.), with

attention given to understanding how these methods are used appropriately in social work research and evaluation processes. Quantitative data analysis procedures at the bivariate and multivariate levels (t-tests; ANOVA; correlation; regression; chi-square test, etc.), hypothesis testing, inferential statistics, and computer assisted data analysis using SPSS will be presented in the context of appropriate data collection methods. Emphasis placed on research proposal development and critical evaluation of research reports. Class meets two hours in-class and one hour of instructor directed assignments. Prerequisite: HWC 511

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 513: Social Work Practice I**

Provides a foundation for generalist practice, including the knowledge base, values and skill development necessary for ethical and effective practice with individuals, families, groups and communities. Students are introduced to the helping process across client systems and across the life span through a strengths perspective and empowerment approach to practice. Evidence-based short-term therapies are used to guide direct practice to address resilience and human development. Class meets two hours in-class and one hour of instructor directed assignments. Corequisite: HWC 500.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 514: Social Work Practice II**

A continuation of HWC 513. Revisits the helping process in greater depth with specific reference to special consideration for work with families, groups, communities and organizations. The broad range of social work roles across client systems is considered. Deepens knowledge of generalist practice, ethical practice and skill development.

Corequisite: HWC 501. Class meets two hours in-class and one hour of instructor directed assignments. Prerequisites: HWC 500 and 513

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 518: Forensic Soc Work: Psychosocial and Legal Issues - Civil Law**

This course provides the foundational knowledge and skills for forensic social work, with a focus on the proceedings that encompass the civil law. Using a trauma-informed perspective, students will be introduced to the civil court structure and the many different proceedings that are addressed by the civil courts including: mental capacity, family court, divorce, Adult Protective Services (APS), guardianship, medical legal issues, education issues, and restorative justice. Students will learn about the various social

work roles and practices in each of these types of proceedings with an emphasis on understanding racial and ethnic disparities.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 519: Clinical Assessment, Diagnosis, and Psychopharmacology**

This course expands upon the knowledge base of human behavior and the social environment. It examines symptomatology and the complexity of mental health diagnostic categories. Students will examine the mental health concerns of diverse social, racial, and ethnic groups, particularly those which are historically devalued, marginalized, and oppressed. The aim is to develop diagnostic and treatment skills by increasing understanding of biological, neurological, social, and cultural contexts--and their interactions-- and how these interactions produce symptoms that are characterized within a constellation of diagnostic categories. The roles and responsibilities of the social worker as a diagnostician and a valued, integral member of the interprofessional team, is emphasized. Focus is placed on the social worker's role in leading team members to become sensitized to all factors impacting the individual and the functioning of the client such as the social determinants of health. Additionally, factors influencing support systems will be examined. The use and misuse of the classification system of the current DSM 5 TR is examined. This examination includes the distinction between major mental disorders and other forms of behavior, recognition of symptoms, assessment of psychosocial functioning within a multi-cultural framework, and the relationship between diagnostic assessment and differential diagnosis. Students are introduced to the uses of pharmacological treatment of specific mental disorders and the side effects of these drugs. Advocacy, social justice, and fostering social change regarding mental illness in larger systems is reinforced. Prerequisites: HWC 500, 501, 504, and 513.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 520: Advanced Social Work Practice with the Aged**

This course examines concepts and strategies for working with the elderly at the primary, secondary and tertiary levels of intervention. It presents and critically analyzes a variety of approaches in working with the elderly and their families. Interventions with the well elderly living in the community, the elderly who suffer some disabilities but who are still living in the community and the elderly who are institutionalized are examined. Class meets two hours in-class and one hour of instructor

directed assignments. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 521: Aging in Place**

This course will cover the key domains that enable older adults to age in place -- the ability to stay in one's home and community safely, independently and comfortably, regardless of age and income. Participants will acquire the skills and knowledge needed to navigate systems and support older adults, their families and caregivers through transitions and choices. Utilizing an integrated care coordination approach, this course will include behavioral/health issues, family, social and community engagement, along with policy and practice considerations.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 522: Men & Masculinities in the 21st Century**

Societal conceptualizations of masculinities directly impacts how men live their lives. This understanding also impacts how men interact with other men as well as with people of all genders. In this class, students will be expected to engage in the active study of how masculinities have influenced their lives and those with whom they interact. how masculinities intersect with issues such as race, class, ethnicity, gender identity and presentation, and sexuality. We will seek to understand these issues as they were historically and as they are today; including a sense of contexts such as those provided by popular media, politics, education, and others.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 523: Growing Old in America: The Social Conditions-Policy and Practice Implications**

Explores the social, political and economic conditions related to aging including long-term care in this society. Identifies social policies and program formats that enhance wellness and support dependencies from a positive perspective. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 524: Models of Change - Trailblazers, 'Good' Troublemakers, & Change Agents**

This class will explore human rights advocates and dig deep into the social movements that have driven societal change. This class stresses the need for social workers to use a human rights framework for practice, especially in our interconnected global economy. This

course will examine human rights, social work as a human rights profession, and in particular, vulnerable populations. This class will highlight timely issues such as human trafficking and environmental justice and will highlight advocates who like John Lewis "Get in good trouble, necessary trouble, and help redeem the soul of America".

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 525: Anger Management**

This course presents an overview of concepts of anger management within a holistic context. Students learn how to recognize external manifestations of anger in themselves, clients, organizations and communities. Anger management strategies that can be taught to clients as part of an intervention plan will be introduced. Environmental and societal factors as "igniting events" of anger in individuals, families, groups and communities are examined. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 526: Crisis Intervention: Opportunities for Change**

This course provides theoretical and substantive content that will enable students to gain knowledge, understanding, and skill in relation to crisis intervention in social work practice. This course defines crisis, provides examples of the types of crises workers will face in various fields of practice, explores the role of the social worker, and the range of interventions needed in response to crisis situations. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 527: Social Work in the Political Process: Campaign School**

Social Workers, and the people they work with, are fundamentally dependent on the decisions made by the people who are elected to the executive and legislative branches of government. In order to advance the values of the Social Work profession, and advocate on behalf of clients, Social Workers must participate and engage in the political process. This course is an exploration of the world of partisan electoral politics as an area of social work practice. Social workers can, and do, play many roles in the political arena. These roles can include, staff to elected officials, volunteer and staff positions on political campaigns, political appointments, lobbying roles and as elected officeholders. This course makes it clear why it is important for social workers to be in the political arena. The specific techniques and requirements for

running for office, or serving in a leadership role on a political campaign, will be covered throughout this course. This is a hybrid course that combines ten class sessions, hybrid learning hours, and required attendance at a two day conference, titled "Campaign School."

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 528: Palliative and End of Life Care**

This course examines the roles of social workers in palliative and end-of-life care in the context of varied palliative care teams and settings. Particular attention will be given to models of palliative care, interdisciplinary practice, and family-oriented care. Additional attention will be given to the relationship of research and practice in palliative care social work.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 529: Complementary and Alternative Medicine**

Human service workers are often required to discuss issues of health and healing. Many individuals, by virtue of their culture, experiences and/or choice, often adhere to a combination of nontraditional and traditional beliefs regarding healthcare. This course familiarizes students with those methods and beliefs most often found in specific cultures. Students will develop an appreciation of each practice in order to interact with clients from a strengths perspective and will gain an international perspective on healthcare modalities. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 530: Case Management in Human Services**

Case management has grown dramatically in the human service field over the last twenty years in response to the growing service needs of individuals and families facing complex life situations and issues. Examines both the macro level and micro level issues facing case managers and agencies as they provide quality services to often oppressed populations. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 531: Advanced Practice Skills I: Developmental Processes**

This course emphasizes the understanding of developmental theories and application to culturally responsive practice with families, youth, and young adults. Focus is placed on recognizing developmental issues and their implications for assessment, engagement, and



early intervention strategies. Familial, cultural, and environmental factors that influence development are discussed. Corequisite: HWC 502 and 534. 3 credits, Fall semester.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **HWC 532: Family, Youth, and Transition to Adulthood Advanced Practice Skills II: Intervention Skills**

Building on the knowledge and skills in Advanced Practice Skills I, this course focuses on enhancing clinical effectiveness in interactions with children, adolescents, and young adults by strengthening assessment and diagnostic skills and understanding related advanced theory. Topics include child welfare related interviewing skills, parenting and communication, advanced solution-focused therapy, motivational interviewing, cognitive behavioral therapy, behavioral health assessment and interventions, rapid assessment tools, and forensic therapeutic interventions. All of these topics are addressed within a trauma- and culturally-responsive framework. Professional and ethical considerations, evaluation of intervention effectiveness, and service delivery in an agency context are woven throughout the course. Corequisite: HWC 503 and 535. 3 credits, Spring semester.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **HWC 533: Family Intervention in Health and Mental Health**

This course focuses on family and marital problems. Environmental, social, economic, psychological and institutional pressures that affect family functioning are examined. Emphasis is placed on intervention skills. Class meets two hours in-class and one hour of instructor directed assignments. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 534: Advanced Policy Practice**

This course surveys historical and current policies relevant to social work practice with families, youth, and young adults. Students will engage in policy analysis including a critical analysis of oppression and inequality in the context of child and family federal policies. In addition, the course will explore culturally sensitive skill development and competencies related to policy practice including social action and activism. Corequisite: HWC 502 and 531. 3 credits, Fall semester.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **HWC 535: Org Ldrshp Across FYT Systems of Care**

This course provides an evidence-based and empirically supported practice framework for developing advanced organizational leadership skills across various systems of care that impact the lives of youth, families, and young adults. Focus is placed on strategic planning, effective communication, anti-oppressive organizational development and evaluation, and organizational analysis including inter- and intra-organizational contexts. 3 credits, Spring Semester

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **HWC 536: Fathers and Families**

This advanced practice elective focuses on engagement, assessment, and interventions with fathers in social work practice. The course provides an historical overview of fatherhood, the socio-cultural context of fatherhood and masculinity, considerations for work with diverse fathers, engagement of men in various settings to enhance fathering, and child support policy in the context of work with men and fathers. This course is offered online with scheduled guest speakers from various father-serving organizations including NYC Office of Child Support Services.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 538: Death and Dying; Loss and Separation**

This course explores student values, attitudes, fears and conceptions relating to death and dying. Issues of loss and separation in relation to various age groups, cultural orientations and societal expectations are examined. The focus is on the acquisition of bereavement counseling skills. Class meets two hours in-class and one hour of instructor directed assignments. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 539: Ancestral Health Practices**

There is an increasing integration of complementary medicine and allopathic medicine. As health professionals, it is important to understand the beliefs and practices of our clients in order to maximize their options and choices. Professionals must be knowledgeable about the healing traditions anchored in different cultures and ethnicity. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 540: Therapeutic Approaches for People with Disabilities**

This course will provide a framework for practice with individuals with disabilities based on cognitive-behavioral and solution-

focused therapies. Emphasis will be placed on understanding the acute issues facing individuals with disabilities primarily from a social model lens which focuses on socio-environmental constraints and barriers. These include limited human rights, access to care and treatment choices, and socio-cultural forces. Psychosocial factors will also be explored. The empirical knowledge base that informs and guides the assessment and theory based interventions of individuals with disabilities will be examined and critiqued.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 541: Leadership in Education in Neurodevelopmental Disorders from a Multidisciplinary Lens**

This course addresses the interdisciplinary role of care for children and adults with autism spectrum disorder (ASD) and other related neurodevelopmental disorders (ND) across the core LEND designated disciplines (nursing, public health, physical therapy, social work, psychology, adult medicine, child medicine, adult/pediatric dentistry, disability studies, family leadership and self-advocacy). The Stony Brook LEND course aims to reduce health disparities by training graduate students and providers from diverse disciplines who may provide care to individuals with ASD/ND across the lifespan. LEND interdisciplinary work will be framed to support policies and practices that bring care closer to the patient/client with ASD/ND and their families and challenge traditional professional boundaries.

*S/U grading*

### **HWC 542: School Social Work: Practice Policy and Research**

Examines the practice of school social work in an in depth manner. It gives an overview of the central issues that occur in schools. It discusses strategies to build a positive and safe school climate for diverse and disenfranchised populations. The course will cover evidenced-based practices including DBT and CBT for schools. It examines the social/political context of working in the school. Topics will also include working with students struggling with psychiatric, psychological, substance use, and familial issues as well as assisting students in special education. Crisis intervention techniques and trauma-informed educational practices will be discussed.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 543: Advanced Clinical Skills for SW in Education**

This class will instruct students about clinical interventions and policy issues in school social work and in social work in colleges and universities. Clinical intervention include-

mindfulness and acceptance-based approaches such as acceptance and commitment therapy (ACT), dialectical behavioral therapy skills (DBT), mindfulness-based cognitive therapy (MBCT), and mindfulness-based stress reduction (MBSR).

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HWC 544: Overview of Substance Abuse**

This course is an examination of the history and development of alcohol and substance abuse problems in the United States. It focuses on the etiology, psychopharmacology and ethical and legal ramifications of the use of licit and illicit substances in our culture. The course provides information on a variety of services available to drug abusers, addicted individuals and their families in the fields of prevention, education and treatment. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HWC 545: Assess & Trtmt of Alch & Sub Misuse**

Students will learn to recognize the bio-psycho-social aspects of addiction and recovery; implement an SBIRT assessment utilizing evidence-based practice models (e.g. Motivational Interviewing; Stages of Change); and develop a foundation of clinical skills to treat addiction.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HWC 546: Interv in Treating Alcohol and Sub Misuse**

Students will develop a comprehensive assessment and apply it to an intervention plan based on client need and best practices in the addiction field. The importance of culture, gender, age, and class, as key considerations in the intervention process will be highlighted throughout the course.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HWC 547: Managing Conflict: Groups, Organizations, and Communities (FYT) (CPPSA)**

A major concern for health and human service managers is conflict in organization, community and group settings. The various types of conflicts and the concepts of negotiation and mediation as interventive strategies are considered. Didactic and experiential learning experiences are utilized. Focus is on analyzing conflict situations and selecting interventive strategies to reduce, contain or heighten the conflict situation. Oppressive conditions, structures and processes are considered major determinants

of human suffering and individual and social problems; students examine how these oppressive conditions are present in conflict situations and consider ways of dealing with them. Class meets two hours in-class and one hour of instructor directed assignments. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HWC 548: Adolescent Development and Health Promotion**

The effect on adolescent development of physiological changes, relationships with peers and family, and societal expectations are examined. Emphasis is on the development of assessment and engagement skills for working with adolescents and their families to help counteract adolescent self-destructive behavior and promote well-being. Class meets two hours in-class and one hour of instructor directed assignments. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HWC 549: Overview of Social Work with Special Populations**

This course examines the issues that social workers must consider when working with traditionally disenfranchised populations. Emphasis will include micro and macro issues when intervening with gay and lesbian individuals, members of diverse racial and ethnic groups, and women, as well as others. The historic as well as contemporary experiences of these individuals' interactions with the health and human service delivery system will be explored. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HWC 550: Culture-Centered Approach to Social Work Practice**

This course provides students with an opportunity for self growth while preparing to work with individuals and their families from a culture-centered value base. Culture-centered foundation practice provides students with a frame of reference for better understanding and appreciation of the difference of their own culture from the cultures of others. Class meets two hours in-class and one hour of instructor directed assignments. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HWC 551: Law and Social Change**

This course introduces students to the interrelationship of the legal process in the United States and the profession of social work. Focuses on the legal process in general,

social welfare law, in particular, and the implications for effective social work practice. Students will be required to explore and integrate the ways in which legal frameworks determine the nature of practice processes and structures within their chosen field of Specialization. Permission required for students not enrolled in the School of Social Welfare. 3 credits, semester varies

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HWC 552: LGBT Social Work Practice: Micro Intv and Pol Chg**

The purpose of this course is to enhance students' professional competence with lesbian, gay, bisexual, and transgender (LGBTQ) people. Content explores social work practice at the micro, mezzo, and macro levels and across social, political, and economic realms. Students will be introduced to LGBTQ civil rights movement and the underlying theories of sexual orientation and sexual identity development. As sexual orientation in contemporary culture is politically charged and socially regulated, students will be taught macro-level advocacy skills to fulfill their call as social workers by promoting social justice and equality. On the micro level, students will learn appropriate clinical assessment tools and social work intervention skills for use with LGBTQ people. A life cycle perspective will be presented to highlight the unique issues of LGBTQ people at various stages of human development, from the very young to the very old. Special concerns within the population, such as the coming out process, adolescent suicide, aging, and coping methods, will be considered.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HWC 553: Chemical Dependency in Special Populations**

This course covers alcoholism and substance abuse with populations that have been traditionally devalued and oppressed. It focuses on development of skills and sensitivity to ethical issues and the needs of ethnic groups, women, the elderly, the mentally ill and LBGTQ people who are chemically dependent. Policy and practice issues related to these populations are considered. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **HWC 554: Legislative Advocacy for Social Workers**

The course will introduce students to the role that social workers play in shaping and influencing the legislative process - from advocacy and lobbying, to elections, to research, writing and passing legislation.

This course will focus on the New York State legislature or the Nassau and Suffolk legislatures, depending on the year. Students will be introduced to the role that social workers can play in shaping policy and how to go about influencing policy. Students will develop the skills necessary to succeed in legislative advocacy on behalf of their clients and the profession.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 555: Supervision in Health and Human Service Organizations**

This course prepares social workers for the variety of tasks related to supervisory practice in health care agencies. Supervision is introduced as a teaching process, as an administrative function and as a program development tool. Emphasis is on helping workers function effectively with culturally diverse clients, populations at risk and the chronically ill. Content includes: historical perspective of supervisory practice; supervisor and agency structure; the organizational context of practice; learning theories; concepts of power, authority and accountability; ethical and clinical issues; supervisory techniques, skill and self awareness; staff and program development and evaluation. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 556: Proposal Writing in the Health and Human Service Fields**

This course provides a comprehensive study of the principles and methods used to prepare program, training, research, demonstration and other types of proposals. Extensive workshop practice in developing appropriate writing skills and in locating and accessing funding sources is included. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 558: Human Services Administration**

An introduction to the practice of administration of public and non-profit agencies, theories of management including alternative decision-making models, understanding of organizational structure and process, external and internal functions including interagency collaboration and personnel and financial management, affirmative action and ethical issues. The course combines theory with case examples, practical exercises and other experiential learning modes. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 559: Mental Health Evidence-Based Practice**

This course develops the knowledge and skills necessary for working with individuals with a diagnosis of serious mental illness using recovery-oriented evidence-based practices. This course is designed for M.S.W. students and M.S.W. mental health practitioners. The course familiarizes students with evidence-based practices, within a recovery-oriented paradigm, as a general approach to practice as well as specific evidence-based interventions to use for individuals with a diagnosis of serious mental illness. Students should have a basic knowledge of serious mental illness as pre- or co-requisite, however a review will be provided. Research literature is examined to determine the various levels of support for specific interventions and essential principles for translating research into practice. Appropriate treatment outcomes that reflect effective quality mental health practice are identified. Focus is on providing assessment and treatment to a diverse group of individuals with a diagnosis of serious mental illness. 3 credits

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 560: Social Work with Immigrants and Refugees**

This course examines pre-migration, migration, and post-migration influences and experiences of immigrants and refugees. The course will also explore the political, social, economic, and environmental context of life in the United States, including the health and mental health, community, and legal systems. Students will learn and apply concepts relevant to social work that define specific strengths, needs, and challenges facing migrant well being from practice and policy levels. Mastery of course content will provide students with an understanding of and appreciation for diversity in self and others from a human rights perspective.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 561: Anti-Racist SW: Understd White Frag & Black Rge**

The course will assist social work students in understanding the complex nature of the dynamics of social oppression, racism, and anti-racist practice. Students will explore their own personal values, beliefs, and behaviors that may limit their ability to practice effective social work with people of diverse backgrounds, in particular, disadvantaged and oppressed persons. Students will acquire the knowledge needed for practice using an anti-oppressive and anti-racist lens framed by an understanding of systemic racism.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 563: Homelessness, Politics and Public Health**

This course analyzes homelessness as an issue of social policy, including its history, recent causes and current demographics. It emphasizes the political and economic context that has made homelessness a major social problem. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 564: Advanced Practice I: Assessment and Skills in Integrated Health**

This course will build advanced competencies as applied in health and mental health settings. Students will learn how to conduct assessments that engage the family and the community, and develop skills for relationship building, care coordination, and strategies for defining and addressing the social determinants of health, utilizing interprofessional practice skills. Topics include primary prevention; acute and long term care; rehabilitation in inpatient and outpatient clinics; forensic social work; substance abuse; medically managed systems; chronic disease; HIV/AIDS; trauma and co-morbid psychiatric issues; cancer. Corequisite: HWC 502 and 574. 3 credits Fall semester

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

### **HWC 565: Advanced Practice II: Strategies and Interventions in Integrated Health**

Building on the knowledge and skills in Advanced Practice I, students will learn current practice strategies, technological advancements, and interventions to address the major health concerns that impact society. Students will investigate population based treatments across systems that are trauma responsive, build on client's strengths, and that are culturally congruent. Corequisite: HWC 503 and 576. Prerequisite: HWC 564. 3 credits, Spring Semester

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

### **HWC 566: Student-Community Development Student Portfolio Project**

Provides an opportunity for students to create a portfolio composed of various components that integrates the student's educational experiences and achievements in the Student-Community Development Specialization. Components may include literature reviews, abstracting research articles, analysis of field placements, and integration of social work and student affairs

literature. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 568: The Workings of the Brain: Practice Issues for Social Workers**

Addresses the organization, development and functions of the brain and how this influences how we think, feel and behave. Causes of organic changes in the brain such as substance abuse, disease and injury are addressed. Advances in neuroscience that have aided in diagnosis and social work practice are covered. Innovative treatment modalities such as EMDR, biofeedback and vagal nerve implants are presented. Strongly emphasizes the combination of science and practice issues. Class meets two hours in-class and one hour of instructor directed assignments. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 569: Child and Adult Sexual Violence: Acute and Long-term Sequelae**

This course focuses on the health and mental health issues presented by individuals who have experienced sexual violence. The different types of sexual violence that occur across the lifespan will be reviewed as well as treatment modalities designed to address these issues. Treatment dynamics such as client safety; stabilization; emphasis on strengths-based treatments that assist clients in regaining a sense of control; and a strong therapeutic alliance are presented. The importance of phase-oriented treatment and post-traumatic growth (PTG) will be reviewed. Countertransference dynamics and clinician self-care will also be presented.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 570: Advanced Tools for Change: Practice I**

Building on foundation knowledge, values and skills, this course will deepen student capacity to work for social change. Students will build their expertise using interpersonal communication, relationship building, organizing skills in select areas such as visioning, problem analysis, community engagement, assessment, action research and mobilizing communities to work for change. This course expands upon the students' learning in their first year policy courses to utilize advanced critical theories to analyze social problems and develop tools for social change with a special emphasis on community and empowerment. 3 credits, Fall Semester

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **HWC 571: Advanced Tools for Change: Practice II**

Building on the knowledge and skills in the first semester of Advanced Tools for Social Change, Part II focuses on developing students' skills in analyzing issues, developing powerful arguments and communicating persuasively with multiple audiences using multiple media platforms. Using a lens of critical theories, students will learn to engage with and mobilize constituents, form coalitions, lobby policymakers and leverage political power to challenge systemic structures of power and privilege and effect positive social change in the areas of students' passion. Corequisite: HWC 503 and 573. 3 credits, Spring Semester

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **HWC 572: Leadership for Social Change**

Leadership is widely understood as a critical success factor for advancing social change. In this class, students are educated to develop advanced leadership skills to create and sustain social-change organizations that address societal inequities. The course covers the many facets of social change leadership, including effective communication, strategic planning, and program development. The course will consider what it means to be a leader, the kinds of skills leaders need to succeed in diverse community settings, and what are the necessary preconditions for social change. Additional focus will be on anti-oppressive organizational and program development, management, resource development and financial management. Specific focus will be devoted to providing students with opportunities to develop their presentation and analysis skills and to receive peer feedback. 3 Credits, Fall Semester

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **HWC 573: Social and Political Change (Hybrid)**

By its nature, social and political change is action oriented. This course will provide students with the opportunity and value, knowledge and skill based guidance to undertake an actual advocacy/community change oriented capstone project. Students will work with community based social change organizations on a social change project for approximately 35 hours during the semester in lieu of classroom meetings. During the 5 in-class meetings and online discussions, students will act as consultants to one another, reflecting on learning from project work, readings and other courses in the

specialization. Corequisite: HWC 503 and 571. 3 credits, Spring Semester

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **HWC 574: Clinical Skills: Motivational Interviewing & Cognitive Behavioral Therapy in Integrated Health**

This course introduces students to advanced evidence-based clinical modalities, that include group treatment, and short term interventions with an emphasis on Motivational Interviewing (MI) and Cognitive Behavioral Therapy (CBT) as applied in health and mental health care settings. Corequisite: HWC 502 and 564. 3 credits, Spring semester

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **HWC 575: Child Welfare: An Overview**

This course covers the impact of historical and contemporary developments within the field of child welfare. It examines the evaluation of child welfare services and the role of child care workers. It also examines out-of-home care, foster care, group home care and institutional care within the context of traditional public/voluntary structure of services and the social/political context. Services in relation to the changing roles of the family and emergence of child care are covered. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 576: Integrated Health: Advanced Health Policy Systems**

The course will address local, federal, state, and organizational policies and funding mechanisms impacting health and mental health. Topics include recent developments in health care reform and current issues and trends in primary and behavioral health care integration. The course will emphasize diversity, health disparities, and social and economic justice. Corequisite: HWC 503 and 565. 3 credits, Fall semester

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **HWC 577: Program Evaluation**

This course provides an in-depth analysis of the technical requirements of program evaluation and the organizational and political constraints that influence the evaluation process. Techniques in the design and implementation of evaluation research in the health and human services fields are covered. Prerequisites: HWC 511 and 512. 3 credits

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 578: Advanced Social Work with Groups**

This course explores the principles and practice of group work in assisting clients to maximize psychosocial functioning. Class members will participate in an experience that encourages them to realize the power of group work process and usefulness of this modality. Group work techniques, context, dynamics, skills and the role of the group facilitator are discussed. In presenting group work with special populations students learn about the impact of issues including development, discrimination, illness, addiction and separation on the commonality of the human experience as it presents in group practice. 3 credits

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 579: Special Topics in Social Work**

These courses examine significant timely issues confronting the profession. Topics include violence as a public health problem, issues of aging, racism, gender, AIDS, the media, and others. Topics vary each term as faculty develop specific modules that address one or more of these issues. Class meets two hours in-class and one hour of instructor directed assignments.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 4 times FOR credit.*

**HWC 581: Public Health and Community Health Intervention**

This course examines many of the critical public health issues of today. Students gain an understanding of the concepts underlying social epidemiology and develop an appreciation of the ways in which the health status of different populations in this country is differentially impacted. Community health planning strategies (e.g. health promotion and health education) are examined. 3 credits

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 582: Organizational Dynamics and Legal and Ethical Issues in Health Care**

This course examines some of the traditional, as well as newer, models through which healthcare services are delivered. Particular emphasis is given to the issue of access to health services as well as the location of the professional social worker within these systems. Students gain the ability to conceptualize many of the critical ethical and legal issues impacting the field today. Class meets two hours in-class and one hour of instructor directed assignments. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 584: Community Analysis and Health Promotion**

Explores diverse concepts of community, analyzes a range of community structures, processes and power relationships. Investigates contemporary models, strategies and tactics of community organizing and health promotion in the United States and in selected other countries and emphasizes efforts made by poor people, ethnic minorities of color and women to organize and mobilize community groups and movements. Highlights group and community analysis and organization skills. Class meets two hours in-class and one hour of instructor directed assignments. Advanced Practice Elective.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 587: Social Work Practice with the Military and Military Families**

This course focuses on the specific challenges of those who serve in the military and the response of social work practitioners to those challenges. The course will explore the nature of war, its impact on those who are wounded - physically and mentally -- and the impact of the military experience on them and their loved ones/caregivers. Particular emphasis will detail the impact of recent wars in Iraq and Afghanistan on returning veterans, many suffering with PTSD, Traumatic Brain Injury and substance abuse problems. Additional areas of exploration include the challenges faced by women in the military, the wounded, those who contemplate suicide. Intervention strategies and case material will enhance student understanding. 3 credits, Fall Semester

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

**HWC 588: The Dynamics of Trauma**

This course will examine the complexity and range of traumatic events. For example, the way temperament, genetic pre-disposition and environment impact traumatic reactions; as well as the physiological and psychological reactions that individuals experience. Throughout this course we will examine therapeutic interventions with different populations (children, adults, groups, elders) as they recover from trauma experiences. This course will cover the range of psychological models that comprise trauma theory and examine the protective factors that mediate post-traumatic growth. Throughout this course we will examine cultural, legal, judicial and policy issues that impact trauma treatments.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 589: Therapeutic Interventions for Trauma**

This course will examine therapeutic interventions with different populations (children, adults, groups, elders) as they recover from trauma experiences. This course will appraise the range of psychological models that comprise trauma theory and examine the promotive factors that mediate Post-traumatic Growth. Throughout this course we will examine cultural, legal, judicial and policy issues that impact trauma treatment.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 590: Overview of Family Violence**

This advanced elective provides an overview of family violence in the United States including child abuse, intimate partner violence (IPV), and elder abuse. The course covers the etiology of each form of family violence, current evidence-based treatment modalities, and mental health and judicial approaches to these issues. Current research for each type of family violence and social policies will also be covered.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 591: SW in Higher Ed: Prac in College & Univ**

Through an interdisciplinary approach, which draws from social work strengths and empowerment perspectives, student affairs perspectives, and college student development theories, this course emphasizes how community on the college campus is influenced and shaped. Historical developments in higher education and student development as well as the impact of societal issues are introduced. This course will follow a student-community development lens and discuss a variety of important topics in higher education including: overview of major policies and programming, campus safety, campus climate and inclusion, social determinants, financial aid, relationships, and mental health.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 592: Social Work in Education: Therapeutic Interventions**

This course reviews a wide-range of clinical practice methods using a trauma-informed lens that are relevant to high school and higher education settings including crisis intervention, rapid assessment tools, biopsychosocial, and review of wellness and prevention services. Students are encouraged to critically examine components of contemporary education and to devise appropriate intervention strategies to accomplish the development of student-centered services, implement tele-mental

health services, and a sense of community within education settings.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 593: Social Work in Higher Education: Wrap-around Care Services**

This course reviews the care coordination involved in the many college student support services offered across various departments including offices of disability support services, counseling and health centers, athletics, student affairs, and campus and residential life. An understanding of the transition from high school to college service systems, transition to adult health care services, as well as how different higher education involved systems function on- and off-campus will also be discussed. Leadership development and social work practice roles to promote student success in higher education settings are emphasized.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 594: Continuation of Practicum Work Experience**

Continuation of placement in practice settings under supervision of a licensed M.S.W.

*S/F graded*

### **HWC 595: Independent Study**

Independent study with an individual faculty member. Designation as enrichment or advanced practice elective is determined with faculty sponsor.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 3 times FOR credit.*

### **HWC 598: LMSW Licensing Preparation**

This is a free non credit course designed to help students pass the LMSW exam. The course will cover test-taking strategies, critical thinking skills for analyzing the test questions, and include review of sample practice questions. Classes will meet twice during the spring semester and in between the two sessions, students will have an opportunity to take the online practice exam and identify the areas requiring further review.

*S/U grading*

### **HWC 599: Maintenance of Matriculation**

For students who are maintaining matriculation while engaging in consultation with faculty regarding completion of courses and/or the Master's Project. Students will be graded S/F.

*1 credit, S/F graded  
May be repeated 6 times FOR credit.*

### **HWC 600: Statistics I**

Provides instruction in the computation, interpretation, and application of data analytic procedures used in social research. Discusses procedures such as descriptive statistics, chi-square, and t-tests, while examining their relevancy for analyzing issues in social work practice. Fall Term.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 601: Statistics II**

Introduces students to multivariate techniques used in the analysis of various kinds of data. Analysis of Variance, Multiple Regression Analysis, Logistic Regression Analysis, and Log-Linear Regression Analysis, as well as more advanced techniques, such as path analysis and survival analysis, are discussed.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 602: Research Methods I**

Presents an overview of the variety of research methodologies utilized in social science and social work, with the goal of providing students with the knowledge and competencies needed to develop and conduct their own research. The course will lead to a sophisticated understanding of the research process including the formulation of research questions, hypothesis development and testing, and choice of research method, involving both quantitative and qualitative methods. Material on quantitative designs will include experimental and quasi-experimental designs, data collection methodologies, scaling, instrument development, and sampling procedures. Material on qualitative designs will address focus groups interviews, key informant interviews, participant observation, unobtrusive observation, text and content analysis, and the use of archival and historical data. Special attention is given to ethical and political issues in the conduct of research.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 603: Research Methods II**

A continuation of HWC 602 Research Methods I.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 604: Naturalistic and Qualitative Research**

Considered is the application of alternative research methods for different questions. The distinction between quantitative and qualitative approaches and methods in the analysis of qualitative data is explored.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 606: Research Practicum I**

Students undertake significant and methodologically rigorous research involving

design, implementation, analysis, and dissemination of a research project. The substantive areas will include health, mental health, or substance abuse. School of Social Welfare faculty, affiliated faculty members from the Health Sciences Center and University social science departments, and principal investigators in community research projects will serve as preceptors. Students will spend ten hours each week for two semesters in a practicum setting. Students have a supervised hands-on, practical experience with an ongoing research project. Typical activities include data analysis, interpretation of results, research report writing, subject recruitment and screening, instrument development, or data collection. The primary objective is to strengthen students' ability to synthesize various phases and components of social research. A focus is on articulating linkages among the research questions, the data gathered to address these questions, the techniques selected for manipulating and analyzing the data, and the interpretation of findings. Students are encouraged to pursue publication stemming from the practicum. While the research practicum may not necessarily expose students to the specific population or problem of greatest interest to them, the skills or competencies mastered can prepare students methodologically to carry out their dissertation research plans.

*3 credits, S/U grading*

### **HWC 607: Research Practicum II**

A continuation of HWC 606 Research Practicum I.

*3 credits, S/U grading*

### **HWC 608: Social Welfare Policy Analysis I**

An analytical approach to public policy formulation in the areas of health, mental health, and substance abuse involving the impact of environmental forces on policy content. Considered are the effects of various institutional arrangements and political processes as well as inquiry into the consequences of various contemporary public policies. Tools and frameworks of policy analysis are examined. Policy alternatives and policy development and implementation are also considered.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **HWC 609: Social Welfare Policy Analysis II**

A continuation of HWC 608 Social Welfare Policy Analysis I. Prerequisite: HWC 608. Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 610: Organizational Theory and Social Welfare Administration**

The focus is on theories and methods available to planners and administrators who function in complex organizational settings. Decision making, political and economic factors, information systems, value conflicts, and adaptations of rational models to emerging realities will be studied. Health and mental health programs will be utilized as exemplars.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 611: Knowledge Building in Social Work: The Philosophy of Applied Social Research**

An examination of the major currents of thought that shape the meta-theoretical, theoretical, and methodological issues related to knowledge building in social work. The impact of pragmatic philosophy on the current "science versus non-science" debate within social work is reviewed. Special attention is given to epistemological approaches and their relation to qualitative and quantitative research strategies. Fall

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 612: Social Science Theory for Social Welfare**

In this course, we explore the nature of social theory and the normative project of social welfare by examining theories of social justice, human rights and oppression. We consider the nature and structure of power, the role of ideology and their impact in a society defined by inequality. Social Construction and critical theory are particularly relevant as their assumptions align well with those of social welfare. Lastly, we explore the tensions and possibilities of democratic theories and ideals, given the current context, as a means to further social welfare's normative project. Throughout the course, students are challenged to explore existing theory and, importantly, to learn and engage in the process of theorizing, themselves.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 613: Seminar in Social Work Education**

Focus is on the place of social work education in the university with attention to issues of current concern such as the integration of professional education with the scholarly research focus of other academic disciplines. Consideration will be given to educational program structure, content, curriculum development, evaluation, and teaching methodologies. Students will be required to teach a course in the B.S.W. or M.S.W.

curriculum under mentorship of a senior faculty member.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 614: Teaching Practicum**

The teaching practicum is a supervised experience in teaching at the master's or undergraduate level in the School of Social Welfare, or in some aspect of academic administration, such as curriculum development, project planning, and/or proposal development. The educational practicum is typically available to doctoral students in the third year. An individualized plan will be developed for implementing the teaching practicum. Practica may include teaching a section of a required graduate/undergraduate course, working as a teaching assistant with a faculty member, and/or co-teaching and working with the curriculum committees and area sequences in curriculum development. Spring

*3 credits, S/U grading*

**HWC 615: Dissertation Seminar I**

Students are expected to survey the current state of the art in their area of interest and to develop a written prospectus on a question suitable for dissertation research. In the second semester, students will refine dissertation proposals through presentation and critique in the seminar. Specific techniques and alternatives in studying a variety of dissertation questions are compared.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 616: Dissertation Seminar II**

A continuation of HWC 615 Dissertation Seminar I.

*3 credits, Letter graded (A, A-, B+, etc.)*

**HWC 679: Special Topics in Policy Research**

Discusses timely policy research issues such as violence as a public health problem, aging, racism, gender, AIDS, poverty and international social work. Topics vary each term as faculty develop specific modules that address one or more of these topics. Offered

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**HWC 695: Independent Study****HWC 699: Dissertation Research on Campus**

Dissertation research under direction of advisor.

*Prerequisite: Advancement to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab. Fall, 1-9 credits, S/U grading May be repeated for credit.*

**HWC 700: Dissertation Research Off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading May be repeated for credit.*

**HWC 701: Dissertation Research Off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must receive clearance from an International Advisor. Fall, Spring, 1-9 credits, S/U grading May be repeated for credit.*

**HWC 800: Full Time SUMMER RESEARCH**

F T SUMMER RESEARCH

*S/U grading*

*May be repeated for credit.*

# IAP

**International Academic Programs****IAP 599: Research**

Supervised research course for students enrolled in foreign universities to fulfill the educational objectives for his or her current degree program at his or her home institution. Research proposals must be prepared by

the student and submitted for approval by the supervising faculty before the semester and beginning of the credit period. Midpoint and final evaluation reports are required. An account of the work and the results achieved is submitted to the supervisor before the end of the credit period. May be repeated. Department Consent Required.

*1-8 credits, S/U grading*

## IDC

### Inter-University Doctoral Consortium

#### IDC 600: Inter-University Doctoral Consortium

*May be repeated for credit.*

## ISE

### Information Systems

#### ISE 503: Data Management

This course provides an understanding of the issues in managing database systems as an essential organizational resource. Students learn the enterprise data architecture components, data storage configurations, and information retrieval methods. It expands from the relational model to the multidimensional model, object-relational techniques, and web accessed data. The course includes concepts, principles, issues, and techniques for managing corporate data resources. Techniques for managing the design and development of large database systems including logical data models, concurrent processing, data distribution, database administration, data warehousing, data cleansing, and data mining. Students will use current methods and tools for database design and development. Limited to CSE/ISE graduate students; others, permission of instructor.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### ISE 506: Quantitative Computer Architecture

Explores the physical structure of a computer; machine representation of information; architecture and organization of various mainframe, mini-, and microcomputers; primary and secondary storage; and input and output communication. Architectural choices are compared and used to determine resulting function and performance. Architectural trade-offs are also identified.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### ISE 507: Project Management

The course focuses on both the technical aspects of project management as well as the human aspects. Technical components include project definition, work breakdown structure development, and the use of optimization techniques for planning a project and optimizing schedules. Graphical approaches to project definition are addressed, as are needs analysis, preliminary design, and detailed design and implementation. Human aspects of project management include forming a project team, managing performance, and resolving conflicts.

*3 credits, Letter graded (A, A-, B+, etc.)*

## ITL

### Italian

#### ITL 500: Reading Italian

Designed to prepare graduate students to read contemporary research in their respective disciplines published in Italian, the course presents systematic instruction in the fundamentals of reading comprehension and in specialized subject-oriented vocabulary.

*Fall or Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

#### ITL 501: Contemporary Italy

Analysis of contemporary Italy and its civilization through the study of the development of its historical, cultural, political, and social characteristics. Designed for potential teachers of Italian at the college as well as secondary school levels, this course emphasizes and traces the evolution of the character and institutions of contemporary Italy.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### ITL 502: Special Topics in Italian Cinema

A topics course given in Italian on Italian cinema. Topics may include films of a particular actor, director, genre, theme, or historical period. Semester supplements to the Bulletin contain specific description when course is offered. May be repeated for credit as topic changes. Prerequisite: advanced oral and written proficiency in Italian.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### ITL 507: Italian Linguistics: Diachronic Development and Synchronic Structures

An examination of the linguistic evolution and the synchronic grammars (phonology, morphology, syntax) of standard Italian and some Italo-Romance dialects.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### ITL 508: Syntax and Composition

This course analyzes and discusses finer points of Italian grammar and investigates diverse writing styles. Students will develop grammatical drills from elementary through advanced levels. Literary masterpieces are translated to demonstrate types of style and possible alternatives in writing.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### ITL 510: Advanced Conversation and Composition

An examination of Italian in the context of contemporary Italy, with an eye to the effects of globalization and localism on language and culture. Class readings and conversations focus on today's multifaceted Italy, steering clear of stereotyped images and misconceptions.

*Prerequisite: Graduate status.*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### ITL 511: History of the Italian Language

A study of the development of the Italian language beginning with its Latin origins, and continuing through modern times.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### ITL 512: Italian Dialects

The linguistic structures of the many languages (i.e., "dialects") spoken in Italy are analyzed. Consideration is also given to the sociolinguistic situation.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### ITL 513: Romance Linguistics

This course examines the linguistic evolution of the Romance languages from the classical period through modern times. The synchronic grammars of Italian, French, and Spanish are examined.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### ITL 516: Seminar on Dante

Dante's Vita Nuova and Divina Commedia are analyzed within their historical, social and moral context of 13th- and 14-centuries Europe. Offered as ITL 516 and CEI 526.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### ITL 522: Seminar in Italian Humanism and Renaissance Literature

Analysis of the works of such writers as Petrarch, Boccaccio, Ariosto, Machiavelli,



Castiglione, Aretino, Tasso, and Michelangelo. Study of the relation of the individual works of these writers to broader historical, cultural, and intellectual developments of the period.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ITL 551: Studies in Italian Romanticism**

Italian romanticism is compared with the movement as it took place in other countries, such as England, Germany, and France. The works of Foscolo, Leopardi, and Manzoni are studied in the philosophical and sociological contexts of the period.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **ITL 552: Studies in the Modern Novel**

A study of the development of the Italian novel from Verga to the latest trends. Stress is placed on the major shifts in sensibility occurring at the beginning of the 19th century and after World War II.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ITL 562: Studies in Contemporary Literature Contemporary Italian Poetry: The Quest for Meaning**

Studies in 20th century literature.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ITL 581: Independent Individual Studies**

Fall and Spring, alternative years,

*1-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ITL 591: Language Acquisition I**

Elementary Italian I intended for graduate students from other programs.

*1-4 credits, Letter graded (A, A-, B+, etc.)*

### **ITL 592: Language Acquisition II**

Elementary Italian II intended for graduate students from other programs.

*1-4 credits, Letter graded (A, A-, B+, etc.)*

### **ITL 593: Language Acquisition III**

Intermediate and Advanced Italian intended for graduate students from other programs. The requirements for the course will include a graduate-level component to be determined by the instructor. May be repeated for credit.

*1-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **ITL 595: Practicum in Teaching**

Fall and Spring,

*1-3 credits, S/U grading*

*May be repeated for credit.*

### **ITL 599: Thesis Research**

May be repeated for credit

*1-6 credits, S/U grading*

*May be repeated for credit.*

### **ITL 800: Summer Research**

*May be repeated for credit.*

## **JPN**

### **Japanese Language**

#### **JPN 501: Advanced Japanese I**

An advanced course designed to strengthen students' ability to understand and speak the Japanese language. Students are required to prepare selected texts and to read and translate them in class. They also write essays based on the texts as well as on Japanese videos.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **JPN 502: Advanced Japanese II**

The second part of an advanced course in Chinese designed to strengthen students' ability to understand and speak the Japanese language. Students are required to prepare selected texts and to read and translate them in class. They also write essays based on the texts as well as on Japanese videos.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **JPN 510: Business Japanese**

A course designed for students who wish to expand their Japanese communication skills in a business context and understand socio-economic situations as well as socio-cultural values in Japan. Upon completing this course, students will be able to hold conversations with correct business vocabulary and with culturally appropriate manners, read authentic materials related to business and economics in Japan, and write business correspondence in proper styles and formats. Advisory Prerequisite: JPN 312 3 credits

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **JPN 511: Advanced Japanese III**

An advanced course designed for the fourth-year students of Japanese to strengthen their ability to understand, speak, read, and write Japanese. Students will read a variety of Japanese texts including newspaper/magazine articles, biographies, and literary works and write creatively and/or professionally using sophisticated vocabulary and advanced kanji

characters. Students will also be trained to comprehend authentic spoken Japanese, using a variety of audio-visual materials and to communicate in Japanese, applying appropriate socio-cultural norms. Not intended for international students from Japan who are part of a two-plus-two or exchange program. Advisory Prerequisite: JPN 312

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **JPN 512: Advanced Japanese IV**

An advanced course designed for the fourth-year students of Japanese to strengthen their ability to understand, speak, read, and write Japanese. Students will read a variety of Japanese texts including newspaper/magazine articles, biographies, and literary works and write creatively and/or professionally using sophisticated vocabulary and advanced kanji characters. Students will also be trained to comprehend authentic spoken Japanese, using a variety of audio-visual materials and to communicate in Japanese, applying appropriate socio-cultural norms. Not intended for international students from Japan who are part of a two-plus-two or exchange program. Advisory Prerequisite: JPN 312

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **JPN 526: Structure of Japanese**

The study of phonology, morphology, syntax, semantics, lexicon, and writing systems of the Japanese language as well as the use and functions of the language in relation to the social structures and interpersonal relationships.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **JPN 545: Learning of Asian Languages**

This course will analyze the cognitive processes involved in the acquisition of Asian languages as second or foreign languages. We will start with a discussion of first language acquisition and compare it with second language acquisition (SLA). Methodologies such as contrastive analysis and error analysis, and concepts such as interlanguage, native and non-native competence, bilingual competence, acceptability, correctness, standard language will be critically examined. We will also consider the variables that affect SLA, including age, context, exposure, attitude, cognition, attention and motivation. Special attention will be given to the applicability of current research paradigms and findings to the acquisition of languages such as Chinese, Japanese, Korean, and Hindi, both in terms of their structural characteristics and in their socio-cultural context.

*3 credits, Letter graded (A, A-, B+, etc.)*

**JPN 585: Translation Studies of Asian Language**

Inquiry into issues in the translation of Asian languages into/from English. This course introduces the recent theories and concepts of translation studies and applies them to the analysis of a variety of Asian texts as source texts or target texts. Students are expected to gain insights into the lexical, grammatical, cognitive, pragmatic, and socio-cultural characteristics of Asian languages as well as social and political issues that surround translation of Asian texts. Texts to be analyzed include, but are not limited to, literary works, newspaper articles, advertisements, brochures, and business letters. Intermediate to advanced proficiency in one of the Asian languages such as Chinese, Japanese, and Korean is needed.

*3 credits, Letter graded (A, A-, B+, etc.)*

**JRN****Journalism****JRN 510: Basic Reporting and Writing for Journalism**

An introduction to the basic elements of writing news and feature stories. Students will gain practical experience reporting on campus and community events in the form of breaking-news reports, news features, profiles, and in-depth news stories. Students will learn how to develop story ideas; find, assess, and interview sources; research topics; identify the important elements in a story; and explain information clearly, concisely, and fairly. Students will also explore of the role of the press in a free society.

*3 credits, Letter graded (A, A-, B+, etc.)*

**JRN 520: Multimedia Journalism**

An exploration into presenting news and feature stories in a digital era. Students will learn both conceptual and practical skills to help them develop targeted, meaningful stories for a variety of digital platforms (e.g., online news outlets, social media, apps, etc.). They will explore issues raised by the migration of news to the web, including questions of privacy and credibility, challenges to traditional journalistic standards, and the increased presence of public opinion. Students will also practice using digital tools such as photography, video, and information-rich graphics. Note: Students must obtain access to Adobe Creative Cloud and download the following Adobe apps to their personal computers to complete assignments: Audition, Bridge, Camera Raw, Photoshop, Premiere.using digital tools such

as photography, video, and information-rich graphics.

*3 credits, Letter graded (A, A-, B+, etc.)*

**JRN 521: Solutions Journalism**

An introduction to rigorous, evidence-based reporting on responses to social problems. Students will explore storytelling tools based on the foundations of solutions journalism (e.g., cover a response to a problem and how it happened; provide evidence of impact, consider effectiveness, not just intentions, through qualitative and/or quantitative data; produce insights that can help others respond to the problem; and address limitations or caveats of the response). Students will practice skills developed by the Solutions Journalism Network (SJN) to design narratives around conflict and problem-focused news coverage, and produce high quality solutions journalism and investigative stories, both in multimedia and written form. As a SJN hub institution, students will access resources from and submit stories to the Solutions Story Tracker® to assist in the development of the field.

*3 credits, Letter graded (A, A-, B+, etc.)*

**JRN 530: The Big Story**

A hands-on experience for students to explore current issues affecting our society, and build stories that highlight their relevance to the public. Students will learn about the context reporters need to provide sophisticated coverage, and take a deep dive into developing a big story about a current topic or issue that they select from a variety of reporting areas (e.g., science, health, environment, politics, culture, technology, sports, business, fashion, communities). Students will practice gathering supporting information from reputable sources and conducting interviews with key stakeholders as needed to produce a solid story.

*3 credits, Letter graded (A, A-, B+, etc.)*

**JRN 544: Freelance Writing**

An exploration of the world of freelance writing, focused on teaching skills and competencies to make a living as a freelance journalist. Students will learn to compellingly speak to a completely different set of editors and audiences from one piece to the next; negotiate their compensation and terms of publication, which can vary significantly from one outlet to the next; build a readership and authorial identity that transcends any specific outlet or institution, while also trying to cultivate relationships with readers and editors at publications they repeatedly publish in; and prepare for rejection with strategies for how to learn from and respond to rejection. Students will develop and attempt to place freelance

work in mainstream media outlets and begin to develop a portfolio of clips and/or essays in progress that can be used as springboard to help launch a writing career.

*3 credits, Letter graded (A, A-, B+, etc.)*

**JRN 545: Mobile Podcasting**

An introduction to podcasting using digital tools. Students will learn skills for creating both scripted and unscripted podcasts, and cover topics such as, developing "intros" and "outros," integrating music and sound effects, and promoting and branding podcasts. Students will collaborate to create a jointly produced podcast that is intended for a broadcast or media company, and/or emerging digital platforms.

*3 credits, Letter graded (A, A-, B+, etc.)*

**JRN 587: Independent Study**

Intensive study of a journalism-related special topic or intensive work on a project undertaken with close faculty supervision. Students must secure a faculty mentor and work with them to submit a proposal to the graduate program director to obtain permission to register.

*3 credits, Letter graded (A, A-, B+, etc.)*

**JRN 588: Graduate Internship**

A practical, hands-on application of journalistic skills in a real-world setting. Students participate in a semester-long internship with an organization or institution devoted to one or more of the program's themes of solutions journalism, data-driven reporting, and/or inclusive communication. The work must allow students to apply journalistic skills related to the educational goals of the program. Student interns will report regularly to a faculty member and will submit a portfolio of their work at the conclusion of the internship.

*1-6 credits,*

*May be repeated for credit.*

**JRN 590: Special Topics in Journalism**

A seminar course on a current topic in journalism. Students enrolled in the MS in Journalism, or the MS in Science Communication may repeat the course as the topic changes. This course cannot be used more than once to satisfy requirements for the Advanced Graduate Certificate in Science Communication.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**JRN 600: Master's Project in Journalism**

A culminating experience for students in the MS in Journalism. Students will identify and

secure a faculty mentor under whom they will work independently to plan, design, and complete a journalistic project of their choice. The project should reflect what students have cumulatively learned in the program and address the needs of an organization, community, or stakeholder group. Each project will have written, visual, and/or interactive components. Students will formally present their work to peers, faculty, and members of the campus/community at the conclusion of the course.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **JRN 603: Storytelling and Narrative Design**

An exploration of how compelling narratives enable audiences to learn and identify with information in meaningful ways. Students will learn the importance of narratives in not only conveying, but also defining and reinforcing how audiences process cultural information such as gender, class, race and ethnicity, sexual identity, and more. Students will work independently and collaboratively to build and assess a variety of narratives and practice telling powerful, personal stories to accurately capture and spread their audience's perspectives.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **JRN 613: International Journalism**

An analysis of the role of media, policies, and technology in the communication between countries and across the world. Students will explore political theories of the press and changes in news flow driven by advancing technologies. Students are expected to select a theoretical approach or paradigm that suits their worldview and apply it to class discussions about the ongoing world news flow. Students will practice oral and on-camera presentations in a professional broadcast studio. Each student will select a country to study for the semester, and will serve as a news analyst for that country in discussions and broadcast experiments, thus facilitating the class to act as an international news desk.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **JRN 615: Data-Driven Storytelling**

A skills-based approach to building data-driven journalistic stories. In a digital age, the public is surrounded by a wealth of information and data, much of which has not been analyzed or interpreted, leaving it open for potential misrepresentation and/or misinterpretation. Students will explore different types of data and learn how this information can be analyzed to discover possible patterns and areas of interest. Students will practice pairing their audience-centered

communication and journalistic skills with data-driven storytelling techniques such as data visualization, to create clarity and meaning in their stories, for a variety of public audiences.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **JRN 625: Media Reporting on Crime**

An analysis of how crime is reported in the media, including a deep dive into the stakes and relevant stakeholders involved, challenges, and best practices for how to cover this sensitive but perennially important topic effectively. This class will leverage social science research to help students understand the extent to which media coverage patterns influence public perceptions and policy preferences on crime and criminal justice. Students will learn about existing trends in crime reporting, surveying the empirical literature of how media coverage of crime tends to vary in systematic ways depending on the characteristics of the victim and alleged perpetrator, and/or the nature of the crime. Students will develop core competencies to help them deal with bearing witness to some of the worst acts human beings commit and prepare to interview people at the worst moments of their lives. They will learn to present and describe findings in ways that are accurate and responsible, but also accessible, concise, and compelling for lay audiences. They will also learn to balance retaining access to law enforcement officers, judges, politicians, activists, and other stakeholders while also subjecting their claims to scrutiny and, at times, presenting facts that undermine the preferred narratives of their sources.

*3 credits, Letter graded (A, A-, B+, etc.)*

## **KOR**

### **Korean**

#### **KOR 501: Advanced Korean I**

An advanced course designed for students who wish to enhance reading comprehension and writing ability in Korean. Reading materials are selected from modern Korean literature, journals, and newspapers. Students are trained in samples of various writing styles. Emphasis is also placed on the idiomatic usage of Korean language and the relation of Korean to Chinese characters.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **KOR 502: Advanced Korean II**

Advanced Korean II is designed for students who have completed at least two years of Korean instruction at the undergraduate level or who already possess a sufficiently high level of fluency. Classes are conducted

in Korean. Reading materials, including excerpts from modern Korean literary works, journals, magazine and newspapers, will be explored and discussed. Other topics such as ancient Korean literature will also be discussed. Through this course students are expected to enhance their ability to grasp the important of literary and academic texts by learning to identify essential points and lines of argument as well as enhance their vocabulary, particularly Sino-Korean terms, and knowledge of idiomatic usage of Chinese-Korean graph dictionaries, including a knowledge of the basic student of graphs and of the most common component radicals, in their original and abbreviated forms. Students will also learn to research in Korean for their term paper

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **KOR 511: Advanced Korean III**

An advanced course designed for the fourth-year students of Korean to strengthen their ability to understand, speak, read, and write Korean. Students will read a variety of Korean texts including newspaper/magazine articles, biographies, and literary works and write creatively and/or professionally using sophisticated vocabulary and advanced hanja characters. Students will also be trained to comprehend authentic spoken Korean, using a variety of audio-visual materials and to communicate in Korean, applying appropriate socio-cultural norms. Students will also learn to research in Korean for their term paper. Advisory Prerequisite: KOR 312

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **KOR 512: Advanced Korean IV**

An advanced course designed for the fourth-year students of Korean to strengthen their ability to understand, speak, read, and write Korean. Students will read a variety of Korean texts including newspaper/magazine articles, biographies, and literary works and write creatively and/or professionally using sophisticated vocabulary and advanced hanja characters. Students will also be trained to comprehend authentic spoken Korean, using a variety of audio-visual materials and to communicate in Korean, applying appropriate socio-cultural norms. Not intended for international students from Korea who are part of a two-plus-two or exchange program. Advisory Prerequisite: KOR 411/KOR 511

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **KOR 526: Structure of Korean**

This course is an introduction to phonology, morphology, syntax, semantics, lexicon, and writing systems of the Korean language as well as the use and functions of the language

in relation to the social structures of Korea at large. The goal of this course is to analyze Korean in ways that might be of most use to a KFL (Korean as a foreign language) teacher and KFL student.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **KOR 545: Learning of Asian Languages**

This course will analyze the cognitive processes involved in the acquisition of Asian languages as second or foreign languages. We will start with a discussion of first language acquisition and compare it with second language acquisition (SLA). Methodologies such as contrastive analysis and error analysis, and concepts such as interlanguage, native and non-native competence, bilingual competence, acceptability, correctness, standard language will be critically examined. We will also consider the variables that affect SLA, including age, context, exposure, attitude, cognition, attention and motivation. Special attention will be given to the applicability of current research paradigms and findings to the acquisition of languages such as Chinese, Japanese, Korean, and Hindi, both in terms of their structural characteristics and in their socio-cultural context.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **KOR 585: Translation Studies of Asian Language**

Inquiry into issues in the translation of Asian languages into/from English. This course introduces the recent theories and concepts of translation studies and applies them to the analysis of a variety of Asian texts as source texts or target texts. Students are expected to gain insights into the lexical, grammatical, cognitive, pragmatic, and socio-cultural characteristics of Asian languages as well as social and political issues that surround translation of Asian texts. Texts to be analyzed include, but are not limited to, literary works, newspaper articles, advertisements, brochures, and business letters. Intermediate to advanced proficiency in one of the Asian languages such as Chinese, Japanese, and Korean is needed.

*3 credits, Letter graded (A, A-, B+, etc.)*

## **LAT**

### **Latin**

#### **LAT 581: Independent Study**

May be repeated for credit as the topic changes. Prerequisite: Must be enrolled in a graduate program.

*1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **LAT 591: Elementary Latin I**

Designed to prepare the beginning student to translate Latin that may be needed for use in undergraduate or graduate study. Focus of the course is on the fundamentals of grammar and techniques of translation. LAT 111/LAT 591 is designed for students who have no prior knowledge of the language. A student who has had two or more years of Latin in high school (or who has otherwise acquired an equivalent proficiency) may not take LAT 111/LAT 591 without written permission from the course supervisor.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **LAT 592: Elementary Latin II**

Designed to prepare the beginning student to translate Latin that may be needed for use in undergraduate or graduate study. Focus of the course is on the fundamentals of grammar and techniques of translation. Prerequisite: Latin 111 or equivalent

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **LAT 593: Readings in Latin Literature I**

This course serves as an introduction to authentic Latin prose and poetry. The students will be introduced to the Roman literature of the Republic and beginning of the Empire. The course includes a brief intensive review of grammar. Additional grammatical constructions will be taught through the literature. The students will read a sampling of a number of authors including Eutropius, Cornelius Nepos, Caesar, Ovid, and Horace. Prerequisite: Latin 112 or equivalent

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **LAT 594: Readings in Latin Literature 2**

This course serves as a study of authentic Latin prose and poetry. The students will read Roman literature of the Republic and beginning of the Empire. The course includes a brief intensive review of grammar. Additional grammatical constructions will be taught through the literature. The students will read a sampling of a number of authors including Caesar, Virgil, Catullus and Cicero

*1-3 credits, Letter graded (A, A-, B+, etc.)*

## **LIN**

### **Linguistics**

#### **LIN 521: Syntax I**

A study of formal grammar as one aspect of our knowledge of language. Concepts and elements of modern syntactic analysis are introduced and motivated using a variety of grammatical phenomena and processes,

across a wide range of languages. Prerequisite: Enrollment in LIN program or permission of instructor

*0-3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 522: Phonetics**

A study of articulatory phonetics and the international phonetic alphabet, with intensive practice in phonetic transcription from a wide variety of languages. Acoustic phonetics, speech perception, and the applications of phonetics to foreign language teaching.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 523: Phonology I**

An introduction to the formal study of sound patterns. Problems from various languages serve as the basis for developing a theory of the representation of sound structure.

Prerequisite: Enrollment in LIN program or permission of instructor

*0-3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 524: TESOL Pedagogy: Theory and Practice (Methods I)**

Theory and practical methodology of language and literacy instruction and assessment to children and adolescents for whom English is not their first language, in alignment with current state, national, and professional standards. Inquiry into instructional approaches, standard-based and data-driven lesson planning, and reflective practices in the teaching and assessment of speaking, listening, reading, and writing. Review and evaluation of resources and technologies. 3 credits, letter graded (A, A-, B+, etc)

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 525: Contrastive Analysis**

A survey of linguistic typology and a comparison of various languages as a basis for understanding the errors made by language learners and devising strategies for teaching a foreign language. May be crosslisted with CEL 551.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 526: Analysis of an Uncommonly Taught Language**

Working from primary and secondary sources, students construct an outline of the phonology, morphology, and syntax of a language previously unknown to them.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **LIN 527: Structure of English**

A description of the major sentence elements, subsystems, and productive grammatical processes of English. The justification of

grammatical categories, interaction between systems and processes, and notions of standard and correctness are discussed with a view to their application in the ESL classroom.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 529: TESOL Pedagogy: Language and Literacy Development through the Content Areas (Methods II)**

Content-based language and literacy instruction and assessment to children and adolescents for whom English is not their first language, in alignment with current state, national, and professional standards. Teacher candidates design standard-based and data-driven curricular modules for teaching language through mathematics, the sciences and the social studies, engage in reflective and collaborative practices, and evaluate web-based technologies. 3 credits, letter graded (A, A-, B+, etc)

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 530: Introduction to General Linguistics**

An introduction to modern theoretical and applied linguistics, including phonology, morphology, syntax, language acquisition, historical linguistics, and sociolinguistics.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 532: Second Language Acquisition**

Study of the acquisition of a second language by children and adults. The focus is on data; the systematicity of the learner's errors, the ease of acquisition in childhood, etc., the adequacy of theories (e.g. Interlanguage processes, the monitor model, the critical period) to explain data, and the reliability of methods of obtaining data. Students conduct an empirical study testing a current hypothesis.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 535: Historical Linguistics**

A study of linguistic change. Topics vary by year and may include the genetic classification of languages; language families, language, and prehistory; reconstruction; types of sound change; types of semantic change; and borrowing. Prerequisite: Enrollment in TESOL, LIN, or CML program

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **LIN 537: Computational Linguistics I**

A hands-on introduction to practical aspects of computational linguistics. Students learn how to perform common tasks such as tagging and tokenization with a state-of-the-art programming language. Topics include basic

data structures and algorithms, n-gram models, regular expressions, and corpus linguistics.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **LIN 538: Statistics for Linguists**

A hands-on introduction to statistical methods in linguistics using R@. Topics covered include aggregation and summary, descriptive statistics, data visualization, hypothesis testing, regression analysis, and an introduction to hierarchical modeling. Students will gain experience with quantitative analysis of real-world linguistic data sets, including corpus data and experimental data, with emphasis on a connection to students' own theoretical research.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **LIN 539: Mathematical Methods in Linguistics**

An overview of the mathematical foundations of theoretical and computational linguistics. Topics covered include set theory, morphisms, logic and model theory, algebra, lattices, lambda calculus, probability theory, information theory, and basics of formal language theory. A strong emphasis is put on the linguistic application of the mathematical concepts in the student and analysis of natural language data

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **LIN 541: Bilingualism**

Study of the social, linguistic, educational, and psychological aspects of bilingualism.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 542: Sociolinguistics**

An introduction to major topics in sociolinguistics, including variation theory, language attitudes, language planning, language change, and pidgins and creoles. Prerequisite: Enrollment in TESOL or LIN program or permission of instructor

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 544: Language Acquisition and Literacy Development**

In-depth exploration of the theories of literacy and language development of native English speakers and students who are English language learners pre-school through grade 12. The development and assessment of literacy skills among children at various stages of learning development and across disciplines will be examined. Attention will also be given to children with special needs and the

integration of technology in the development of literacy skills.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 550: Selected Topics in Linguistics**

Topics are announced each semester. The course may be repeated for credit if topic differs.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **LIN 555: Error Analysis**

Study of the systematic errors made by foreign language learners and the potential of various linguistic theories to predict and account for these errors.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 571: TESOL Pedagogy: Curriculum Design and Evaluation**

An in-depth study of curriculum design and evaluation with a focus on needs analysis, goals and objectives, approaches to language learning and teaching, assessment, resources, and program evaluation.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 572: Course Design: Theory and Practice**

LIN 572 explores how to plan & implement an instructional course in all its phases. Although its focus is on design of a one-semester college-level course, the theory and implementation ideas developed are relevant and applicable to instruction in all educational settings, including K-12 classes, and industrial, corporate and governmental training courses & seminars. In a given semester LIN 572 will adopt a specific curriculum design framework and will explore the practical creation of courses within that framework.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 574: Managing Instruction, Assessment, and Resources in TESOL**

Investigation and evaluation of instructional planning and assessment aligned with current state, national, and professional standards. Teacher candidates practice content-based curriculum development, and use of technologies for language and literacy development among English language learners and reflect on their teaching in multi-level classrooms. Partnerships with colleagues, parents and the respective communities are explored. 3 credits, letter graded (A, A-, B+, etc)

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 577: Field Experience for Teaching English as a Foreign Language**

Observation, inquiry, and practice of instruction in the area of English as a Foreign Language through various methods and in various settings. Students interested in this field experience are required to meet with the instructor of LIN 524 and/or LIN 529 to prepare a specific semester plan. Fifty hours fieldwork or research. Co-requisite: LIN 524 or LIN 529, offered fall and spring. This course does not satisfy requirements for NYS Teacher Certification. 1 credit, S/U grading, May be repeated 1 time for credit.

*1 credit, S/U grading  
May be repeated 1 times FOR credit.*

### **LIN 578: Field Experience in Educational Contexts**

Exploration, inquiry, and practice of English language instruction strategies and approaches. Prerequisite: Admission to MA TESOL Teacher Education Program

*1 credit, S/U grading*

### **LIN 579: Field Experience PreK-12**

Observation and practice of data-driven language and literacy instruction and assessment across disciplines for children and adolescents for whom English is not their first language. Teacher candidates are placed in diverse educational settings in pre-elementary through secondary levels for 50 hours of field experience. 1 credit, S/U grading May be repeated for credit

*1 credit, S/U grading  
May be repeated 2 times FOR credit.*

### **LIN 581: LIN 581: Supervised Student Teaching in TESOL: Primary and Middle Level Grades PreK-6**

TESOL teacher candidates receive supervised practice teaching by arrangements with selected schools across the region. The student teacher reports to the school to which he or she is assigned each full school day for the entire semester. Applications must be filed in the academic year preceding that in which the teacher candidate plans to take the course. 3 credits, S/U grading

*3 credits, S/U grading*

### **LIN 582: Supervised Student Teaching in TESOL: High School (Grades 10-12)**

TESOL teacher candidates receive supervised practice teaching by arrangement with selected schools across the region. The student teacher reports to the school to which he or she is assigned each full school day for the entire semester. Applications must be filed in the academic year preceding that in which the teacher candidate plans to take the course. 3 credits, S/U grading

*3 credits, S/U grading*

### **LIN 591: Directed Readings**

Students read and evaluate the literature on a topic of special academic interest or professional relevance under the direction of a faculty member.

*1-3 credits, S/U grading  
May be repeated for credit.*

### **LIN 592: Directed Research**

Students conduct research on a topic of special academic interest or professional relevance under the direction of a faculty member. The course will also cover responsible conduct in research and scholarship.

*1-3 credits, S/U grading  
May be repeated for credit.*

### **LIN 595: Final Project**

Students present a thesis consisting of original work on a topic in theoretical, experimental, or computational linguistics under the supervision of a faculty member. The work may take various forms, including a thesis, a technical report, or a programming project. Both the topic and the format of the work must be approved by the faculty supervisor. 0-6 credits.

*0-6 credits, S/U grading  
May be repeated for credit.*

### **LIN 600: Colloquium in Linguistics**

An introduction to research in linguistics, with presentations by faculty and visiting scientists. Topics include current research questions and ethics of research and publishing. The course will also cover responsible conduct in research and scholarship.

*0-3 credits, S/U grading  
May be repeated for credit.*

### **LIN 605: Mathematical Linguistics Workgroup**

An introduction to research in mathematical linguistics, with presentations by faculty, students, and visiting scientists. Topics include current research questions, the interplay of linguistics with mathematics and other STEM-fields, research software for mathematical linguistics, mathematical writing in linguistics, and how to present mathematical work to a general public.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **LIN 621: Syntax II**

A detailed consideration of recent developments in syntactic theory, including treatments of constituency and word order, grammatical relations, typological variation

and linguistic universals, and constraints on grammatical rules and representations.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **LIN 623: Phonology II**

A study of recent developments in phonological theory, with particular attention to nonlinear models of phonological representation and constraint-based models.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **LIN 624: Morphology and Word Formation**

The internal structure of words and the place of the word in syntax, phonology, and the lexicon. A variety of analytical methods -- distributional, experimental, and computational-- will be introduced.

*0-3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 625: Semantics**

An investigation of the role of semantics (the theory of meaning) in the overall theory of grammar, structured around such topics as formal semantics, the interaction of syntax and semantics, and lexical semantics. Prerequisite: LIN 521

*0-3 credits, Letter graded (A, A-, B+, etc.)*

### **LIN 626: Computational Phonology**

An in-depth survey of natural phonology from a computational perspective. Topics vary by year and may include formal language theory (subregular hierarchy, finite-state transductions), computation modeling (maximum entropy grammars, Hidden Markov Models), and machine learning.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **LIN 627: Computational Semantics**

A study of the computational challenges that arise in the interpretation of natural language utterances. Students are introduced to the logical description of sentence meaning and how these descriptions can be constructed in an algorithmic fashion. The course includes a significant programming component. The selection of topics varies from year to year and may include propositional and first-order logic, typed logics, model theory and model checking, mereology, intensional semantics, quantifier scope, pronoun resolution, discourse representation, scalar implicatures, game-theoretic pragmatics, lexical semantics, and Bayesian inference.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**LIN 628: Computational Syntax**

An in-depth survey of natural language syntax from a computational perspective. The primary focus is on combining state-of-the-art techniques from formal language theory with empirical insights from linguistic theory. Topics covered vary by year and may include tree transducers, logics for tree description, weak and strong generative capacity of natural language, lexicalized grammar formalisms, unification grammars, or the expressivity of probabilistic formalisms.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**LIN 629: Learnability**

An introduction to learnability theory and its implications for language typology and language acquisition. The selection of topics varies and may include identification in the limit from positive text, PAC learning, lattice-based learners, Boolean function learning, neural networks, and learning algorithms for linguistic formalisms. Students will develop familiarity with the primary literature and learn important proof techniques of the field.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**LIN 630: Parsing and Processing**

A survey parsing theory for natural language processing and its applications in psycholinguistic modeling. The course covers a wide variety of parsing algorithms for context-free and mildly context-sensitive grammar formalisms. The performance of these algorithms is carefully analyzed and set in relation to empirical phenomena of human sentence processing.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**LIN 637: Computational Linguistics 2**

An introduction to the theoretical foundation of computational linguistics. The course emphasizes the importance of algorithms, algebra, logic, and formal language theory in the development of new tools and software applications. Empirical phenomena in phonology and syntax are sampled from a variety of languages to motivate and illustrate the use of concepts such as strictly local string languages, tree transducers, and semirings. Students will develop familiarity with the literature and tools of the field.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**LIN 650: Selected Topics: Graduate Seminar**

Topics will be announced each semester. The course may be repeated for credit if topic differs.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**LIN 651: Syntax Seminar**

Topic varies and relates to current issues in the field and research activities of faculty and students. Past topics have included A-dependencies, adjectival and adverbial modification, word order and antisymmetry.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**LIN 653: Phonology Seminar**

Topic varies and relates to current issues in the field and research activities of faculty and students. Past topics have included interface issues (phonetics, morphology, syntax), functional motivations for phonological constraints (articulatory ease, perceptual salience, parsing considerations), intonation, and second language and loanword phonology.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**LIN 655: Computational Linguistics Seminar**

An overview of the mathematical foundations of theoretical and computational linguistics. Topics covered include set theory, morphisms, logic and model theory, algebra, lattices, lambda calculus, probability theory, information theory, and basics of formal language theory. A strong emphasis is put on the linguistic application of the mathematical concepts in the study and analysis of natural data.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**LIN 680: Qualifying Paper Workshop**

Doctoral candidates will present and discuss their own research work. The course will also cover responsible conduct in research and scholarship. Prerequisite: Advanced standing

*1-3 credits, S/U grading  
May be repeated for credit.*

**LIN 698: Graduate Practicum in Teaching**

*May be repeated for credit.*

**LIN 699: Dissertation Research on Campus**

Independent research for the Ph.D. degree. Open only to candidates for the Ph.D. degree who have advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the

Brookhaven National Lab. The course will also cover responsible conduct in research and scholarship.

*1-9 credits, S/U grading  
May be repeated for credit.*

**LIN 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus.

*1-9 credits, S/U grading  
May be repeated for credit.*

**LIN 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver be second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must receive clearance from an International Advisor.  
Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

**LIN 800: Summer/Winter Research**

*May be repeated for credit.*

# MAE

**Mathematics Teacher Preparation****MAE 501: Foundations of Secondary Mathematics Curriculum**

A re-examination of the current middle school and high school mathematics curriculum. A review of the techniques and discussion of the ideas from a more advanced point of view, including topics in algebra, geometry, elementary functions, and probability and statistics. Competence in basic secondary school mathematical ideas and techniques is tested.

*3 credits, Letter graded (A, A-, B+, etc.)*

**MAE 510: Introduction to Methods of Teaching and Learning Standards**

Introduction to the basic methods of teaching middle school and high school mathematics, including study of lesson designs based on National Council of Teachers of Mathematics (NCTM) and New York State standards, and the study of pedagogical techniques including cooperative learning and the uses of technology. Students also engage in guided observation of middle school and high school mathematics classes.

*3 credits, Letter graded (A, A-, B+, etc.)*

**MAE 520: Advanced Methods of Teaching Secondary School Mathematics**

The philosophy and goals of mathematics education, with an emphasis on implementation: curriculum development; teaching techniques and styles, and learning theories and styles; lesson planning and assessment. Students will plan an entire unit, the work sample, including lesson plans and assessments, for inclusion in the professional portfolio.

*3 credits, Letter graded (A, A-, B+, etc.)*

**MAE 530: Research and Readings in Math Education**

Tutorial studies concerning current issues in mathematics education, including recent research and topics in the history of mathematics and their relation to teaching practice. Students write a research paper for inclusion in the professional portfolio. Prerequisites: MAE 501 and 510. Enrollment Limit: 18

*Fall, 1 credit, Letter graded (A, A-, B+, etc.)*

**MAE 540: Clinical Experience**

Supervised classroom experience in both middle school and high school settings, including experience in a high needs district, individual tutoring, working with small groups, and working as an inclusion aide. Seminar discussions focus on classroom observations and experiences.

*2 credits, Letter graded (A, A-, B+, etc.)*

**MAE 551: Supervised Student Teaching in Middle School**

Student teaching under the supervision of an experienced teacher in middle school and high school settings. These courses must be taken simultaneously.

*Prerequisites: MAE 520, 530, and 540; satisfaction of all other program requirements; permission of the Director of Mathematics Education.*  
*Fall, 3 credits, S/U grading*

**MAE 552: Supervised Student Teaching in High School**

Student teaching under the supervision of an experienced teacher in middle school and high school settings. These courses must be taken simultaneously.

*Prerequisites: MAE 520, 530 and 540; satisfaction of all other program requirements; permission of the Director of Mathematics Education.*  
*Fall, 3 credits, S/U grading*

**MAE 554: Student Teaching Seminar**

The student teaching experience (MAE 551/552) serves as a focus for weekly discussions of teaching and learning styles and techniques, and classroom management issues. Includes N.Y. State mandated seminars on child abuse, substance abuse and school violence.

*Prerequisite: Permission of the Director of Mathematics Education.*  
*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**MAE 698: Independent Study, Mathematics Education**

Independent study. Topics in mathematics education. Semesters Offered:

*Fall, Spring, 1-12 credits, S/U grading*  
*May be repeated 1 times FOR credit.*

**MAE 699: Dissertation Research On Campus**

Dissertation research for students completing thesis research in mathematics education.

*1-9 credits, S/U grading*  
*May be repeated for credit.*

**MAE 701: Dissertation Research Off Campus**

Off campus dissertation research for students completing thesis research in mathematics education. All international students must receive clearance from an International Advisor.

*1-9 credits, S/U grading*  
*May be repeated for credit.*

## MAR

### Marine Sciences

**MAR 501: Physical Oceanography**

Examines physics of ocean circulation and mixing on various scales with strong emphasis on profound effects of Earth's rotation on motions and distribution of properties. An introduction to physics of estuaries and other coastal water bodies.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 502: Biological Oceanography**

Examines biological processes in the ocean, and introduces major ocean biomes and groups of organisms. A broad treatment of energy and nutrient cycling in coastal and open ocean environments.

*Prerequisite: Enrollment in MAS program or permission of instructor*  
*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 503: Chemical Oceanography**

Introduction to chemical oceanography. Topics include origin and history of seawater, major and minor constituents, dissolved gases, the carbon dioxide system, distribution of properties in the world ocean, isotope geochemistry, and estuarine and hydrothermal vent geochemistry.

*Prerequisite: Enrollment in MAS program or permission of instructor*  
*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 504: Statistics and Experimental Design**

This course has been devised to provide basic background and hands on experience to assist graduate students in developing key skills in an essential aspect of the research enterprise, namely statistics analysis and experimental design.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 505: General Circulation of the Atmosphere**

This course provides an introduction to the general circulation of the atmosphere, covering aspects in observations, data analyses, and basic theories.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 506: Geological Oceanography**

An introduction to the geological oceanography of the world ocean with emphasis on the coastal environment; discussions of the physical processes controlling the structure and evolution of the ocean basins and continental margins, the distribution of marine sediment, and the development of coastal features.

*Prerequisite: Enrollment in MAS program or permission of instructor*  
*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 507: Marine Conservation**

The fundamental concepts of conservation science, a synthetic field that incorporates principles of ecology, biogeography,



population genetics, systematics, evolutionary biology, environmental sciences, sociology, anthropology, and philosophy toward the conservation of biological diversity will be presented within the context of the conservation of marine resources. Examples drawn from the marine environment emphasize how the application of conservation principles varies in different environments.

*Prerequisite: Enrollment in MCP or MAS program or permission of instructor*  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 508: Found Mar Sci 1: Biogeochemical**

This course provides an integrated view of the chemistry, geology and biology of the oceans, using the carbon cycle as an overarching theme to help students tie more specific concepts, mechanisms, and facts into a unified whole. Several other themes will also be embedded throughout the course, including other elemental cycles, timescales on which various processes operate, differences in how major ocean ecosystems (biomes) function, and the biogeochemical evolution of Earth.

*Prerequisite enrollment in MAS program or permission of instructor*  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 509: Found Mar Sci 2: Physics of Oceans, Atmos, Climate**

Introduction to principles of physics governing the patterns of ocean and atmospheric properties. Discussion of the theoretical basis for energy exchange between the two environments and how it governs the spatial and temporal scales of the fluid dynamics includes how these processes interact with climate.

*Prerequisite enrollment in MAS program or permission of instructor*  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 510: Modeling Techniques in Chemical Oceanography**

Derivation of solutions to advection-diffusion-reaction equations for marine sediments and waters. One- and multi-dimensional models are developed for dissolved and solid-phase substances in cartesian, cylindrical, and spherical coordinates. Effect of imposing multiple layers on these systems is examined.

*Prerequisite: Permission of instructor*  
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 511: Benthic Ecology**

This course focuses on the ecological interactions of benthic organisms and their habitat. Topics include life histories,

the roles of competition, predation and disturbance, feeding adaptations and food webs, interactions between benthic organisms and water motion, sediment chemistry, and other abiotic factors, and evolutionary history of benthic ecological processes.

*Spring, alternate years, 2 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 512: Marine Pollution**

Review of the physical and chemical characteristics and speciation in the marine environment of organic pollutants, metals and radionuclides including bioavailability, assimilation by marine organisms, toxicity, and policy issues.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 513: Atmospheric Aerosols-Clouds, Climate, and Chemistry**

Atmospheric aerosol particles have been recognized to contribute the largest uncertainties to the global radiative forcing estimates and affect air quality. This course introduces graduate students to the physical and chemical properties of aerosol particles and how those affect the particles' role in the atmosphere. Knowledge of how these particles interact with their surroundings is crucial to assess the impact of aerosols on air quality and climate. This course covers the fundamental mathematical, physical, and chemical descriptions of aerosol particles such as particle size distributions, thermodynamics of aerosols, aerosol hygroscopicity, physical and chemical particle transformation, carbonaceous aerosol, aerosol cloud interaction (cloud condensation and ice nuclei), aerosol optical properties, aerosol climate effects, and gas-to-particle (heterogeneous) reactive processes.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 514: Environmental Management**

This is an introduction to environmental management, and will focus on the interplay between science and public policy. Concepts include problem identification and definition, collection and analysis of relevant data to produce information, and the roles of public perception and action in ultimately determining outcomes when consensus is not reached. Specific fields to which these concepts will be applied will be solid waste management and coastal management. Current local problems will be used to illustrate the broader conceptual issues. Offered as MAR 514, EST 540 and CEY 501. 3 Credits, ABCF Grading

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 515: Phytoplankton Ecology**

The biology and ecology of marine phytoplankton. Covered are life cycles, growth, nutrient uptake, grazing, and the effects of environmental factors on growth and survival of phytoplankton. The characteristics of various classes are examined and are related to environmental conditions.

*Prerequisites: General biology*  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 516: Ecosystem Science for Fisheries Management**

This course will provide an overview of the science and mathematical models that are typically used to inform Ecosystem-based Fisheries Management (EBFM). The course will review single-species models, multispecies models and full system models. Advantages and disadvantages of implementing these approaches into management and policy will be explored. No modeling experience is necessary. The course requires familiarity with quantitative methods, but emphasizes current literature and case studies where EBFM has been or is being implemented as main learning elements.

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 517: Waves**

Theory and observations of surface waves, internal waves, and planetary waves; wave-wave, wave-current, and wave-turbulence interactions; surface wave prediction; beach processes.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 518: Coastal Processes**

Coastal Processes: Classification and basic theory of water waves, tides and sediment transport. This background forms the basis for a description of shore processes including beaches, and coastal erosion. The variety of the world's coastal environments will be differentiated in terms of physical processes. The behavior of beaches also will be examined. Co-scheduled with MAR 304 Waves, Tides and Beaches.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 519: Geochemistry Seminar**

This course explores topics in low-temperature geochemistry as chosen by the instructors and participants. The seminar series is organized around a theme such as early diagenesis, estuarine geochemistry, or aquatic chemistry. Students are required to lead one of the seminars and to participate in discussions.

*Prerequisite: MAR 503 or permission of instructor*

*Spring, 1 credit, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

### **MAR 520: New Production and Geochemical Cycles**

Consideration of oceanic new production for a variety of ecosystems. Quantitative examination of the impact of new production on the transport and cycling of major and minor elements and pollutants.

*Spring, alternate years, 2 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 521: Long Island's Groundwater**

This course will cover basic groundwater concepts in unconsolidated sediments, and examine contamination issues in light of Long Island's particular hydrogeology, land use, and waste management history. Mathematical principles will be discussed but not stressed; scientific and technical papers discussing particular concepts or problems, including important local examples, will be closely read.

*Prerequisite: Permission of instructor. Offered as MAR 521 or HPH 673.*

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 522: Envir Toxicology & Public Health**

Principles of toxicology and epidemiology are presented and problems associated with major classes of toxic chemicals and radiation to human and environmental health are examined in case study format.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 523: Marine Mammal Biology and Conservation**

This course provides an introduction to the basic biology of marine mammals, focusing particularly on various adaptations (e.g., morphological, physiological, acoustic) to life in the marine environment, as well as the ecology and behavior of marine mammals, and the conservation and management of marine mammal populations.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 524: Organic Contaminant Hydrology**

There are a host of chemical, biological, and physical processes that affect the transport and fate of organic chemicals in natural waters. This course concerns understanding these processes and the structure-activity relationships available for predicting their rates. The major focus of this class is on contaminant hydrology of soil and aquifer environments, and includes the principles

behind remediation and containment technologies. This course is offered as both MAR 524 and GEO 524.

*Prerequisite: GEO 526 or MAR 503 or permission of instructor*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 525: Environment & Public Health**

Review of the interactions of humans with the atmosphere and water resources, especially in the Long Island coastal community. An introduction is provided to the field of environmental health and the practices relevant to an urban/suburban and coastal setting.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 526: Mechanisms of Pollutant Responses in Aquatic Organisms**

This course examines the molecular and biochemical basis for contaminant responses in aquatic organisms. Course will be taught in seminar format utilizing the current scientific literature as a basis for discussion. Prerequisite: Permission of instructor.

*Fall, alternate years, 2 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 527: Current Issues in Global Climate Change**

This course is designed to strengthen skills in understanding and evaluating scientific papers, writing scientific comments, and making presentations to an audience. Topics will be selected from current research in global climate change relevant to a wide range of disciplines in marine and atmospheric sciences and sustainability studies. The course is organized into four modules which focus on climate-related topics in 1) atmospheric science, 2) marine science, 3) sustainability studies, and 4) communicating climate science to the public.

*2 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 528: Ocean Atmosphere Interactions**

This course discusses the fundamental physical mechanisms through which the ocean and atmosphere interact. These principles are applied to the understanding of phenomena, such as the El Nino Southern Oscillation, the effects of sea surface temperature on the distribution of low-level winds and development of tropical deep convection, and the effects of tropical deep convection and mid-latitude storms on the ocean's mixed layer. Both modeling and observational aspects are discussed. Material will be taken from selected textbooks, as well as recent literature.

*Prerequisite: Permission of instructor*

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 529: Isotope Geochemistry**

This course deals both with the use of radio and stable isotope applications to the earth sciences.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 530: Organic Geochemistry**

Introduction to the organic chemistry of the earth, oceans, and atmosphere. Topics include production transformation and fate of organic matter; use of organic biomarkers and stable and radioisotopes; diagenesis in recent sediments; oil and coal production and composition; dissolved and particulate organic matter in seawater.

*Prerequisite: Permission of instructor*

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 531: Long Island Marine Habitats**

Focusing on six representative marine environments around Long Island, this course emphasizes the natural history of local marine communities, as well as quantitative ecology, hypothesis testing, and scientific writing. Students visit the sites, measure environmental parameters, and identify the distribution and abundance of common plants and animals. Using qualitative and quantitative methods in the field and laboratory, the class determines major factors that control the community structure in each habitat. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 532: Marine Protected Areas**

Marine Protected Areas (MPAs) are parts of the ocean that are zoned to exclude activities that are potentially detrimental to the ecosystem. Marine Reserves are special types of MPAs in which the harvesting of marine wildlife is prohibited. MPAs are rapidly gaining traction worldwide as a tool to preserve or restore ecosystems, protect endangered species, or sustain nearby commercial and recreational fisheries. This course is designed to provide students with a robust background in the science behind the design, implementation, and expected outcomes of establishing MPAs. The course is largely field-based, and will explore MPA-related issues by traveling to one or more MPAs to learn about the challenges, benefits, and limitations of MPAs for marine conservation from local scientists, managers, and rangers.

3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 533: Instrumental Analysis**

Fundamental principles of instrumental chemical analysis and practical applications of molecular spectroscopy, atomic spectroscopy, mass spectrometry and chromatography. These instruments are widely used in environmental and oceanography problem solving. Lectures cover basic concepts of chemical analysis and the fundamental principles of the analytical techniques to be used. In the laboratory, students gain hands-on experience both by performing a series of required basic chemical determinations (nutrients and trace metals in sediments and in seawater water) and by undertaking special projects. Students prepare written reports describing the methods, the theory underlying those methods, results, and figures of merit. Students also present their results orally in brief presentations.

*Prerequisites: Permission of instructor*  
*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 534: Scientific Decision Support**

In this innovative course, professional government and industry scientists, policy makers and other decision makers will present and lead discussions on the science, societal and other challenges associated with decision support in their field. We will explore a wide range of decision support systems ranging from decision making in public health, natural resource management, and climate adaptation as well as explore different career paths and work environments involved in scientific decision making. Local speakers will be invited, but most presentations will be remote via standard network tools, thereby eliminating travel costs and greatly lowering the barrier to participation and hence enabling a very wide ranging seminar program. We already anticipate seminars from scientists at NOAA, NASA, NIH, DOE, Global Electric, IBM and CDC laboratories, and from officials of multiple local, state and federal agencies, and from journalists associated with multiple formats. The sessions will be recorded and made available for nationwide access.

*1 credit, Letter graded (A, A-, B+, etc.)*

### **MAR 535: The Atom and Environmental Radiation in the Nuclear Age**

This course will address technical and societal aspects relating to nuclear power and the general issue of environmental radioactivity. It will cover basics of the nuclear industry and the nature of radioactivity. This includes the production, storage, and disposal of diverse radionuclides emanating from the nuclear

fuel cycle and nuclear weapons testing. The properties of major radionuclides will be explored. The course will also consider the complex issue of biological risks posed by radionuclides at different doses to living organisms, including man. Economic and political constraints on nuclear power generation will be discussed for the US and other countries, as will the actual and perceived risks associated with environmental radioactivity.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 536: Environmental Law and Regulation**

This course covers environmental law and regulations from inception in common law through statutory law and regulations. The initial approach entails the review of important case law giving rise to today's body of environmental regulations. Emphasis is on environmental statutes and regulations dealing with waterfront and coastal development and solid waste as well as New York State's Environmental Quality Review Act (SEQRA) and the National Environmental Policy Act (NEPA). This course is cross-listed with CEY 503.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 537: Tropical Marine Ecology**

The goal of this class is to teach students about the ecology of the tropical coral reef environments through lectures, field trips, snorkeling trips, SCUBA diving trips and student designed research projects. The first half of the course will be devoted to formal lectures, demonstrations, and instructor-led field trips to provide students with a basic knowledge of the common organisms and the roles they play in various coral reef ecosystem. During the second half of the course, with help from faculty, students will develop and carry out individual research projects examining organismal ecology of coral reefs.

*4 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 538: Methods of Univariate Statistics in Atmospheric and Ocean Sciences**

An introduction to basic statistical concepts and their applications to analysis of data in atmospheric and marine sciences. The topics include distribution, statistical estimation, hypothesis testing, analysis of variance, linear and nonlinear regression analysis, and basics of experimental design. In-depth class discussions of the theoretical concepts are accompanied by extensive applications to data sets supplied by the instructor and the students.

*Prerequisites: Enrollment in MAS program or permission of instructor*  
*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 539: Economics of Coastal and Marine Ecosystems**

Considering the socioeconomic implications of policy decisions involving environmental and natural resources has become increasingly important for ecosystem management. This course will view human interactions with coastal and marine ecosystems through the lens of economics. Topics will include the basics of welfare analysis, the concept of ecosystem services, the challenges associated with public goods, methods for economic valuation of non-market goods and services, and strategies for sustainable use of coastal and marine resources. In addition to exploring the fundamental principles of environmental economics, the course will also evaluate their real-world application through national and international policy examples.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 540: Marine Microbial Ecology**

An historical perspective of the field, aspects of nutrition and growth, microbial metabolism, and trophodynamic relationships with other organisms. Emphasis on roles of microorganisms in marine environments such as salt marshes, estuaries, coastal pelagic ecosystems, and the deep sea, as well as microbial contribution to geochemical cycles. Contemporary and classical methodologies covered.

*Prerequisite: MAR 502 or permission of instructor*  
*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 541: Foundations of Atmospheric Sciences I**

This course is intended to introduce graduate majors to the foundations in the atmospheric sciences necessary for future, more specialized courses. This course covers atmospheric thermodynamics, radiative transfer, tropospheric and stratospheric chemistry, and cloud microphysics.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 542: Foundations of Atmospheric Sciences II**

This course introduces cloud physics, atmospheric chemistry, boundary layer turbulence, and atmospheric radiation. This is the second course in a two-course series taught at the level appropriate to all students in atmospheric sciences.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 543: Reading and Proposal Development**

This course is intended to help young scientists read relevant literature, discuss and analyze it critically and prepare a research proposal based on some aspect of the readings over the semester. The skills learned will help PhD students prepare for their comprehensive or oral qualifying exam. It will also serve for cohort-building among first-year students, all of whom are required to take it.

*1 credit, Letter graded (A, A-, B+, etc.)*

### **MAR 544: Atmospheric Radiation**

Discussion of the compositions and radiative components of planetary atmospheres. Blackbody and gaseous radiation with emphasis on the respective roles of electromagnetic theory and quantum statistics. Derivation of the equation of transfer and radiative exchange integrals, with application to energy transfer processes within the atmospheres of Earth and other planets.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 545: Paleoclimatology and Paleogeography**

This course will provide an extensive overview of the methods used in paleoclimate research and an examination of important climate events during the Late-Mesozoic and Cenozoic eras. We will discuss proxies used to create paleoclimate reconstructions forcing mechanisms on interannual to million year time scales, climate effects on geological and biological processes, and the modeling of present climate and extrapolation to past and future climates.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 546: Marine Sedimentology**

Study of sedimentology in the marine environment including an introduction to fluid mechanics, sediment transport theory, quantitative models of sedimentation, and dynamic stratigraphy.

*Prerequisite: Permission of instructor*  
*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 547: Geophysical Fluid Dynamics I**

Fundamentals of rotating, stratified fluid dynamics as applied to atmospheric and oceanic flows: primitive equations, shallow water theory, potential vorticity dynamics, quasigeostrophic approximation, barotropic

instability, and baroclinic instability.

*Prerequisite: MAR 501, MAR 509, or permission of instructor*  
*Offered Spring*  
*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 548: Geophysical Fluid Dynamics II**

Continuation of geophysical fluid dynamics I. Course covers waves and wave-mean flow interaction in geophysical fluids dynamics with examples from oceanic and atmospheric flows. *Prerequisite: Mar 547 or permission of instructor*  
*Offered Fall*

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 549: Current Topics in Atmospheric Sciences**

This course will discuss current research topics in atmospheric sciences and their connections with advance course materials.

*Semesters Offered:*

*Fall and Spring, 0-2 credits, S/U grading*  
*May be repeated 1 times FOR credit.*

### **MAR 550: Topics in Marine Sciences**

This is used to present special interest courses, including intensive short courses by visiting and adjunct faculty and courses requested by students. Those given in recent years include Nature of Marine Ecosystems, Science and Technology in Public Institutions, Plutonium in the Marine Environment and Problems in Estuarine Sedimentation.

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **MAR 551: Special Topics in Management**

This course involves in-depth examination and assessment of one or two topical problems and issues in the management of fisheries in the mid-Atlantic region. Fisheries management encompasses a diversity of disciplines and interests: biology, ecology, mathematics, law, policy, economics, analytical modeling, sociology, and anthropology. The class conducts a detailed and thorough review of one or two key fisheries management problems that incorporate component issues spanning this range of disciplines. Students form several teams, each team focusing on one aspect of the overall problem and preparing a report detailing that aspect and making recommendations on how management decisions can be improved.

*Prerequisite: Permission of instructor*  
*Fall and Spring, 1-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **MAR 552: Directed Study**

Individual studies under the guidance of a faculty member. Subject matter varies according to the needs of the students. Fall, Spring and

*Summer, 1-12 credits, S/U grading*  
*May be repeated for credit.*

### **MAR 553: Fishery Management**

Survey of the basic principles of and techniques for studying the population dynamics of marine fish and shellfish. Discussion of the theoretical basis for management of exploited fishes and shellfish, contrasting management in theory and in practice using local, national, and international examples. Includes lab exercises in the use of computer-based models for fish stock assessment.

*Prerequisite: Calculus I or permission of instructor*

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 554: Aquatic Animal Diseases**

This course is designed to expose students to fundamental and current issues pertaining to host/pathogen interactions in aquatic environment. By the end of the course, students should have a basic understanding of disease processes in aquatic animals; knowledge of the tools used for disease diagnosis; and an appreciation of disease management tools available today. A particular accent is given to the role of the environment as an important factor in infectious and non-infectious diseases.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 556: Conservation's 3 Rs: Reading, Writing, Raising Money**

By providing instruction in critical reading, effective writing, and fundraising, this course will fill a need for graduate students, particularly for students in the Marine Conservation and Policy (MCP) program. This course will help students to both understand the public discourse in marine and wildlife conservation and policy issues and to effectively communicate these issues to a wide audience. Although the course was designed with Marine Conservation and Policy students in mind, the course will also be useful to graduate students interested in improving their ability to write effective, understandable, and interesting pieces that help advance public understanding and support for issues in conservation and science more generally. Communication and outreach, and particularly the ability to express the

importance of scientific research to the public, is an important component of conducting research and doing conservation work, and is increasingly becoming required and emphasized by funding agencies.

*2 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 557: Case Study and Project Planning Seminar**

This seminar will introduce students to case studies in marine conservation carried out regionally, nationally, and internationally through seminars given by professionals in the field. In addition students will be given direction on how to develop a plan for a case study as well as instruction on how to obtain, analyze, and present data. Students will be required to submit a written project plan for either their Capstone Project or Internship prior to the end of the semester.

*Fall, 1 credit, S/U grading*

### **MAR 558: Remote Sensing**

Theory and application of remote sensing and digital image analysis to marine research. Students use standard software and PCs for digital filtering, enhancement, and classification of imagery.

*Prerequisite: MAR 501, 502, 504, 506, or permission of instructor*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 559: Risk Analysis, Error and Uncertainty**

This seminar style course will explore error estimation, uncertainty propagation, risk analysis, model validation, and decision analysis.

*Fall, alternate years, 2 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 560: Ecology of Fishes**

Introduction to current research in the ecology of fishes. Topics such as population regulation, migration, reproductive strategies, predator-prey interactions, feeding behavior, competition, life history strategies, and others are discussed.

*Prerequisite: Familiarity with concepts of ecology or biological oceanography*

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 561: Quantitative Fisheries Ecology**

The course covers quantitative models that are currently utilized to assess the status of fish stocks and academic pursuits of understanding single-species and ecosystem dynamics. The course builds on basic ecological models

such as the density-independent exponential and density-dependent logistic models and introduces equilibrium and non-equilibrium production models and statistical-catch-at-age techniques. Recruitment and growth models commonly used in fisheries ecology are also covered. Least-squares, non-linear and likelihood methods are utilized in model parameter estimation. Statistical techniques such as bootstrapping and Monte Carlo methods are used to assess uncertainty in models outputs. This course is useful for students that plan academic or management careers in fisheries and wildlife research.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 562: Early Diagenesis of Marine Sediments**

The course treats qualitative and quantitative aspects of the early diagenesis of sediments. Topics include diffusion and adsorption of dissolved species; organic matter decomposition and storage; and diagenesis of clay materials, sulfur compounds, and calcium carbonates. The effects of bioturbation on sediment diagenesis are also discussed. This course is offered as both MAR 562 and GEO 562.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 563: Early Diagenesis of Marine Sediments II**

The basic principles and concepts of diagenetic processes developed in MAR/GEO 562 are used to examine in detail early diagenesis in a range of sedimentary environments. These include terrigenous and biogenic sediments from estuarine, lagoonal, deltaic, open shelf, hemipelagic, oligotrophic deep-sea, and hydrothermal regions.

*Prerequisite: Permission of instructor*  
*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 564: Atmospheric Structure and Analysis**

Real world applications of basic dynamical principles to develop a physical understanding of various weather phenomena. Topics include the hypsometric equation, structure and evolution of extratropical cyclones, fronts, hurricanes and convective systems, surface and upper air analysis techniques, radar and satellite interpretation, and introduction to operational products and forecasting.

*Prerequisite: 1 year of calculus.*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 565: Tropical Meteorology**

The goal of this class is to provide a working knowledge of the dynamics and thermodynamics of the tropical atmosphere. A variety of tropical circulations and phenomena will be studied in detail, including regional and large-scale tropical circulations and their role in the global general circulation, tropical wave dynamics, convection and convective systems, synoptic, intraseasonal, and seasonal variability; monsoons, the El Niño/Southern Oscillation, tropical cyclones.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 566: Air Pollution and Global Warming**

This course provides a detailed introduction of the formation of gaseous and particulate pollutants and the role they play in affecting global warming. The pollutants discussed include carbon monoxide, sulfur oxides, nitrogen oxides, ozone, hydrocarbons, particulate matter, and greenhouse gases.

The emissions of these gases from natural and industrial sources and the principles used for controlling the latter are described. The chemical and physical transformations of the pollutants in the atmosphere are investigated and the phenomena of urban smog and acid rain are discussed. The impact of these pollutants on the planet's climate are outlined. Current proposals of renewable energy supply and combatting temperature increase by geoeengineering solutions are examined. This course discusses technical, ethical, and commercial perspectives that have shaped pollution producing industrial processes during historical times and in the present era. The efforts to formulate regulatory control mechanisms to limit the impact of air pollution and to ameliorate global warming are outlined in this class.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 567: Chemical Sensors in Oceanography**

An introduction to chemical sensors and their application in oceanography with emphasis on in-situ sensing in coastal environments, discussions of the sensor principles and fabrication, and biogeochemical processes revealed by in-situ measurements.

*Spring, alternate years, 2 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 568: Practical Skills for Scientists**

This course is designed to introduce first-year graduate students to the standards and practices of conducting original scientific research in a professional and responsible manner. This course will guide students as they develop practical skills in communicating

in both oral and written formats, and as they practice some of the formal and informal interactions (including questions and discussions after presentations, critical reading, and peer review) characteristic of working as a scientist. Students will learn to construct hypotheses and approaches to test them, write a scientific proposal, evaluate proposals as a peer reviewer, critically read papers from the primary scientific literature, give interesting, informative, and concise oral scientific presentations, explain and justify the standards of responsible conduct of research, identify irresponsible conduct of scientific research and respond appropriately. Spring  
3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 569: Statistics With R**

Essentials of conducting statistical analyses using software developed by the R Project for Statistical Computing. R is free software that has been developed by contributors around the world and is quickly becoming a standard environment for conducting scientific data analyses. The course will cover the basic language, data management, graphics, and the application of R to a variety of statistical techniques such as ANOVA, regression, MDS and PCA, GLMs and GAMs. The class is intended to explore the capabilities of R and a basic graduate understanding of statistics is required. Fall, 3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 570: Methods of Multivariate Statistics in Atmospheric and Marine Sciences**

This course on multivariate statistical methods of interest in marine and atmospheric sciences discusses Principal component (EOF) analysis, canonical correlation analysis, maximum covariance analysis, discrimination and classification, and cluster analysis. Applications of the topics to oceanographic/atmospheric data are shown using MATLAB. The class provides a hands-on experience requiring each student to apply the techniques to his/her own data and the results are discussed in class with feedback from the instructors and other students. 3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 571: Zooplankton Ecology**

The course is designed to acquaint the student with the theoretical problems and applied methodology in ecological studies of marine and freshwater zooplankton. Topics will include taxonomy, anatomy, physiology, life history strategies, population dynamics, and food chain interaction.

*Prerequisites: MAR 502 and permission of instructor*  
*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 572: Geophysical Simulation**

Basic equations and boundary conditions. Linear and nonlinear instabilities. Finite-difference and time integration techniques for problems in geophysical fluid dynamics. Numerical design of global atmospheric and ocean models. Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 573: Special Topics-Chemical Oceanography**

This course is designed for the discussion of topics of special interest on demand that is not covered in regularly scheduled courses. Examples of possible topics include carbonate chemistry, isotope chemistry, and microbial chemistry. 1-4 credits, Letter graded (A, A-, B+, etc.)  
*May be repeated for credit.*

### **MAR 574: Special Topics: Ocean Dynamics**

Introductory dynamical oceanography, framework and applications. 1-4 credits, Letter graded (A, A-, B+, etc.)  
*May be repeated for credit.*

### **MAR 575: Special Topics-Geological Oceanography**

The course proposes to take several views of the ecology and biogeochemistry of intertidal wetlands to see whether one or more of these views might be useful in reinvigorating interest in the study of wetland function for its own sake. Ecology and plant life history will be studied in addition to geology and wetlands management. 1-4 credits, Letter graded (A, A-, B+, etc.)  
*May be repeated for credit.*

### **MAR 576: Special Topics-Biological Oceanography**

The course is designed for the discussion of topics of special interest on demand that is not covered in regularly scheduled courses. Examples of possible topics include grazing in benthic environment, coastal upwelling, the nature of marine ecosystems, and marine pollution processes. *Prerequisite: Permission of instructor*  
*Fall, 1-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **MAR 577: Special Topics-Coastal Zone Management**

The course is designed for the discussion of topics of special interest on demand that is not covered in regularly scheduled courses. Examples of possible topics include microcomputer information systems, environmental law, coastal pollution, dredge spoil disposal, science and technology in public institutions, and coastal marine policy. Prerequisite: Permission of instructor  
*Fall and Spring, 1-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **MAR 578: Bio & Conservation/Seabirds**

This course provides an overview of the biology and conservation of seabirds, covering basic and applied aspects of seabird biology. We examine specific biological adaptations (e.g., morphological and physiological adaptations for diving and flying) in the first third of the course, and review population-level processes and behavioral patterns (e.g., population ecology and migration) in the second part of the course. The last third of the course applies this knowledge of seabird biology and ecology to current conservation issues and management efforts, both within the United States and internationally. 3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 579: Bio & Conservation/Sea Turtles**

This course provides an overview of the biology and conservation of sea turtles, and highlights different "solutions" to challenges these organisms face while living in the marine environment. We begin by discussing biological adaptations and ecological processes, and will then examine these concepts in relation to conservation and management issues facing different sea turtle species. This course will be primarily lecture-based, although we will take advantage of additional learning opportunities, such as necropsies conducted with the Riverhead Foundation. 3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 580: Seminar**

A weekly series of research seminars presented by visiting scientists and members of the staff. *Fall and Spring, S/U grading*  
*May be repeated for credit.*

### **MAR 581: Next Generation Sequencing Applications in Functional Genomics**

Functional and Integrative genomics is a new area of marine research that seeks to place the functional significance of an organism's

genes into an ecological and evolutionary context. This course provides an integrated view of how these methods can be used to answer questions regarding marine organisms, evolution, biology and ecology. Over the course of the semester, examples will cover various topics including marine biodiversity, population structures, environmental adaptation, stress responses, phylogeny of animals, aquaculture and fisheries, interaction between species (predation, parasitism, mutualism). A particular accent is given to the role of Next Generation Sequencing technologies in answering questions related to these topics.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 582: Advanced Atmospheric Dynamics**

Application of the concepts of balanced flow and potential vorticity thinking - conservation and inversion - to study wave propagation, baroclinic instability, evolution of cyclones and baroclinic waves, and wave- mean flow interactions.

*Prerequisite: MAR 594*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 583: Doppler Weather Radar**

This class is designed to provide students who have not previously had an undergraduate class on the topic with a working knowledge of Doppler weather radar, including: what the basic components of a weather radar are, a theoretical background of how radars operate, an in-depth understanding of the wide variety of weather radar applications used in atmospheric science careers, and an overview on the use of emerging radar technologies in new and updated Doppler weather radar systems. Students also will gain hands-on experience working with Doppler radar data and radar viewing and editing software.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 584: Applied Marine Ecology Seminar**

This course provides an opportunity for advanced graduate students to practice presenting data on their thesis research in areas broadly related to how individuals and communities of marine organisms respond to changes in their environments. Each student will prepare an abstract of the work they plan to present and assign an appropriate review or research paper for the class to read. They will then prepare a formal presentation of their work suitable for a departmental seminar. Faculty and students will provide constructive criticism of the presentation as

well as participate in a discussion of the work.. May be taken more than once for credit.

*Fall, 1 credit, S/U grading  
May be repeated for credit.*

### **MAR 585: Coastal Geology Seminar**

An assessment of recent developments in coastal geology. Discussion of advances in the application of sedimentology, stratigraphy, and geomorphology to the study of coastal environments. Modern-ancient analogues are emphasized where appropriate.

*Prerequisite: Stratigraphy and sedimentary marine geology*

*Fall, 2 credits, S/U grading  
May be repeated for credit.*

### **MAR 586: Introduction to Ecological Modeling**

This course will provide students with a familiarity of the major concepts, approaches, and underlying rationale for modeling in the ecological sciences. Topics will include reviews of theoretical and empirical models, the use of models in adaptive management, and how to confront models with data to evaluate alternative hypotheses. Roughly 1/3 of the course will be devoted to the use of models in management, focusing on the problems of fitting models to data and management pitfalls that follow. Course work will consist of readings, in class exercises, and group assignments that involve the construction, analysis, and interpretation of ecological models.

*Prerequisite: BEE 550, BEE 552; MAT 131 or equivalent; any statistics course.*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 587: GIS: Display and Analysis of Environmental Data**

Elements of Geographic Information Systems (GIS) with an emphasis on environmental applications, especially those related to marine and coastal systems. The course includes hands-on exercises to familiarize students with GIS capabilities. A project will be required.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 588: Molecular Marine Ecology**

DNA analysis offers a new window into the ecology of marine organisms, shedding light on aspects of their biology that are traditionally difficult to study, such as their evolutionary history, population structure, population demographic history and reproductive patterns. In this way, DNA analysis can help us better manage fisheries and conserve endangered marine species. This course is

designed to expose graduate students to the burgeoning field of molecular ecology and the application of molecular analyses to fisheries management and conservation. Lectures will be supplemented by a group laboratory project, where students will apply techniques such as DNA extraction, polymerase chain reaction, DNA sequencing and computer based analysis of genetic data to address a contemporary marine conservation or fisheries issue.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAR 589: Capstone Project in Marine Conservation and Policy**

Students will conduct an in depth capstone study involving independent analysis of available data and produce an original synthesis paper based on a committee-approved, consequential topic in marine conservation. All students will also present their project at the annual Program Symposium.

*Prerequisite: Permission of Instructor*

*Summer, 1-6 credits, S/U grading  
May be repeated for credit.*

### **MAR 590: Research for MS Students**

Original investigation undertaken with the supervision of the advisor.

*Fall and Spring, 1-12 credits, S/U grading  
May be repeated for credit.*

### **MAR 591: RCRS and Professional Development**

This course is intended to help young scientists begin to plan and enact purposeful professional development activities. The course will focus on using Individual Development Plans as a mechanism for accomplishing career development and advancement, on studying both formal definitions of research misconduct and the daily dilemmas of conducting research and scholarship in a responsible manner, and on other professional development issues of student interest.

*1 credit, Letter graded (A, A-, B+, etc.)*

### **MAR 592: Internship in Marine Conservation and Policy**

Students will obtain practical work experience through an internship with local, state or federal agencies or not for profit organizations working in the area of marine conservation and policy. To complete the internship, students will prepare a written report on their activities and present their internship project at the annual Program Symposium.

*Spring,  
Summer, 1-6 credits, S/U grading  
May be repeated for credit.*

**MAR 593: Atmospheric Physics**

Advanced cloud physics, atmospheric convection, and other moist processes.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 594: Atmospheric Dynamics**

This course covers atmospheric waves, quasi-geostrophic theory, and atmospheric dynamic instability.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 595: Graduate Seminar in Atmospheric Sciences**

Discussion of special research topics centered on monographs, conference proceedings, or journal articles. Topics include climate change, atmospheric chemistry, radiation transfer, and planetary atmospheres. This course is intended primarily for students who have passed the written qualifying examination in atmospheric sciences, although other students may enroll with permission of the faculty seminar leader.

*Fall and Spring, 0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**MAR 596: Principles of Atmospheric Chemistry**

The application of photochemistry and reaction kinetics to the atmospheres of the Earth and planets. The composition and structure of various regions of atmospheres, including the troposphere, stratosphere, and ionosphere. Incorporation of chemical rate processes and physical transport into models. Production of airglow and auroral emissions.

*Prerequisite: Permission of instructor  
Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 598: Synoptic and Mesoscale Meteorology**

Course examines the structure and evolution of synoptic and mesoscale systems using observations, modern dynamical analysis, and numerical weather prediction models. Diagnosis of synoptic systems includes applications of quasi-geostrophic theory to baroclinic waves; jet stream and frontal circulations. A survey of the concepts of mesoscale systems includes convective systems, gravity waves, and terrain-coastal circulations. The student will investigate such phenomena in the laboratory as well as individual projects.

*Spring, alternate years, 4 credits, Letter graded (A, A-, B+, etc.)*

**MAR 599: Atmospheric Boundary Layer Processes**

This course provides the theoretical foundation for a quantitative understanding of transport processes and chemical transformations in the atmospheric boundary layer. Topics covered in this course include the equations of motions for the lower troposphere; the budget of turbulent kinetic energy; turbulent fluxes of momentum, heat and mass; treatment of chemical transformations; and the representation of these processes in numerical models.

*3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 600: Fisheries Stock Assessment**

Stock assessment is essential in a sustainable fisheries management. It involves data collection, data processing and modeling to estimate stock size and status, quantify the impacts of fishing activity on the stock dynamics, and identify maximum sustainable fisheries catch. Building on the quantitative fisheries ecology course, this course will be focused on the application of different stock assessment models in estimating fish stock dynamics, determining stock status, and develop catch advice for fisheries management. The course will be covered by lectures, hands-on stock assessment modeling using NOAA toolbox, case studies, peer reviewing real stock assessment reports, and group projects. This course is designed for the students who are interested in fisheries stock assessment and management. It is ideal for the students who are interested in marine fisheries resource assessment and management and who have taken MAR 561: Quantitative Fisheries Ecology or have good knowledge about fish population dynamics.

*3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 601: Dynamic model with Matlab**

This course is designed to provide basic programming skills with the use of selected Matlab toolboxes to analyze marine and atmospheric science data, to perform challenging simulations, and to explore selected problems in marine and atmospheric and related fields. The course will emphasize functionalities and applications of the matrix manipulations, signal processing, statistical, and mapping toolboxes within the context of marine science problems. The goal is to give the students exposure to tools and programming techniques to enable them to work individually or in a group on a final project relevant to their research interest. Topics will include efficient Matlab programming techniques, simple numerical modeling and learning to build a classifier for recognition and measurement, separating and

clustering data, graph and representation and spectral clustering.

*2 credits, Letter graded (A, A-, B+, etc.)*

**MAR 602: Marine Invasive Alien Species in Tropical and Temperate Climates**

The course is designed to instruct students in the biology and ecology of marine invasive species using real examples from the Caribbean and the temperate areas of the US Atlantic coast. Additionally, it will include management strategies to control current invasive species, as well as strategies to prevent future invasions. Topics in this course will span policy and legislative requirements, marine conservation and planning, scientific research, biological and ecological characteristics, survey and monitoring methods, public outreach and education strategies. These topics will enable the students to provide sound technical and scientific guidance to the management and prevention of marine invasive species in the Wider Caribbean and the Atlantic Regions.

*0-3 credits, Letter graded (A, A-, B+, etc.)*

**MAR 603: Ocean Physics Seminar**

This course explores topics in ocean physics as chosen by the instructors and participants. The seminar series is organized around themes such as estuarine physics, or coastal dynamics, ocean and climate, ocean circulation, etc. Students are required to lead at least one of the seminars and to participate in discussions. Prerequisite: MAR 509 or permission of instructor Fall and spring, 1 credit, ABCF grading, May be repeated for credit

*1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**MAR 604: Coral Biology and Conservation: Red Sea program**

Coral reefs of the world are at the brink of collapse with only 10% expected to survive past mid-century. We will combine field work and lab projects with lectures to facilitate student exploration of the causes of this global decimation and potential approaches to conserve what remains of a critically important ecosystem. Conducted at an advanced research facility in Eilat, Israel on the shores of the Gulf of Aqaba, this course will enable students to closely study the northern Red Sea l s reefs, one of the few major reef ecosystems expected to survive this century. The course location allows students to conduct field work on fringing reefs located a few meters from the beach of the research facility, attend lectures from international faculty, and interact with the international students participating in the course.



3 credits, Letter graded (A, A-, B+, etc.)

### **MAR 650: Dissertation Research for PhD**

Original investigation undertaken with the supervision of research committee.

Fall and Spring, 1-9 credits, S/U grading  
May be repeated for credit.

### **MAR 655: Directed Study for PhD**

Individual studies under the guidance of a faculty member. Subject matter varies according to the needs of the student.

Prerequisite: Permission of instructor  
Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.

### **MAR 670: Practicum in Teaching**

Fall and Spring, 1-3 credits, S/U grading  
May be repeated for credit.

### **MAR 699: Dissertation Research for G5**

Research course exclusively for students who have been advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

Fall and Spring, 1-9 credits, S/U grading  
May be repeated for credit.

### **MAR 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.

### **MAR 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The

charge will only be removed if other plan is deemed comparable.

All international students must received clearance from an International Advisor.  
Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.

### **MAR 800: Summer/Winter Research**

Summer/Winter Research. 0 credits, S/U grading. May be repeated.

S/U grading  
May be repeated for credit.

## **MAT**

### **Mathematics**

#### **MAT 511: Fundamental Concepts of Mathematics**

Fundamental Concepts of Mathematics. Brief history of mathematics; sets, functions and logic; constructions of number systems, including their historical development; mathematical induction. The main focus of the course will be on the construction and writing of mathematical proofs. Fall, Spring, or Summer, 3 credits, Letter graded (A, A-, B+, etc.)

#### **MAT 512: Algebra for Teachers**

Linear algebra, the algebra of polynomials, algebraic properties of the complex numbers, number fields, solutions of equations. Mathematical topics integrate the study of the historical development of algebra, including contributions from diverse cultures. Prerequisite: MAT 511 Semesters Offered: Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)

#### **MAT 513: Analysis for Teachers I**

Topics in differential calculus, its foundations, and its applications. This course is designed for teachers and prospective teachers of advanced placement calculus. Mathematical topics integrate the study of the historical development of calculus, including contributions from diverse cultures. Prerequisite: MAT 511 Fall, Spring, or Summer, 3 credits, Letter graded (A, A-, B+, etc.)

#### **MAT 514: Analysis for Teachers II**

Topics in calculus, its foundations, and its applications. Emphasis is on integration and on numerical techniques. This course is designed for teachers and prospective teachers of advanced placement calculus. Mathematical topics integrate the study of the historical development of calculus, including

contributions from diverse cultures. Analysis for Teachers I is not a prerequisite for this course. Prerequisite: MAT 511 Fall, Spring, or Summer, 3 credits, Letter graded (A, A-, B+, etc.)

#### **MAT 515: Geometry for Teachers**

A re-examination of elementary geometry using concepts from analysis and algebra. Mathematical topics integrate the study of the historical development of Euclidean and non-Euclidean geometries, including contributions from diverse cultures. Prerequisite: MAT 511 Fall, Spring, or Summer, 3 credits, Letter graded (A, A-, B+, etc.)

#### **MAT 516: Probability and Statistics for Teachers**

A priori and empirical probabilities; conditional probability; mean and standard deviation; random variables; financial distributions; continuous distributions; sampling; estimation; decision making. Mathematical topics integrate the study of the historical development of statistics and probability, including contributions from diverse cultures. Prerequisite: MAT 511 Fall, Spring, or Summer, 3 credits, Letter graded (A, A-, B+, etc.)

#### **MAT 517: Calculators and Computers for Teachers**

Calculators and Computers for teachers. Graphing calculators, programming, computing and curve sketching; Geometers Sketchpad or other computer based classroom tools; educational use of the world wide web. Fall, Spring, or Summer, 3 credits, Letter graded (A, A-, B+, etc.)

#### **MAT 518: Seminar on the Uses of Mathematics**

This seminar explores the ways in which secondary school and elementary college mathematics are used in such diverse areas as psychology, sociology, political science, economics, business, engineering, physics, chemistry, biology, and medicine. Primarily for secondary school teachers of mathematics. Fall, Spring, or Summer, 3 credits, Letter graded (A, A-, B+, etc.)

#### **MAT 519: Seminar in Mathematics in Teaching and Learning**

Seminar format. This course involves deliberative group inquiry - through reading, writing and intensive discussion

- into mathematics teaching, learning and mathematics education research; analysis and design of cognitively demanding mathematical tasks; and analysis of students' mathematical thinking, written responses, and common misconceptions in the mathematics classroom. Each student completes an action research project focused on a topic selected with guidance from the instructor.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 520: Geometry for Teachers II**

Vector algebra on the plane and in the 3-space; area and volume of geometric figures; analytic geometry. Prerequisite: MAT 511

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 521: Introduction to Number Theory**

Congruences, quadratic residues, quadratic forms, continued fractions, Diophantine equations, number-theoretical functions, and properties of prime numbers.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 522: Introduction to Measure Theory**

Introduction to Lebesgue measure and integration. Aspects of Fourier series, function spaces, Hilbert spaces, Banach spaces.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 523: Analysis in Several Dimensions**

Continuity, differentiation and integration in Euclidean  $n$ -space. Differentiable maps. Implicit and inverse function theorems. Differential forms and the general Stokes' theorem.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 524: Abstract Algebra I**

Groups and rings together with their homomorphisms and quotient structures. Unique factorization, polynomials, and fields.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 525: Abstract Algebra II**

A continuation of MAT 524, covering modules over rings (including the structure theorem for Modules over Principal Ideal Domains), theory of fields, field extensions, and an introduction to Galois theory.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 526: Linear Algebra**

Finite dimensional vector spaces over a field, linear maps, isomorphisms, dual spaces, quotient vector spaces, bilinear and quadratic

functions, inner products, canonical forms of linear operators, multilinear algebra, tensors.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 529: Basic Topology and Geometry (for Masters Program)**

A broadly based introduction to topology and geometry, the mathematical theories of shape, form, and rigid structure. Topics include intuitive knot theory, lattices and tiling, non-Euclidean geometry, smooth curves and surfaces in Euclidean 3-space, open sets and continuity, combinatorial and algebraic invariants of spaces, higher dimensional spaces.

*There will be a required short paper on the fundamental group of a topological space or some similar topic.*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 530: Topology, Geometry I**

Basic point set topology; connectedness, compactness, continuity, etc. Metric spaces, function spaces, and topological manifolds. Introduction to algebraic topology; fundamental group and covering space; homology; applications.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 531: Topology, Geometry II**

Foundations of differentiable manifolds: differentiable maps, vector fields and flows, and differential forms and integration on manifolds. Stokes' theorem. Frobenius theorem. Lie derivatives. Immersions and submersions. DeRham cohomology, cochain complexes, degree of a map, Mayer-Vietoris Theorem.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 532: Real Analysis I**

Ordinary differential equations; Banach and Hilbert spaces; inverse and implicit function theorems; Lebesgue measure; general measures and integrals; measurable functions; convergence theorems for integrals.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 533: Real Analysis II**

Representations and decomposition theorems in measure theory; Fubini's theorem;  $L^p$  spaces; Fourier series; Laplace; heat and wave equations; open mapping and uniform boundedness theorems for Banach spaces; differentiation of the integral; change of variable of integration. Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 534: Algebra I**

Groups: normal subgroups, quotient groups, Lagrange's theorem, class formula, finite  $p$ -groups and solvable groups, Sylow's theorems, finitely generated abelian groups. Rings and modules: subrings, fields, prime and maximal ideals, quotient rings, ID's, PID's, UFD's, polynomial rings, field of fractions, the Wedderburn theorem, Hilbert basis theorem, finitely generated modules over a PID. Vector spaces: basis, linear maps and matrices, dual spaces, determinants, eigenvalues and vectors, inner products, spectral theorem for normal operators.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 535: Algebra II**

Vector spaces: Cayley-Hamilton Theorem, Jordan normal form, bilinear forms, signature, tensor products, symmetric and exterior algebras. Homological algebra: categories and functors, universal and free objects, exact sequences, extensions. Representation theory for finite groups: irreducible representations and Shur's Lemma, characters, orthogonality. Galois theory: splitting fields, finite fields, extension fields of various types, Galois polynomial and group, fundamental theorem of Galois theory, symmetric functions.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 536: Complex Analysis I**

Elementary functions, holomorphic functions. Cauchy theory, power series, classification of isolated singularities, calculus of residues, open mapping theorem, Riemann mapping theorem.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 537: Several Complex Variables**

Definition and basic properties of holomorphic functions and mappings. Analytic sets: Basic definitions, Local theory of Weierstrass, Meromorphic functions, Hartogs Phenomenon. Domains of convergence of power series. Domains of holomorphy. Pseudoconvexity and the Levi Problem. Complex manifolds, holomorphic vector bundles and Hermitian metrics. Cousin problems.  $L^2$  estimates for the inhomogeneous Cauchy-Riemann Equations and applications.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 538: Riemann Surfaces**

Basic definitions and examples. Holomorphic differential forms. Riemann-Hurwitz Theorem. The Riemann-Roch Theorem. The Dirichlet Problem. The Hodge Theorem for Riemann surfaces. Embeddings into Projective Space. Uniformization theorem(s). Abel's Theorem

and Jacobi's inversion theorem. Further topics may include: Sheaves and cohomology. Fields of meromorphic functions, valuations and connections with algebraic number theory. Monodromy and classification of branched covers.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 540: Advanced Topology, Geometry I**

Homotopy, fundamental group and higher homotopy groups, fiber bundles and covering, homotopy exact sequences of pairs, fiber bundles, classification of coverings, CW-complexes, homotopy excision, suspension, topological manifolds, topological classification of 1- and 2-manifolds.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 541: Algebraic Topology**

Singular and simplicial homology, their properties and equivalence, calculations for CW-complexes. Eilenberg-Steenrod axioms, cohomology, cup and cross products, Poincare, Lefschetz and Alexander dualities. Prerequisites: MAT 530, MAT 531, Fall

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 543: Representation Theory**

[will alternate with MAT 544] An introduction to representation theory, with a focus on explicit examples. Representations of finite groups (in characteristic zero), especially symmetric and alternating groups. Representation theory of compact Lie groups and semisimple Lie algebras (which may also be covered in MAT 552). Representations of classical groups, esp.  $GL(n)$  and orthogonal groups. Schur-Weil duality for representations of  $S_n$  and  $GL(n)$ , Young diagrams. Other possible topics include spin representations and Clifford algebras, representations of exceptional groups, applications to physics (e.g. hydrogen atom, spin, quarks), or an introduction to invariant theory. Sample textbooks: - W. Fulton and J. Harris, Representation Theory: A First Course - A. Kirillov, Introduction to Lie Groups and Lie Algebras - T. Bröcker, Representations of compact Lie groups - P. Etingof et al, Introduction to representation theory (<https://bookstore.ams.org/stml-59/>) - G. Heckman, Lie Algebras in Mathematics and Physics (<https://www.math.ru.nl/~heckman/Lie.pdf>) Prerequisites: MAT 535.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 544: Commutative and Homological Algebra**

An introduction to the techniques of commutative and homological algebra useful in algebra, algebraic geometry, number theory, and related fields. Review of rings and modules, tensor products and localization. Spectrum of prime ideals, Noetherian and Artinian rings and modules, completion, dimension theory, local rings, discrete valuation rings and Dedekind domains, integral dependence. Chain complexes, projective and injective resolutions, examples of derived functors (Ext and Tor), basic category theory (adjoint functors, natural transformations, limits and colimits), abelian categories. Prerequisite: MAT 535

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 545: Complex Geometry**

Foundational material and techniques in complex algebraic and differential geometry: Review of basic results in several complex variables/analytic geometry, sheaves and cohomology of sheaves, complex vector bundles, Chern classes, positivity, Kaehler manifolds, projective manifolds, Hodge decomposition for Kaehler manifolds, Kodaira vanishing theorem, Hard Lefschetz Theorem, divisors and line bundles, Bertini's theorem, Lefschetz theorem on  $(1,1)$  classes, blowing up, Kodaira's embedding theorem.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 550: Introduction to Probability**

[will alternate with MAT 551] Introduction to probability theory: independence, laws of large numbers, central limit theorems, martingales, Markov chains, and a selection of other topics such as ergodic theory, Brownian motion, random walks on graphs and groups, percolation, mixing times, randomized algorithms.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 551: Introduction to PDE**

Introduction to basic types of partial differential equations and techniques for studying them. First order equations; The Cauchy problem and the Cauchy-Kovalevskaya Theorem; Laplace, heat, and wave operators; Sobolev and Holder spaces; second order linear elliptic equations: weak solutions, existence and regularity theory;  $L^p$  and Schauder estimates; de Giorgi-Nash-Moser theory; introduction to nonlinear equations" Prerequisite: MAT 531, MAT 536

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 552: Introduction to Lie Groups and Lie Algebras**

An introduction to Lie groups and Lie algebras, as used in mathematics and physics. Basic facts about Lie groups and Lie algebras; classical groups. Structure theory of Lie algebras. Representation theory of  $sl(2, \mathbb{C})$ . Classification of complex semisimple Lie algebras via their root systems. Examples of exceptional Lie algebras. Other possible topics include the representation theory compact Lie groups and semisimple Lie algebras (with a focus on analytic techniques).

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 554: Harmonic Analysis**

An introduction to the methods and ideas of modern harmonic analysis, including: Fourier series and integrals (convergence, summability,  $L^p$ ); Maximal functions, weak type inequalities, interpolation; the Hilbert transform; singular integrals with Calderon-Zygmund kernels;  $H^1$  and Bounded Mean Oscillation; Muckenhoupt  $(A_p)$  weights; Multipliers; the  $T(1)$  theorem. Offered every second year.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 555: Ergodic Theory and Smooth Dynamics**

This course will give an overview of the main known topological, geometrical, and measure theoretical phenomena of smooth dynamics: 1) Zero entropy of dynamics: Circle diffeomorphisms, KAM, period doubling, renormalization. 2) Hyperbolic dynamics: stable manifold theorem, structural stability, central limit theorem, symbolic dynamics. 3) General smooth ergodic theory: Oseledec, Pesin, Birkhoff theorems. 4) Non-hyperbolic examples: non-uniform hyperbolic examples, homoclinic theory, Newhouse phenomenon, aspects of unimodal dynamics, aspects of Henon dynamics. Prerequisites: MAT 531, MAT 533, MAT 536 3 credits. Offered in Spring.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 556: One-dimensional Real and Complex Dynamics**

Advanced material and techniques in one-dimensional dynamics. In real one-dimensional dynamics: circle diffeomorphisms, combinatorics and kneading theory, wandering intervals, ergodic properties and invariant measures, renormalization. For complex one-dimensional maps: Julia, Fatou sets, the Mandelbrot set, fixed point theory, external rays, quadratic-like maps and little Mandelbrot copies.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MAT 560: Mathematical Physics I**

Classical mechanics: Lagrangian and Hamiltonian formalism, Hamiltonian group actions. Special relativity and Lorentz and Poincare groups. Classical field theories: Lagrangian and Hamiltonian formulation, Noether theorem, examples. Relativistic theories. Gauge theories: electrodynamics and Yang-Mills theories. General relativity: Einstein-Hilbert action, Einstein equations and Schwarzschild solution. Optional topics may include: Chern-Simons and topological field theories; Classical theory of spinor fields and supergeometry.

3 credits, Letter graded (A, A-, B+, etc.)

### **MAT 561: Mathematical Physics II**

Quantum mechanics: Heisenberg and Schrodinger formalism, examples. Feynman path integral. Quantum field theory: Canonical quantization, Fock space and creation/annihilation operators. Relativistic particles and unitary representations of the Poincare group. Path integral formalism for fields. Quantization of gauge fields, gauge fixing. Optional topics may include: Dirac equation and spinors, integration over anticommuting variables. Supersymmetric quantum field theories. Topological quantum field theories and other examples, localization.

3 credits, Letter graded (A, A-, B+, etc.)

### **MAT 562: Symplectic Geometry**

Hamilton's equations and their physical origin, symplectic manifolds and various submanifolds; Moser arguments including Darboux theorem and Moser neighborhood theorems, contact manifolds, contact hypersurfaces, symplectizations, Legendrian front diagrams, topological Legendrian knot invariants, almost complex structures compatible with symplectic form, Hamiltonian group actions and symplectic reduction, symplectic toric manifolds, h principle with emphasis on holonomic approximation theorem along with applications to symplectic and contact geometry, Gromov non squeezing theorem and a summary of pseudoholomorphic curve theory. Prerequisite: MAT 531

3 credits, Letter graded (A, A-, B+, etc.)

### **MAT 566: Differential Topology**

Vector bundles, transversality, and characteristic classes. Further topics such as imbeddings and immersions, intersection theory, surgery, and foliations.

Prerequisite: MAT 531

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

### **MAT 568: Differential Geometry**

Connections, curvature, geodesics, parallelism, and completeness. Riemannian manifolds,

geometry of sub-manifolds; method of integral formulas; applications to global extrinsic theorems. Riemannian curvature. Gauss-Bonnet theorem, Hopf-Rinow theorem.

Prerequisite: MAT 531

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

### **MAT 569: Differential Geometry**

A broad introduction to the fundamentals of modern Riemannian geometry, including major ideas and useful techniques: holonomy groups, symmetric spaces; Riemannian submersions; constructing manifolds of non-negative sectional curvature; Ricci and scalar curvature; Weyl curvature and conformal geometry; harmonic forms and the Hodge theorem; the Bochner technique; the Bishop-Gromov inequality; the Cheeger-Gromoll splitting theorem; Gromov-Hausdorff convergence. Prerequisite: MAT 568

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

### **MAT 589: Introduction to Algebraic Geometry**

This course offers a systematic introduction to algebraic geometry, from a modern, scheme-theoretic perspective.

3 credits, Letter graded (A, A-, B+, etc.)

### **MAT 598: Teaching Practicum**

Seminar and workshop for new teaching assistants.

Fall, 3 credits, S/U grading

### **MAT 599: M.A. Research**

May be repeated for credit.

### **MAT 602: Topics in Algebra**

Typical topics are drawn from group theory, ring theory, representation theory of groups and algebras, fields and commutative algebra, homological algebra.

Prerequisite: Permission of instructor  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **MAT 603: Topics in Algebra**

Typical topics are drawn from group theory, ring theory, representation theory of groups and algebras, fields and commutative algebra, homological algebra.

Prerequisite: Permission of instructor  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **MAT 608: Topics in Number Theory**

Typical topics are drawn from analytic number theory, algebraic number theory, diophantine equations, and transcendental number theory,

with indications of methods from algebra, geometry, analysis, and logic.

Prerequisite: Permission of instructor  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **MAT 609: Topics in Number Theory**

Typical topics are drawn from analytic number theory, algebraic number theory, diophantine equations, and transcendental number theory, with indications of methods from algebra, geometry, analysis, and logic.

Prerequisite: Permission of instructor  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **MAT 614: Topics in Algebraic Geometry**

Typical topics are drawn from varieties and schemes, algebraic curves, and their arithmetics. Fall

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **MAT 615: Topics in Algebraic Geometry**

Typical topics are drawn from varieties and schemes, algebraic curves, and their arithmetics. Fall

3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **MAT 620: Topics in Topology**

Topics of current interest such as foliations, surgery, singularities, group actions on manifolds, and homotopy theory.

Prerequisite: Permission of instructor  
Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **MAT 621: Topics in Topology**

Topics of current interest such as foliations, surgery, singularities, group actions on manifolds, and homotopy theory.

Prerequisite: Permission of instructor  
Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.

### **MAT 626: Topics in Complex Analysis**

Topics selected from Riemann surfaces, quasiconformal mappings, several complex variables, Fuchsian groups, Kleinian groups, moduli of Riemann surfaces and Kleinian groups, analytic spaces, singularities.

Prerequisite: Permission of instructor MAT 626 - Fall, MAT 627 -

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

*May be repeated for credit.*

### **MAT 627: Topics in Complex Analysis**

Topics selected from Riemann surfaces, quasiconformal mappings, several complex variables, Fuchsian groups, Kleinian groups, moduli of Riemann surfaces and Kleinian groups, analytic spaces, singularities.

Prerequisite: Permission of instructor MAT 626 - Fall, MAT 627 -

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 632: Topics in Differential Equations**

Typical topics are hyperbolic or elliptic systems, parabolic equations, spectral theory, finite difference equations, Cauchy-Riemann equations and complex vector fields, equations with constant coefficients, solvability of linear equations, Fourier integral operators, nonlinear equations.

Prerequisite: Permission of instructor

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 633: Topics in Differential Equations**

Typical topics are hyperbolic or elliptic systems, parabolic equations, spectral theory, finite difference equations, Cauchy-Riemann equations and complex vector fields, equations with constant coefficients, solvability of linear equations, Fourier integral operators, nonlinear equations.

Prerequisite: Permission of instructor

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 638: Topics in Real Analysis**

Topics selected from functional analysis, harmonic analysis, Banach algebras, operator theory. Prerequisite: Permission of instructor MAT 638 - Fall, MAT 639 -

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 639: Topics in Real Analysis**

Topics selected from functional analysis, harmonic analysis, Banach algebras, operator theory. Prerequisite: Permission of instructor MAT 638 - Fall, MAT 639 -

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 641: Topics in Lie Groups Theory**

Typical topics are universal enveloping algebras; free, solvable and nilpotent Lie algebras; Lie theory and formal groups; root systems, Dynkin diagrams, classification and representations of complex semisimple Lie algebras; method of orbits; representations of non-compact Lie groups; loop groups.

Prerequisite: MAT 552

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 644: Topics in Differential Geometry**

Typical topics will be drawn from areas such as comparison theorems, pinching theorems, Morse theory, characteristic classes, minimal varieties, Hodge theory, spectrum of the Laplacian, and geometry of general relativity.

Prerequisite: Permission of instructor MAT 644 - Fall, MAT 645 -

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 645: Topics in Differential Geometry**

Typical topics will be drawn from areas such as comparison theorems, pinching theorems, Morse theory, characteristic classes, minimal varieties, Hodge theory, spectrum of the Laplacian, and geometry of general relativity.

Prerequisite: Permission of instructor MAT 644 - Fall, MAT 645 -

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 648: Topics in Mathematical Physics**

Typical topics are mathematical methods of classical and quantum mechanics; methods of functional integration and its applications; infinite-dimensional Lie algebras, quantum groups and representations; conformal field theories; super-symmetry; topological quantum field theories; gauge theories and geometry in four-dimensions; supergravity and mirror symmetry; strings.

Prerequisite: Permission of instructor

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 649: Topics in Mathematical Physics**

Typical topics are mathematical methods of classical and quantum mechanics; methods of functional integration and its applications; infinite-dimensional Lie algebras, quantum groups and representations; conformal field

theories; super-symmetry; topological quantum field theories; gauge theories and geometry in four-dimensions; supergravity and mirror symmetry; strings.

Prerequisite: Permission of instructor

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 655: Topics in Dynamical Systems**

Typical topics are drawn from holomorphic and low-dimensional dynamics, hyperbolic dynamics, theory of Hamiltonian systems, ergodic theory, and bifurcation theory.

Prerequisite: Permission of instructor

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 656: Topics in Dynamical Systems**

Typical topics are drawn from holomorphic and low-dimensional dynamics, hyperbolic dynamics, theory of Hamiltonian systems, ergodic theory, and bifurcation theory.

Prerequisite: Permission of instructor

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 662: Advanced Topics in Algebra**

Prerequisite: Permission of instructor

*MAT 662 - Fall, MAT 663 -*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 663: Advanced Topics in Algebra**

Prerequisite: Permission of instructor

*MAT 662 - Fall, MAT 663 -*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 666: Advanced Topics in Topology**

Prerequisite: Permission of instructor

*MAT 666 - Fall, MAT 667 -*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MAT 667: Advanced Topics in Topology**

Prerequisite: Permission of instructor

*MAT 666 - Fall, MAT 667 -*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**MAT 670: Advanced Topics in Complex Analysis**

Prerequisite: Permission of instructor

MAT 670 - Fall, MAT 671 - Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 671: Advanced Topics in Complex Analysis**

Prerequisite: Permission of instructor

MAT 670 - Fall, MAT 671 - Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 674: Advanced Topics in Differential Equations**

Prerequisite: Permission of instructor

MAT 674 - Fall, MAT 675 - Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 675: Advanced Topics in Differential Equations**

Prerequisite: Permission of instructor

MAT 674 - Fall, MAT 675 - Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 678: Advanced Topics in Real Analysis**

Prerequisite: Permission of instructor

MAT 678 - Fall, MAT 679 - Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 679: Advanced Topics in Real Analysis**

Prerequisite: Permission of instructor

MAT 678 - Fall, MAT 679 - Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 682: Advanced Topics in Differential Geometry**

Prerequisite: Permission of instructor MAT 682 - Fall, MAT 683 -

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 683: Advanced Topics in Differential Geometry**

Prerequisite: Permission of instructor MAT 682 - Fall, MAT 683 -

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 685: Advanced Topics in Dynamics**

An advanced topic selected from holomorphic and low-dimensional dynamics, hyperbolic dynamics, KAM theory, smooth ergodic theory, geodesic flows, bifurcation theory.

Prerequisite: Permission of instructor Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 686: Advanced Topics in Dynamics**

An advanced topic selected from holomorphic and low-dimensional dynamics, hyperbolic dynamics, KAM theory, smooth ergodic theory, geodesic flows, bifurcation theory.

Prerequisite: Permission of instructor Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 690: Advanced topics in algebraic geometry**

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 691: Advanced topics in algebraic geometry**

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**MAT 696: Mathematics Seminar**

May be repeated for credit.

**MAT 697: Mathematics Colloquium**

May be repeated for credit.

**MAT 698: Independent Study**

May be repeated for credit.

**MAT 699: Dissertation Research on Campus**

Dissertation research under direction of advisor. Prerequisite: Advancement to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

Fall, Spring, and Summer, 1-9 credits, S/U grading

May be repeated for credit.

**MAT 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.

**MAT 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

All international students must received clearance from an International Advisor.  
Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.

**MAT 800: FULL TIME SUMMER RES**

May be repeated for credit.

## MBA

### Business Administration

**MBA 502: Finance**

The goal of the course is to introduce students to modern finance theory and its application to real world financial decision-making. We will use mathematics to develop financial models that address Valuation, Risk and Return, Capital Budgeting, and Capital Structure. Students will work on Excel-based case studies to further their understanding of real-world applications of those models. Prerequisite: Admission to the MS in Finance or 48 credit MBA programs

3 credits, Letter graded (A, A-, B+, etc.)

**MBA 503: Data Analysis and Decision Making**

An introduction to statistical techniques useful in the analysis of management problems. We motivate each topic by managerial

applications, and we analyze actual data sets using modern statistical software. Topics include probability estimation, hypothesis testing, and regression analysis. Prerequisite: Students must be admitted into one of the College of Business Programs

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MBA 504: Financial Accounting**

Introduction and exploration of basic financial accounting terminology, principles, concepts, and their relevant business applications.

This course will include the recording, summarization, and adjustment of financial transactions and the preparation and presentation of the basic financial statements. Other topics will include valuation methods for cash, accounts receivable, inventory and property, plant and equipment. This course is also offered as EMP 502. Prerequisite: Student in 48 credit MBA Program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MBA 505: Marketing**

A survey course covering the foundations of the marketing discipline. The course is designed to give students conceptual frameworks and tools to help firms meet demands of the marketplace in a profitable way. A wide range of marketing strategy topics (e.g., segmentation, positioning) and marketing tactics (the Four P's of Marketing -- Product, Price, Place and Promotions) will be covered, as well as development of the discipline's foundations (definition, philosophy, and the history of marketing). Prerequisite: Student in 48 credit MBA Program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MBA 506: Leadership, Team Effectiveness and Communications**

The purpose of the course is to introduce you to the multifaceted phenomenon of leadership, teams, and communications. It seeks to answer the following three questions: What do leaders really do? What makes teams effective? How do you create persuasive communications? The course addresses such topics as leadership styles, building motivated teams, and developing strategic communications. It examines these topics with a goal of not only imparting knowledge about evidence-based managerial practices but also assisting students to acquire the skills necessary to become business leaders, team builders and articulate communicators. Prerequisite: Students must be admitted into one of the College of Business Programs

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MBA 507: Ethics in Management**

This course examines the main ethical problems facing the modern manager. Emphasis is placed on the moral and ethical responsibilities that relate to investors, employees, customers, and the community. Students will learn the basic vocabulary of business ethics. Prerequisite: Students must be admitted into one of the College of Business Programs

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MBA 509: Continuous Quality Improvement**

This course provides students with understanding of concepts of TQM and quality improvement methods to attain world-class performance in business operations. Topics include policy deployment, process improvement methodology, daily work management, quality story methodology, six sigma, poka-yoke, ISO, Deming and Baldrige Awards criteria.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MBA 511: Technological Innovations**

Innovation drives the modern firm by the interaction of technical invention and managerial entrepreneurship. This course explores the variety of sources of new products, processes, and services, such as inventors, universities, research and development departments in industry, and government labs. In addition, the course explores the variety of ways of bringing new products, processes, and services to market, including startup firms, acquisitions, mergers, and entrepreneurship within the firm. Case studies showing the interaction of invention and entrepreneurship are analyzed. A term project is required in which the student either analyzes the history of invention and entrepreneurship in a major firm or writes a business plan for high technology startup firm. Prerequisite: Students must be admitted into one of the College of Business Programs

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MBA 512: Business Strategy**

The focus of this course is on the strategic issues and challenges facing companies in today's competitive landscape. As a capstone, this course integrates and builds upon your experiences in the functional areas of business and provides an opportunity for students to evaluate and apply knowledge from their core business courses. The study of strategic management will help students improve their understanding and expertise in the functional areas of business, focusing on how managers work together to develop a strategy that will capture market share and increase shareholder wealth. A fundamental question of strategy

is: Why are some firms more successful than others? This course should be taken in the last semester of your degree program.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MBA 514: Collective Bargaining and Arbitration in the Public Sector**

This course presents an overview of the history, procedures, and problems of public sector labor relations, and comparisons with the private sector. The role of public opinion and politics in public sector bargaining will be explored. Students will role play the negotiation of a public sector contract: preparation of bargaining package, negotiation, mediation, fact-finding, arbitration. They will also prepare, present, and critique a public sector grievance case from its shop origins to its final disposition by arbitration.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MBA 515: Managing in a Global Economy**

Because both the similarities and differences of organizations and management across national boundaries must be a part of the knowledge base of tomorrow's manager, this course examines proprietorships, partnerships, corporations, governmental regulatory agencies, public authorities, voluntary social services, multinational corporations, and strategic alliances, as well as combinations of these organizations, across sectoral and national boundaries. Prerequisite: Students must be admitted into one of the College of Business Programs

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MBA 517: Information Systems for Management**

Information systems and its role in strategic planning and managerial operations in business. The systems approach to the analysis, design, and implementation of information systems. Recent developments in information technology and its impact on existing and future information systems. Prerequisite: Students must be admitted into one of the College of Business Programs

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MBA 521: Industry Project**

Under faculty supervision, groups of students work for clients on management issues in a variety of areas such as health care, MIS, marketing, data analysis, business plans, and the like. The course provides students with the opportunity to apply the analytic skills they have learned in the classroom to actual management problems. Students also gain practical experience in business writing, giving

formal presentations, and working in teams. The format for the course is a combination of work in the classroom and "lab" work. The lab work consists of visits with a client, developing a formal proposal, generating a final report, and various other elements of a professional consulting arrangement.

Prerequisite: Students must be in the 36 credit General MBA, MBA in Accounting, MBA in Finance or MBA in Marketing program; MBA 501, 502, 503, 504, 505, 506, and 511

*6 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 522: Business Project**

Students will work in consultation with the instructor to identify and then define a business problem, at which point they will write a formal business proposal to study the problem using published data. After educating themselves thoroughly about the variables involved with the business problem, students will apply high-level critical thinking to develop a written recommendation to solve or mitigate the business problem. Students will then create a video presentation of their recommendation. The course is operated as a mixture of lectures during which students will receive instruction about critical thinking, data analysis, evaluation of published research, business writing, and business presenting, and seminars during which students will consult with the instructor during every phase of their specific projects. Prerequisite: Students in College of Business graduate programs; 15 credits for 36 credit programs, G2 standing for 48 credit programs

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 530: Employee Dispute Resolution and Conflict Management**

The methods and procedures for reaching negotiated agreements. Topics include reducing conflict and confrontation between contending parties, analysis of the techniques of win-lose and win-win negotiation, and mediation. Students are expected to participate in a series of workshop activities and simulated cases to reveal how negotiation and mediation are applied to resolving difficulties in business management, labor relations, international and domestic affairs, patient/doctor/hospital relations, and other areas where negotiation and mediation play a significant role in modern life.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 531: New Developments in Human Resource Management**

This is an advanced course, designed to examine new developments and professional concerns in human resource management. The course focuses on such topics as productivity

in the American workplace; developing union/management cooperation for productivity; methods of training in the workplace; impact of the computer revolution on the personnel field; and specialized personnel needs of the new workforce in a high-tech and service economy.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 538: Organizational Development and Change Management**

This course will acquaint students with types of organizational change and the roles of human resources managers as change agents and internal consultants. Cases, group exercises, and class discussions are used to examine change methods, employees' reactions to change, facilitation techniques, and evaluation methods. Roles of leaders, managers, employees, and human resources professionals are considered. Targets of change include job designs, interpersonal relationships, downsizing/rightsizing and organizational structures. Quality improvement, employee involvement, and professional development are studied as examples of change strategies. Students learn how to help their co-workers cope, as well as how to become trusted business advisors within the organization. This course is offered as both HRM 538 and MBA 538 (formerly CEX 538). Prerequisite: MBA 532/HRM 532.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 540: Data Mining for Business Intelligence**

The recent advances in the Internet and information technologies have resulted in an explosion of demand for big data analytics. The importance of data mining has already been recognized widely in the industry including many business areas, such as marketing science, financial analysis, and corporation management. In this course, we will be focusing on both key concepts and models of data mining and their implementations based on real-world data in business. Students will learn to process data using Excel, and apply data mining models using Weka, a data mining software. Prerequisite: MBA 503, Enrolled in College of Business Graduate Program

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 543: Business Analytics**

An introduction to mathematical models useful in the analysis of management problems. We motivate each topic by managerial applications, and we analyze problems using modern software. Topics include forecasting, linear, nonlinear, and integer optimization, simulation, Markov processes, decision

analysis, and multi-criteria decision making. Prerequisite: College of Business & MBA 503 prerequisite/co-requisite

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 544: Supply Chain Management and Analytics**

Businesses engage in a diverse set of activities in their daily operations including production planning, resource procurement, inventory management, distribution, and interaction with other firms. The goal of supply chain management is to maximize the economic value of these activities through system level coordination. A successful supply chain streamlines the flow of materials, goods, information, and capital along each component of the supply chain. Prerequisite: Enrolled in one of the College of Business Graduate Programs & MBA 543 co-requisite

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 548: Fundamentals of the Bioscience Industry**

A 4-module course set up to provide students with a comprehensive introduction to the complexities of the bioscience business environment.

Prerequisite: Must be either a BME or MBA graduate student (West Campus). All other students must obtain permission from the instructor.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 553: Simulation and Modeling**

A comprehensive course in formulation, implementation, and application of simulation models. Topics include data structures, simulation languages, statistical analysis, pseudo-random number generation, and design of simulation experiments. Students apply simulation modeling methods to problems of their own design. This course is offered as CSE 529, AMS 553 and MBA 553.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 557: Introduction to Professional Consulting**

The Introduction to Professional Consulting course covers the complete process of business consulting, from developing business proposals and mobilizing consulting teams, to producing deliverables and deploying solutions. The course is designed to provide MBA students with the background and basic skills needed to pursue a career in consulting. The course covers how professional service companies conduct consulting in areas such as strategy consulting, business change, training, organizational development, and IT. Practical



concepts, tools, techniques and frameworks are covered that can be used in all forms of consulting and in any area of application. The course emphasizes the competencies needed to become a trusted advisor.

*Offered*

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 566: Business law**

This course provides an understanding of the nature of law and its role in business and surveys some of the regulatory issues faced by businesses. The law of business contracts will be examined in depth. Other topics include property rights, bailments, and agency concepts, business organizations, securities law and regulation, and laws and regulations impacting technology development. This course requires case analysis, problem solving, development of critical thinking skills, and oral and written communication. Prerequisite: Students must be admitted into one of the College of Business Programs

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 570: New Venture Creation**

This course helps the student develop a business plan for his or her own business idea or a plan for an entrepreneur. With the support of visiting practitioners, students take a business idea through all the planning steps. A business plan suitable for presentation to potential investors will be written and presented orally at the end of the class.

*3 credits, Letter graded (A, A-, B+, etc.)*

Prerequisite: Admission to one of the MBA programs

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 571: Sustainable Entrepreneurship**

Students explore the concept of social entrepreneurship including motivation and skills for advocacy, entrepreneurship, and leadership. Topics include forms of social entrepreneurship (private, public, and not-for-profit), venture capital and fund raising, market analysis, marketing, communications, human resources and human relations, including negotiation and conflict resolution methods. Students will explore models of corporate social responsibility, university service to the community, and grass-roots ventures spawned by perceived need and the will to make a difference. Students work in teams to develop a strategic business plan for their own venture and present their proposals to the class. *3 credits, Letter graded (A, A-, B+, etc.)* Prerequisite: Admission to one of the MBA programs

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 574: Project Management**

This course will explore the theory and practice of managing a project. We will examine the various tools that are available to monitor and measure managerial tasks and to define common business processes. Every aspect of business entails the execution of a series of defined tasks and the associated allocation of corporate resources. From developing new products to implementing customer loyalty programs, managers must understand business processes including their associated tasks, inter-relationships and transformations. Project management involves three primary activities: defining manageable tasks, mapping their logical flow, and creating an implementation process. In the course, we will explore ways to manage these functions successfully to increase the probability of achieving desired results. We will use the latest software tools including: MS Project, MS Visio, @Risk Project Simulation, Business Plan Pro 2007, WIP Information System - online and C-Commerce tools such as Instantstream. We will use Blackboard extensively to interact (c-commerce), post grades, assignments, information and notices. Access Blackboard using [blackboard.sunysb.edu](http://blackboard.sunysb.edu).

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 584: Transforming Electricity Markets With Renewable Energy**

This course is intended to provide students with an overview of how the business of electric energy works. This will include an introduction to wholesale electric energy markets (including energy pricing in centralized markets, capacity auctions, and hedging), how to prevent market abuse, the role of regional grid operators, how new electric transmission facilities and generating stations are planned, and how green energy (wind, hydro, and solar) and conservation measures are integrated into the wholesale electric markets. The course will also touch on recent trends in retail electric markets. Finally, this course will also explore the role of federal and state regulators and the courts in the wholesale electric energy business.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 586: Virtual Communications and Meetings**

Analyzes the growth of and interaction among wireless markets. These markets include devices and services for wide area broadband networks and 802.11b wireless local area networks. Growth factors include business strategies executed by major

firms and startups, and roles played by government regulations and community groups in development and delivery of network technology. Student projects for clients or one's own startup investigate wireless strategies in consumer, home, commercial, educational or health care markets.

*Prerequisites: MBA 517, MGT 571, MGT580. Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 587: Decision Support Systems**

An advanced project-oriented course focusing on the interrelationships among management information systems, statistics, and management science. Both model-driven and data-driven decision support systems will be considered. Students will identify an appropriate business application, select suitable management science and statistical methodologies, build the required information system, and demonstrate how their decision support system addresses the stated management problem. Prerequisite: MBA 503 & MBA 543

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 588: Database Management**

Database processing is the foundation upon which all current applications rely and represent the repositories of business intelligence that play a crucial role in the strategic success or failure of a corporation. Even though they vary in size, complexity and organizational scope, there is an underlying common database engine that can be used to manipulate and analyze the stored information. The purpose of this course is to introduce the business professional to the fundamental concepts of database creation, design, application integration, maintenance, management and subsequent analysis.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MBA 589: Operations Management**

A managerial approach to the concepts, issues, and techniques used to convert an organization's resources into products and services. Through the course, students will develop an ability to understand key concepts in operations management, analyze the performance of systems quantitatively, gain insights into performance characteristics, recognize various trade-offs in operations management decisions, and apply concepts and analytical methods to help improve organization's operational performance. Prerequisite: MBA 503, working knowledge of probability, and statistics is necessary. Student in 48 credit MBA program

*3 credits, Letter graded (A, A-, B+, etc.)*

**MBA 592: Organizational Behavior**

An approach to understanding the behavior of individuals in organizations is developed, with emphasis on implications for effective management. This approach is used to analyze decision problems encountered in managing human resources. Topics include individual and group decision-making skills, recruitment and selection, employee ability, motivation and incentive systems, job satisfaction, performance assessment and management, retention, training, and employee development. Prerequisite: Student in 48 credit MBA program

*3 credits, Letter graded (A, A-, B+, etc.)*

**MBA 595: Individual Directed Research in Business**

Designed to accommodate independent research projects on an individual basis with faculty guidance.

*Fall and Spring, 1-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**MBA 596: Special Topics in Business**

These courses are offered on topics that are timely and significant to the profession. The courses are led by experts in the particular topic. Prerequisite: Student in College of Business Graduate Program

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

**MBA 599: Business Internship**

An academic internship is a form of experiential education that integrates knowledge and theory learned in the classroom with practical application and skill development in a professional setting. An integral component of the experience that distinguishes it from other types of work is one or more forms of structured and deliberate reflection based on predetermined learning objectives.

*Fall, Spring, and Summer, 1-3 credits, Letter graded (A, A-, B+, etc.)*

**MBA 800: Summer Research**

*May be repeated for credit.*

# MCB

## Molecular and Cellular Biology

**MCB 500: Directed Readings in Molecular and Cellular Biology**

Directed readings in topics of current interest, under supervision of a faculty sponsor.

Prerequisite: matriculation in MCB graduate program or permission of instructor.

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**MCB 503: Molecular Genetics**

Introduces the classical work and current developments in lower and higher genetic systems. Covers gene structure and regulation in prokaryotic and eukaryotic organisms, mutational analysis and mapping, transposable elements, and biological DNA transfer mechanisms. Bacteriophage as well as lower and higher eukaryotic systems are used to illustrate aspects of molecular genetic structure and function. This course is offered as both MCB 503 and HBM 503. Prerequisite: matriculation in graduate program or permission of instructor

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**MCB 509: Experimental Molecular & Cellular Biology**

An introduction to modern biochemical research techniques. The student spends a half term in the laboratory of each of four different members of the staff selected in consultation with the course director. In each laboratory the student participates in some aspect of the ongoing research pursued by the faculty member. Prerequisite: matriculation in MCB graduate program or permission of instructor.

*Fall and Spring, 1-4 credits, Letter graded (A, A-, B+, etc.)*

**MCB 510: Experimental Molecular & Cellular Biology**

An introduction to modern biochemical research techniques. The student spends a half term in the laboratory of each of four different members of the staff selected in consultation with the course director. In each laboratory the student participates in some aspect of the ongoing research pursued by the faculty member. Prerequisite: matriculation in MCB graduate program or permission of instructor.

*Fall and Spring, 1-4 credits, Letter graded (A, A-, B+, etc.)*

**MCB 517: Biomembranes**

Examines the molecular architecture of membranes; the structure, organization, functions, and assembly of lipids and proteins in biological membranes.

*Prerequisite: Matriculation in Graduate Program or permission of instructor.*

*Fall, 1 credit, Letter graded (A, A-, B+, etc.)*

**MCB 520: Graduate Biochemistry I**

Several topics in modern biochemistry are treated at an advanced level. Topics covered will include protein structure, enzyme kinetics and mechanisms, and enzyme regulation. May not be taken by students with credit for CHE 541. Prerequisite: undergraduate biochemistry course, matriculation in graduate program or permission of instructor

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**MCB 531: Graduate Seminar in Molecular & Cellular Biology**

Seminars are given by graduate students on current literature in the fields of biochemistry, molecular biology, cell biology or developmental biology. Prerequisite: matriculation in graduate program or permission of instructor.

*1 credit, Letter graded (A, A-, B+, etc.)*

**MCB 532: Graduate Seminar in Molecular & Cellular Biology**

Seminars are given by graduate students on current literature in the fields of biochemistry, molecular biology, cell biology or developmental biology. Prerequisite: matriculation in graduate program or permission of instructor

*Spring, 1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated 3 times FOR credit.*

**MCB 550: Entering Mentoring**

This seminar series is designed for graduate students and postdoctoral researchers of biology who may become science faculty. The goal is to help them become effective mentors through discussions, collective experiences, and novel strategies to improve mentoring skills. This course is comprised of eight one-hour sessions in which topics related to the role and responsibilities of a mentor are discussed. Topics touch on ethical, intellectual, personal, and interpersonal issues that are associated with effective mentoring. Prerequisite: Must be MCB graduate student or permission of instructor. Summer only, 1 credit, S/U grading

*1 credit, S/U grading*

**MCB 555: Big Data in Biology**

An introduction to big data in biology, with an emphasis on the concepts, research questions, methods, and data analysis. Particular emphasis is placed on sequencing methods and analysis, genomics, transcriptomics, proteomics, cellular networks, high-throughput phenotyping, and systems genetics.

*2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**MCB 599: Dissertation Research**

Original investigation under the supervision of a member of the staff. Prerequisite: matriculation in MCB graduate program or permission of instructor.

*Fall and Spring, 1-12 credits, S/U grading  
May be repeated for credit.*

### **MCB 601: Colloquium in Molecular and Cellular Biology**

A weekly series of talks and discussions by visiting scientists covering current research and thinking in various aspects of molecular and cellular biology. Required for all MCB graduate students. Attendance is mandatory. Visitors welcome. Prerequisite: matriculation in MCB graduate program or permission of instructor.

*Fall and Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

### **MCB 602: Colloquium in Molecular and Cellular Biology**

A weekly series of talks and discussions by visiting scientists covering current research and thinking in various aspects of molecular and cellular biology. Required for all MCB graduate students. Attendance is mandatory. Visitors welcome. Prerequisite: matriculation in MCB graduate program or permission of instructor.

*Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

### **MCB 603: Student Seminar in Molecular and Cellular Biology**

Seminars given by MCB graduate students on the progress of their own thesis research. Required of all students every term in which they are registered in Graduate Studies in Molecular Biology and Biochemistry. Attendance is mandatory. Visitors welcome. Prerequisite: matriculation in MCB graduate program or permission of instructor.

*Fall, 1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **MCB 604: Student Seminar in Molecular and Cellular Biology**

Seminars given by MCB graduate students on the progress of their own thesis research. Required of all students every term in which they are registered in Graduate Studies in Molecular Biology and Biochemistry. Attendance is mandatory. Visitors welcome. Prerequisite: matriculation in MCB graduate program or permission of instructor.

*Fall, 1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **MCB 656: Cell Biology**

Introduction to the structural and functional organization of cells and tissues and to the way structure relates to function. Particular emphasis is placed on nuclear and chromosomal structure, signal transduction, protein translocation, the cytoskeleton and the extracellular matrix. The interaction of cellular structures and components and their regulation is stressed as is the organization and interaction of cells in tissues. The course is comparative and includes examples of cells and tissues from vertebrates, invertebrates, plants, and prokaryotic systems. Prerequisite: matriculation in graduate program or permission of instructor.

*Spring, 3-4 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MCB 657: Principles of Development**

This course deals with developing systems at all levels from the morphological to the molecular. Illustrative material from both animal and plant kingdoms is used. Special attention is given to gametogenesis, genetic control of early development, transcriptional and translational control of protein synthesis, the role of cell division and cell movements, and cell-to-cell interactions in defining developing systems.

*Prerequisite: MCB 656, matriculation in graduate program or permission of instructor.  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MCB 699: Dissertation Research on Campus**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab. Prerequisite: matriculation in MCB graduate program or permission of instructor.

*Fall and Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **MCB 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5), matriculation in MCB graduate program or permission of instructor. Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus.

*All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.*

*Prerequisite: matriculation in MCB graduate program or permission of instructor.  
Fall and Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **MCB 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5) in MCB graduate program or permission of instructor. Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must receive clearance from an International Advisor.  
Fall and Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **MCB 800: Summer Research**

Prerequisite: matriculation in MCB graduate program or permission of instructor.

*Summer, S/U grading  
May be repeated for credit.*

## **MCR**

### **Clinical Investigation**

#### **MCR 501: Experimental Clinical Research**

This course will (1) introduce trainees to formulation of a research question and hypothesis testing and; (2) introduce trainees to various research methodologies and how they are used to answer clinical research questions. This is not a clinical trials design course but rather is focused on how a clinical paradigm is used to formulate a research question and develop a hypothesis.

*Offered  
Summer, 1 credit, Letter graded (A, A-, B+, etc.)*

#### **MCR 506: Biostatistics 1 for Clinical Scientists**

This is Part One of a two-part biostatistics training sequence. This course serves as an introduction to the principles and methodologies of biostatistics for clinical researchers. The material covered includes probability and distribution, descriptive statistics, point and interval estimation, hypothesis testing, correlation, linear regression, ANOVA, ANCOVA, logistical

regression, survival analysis, and non-parametric tests.

*Prerequisite: High school algebra  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MCR 507: Biostatistics II**

The second course in biostatistics in the clinical scientists training sequence is intended to further acquaint the trainees with the commonly used procedures covered in the first course and to learn to apply these procedures to real and simulated datasets using statistical software. As part of the course requirement, the trainees will need to complete a course project analyzing an appropriate research data set. Offered

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MCR 514: Epidemiology for Clinical Scientists**

The aims of this course are to introduce trainees to basic epidemiologic concepts, methods and topics, and to provide them with skills to critically evaluate published literature, interpret data, and develop an evidence based approach to medical practice. Upon completion, trainees will be able to apply basic epidemiologic principles and methods to problems encountered in clinical medicine. Co-requisite: MCR 506 Offered

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MCR 525: Contemporary Topics in Clinical and Translational Research**

This monthly lunchtime seminar is designed to expose clinical and basic science students to contemporary topics in clinical and translational research. Topics include. "-Omics", Biobanking and Biorepositories, Biomedical Informatics, Imaging and Big Data. Lunch will be provided.

*1 credit, S/U grading  
May be repeated 3 times FOR credit.*

### **MCR 549: Legal and Regulatory Issues in Clinical Research**

Major contemporary legal and regulatory issues associated with scientific research will be discussed. Additionally, this course will introduce students to the history behind the regulations that safeguard human subjects, will educate students in detail about their responsibilities as clinical investigators.

*Offered  
Summer, 1 credit, Letter graded (A, A-, B+, etc.)*

### **MCR 562: Data Management and Informatics for Clinical Scientists**

This course provides students with computer and data management skills required to complete a research project. Questionnaire development, data processing and analysis, and issues surrounding data security are covered. Students will learn to use Excel, Access and Velos eResearch for data input and management, SPSS for data processing and analysis, and powerpoint and Word for presentations and report generation. Hands-on exercises are used to develop skills.

*Offered  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MCR 566: Clinical Research Methods**

This course aims to introduce trainees to the different aspects of clinical trial design, conduct, management and analysis; and to provide trainees with a basic understanding of the key elements of clinical trial design and practice.. 2 credits, Fall term, Professor Leslie Hyman, PhD

*2 credits, Letter graded (A, A-, B+, etc.)*

### **MCR 567: Research in Population Health and Clinical Outcomes Research**

This course provides an overview of research methods as applied to questions raised in the fields of population health and clinical science. It covers the topics of risk adjustment, cost assessment, access to, utilization and quality of care, outcomes and health status measurement, and health system performance.

*Offered  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MCR 580: GCRC/SAC Scientific Review Process**

Students will understand and participate in the process of scientific review of human subject research protocols submitted to the GCRC.

*Offered  
Fall, 1 credit, Letter graded (A, A-, B+, etc.)*

### **MCR 601: Ethics and Professionalism in Clinical Research**

Using an interactive case-based format, the topics covered include the justification of human research and reasonable balance of risk versus benefits; the use of animals in biomedical research; issues of informed consent and IRB paperwork processing; the ethical challenges of clinical research; ethical concerns associated with genetic testing and screening; research involving minors and adults of questionable capacity to consent; conflict of interest and funding of research for individuals and institutions; investigator responsibilities with regard to fulfilling government regulations; scientific fraud and whistle blowing; the scientific community

and mentoring; authorship and attribution; special populations and inclusion of minorities and; emergency research-related special requirements. Offered Winter, 2 Credits, ABCF Grading

*2 credits, Letter graded (A, A-, B+, etc.)*

### **MCR 630: Technology Transfer**

Students will be exposed to concepts including disclosing inventions, protecting intellectual property, working with industry/working with university faculty, licensing, collaborative agreements, intellectual property protection and management and commercialization.

*Offered  
Spring, 0-6 credits, Letter graded (A, A-, B+, etc.)*

### **MCR 650: Molecular and Laboratory Methods in Clinical Research**

The aims of this course are to introduce trainees to laboratory methods relevant to clinical research with an emphasis on molecular medicine.

*Offered  
Fall, 2-3 credits, Letter graded (A, A-, B+, etc.)*

### **MCR 684: Writing a Research Proposal**

This course will help students develop the skills necessary to design a research proposal including framing the specific aims, evaluation of the literature, description of preliminary data and research methods, proposed biostatistical analysis and power calculations, defining eligibility criteria, and development of a safety plan, issues of recruitment including under-represented ethnic and racial groups.

*Offered  
Summer, 1 credit, Letter graded (A, A-, B+, etc.)*

### **MCR 692: Research in Progress**

This course meets weekly and is attended by all trainees and mentors. Trainees present updates of their research endeavors and receive input from experienced mentors. Trainees are exposed to discussion among mentors on research design and interpretation.

*Offered  
Fall and Spring, 1 credit, S/U grading*

### **MCR 693: Clinical Research Opportunities at Stony Brook University and Affiliated Institutions**

The aims of this series are to familiarize trainees with the range and breadth of multidisciplinary clinical research carried out at Stony Brook and its affiliated institutions, and to provide examples of successful team

approaches to study design, data analysis and ethical issues in clinical research. At each semester, a research team will be highlighted that will describe how the team came to be formed followed by a presentation about the research hypothesis, study design, data collection and analysis, and future work to follow.

*Offered*

*Fall, Spring, and Summer, 1 credit, Letter graded (A, A-, B+, etc.)*

### **MCR 694: Seminars in Clinical Research**

Offered

*Fall and Spring, 1 credit, Letter graded (A, A-, B+, etc.)*

### **MCR 695: Defining and Developing a Career Path in Clinical and Transnational Research**

Students will read and discuss chapters from the Howard Hughes Medical Institute "Making the Right Moves" online textbook and develop a career plan. Topics include how to set up your lab, networking, conflicting resolution and managing your staff.

*1 credit, S/U grading*

### **MCR 696: Presenting Research Results to Peer Audiences**

Students will have reading assignments on designing and giving a great talk as well as how to write a paper suitable for publication in a peer reviewed journal. Students will have an opportunity to practice giving a talk about their research projects. Masters students will present a summary of their thesis project to date. Each student in the Masters in Clinical Research Program will present a final project as part of the Annual Research Symposium held the last day of class.

*1 credit, S/U grading*

### **MCR 698: Practicum in Teaching**

The course provides hands-on experience in classroom teaching and mentoring students in the conduct of clinical research. Other activities may include preparation and supervision of class projects, exams, homework assignments, creation of voice over PowerPoint lectures, and participation in interactive Blackboard student discussions. A final report that summarizes the activities completed and provides a self-reflection on the experiences gained during the practicum is required at the conclusion of the course. Participation by advanced graduate student under the supervision of program faculty. Prerequisite: Permission of the supervising

faculty. 3 credits, S/U grading May be repeated 2 times FOR credit.

*3 credits, S/U grading  
May be repeated for credit.*

### **MCR 699: Masters Thesis**

Original investigation in clinical research undertaken with the supervision of the student's Thesis Committee. 1-6 Credits, ABCF Grading

*1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 4 times FOR credit.*

## **MEC**

### **Mechanical Engineering**

#### **MEC 500: Modeling and Control of Manufacturing Systems**

Introduction to manufacturing system modeling and analysis. Fundamental principles of production systems. Analytical and simulation approach to production system performance analysis, continuous improvement, and design. Topics include mathematical modeling of production systems, production lines with various statistic distribution models of machine reliability, improvement analysis and real-time decision making. Includes both the relevant fundamental concepts and the extensive practical knowledge base on which manufacturing research, development, and design depend. The students are expected to complete a project, in which they will interpret real-life manufacturing plant operation in the light of course principles and suggest improvement solutions.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MEC 501: Convective Heat Transfer and Heat Exchange**

Differential and integral formulation. Exact and approximate solutions. Topics include parallel and boundary layer flows, similarity solutions, external and internal flows, laminar and turbulent convection, and forced and free convection.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **MEC 502: Conduction and Radiation Heat Transfer**

Heat conduction and conservation laws; formulation of conduction equations in differential and integral forms; analytical solution techniques including Laplace transforms and separation of variables; scaling analysis; black body radiation, Kirchoff's law, analysis of heat conduction problems; analysis of radiative exchange between surfaces and

radiative transport through absorbing, emitting, and scattering media.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **MEC 506: Energy Management in Commercial Buildings**

Topics include basic heating, ventilating, and air-conditioning (HVAC) system design and selection for commercial buildings (includes both low-rise and high-rise buildings); selection of central plant components and equipment; calculation of space heating and cooling load; computer techniques for estimating annual energy consumption; design tools for reducing energy consumption; ASHRAE codes; building controls; BACnet.

*Prerequisite: B.S. in mechanical engineering or related fields*

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **MEC 507: Mathematical Methods in Engineering Analysis I**

An introduction to the use of mathematical analysis techniques for the solution of engineering analysis problems and the simulation of engineering systems. Both continuous and discrete methods are covered. Initial and boundary value problems for ordinary and partial differential equations are treated.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **MEC 508: Mathematical Methods in Engineering Analysis II**

A continuation of the material covered in MEC 507. Introduction to and application of numerical analysis techniques used in engineering such as finite elements and fast Fourier transforms. Determination of response characteristics of dynamic systems. Combinatoric methods and techniques for optimization of engineering design and systems/process analysis problems.

*Prerequisite: MEC 507*

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **MEC 509: Transport Phenomena**

Introduction to differential and integral formulation of mass, momentum, and energy transport in fluids and solids. Topics include viscosity, laminar flow, turbulent flows, conduction, convection, heat transfer coefficients, radiation, boundary layers, diffusion, and applications to energy technology.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 510: Object-Oriented Programming for Scientists and Engineers**

Practical introduction to C++ and object-oriented programming for a first programming course for scientists and engineers. Covers basics of application software development such as problem decomposition, structure charts, object modeling, class diagrams, incremental code building, and testing at a beginner's level. Features the concepts of abstract data types (ADT), encapsulation, inheritance, composition, polymorphism, operator and function overloading besides studying UML (Unified Modeling Language) as a graphical representational design technique. The course follows the evolution of programming ideas from the use of a single function to the use of structural charts and functions to modularize and finally to the use of object-oriented programming.

*Prerequisite: B.S. in science or engineering Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 511: Mechanics of Perfect Fluids**

Lagrangian and Eulerian frames. Dynamical equations of momentum and energy transfer. Two-dimensional dynamics of incompressible and barotropic perfect fluids and of the compressible perfect gas. Conformal mapping applied to two-dimensional fluid dynamics. Jets and cavities. Surface waves, internal waves. Perfect shear flows.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 512: Mechanics of Viscous Fluids**

The role of viscosity in the dynamics of fluid flow. The Navier-Stokes equations, low Reynolds number behavior including lubrication theory, percolation through porous media, and flow due to moving bodies. High Reynolds number behavior including steady, unsteady, and detached boundary layers, jets, free shear layers, and wakes. Phenomenological theories of turbulent shear flows are introduced.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 514: Advanced Fluid Mechanics: Introduction to Turbulence**

Introductory concepts and statistical descriptions: kinematics of random velocity fields; equations of motion; experimental techniques: isotropic turbulence, closure problem; transport processes.

*Prerequisite: MEC 512*

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 516: Energy Technologies Laboratory**

Experiments in the areas of infrared imaging, heat pumps, batteries/power electronics, solar thermal, thermal conductivity, and insulation. The focus is on system efficiencies, system integration, and design for residential markets. The fundamentals of the relevant technologies will be presented and utilized in the laboratory sessions. Student groups are assigned laboratory projects focused on applying various energy technologies to solve engineering problems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 517: Energy Technologies Laboratory II**

Experiments in the areas of thermoelectric power, fuel cells, photovoltaics, wind turbines, hydrogen storage, hydrogen generation, and power electronics in addition to related project work. The focus is on system efficiencies, system integration, and design for residential markets. Student groups are assigned laboratory projects to build experience applying various energy technologies to solve problems.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 518: Energy Harvesting**

MEC 518 Energy Harvesting is designed to systematically disseminate recent advances in various energy harvesting technologies in the last decade. The topic will include mechanical vibrations, piezoelectric materials, electromagnetic transducers, thermoelectric materials, electromechanical system design, power electronics, and control, as well as the applications of energy harvesting to vehicles, transportations, civil structures, and ocean waves.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 520: Smart Materials for Sensing and Actuation**

An introduction to the properties, characterization, manufacturing, and applications of various smart materials and structures. This course will cover sensors, actuators, and energy devices based on smart materials, including piezoelectric materials, electroactive polymers, magnetostrictive materials, magnetorheological fluids, and shape memory polymers. The goal is to expose students to fundamentals of smart materials and structures needed for the design and applications in engineering applications.

*3 credits, Letter graded (A, A-, B+, etc.) May be repeated for credit.*

### **MEC 521: Thermodynamics**

This course begins with a review of the fundamental concepts and laws of classical thermodynamics. Then the thermostatic theory of equilibrium states and phase transitions is treated, followed by the thermodynamic theory of processes of simple systems and composite systems, including heat engines. Special topics may include statistical thermodynamics, irreversible thermodynamics, radiation and photovoltaic energy conversion, biological thermodynamic processes, and other topics of current interest.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 522: Building Energy Dynamics and Technology**

Building is treated as a time-dependent energy system, with its interactive components coupled through energy and mass flows under an environment defined in terms of sunlight, ambient air and wind and with its equipment which assist in meeting building-dwellers comfort requirements. Major components discussed are thermal mass (both interior mass and envelope mass) and their thermal capacities, building envelopes and their heat transfer resistances, room air including its circulation and heat exchange with thermal mass, and the transparent part of the envelope the glazing or windows and the solar system passing through it during the day and the heat loss during the night time. Major equipment include lighting, air circulation system, cooling and heating equipment, solar thermal panels and solar PV panels, and other equipment including integrated electric and control units. Of the comfort requirements only temperature-and-humidity and illumination are studied with the objective of creating, through a system-understanding of the building, buildings that in the short run meet these requirements involving minimal use of energy and in the long run are benchmarked against the environmentally regenerative capabilities of wilderness.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 523: Internal Combustion Engines**

Combustion fundamentals. Carnot cycle; reversible internal combustion engine cycle; introduction to practical internal combustion engine cycles. Internal combustion piston engines; engine combustion and emission processes; engine operating characteristics. Gas turbine engines. Composite engines: turbocharging piston engines; gas generator engines; turbocompounding engines. Method of exhaust heat recovery for improvement of thermal efficiency. Method of intercooling-

supercharging for thermal efficiency improvement.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 524: Computational Methods for Fluid Mechanics and Heat Transfer**

Introduction of finite difference, finite volume, and finite element methods for incompressible flows and heat transfer. Topics include explicit and implicit schemes, accuracy, stability and convergence, derived and primitive-variables formulation, orthogonal and non-orthogonal coordinate systems. Selected computer assignments from heat conduction, incompressible flows, forced and free convection.

*Prerequisite: MEC 507*

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 526: Modern Power Cycles**

First and second law design and analysis of modern power cycles including Rankin Steam Cycles, Bryton Gas Turbine cycles, Combined Cycles, Cogeneration, Central Heat and Power Generation (CHP), Tri-generation and current advances in thermal power systems design and analysis. Cycle efficiency and factors effecting performance and plant efficiency. Thermodynamic analysis of proposed as well as existing thermal energy systems.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

### **MEC 527: Introduction to Building Energy Modeling**

Designing high performance buildings requires the application of building energy modeling (BEM) that uses computer-based software to simulate thermal processes in buildings. In applying building energy modeling, this course emphasizes the importance of formulating the problem in terms of assumptions: The two alternative assumptions are the static building load assumption and the dynamic building process assumption. The resistor-capacitor (RC) model is introduced. With a 3D building model developed in Autodesk Revit, energy analysis is carried out with a series of software. Popular whole-building energy simulation programs, such as EnergyPlus and TRNSYS, are then explained briefly.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 529: Introduction to Robotics: Theory and Applications**

Topics: robot components and mechanatronic aspects of robotics (sensors, actuators, and effectors, system integration); rotation, translation, rigid-body transform; robotics foundations in kinematics and inverse

kinematics, dynamics, serial and parallel manipulators and their duality, introduction to mobile robots and LEGO Robotics, control theories, motion planning, trajectory generation, grasping and manipulation, robotic programming language, industrial robotics, manufacturing automation, and societal impacts. Include hands-on projects.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 530: Applied Stress Analysis**

Advanced mechanics of solids and structures. Elastic boundary value problems are analyzed with various solution techniques including finite element method. Major topics are stress and strain, FEM formulations, material behaviors, 2D elastic problems, stress function and fracture. Detailed studies of structural components are carried out with FEM with emphasis on optimal mesh design and proper interpretations of computed results.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 532: Vibration and Control**

Fundamentals of vibrations and control of vibrations of structures and dynamic systems. Topics include one dof systems and responses, frequency response, multiple dof systems and responses, relevant classical control theory, modern state-space feedback control theory, application of control methodology in systems with dynamics and vibration, eigenvalue problems and modal analysis, vibration analysis of various continuous systems.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 536: Mechanics of Solids**

A unified introduction to the fundamental principles, equations, and notation used in finite deformation of solids, with emphasis on the physical aspects of the subject. Cartesian tensor representation of stress, principal values, finite strain, and deformation. Conservation of mass, momentum, and energy. Formulation of stress-strain relations in elasticity, and compatibility relations. The use of general orthogonal coordinate systems in the equations governing solids. Principles of virtual displacement and virtual work.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 537: Combustion Research Laboratory**

Experimental methods for testing and development of internal combustion engines. Methods for measuring engine performance and emissions. Review of combustion chemistry and thermodynamics. Engine cycle quantities measurements. Students will apply

these methods to reciprocating engines and gas turbines.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 539: Introduction to Finite Element Methods**

(formerly Finite Element Methods in Structural Analyses)

*Theory of finite element methods and their application to structural analysis problems. Matrix operations, force and displacement methods. Derivation of matrices for bars, beams, shear panels, membranes, plates, and solids. Use of these elements to model actual structural problems. Weighted residual techniques and extension of the finite element method into other areas such as heat flow and fluid flow. Laboratory sessions introduce use of the computer in solving finite element problems. Programs for the solution of force and displacement method problems are configured. A computer project consisting of the solution and evaluation of a structural problem is required.*

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 540: Mechanics of Engineering Structures**

An introduction to variational principles of mechanics and the development of approximation methods for the solution of structural mechanics problems. Linear and nonlinear theories of beams and thin plates are developed along with their framework for numerical solutions. An introduction of the general theory of structural stability is presented along with its application to the buckling and initial postbuckling behavior of beams and plates.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 541: Elasticity**

Formulation of boundary value problems. Compatibility equations and reciprocal theorem. Torsion of noncircular cross-sections. Fundamental solutions for two- and three-dimensional domains. Potential function formulations. Use of integral transforms and complex variable approaches. Formulation and solution of problems in thermoelasticity.

*Prerequisite: MEC 536*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 543: Plasticity**

Stress and deformation of solids: yield criteria and flow rules for plasticity deforming solids; the notion of a stable inelastic material; static and dynamic analysis of plastic bodies under mechanical and thermal loading; use of load

bounding theorems and the calculation of collapse loads of structures; the theory of the slip-line field.

*Prerequisite: MEC 541*

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 549: Robot Dynamics and Control**

This course will cover the fundamentals of dynamic modeling and control techniques for robots, focusing mainly on robot manipulators. The dynamic modeling part includes Lagrange formulation, Newton Euler formulation, properties of the dynamic equations, and trajectory planning with dynamic constraints, and the control part includes nonlinear systems, state-space representation, Lyapunov stability theorems, feedback linearization, linear controller design, position control, motion control, inverse dynamics control, robust control, adaptive control, force control, impedance control, hybrid motion force control, and implementation of controllers. Prerequisite: MEC 529

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **MEC 550: Mechatronics**

An introduction to the design, modeling, analysis and control of mechatronic systems (smart systems comprising mechanical, electrical, and software components). Fundamentals of the basic components needed for the design and control of mechatronic systems, including sensors, actuators, data acquisition systems, microprocessors, programmable logic controllers, and I/O systems, are covered. Hands-on experience in designing and building practical mechatronic systems are provided through integrated lab activities.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 552: Mechanics of Composite Materials**

The course is concerned with the analysis of layered composite materials subject to mechanical loads. Cartesian tensor calculus is used. Homogeneous anisotropic media are studied first. The effect of layering is then analyzed. Applications to plates and shell are studied and analytical methods of solution are given. Numerical analysis of composite solids is also considered using finite difference and finite element methods.

*Prerequisite: MEC 536*

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 556: Introduction to Engineering Mechanics of Composites**

Introduction to the engineering mechanics of fiber reinforced composites. Brief history of the development of fiber composites, their properties, advantages, limitations and applications. Overview of the different types of composites but with focus on long fiber reinforced composites; particularly, lamina and laminate concepts characteristics and configurations. Topics covered include: elastic properties of unidirectional lamina, strength of unidirectional lamina, elastic behavior of multidirectional laminates and stress and failure of multidirectional laminates. Design methodologies and considerations for structural composite materials. The students are expected to complete a project, in which they will design a real-life structural part out of composite materials using course principles.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 557: Introduction to Fiber Composites Fabrication and Characterization**

Overview of fiber reinforced composites, applications and mechanical properties. Introduction to fiber composites fabrication methods as well as experimental characterization methods used in acquiring their relevant mechanical properties. Fabrication topics include: Impregnation of fibers; Prepregs; Stacking; Curing; Vacuum bagging; Autoclave technology; Out-of-autoclave manufacturing processes; Molding; Processing; Cutting and Joining. Topics in mechanical characterization include: Experimental methods; Characterization of the elastic properties and failure strengths of unidirectional lamina; Characterization of the elastic properties and failure strengths of multidirectional laminates. Course is divided into in-class lectures and laboratory sessions. The students are expected to complete a project, in which they will design, fabricate and test a real-life structural part made out of composite materials using course principles.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 559: Mobile Robotics and Autonomous Vehicles**

This course will cover the fundamentals of planning, state estimation, and control techniques for mobile robots and autonomous vehicles. Key topics include: Kinematics of wheeled mobile robots; State estimation, Localization, and Mapping; Simultaneous Localization and Mapping Algorithms (SLAM) Algorithms; Path planning, Obstacle Avoidance, and Non-holonomic Control; Mobile robot programming and control architecture.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **MEC 560: Advanced Control Systems**

Analytical methods applied to the design of multivariable linear control systems. Introduction to linear system theory: linearization, solution of linear matrix differential equations, stability, controllability, observability, transformations to canonical forms. Formulation of control objectives. Deterministic state observer. Full-state feedback control based on pole assignment and linear quadratic optimization theory. Linear systems with stochastic inputs and measurement noise. The response of linear systems to random input; stochastic state estimator (Kalman filter); separation principle of stochastic control and estimation; system robustness.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 564: Fundamentals of Aerodynamics**

Kinematics and dynamics of incompressible irrotational flow; stream function and the potential functions; Euler and Bernoulli equations. Thin-foil theory; lift and moment for symmetric and cambered airfoils. Finite-wing theory; induced drag. Compressible flow, small disturbance theory; thin wings at subsonic and supersonic speeds.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 565: Aerospace Propulsion**

Fundamentals of propulsion; performance parameters, thermodynamic cycles. Introduction to combustion and combustors. Performance and cycle analysis of various flight propulsion systems: turbojets, turbofans, turboprops, ramjets, scramjets, rockets, propellers. Design of supersonic inlet nozzles, component matching and map.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 567: Kinematic Analysis and Synthesis of Robotic Mechanisms**

Introduction, mechanism structure, basic concepts of mechanisms, canonical representation of motion. Kinematic analysis, algebraic method, vector-loop method, complex number method, spherical and spatial polygon method, matrix method, dual-number quaternion method, screw coordinate method, line coordinate method, motor algebra method, type synthesis, number synthesis, coupler curves, curvature theory path generation, finite displacement theory, rigid body guidance, function generation, computer-aided mechanisms analysis and synthesis.

*3 credits, Letter graded (A, A-, B+, etc.)*



**MEC 568: Advanced Dynamics**

Newtonian and Lagrangian mechanics of rigid bodies; kinematics, inertia tensor, principle of momentum, principle of virtual work, potential and kinetic energy, equations of motion, extraction of information from the equations of motion, and application to engineering problems.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**MEC 569: Aerial Robotics**

This hands-on course covers a broad range of topics related to aerial-robotics. There is a comparative analysis of the most common types of flying vehicles. A few of the most common control strategies such as cascaded control, dubins path, and flocking algorithms are covered as well. Lastly, we look at the latest work in both the scientific literature and industry. In particular, this course covers multicopters, fixed-wings, flapping-wings, aerial swarms, perching, collision resilience, search & rescue, and flight testing. There are two hands-on projects, the first consists of searching a space for a safe landing point with a crazyflie quadcopter, and the second is navigation of a narrow passage with a fixed-wing robot. At the end of the class, the students will be able to critically evaluate existing aerial robotic systems, conceive new systems, and implement functional prototype vehicles.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

**MEC 570: Introduction to Engineering Tribology**

Focus is on the fundamentals of tribology, the science of surfaces in relative motion, with an introduction to friction, lubrication, and wear. The basics of tribology science: engineering surfaces, contact mechanics, lubrication theory, wear processes and modeling, wear properties of materials, and tribology test methods will be covered. Analysis of tribological aspects of machine components and bearings. Industrial case studies will be presented to place the topics in context to industry and society.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**MEC 571: Analysis and Design of Robotic Manipulators**

Introduction to robot manipulators from the mechanical viewpoint, emphasizing fundamentals of various mechanisms and design considerations. Kinematics on 2D and 3D manipulators; statics and dynamics; motion planning; control fundamentals; algorithms

development; computer-graphics simulation of manipulators; current applications.

*Prerequisite: Permission of instructor  
Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)*

**MEC 572: Computer-Aided Design of Shapes and Motions**

This class would focus on presenting a unifying treatment for the design of geometric shapes, such as curves and surfaces as well as motions of entities, such as lines, planes, and rigid bodies. It will be shown that in the language of projective geometry, one can design curves, surface, and motions utilizing same algorithms and similar data structures.

In the process, the students will learn the theory of NURBS (Non- Uniform Rational B-splines), which is the standard representation in existing CAD/CAM system, and extend it to the space of rigid body displacements for the design of motions. Students will implement shape and motion design algorithms in graphical computer programs.

*3 credits, Letter graded (A, A-, B+, etc.)*

**MEC 575: Introduction to Micro Electro-Mechanical Systems (MEMS)**

An introduction to the fundamental knowledge and experience in the design and manufacture of microsystems. Emphasis will be placed on the methodologies for design, fabrication, and packaging of microsystems. An overview on fabrication and manufacturing technologies for producing microsystems will also be covered. Interdisciplinary nature of MEMS will be emphasized via various engineering principles ranging from mechanical and electrical to materials and chemical engineering. Introduction of the working principles of micro actuators, sensors, and transducers.

*Prerequisite: Permission of instructor  
Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**MEC 579: Optical Measurement**

Introduction to optical measurement and its applications to the fields of solid mechanics, design and manufacturing, and thermal and fluid systems. Topics include fundamentals of optics, lasers, and detectors, dimensional and surface metrology, machine vision, measurement of temperature, concentration, and density, and optical techniques for stress analysis and nondestructive testing.

*3 credits, Letter graded (A, A-, B+, etc.)*

**MEC 585: Total Quality Management**

Concepts of TQM and quality improvement methods to attain world-class performance in business operations. Topics include

policy deployment, process improvement methodology, daily work management, quality story methodology, six sigma, poka-yoke, ISO, Deming and Baldrige Awards criteria.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**MEC 596: Projects in Mechanical Engineering**

Conducted jointly by graduate students and one or more members of the faculty.

*1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**MEC 597: Graduate Research and Study in Manufacturing**

Independent research or project in the area of manufacturing processes or systems.

*1-6 credits, Letter graded (A, A-, B+, etc.)*

**MEC 599: Research**

*Fall, Spring, and Summer, 1-12 credits, S/U grading*

*May be repeated for credit.*

**MEC 630: Special Topics in Fluid Mechanics**

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and staff. Advanced topics and specialized topics will be discussed, particularly those of current interest.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**MEC 631: Special Topics in Heat Transfer**

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and staff. Advanced topics and specialized topics will be discussed, particularly those of current interest.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**MEC 633: Special Topics in Thermodynamics**

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and staff. Advanced topics and specialized topics will be discussed, particularly those of current interest.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**MEC 634: Advanced Topics in Kinematics and Dynamics of Machines**

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and staff. Advanced topics and specialized topics will be discussed, particularly those of current interest.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **MEC 635: Advanced Topics in Nonlinear Dynamic Systems**

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and staff. Advanced topics and specialized topics will be discussed, particularly those of current interest.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **MEC 636: Advanced Topics in Mechanical Vibration**

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and staff. Advanced topics and specialized topics will be discussed, particularly those of current interest.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **MEC 637: Special Topics in Precision Engineering**

The subject matter of each special topics course varies from semester to semester, depending on the interests of students and staff. Advanced topics and specialized topics will be discussed, particularly those of current interest.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **MEC 641: Fracture Mechanics**

The mechanics of brittle and ductile fracture in engineering materials are studied. Major subjects are linear elastic fracture, elastic-plastic fracture, and fatigue crack analysis. Topics also include stress intensity factor, energy release rate, J-integ.

*Prerequisite: MEC 536,  
Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)*

### **MEC 651: Advanced Finite Element Analysis**

Finite element method for the analysis of continuous media. In-depth discussion of penalty method, integration techniques, and differential equation solvers. Computer implementation of finite element code in nonlinear elastic, elastic-plastic materials,

and dynamic problems. Major topics are 2-D and 3D element formulations, stress update algorithms, Newton-Raphson iterative technique, and explicit/implicit time integration schemes.

*Prerequisites: MEC 541, MEC 539  
Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)*

### **MEC 656: Aerospace Propulsion**

Fundamentals of propulsion; performance parameters, thermodynamic cycles. Introduction to combustion and combustors. Performance and cycle analysis of various flight propulsion systems: turbojets, turbfans, ramjets, scramjets, rockets, propellers. Design of supersonic inlet nozzles, component matching and map.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 662: Advanced Vibration and Analysis**

Principle and techniques of vibration analysis of structures and machines. Includes free and forced vibration responses of linear limp-parameter, multiple dof systems; model analysis of distributed, continuous systems; non-linear vibration analysis; random vibrations.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 691: Mechanical Engineering Seminar**

This course is designed to expose students to cutting-edge research and development activities in mechanical engineering. Speakers are invited from both on and off campus. Fall and spring. 0 credits, S/U grading. May be repeated.

*S/U grading  
May be repeated for credit.*

### **MEC 695: Mechanical Engineering Internship**

Participation in off-campus engineering practice in private corporations, public agencies, or non-profit institutions as an intern. Students will be required to have a faculty adviser as well as a contact coordinator at the place of internship, to participate with them in regular consultations on the project, and to submit a final report to both and the Graduate Program Director. Credits from this course cannot be applied toward the MS and/or PhD degree. 1 credit, S/U grading. Offered Fall and Spring semesters

*1 credit, S/U grading  
May be repeated 3 times FOR credit.*

### **MEC 696: Special Problems in Mechanical Engineering**

Conducted jointly by graduate students and one or more members of the faculty.

*1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **MEC 696: Aerial Robotics**

This hands-on course covers a broad range of topics related to aerial-robotics. There is a comparative analysis of the most common types of flying vehicles. A few of the most common control strategies such as cascaded control, dubins path, and flocking algorithms are covered as well. Lastly, we look at the latest work in both the scientific literature and industry. In particular, this course covers multicopters, fixedwings, flapping-wings, aerial swarms, perching, collision resilience, search & rescue, and flight testing. There are two hands-on projects, the first consists of searching a space for a safe landing point with a crazyflie quadcopter, and the second is navigation of a narrow passage with a fixed-wing robot. At the end of the class, the students will be able to critically evaluate existing aerial robotic systems, conceive new systems, and implement functional prototype vehicles.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MEC 697: Practicum in Teaching I**

Every TA must register for the course

*Fall, Spring, S/U grading  
May be repeated for credit.*

### **MEC 698: Practicum in Teaching II**

Practicum in teaching under faculty supervision

*1-3 credits, S/U grading  
May be repeated for credit.*

### **MEC 699: Dissertation Research on Campus**

Prerequisite: Advancement to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, and Summer, 1-9 credits, S/U grading  
May be repeated for credit.*

### **MEC 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **MEC 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.  
Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **MEC 800: Full Time Summer Research**

*May be repeated for credit.*

## **MGT**

### **Harriman School**

#### **MGT 535: Financial Accounting**

Introduction and exploration of basic financial accounting terminology, principles, concepts, and their relevant business applications. This course will include the recording, summarization, and adjustment of financial transactions and the preparation and presentation of the basic financial statements. Other topics will include valuation methods for cash, accounts receivable, inventory and property, plant and equipment. This course is also offered as EMP 502.

*3 credits, Letter graded (A, A-, B+, etc.)*

## **MKT**

### **Marketing**

#### **MKT 516: Strategic Brand Management**

Highly interactive course. Hands-on, practical exploration of product, service, and enterprise-wide brand building and management. Course is structured along daily responsibilities and challenges faced by working brand/marketing managers and will provide experience with proven strategies for building successful brands in the competitive marketplace,

the decisions and options faced by brand managers, and the tools to effectively manage brands. Prerequisite: Students must be admitted into one of the College of Business Programs

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MKT 519: Social Media Marketing Strategy**

Social Media Marketing Strategy covers theoretical and practical perspectives for developing and implementing social media marketing strategies. The course is designed to expose students to state-of-the-art practices in social media marketing with an emphasis on leveraging insights from social media to inform strategic firm decisions. Prerequisite: Students must be in one of the College of Business Graduate Programs, MBA 505

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MKT 534: Marketing and Society**

This course applies traditional marketing principles and techniques to the challenges and rewards of promoting positive public behavior. We will first examine arguments for marketing being used as a force for bad or as a force for good before exploring concepts and theories from the behavioral sciences including psychological, sociological, economic, and cultural perspectives and analyzing their usefulness for promoting public welfare. By the end of the course, students will propose a comprehensive social marketing plan for enhancing consumer welfare in their domain of interest. Prerequisite: Students in one of the College of Business Graduate Programs & MBA 505 OR Student in 36 credit General MBA or 36 credit Marketing MBA program

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MKT 565: Consumer Insights**

Marketing is the business function that deals with customers' needs and wants. Thus, an essential component of marketing is understanding consumers and to develop a deep understanding of consumers' needs and wants, you need to conduct marketing research. Psychological and social science research has produced numerous theoretical and technological advances that offer access to the inner workings of the mind, providing marketers with research tools to more effectively discover and fulfill consumer needs. This course provides an overview of the marketing, psychological, and social science knowledge relevant to consumer behavior and also provides an introduction to research methods for marketers to utilize when pursuing organizational goals. In this course, students will learn about qualitative and quantitative marketing techniques such as how to conduct

a focus group, how to conduct high-quality survey research, how to conduct conjoint analysis, and how to use the IAT to develop a deeper understanding of consumers' implicit beliefs. Prerequisite: MBA 505 or 36 credit MBA in Marketing Student

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MKT 567: Integrated Marketing Management**

Marketing managers must be able to determine which customers their organization should serve, which products and services it should offer them, and how. This course is intended to develop an analytical framework for these decisions that permits managers to maximize their organization's return on marketing expenditures. Emphasis will be placed on developing a position in the marketplace that provides value to customers that is not readily duplicated by competitors. As a result, the first half of the course will develop models for understanding customers, competitors, and collaborators (e.g., suppliers and intermediaries). The second half of the course will examine tools available to marketers to execute strategic decisions. Prerequisite: MBA 505 or 36 credit MBA in Marketing Student

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MKT 569: Digital Marketing**

Marketing on the internet is constantly changing. This course will give you a theoretical and practical understanding of different digital marketing activities, current trends and changes, and the skills to perform vital daily digital market functions. We will cover Search Engine Optimization and Search Engine Marketing (SEO/SEM), Email Marketing, Social Media Campaigns, Reputation Management and E-mail marketing. By the end of the course, students will have earned multiple certifications, for example Google Ads, Google Analytics, Hubspot, and any additional certifications as is consistent with industry best practices at the time. All of these certificates are well-respected and regarded in industry and will place students in a good position for the Digital Marketing job market. Prerequisite: Students must be admitted into one of the College of Business Programs

*3 credits, Letter graded (A, A-, B+, etc.)*

## **MST**

### **Medical Scientist Training Program**

### **MST 501: Selected Topics in Translation/Research and Clinical Pathological Correlations**

The learning goals of this course are for the students to gain an appreciation of examples of research by physician scientists and its clinical application. A clinical case will be presented by faculty or senior students and this case will be discussed in the light of a recent biomedical research publication. The publications are presented, analyzed and discussed by the students as a group. Topics are selected from the recent biomedical literature and can involve any clinical discipline, basic life science research topics as well as bioengineering topics.

*0-1 credits, S/U grading  
May be repeated for credit.*

### **MST 502: Clinical Scientist Seminar Series**

The learning goals of this course are for the students to gain an appreciation of examples of research by physician scientists and its clinical application. A clinical case will be presented by faculty or senior students and this case will be discussed in the light of a recent biomedical research publication. The publications are presented, analyzed and discussed by the students as a group. Topics are selected from the recent biomedical literature and can involve any clinical discipline, basic life science research topics as well as bioengineering topics.

*0-1 credits, S/U grading  
May be repeated for credit.*

### **MST 698: Practicum in Teaching**

Teaching practicum, supervised by a faculty member, for the MSTP Program. Course to be identified by the student and graduate studies director.

*0-1 credits, S/U grading  
May be repeated for credit.*

## **MUS**

### **Music**

#### **MUS 500: Introduction to Critical Music Studies**

An introduction into the scholarly study of Western music. Topics may include: bibliographic tools for research; historical, theoretical, and analytical methodologies; textual scholarship; organology and iconography; performance practice; aesthetics and criticism; sociology of music; perception and cognition; gender and sexuality; musicology in today's academia and society.

Overview of the history of the field. Emphasis on recent trends in American musicology.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **MUS 501: Compositional Skills of Tonal Music**

An intensive course in chorale harmonization and counterpoint. (Enrollment limited to 12.) Permission of instructor required. Fall of alternate years, 3 credits, Letter graded (A, A-, B+, etc.)

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **MUS 502: Proseminar in Tonal Analysis**

The application of various techniques of analysis to tonal works. Rhythmic, harmonic, linear, thematic, and other elements of musical structure are considered. Preparation equivalent to MUS 501 is assumed.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **MUS 503: Music in the 20th and 21st Centuries**

An intensive course in contemporary musical styles, focusing on historical problems. Seminar reports and research papers on works of major significance.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **MUS 504: Analysis of Music of the 20th and 21st Centuries**

Detailed analyses of various works that are representative of the significant compositional systems of recent music.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **MUS 505: Foundations of Musicianship**

An intensive workshop in the skills of sight singing and dictation of tonal melodies, rhythm, and diatonic harmony. Repertoire is drawn from diverse styles and periods. Qualified students may be exempted from this course through a placement exam given at the beginning of the fall semester.

*Fall, 2 credits, Letter graded (A, A-, B+, etc.)*

#### **MUS 506: Graduate Musicianship**

An intensive workshop in the development of musicianship skills in advanced tonal and atonal music. The course includes dictation in a variety of harmonic, melodic, and rhythmic categories and prepared singing and sight-singing of complex tonal and atonal melodies (in bass, alto, tenor, and treble clef). Qualified students may be exempted from this course through a placement exam given at the beginning of the fall semester.

*Spring, 2 credits, Letter graded (A, A-, B+, etc.)*

#### **MUS 507: Studies in Music History**

Concentrated study of the works of a single composer, or of repertoires that represent single compositional tendencies in Western music. Recent topics have included Mozart's operas, Goethe's Faust and the symphonic tradition, Bach cantatas, virtuosity, Stravinsky, music and nationalism, and introduction to popular music studies.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **MUS 508: Studies in Composition and Theory**

Study of contemporary or traditional compositional techniques or styles, including both analysis and exercises in writing. Not more than eight credits of MUS 507, 508, and 509 combined may be counted toward the degree.

*Fall or Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **MUS 509: Performance Studies**

Study of an instrument or voice as a supplement to other work in a graduate music program. This course is designed for students who require piano study in order to pass the piano proficiency requirement, and for students not in a performance degree program who wish to study voice or an instrument. Prerequisite: Audition Not more than eight credits of MUS 507, 508, and 509 combined may be counted toward the degree.

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **MUS 510: Introduction to African Drumming**

Students will gain greater skills and insight into effectively performing Agbadza, Gahu, and Agbekor pieces (drumming) collaborating with each other and increasing their stage presence and confidence. At the end of the semester we will have prepared together a concert of west African drumming music to be given at least once. Students will also acquire valuable information about the history of those drummings and how they changed through time and space.

*1 credit,  
May be repeated for credit.*

#### **MUS 513: Workshop in Instrumentation and Orchestration**

Studies in writing for specific instruments and ensembles through practical exercises and examination of the repertory. Faculty and student performers discuss the capabilities of their instruments and perform and discuss exercises written for the class.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 514: Audio Engineering**

Technical fundamentals of audio engineering for the serious practitioner, with primary emphasis on sound reinforcement and recording arts. The course focuses on measurement and critical listening, and investigates the basic operational theory of principal devices and systems.

*Prerequisite: permission of instructor*  
*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 515: The Fundamentals of Electronic Music**

A short survey of the history and literature of the medium is followed by study of the pertinent background in theoretical acoustics and practical engineering. Students are instructed in the basic techniques of electronic sound production and modification.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 516: Electronic Music Workshop**

Individual short experimental works or specific assignments. Uses of electronic music equipment.

*Prerequisite: MUS 515 or the equivalent*  
*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 517: Introduction to Computer Music**

A hands-on introduction to the uses of computers in the creation and performance of music. Topics include software synthesis, computer manipulation of natural sound, MIDI instruments and their use, and interactive performance. There is a brief survey of the history, literature and repertoire of the field.

*Prerequisite: Music major or permission of the instructor*  
*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 518: Advanced Projects in Computer Music**

Advanced projects, individual or collaborative, in computer music.

*Prerequisite: MUS 517 and permission of instructor*  
*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 519: Composer's Forum**

Practicum for student composers to learn how to present their music in a professional context.

*1-2 credits, S/U grading*  
*May be repeated for credit.*

### **MUS 520: Introduction to Research and Writing for MM and DMA Students**

An introduction to music research and bibliography for DMA and MA students in their first year of study. Introduces students to music research databases and searching, proper bibliographic practices, score editions and other information relevant to doctoral research. Administered as an asynchronous tutorial with synchronous components added as needed. May be waived by proof of comparable course in earlier study.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 523: Advanced Composition**

Individual projects for graduate students in composition.

*Fall and Spring, 2-6 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **MUS 524: Topics in Music Composition**

Topics in Music Composition treats specific genres and techniques of music composition—such as composing for string quartet, opera, orchestra, wind ensemble, Pierrot ensemble—in any given semester and is intended as a practical course for composers. Students will compose for an ensemble, workshop their music, and study relevant scores by other composers. 1-3 credits.

*1-3 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **MUS 534: Opera Studies**

One of the most resilient and popular genres of spectacle in the West, opera has seen a remarkable continuity as an institution since its birth in 1600. Performed in the opera house, it has been produced by a fixed set of characters: the impresario, the librettist, the composer, the stage designer, and the director, but also singers, instrumentalists, dancers, and the chorus. Operas have traditionally absorbed narratives from mythology and history but have also been characterized by freely-invented plots. Operas have often generated political, philosophical, and artistic debates, and provide today's scholars with a unique window into historical, ideological, sociological, and aesthetic issues. The hybrid genre par excellence, opera continues to be a catalyst for creativity in various arts, and

in present-day production often features the most advanced media and technologies. This seminar will capitalize on both the continuity and the diversity of the genre, bringing together graduate students in music history, theory, and performance.

*Offered*  
*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **MUS 535: Lecture-Workshop in the Performance of Baroque Music**

An examination of problems confronting the performer of music from the period ca. 1600-1750, from both musicological and practical points of view. The basso continuo, its function and realization; phrasing and articulation; ornaments, notated and improvised; period instruments; aspects of notation; bibliography. The course meets in lecture for two hours each week with a third hour devoted to the coaching of a rehearsal or performance of music prepared by members of the class.

*Fall or Spring, alternate years, 3 credits,*  
*Letter graded (A, A-, B+, etc.)*

### **MUS 536: Area Studies in Ethnomusicology**

Examination of the music of a selected world area, combining musical analysis with a consideration of historical, social, and performance contexts. Recent topics have included Brazilian music from 1822 to the present; music, politics, and society in Eastern Europe; and a century of Middle Eastern musics. May be repeated for credit.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **MUS 537: Research Methods in Ethnomusicology**

A practicum covering both the theoretical foundations and practical components of ethnomusicological field research and analysis. Emphasis is on designing and undertaking a small musical ethnography, and on exploring practical, ethical, ontological and epistemological aspects of ethnomusicological research. Weekly readings and a final project.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 538: Phenomenological Approaches to Music Analysis**

Concepts from phenomenological philosophy are used as a basis for the study of music from various periods and cultures, with an emphasis on recent music in the Western classical tradition. Readings include Heidegger,

Husserl, and later writings in phenomenology; philosophies of space and time; and music theoretic studies by Clifton, J. Kramer, Lewin, and others.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 539: Proseminar in Ethnomusicology**

An introduction to the field of ethnomusicology as practiced in Europe and North America over the past century. Theoretical and methodological approaches in ethnomusicology are examined as they relate to major periods in the history of ethnographic disciplines.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 540: Studies in Cultural Historiography**

This course is intended to promote the student's knowledge and reflection about the study of the history of the arts as history.

It is organized on the following topics: origins and philosophical foundations of the modern historical consciousness; the nature of historical knowledge and explanation; historiographic models; and origins, philosophical foundations, and genres of historical musicology.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 541: Topics in the Cross-Cultural Study of Music**

Examination of a topic of current interest in the cross-cultural study of music. Readings from various intellectual traditions in the humanities and social sciences provide a context within which to appraise recent research in ethnomusicology, historical musicology, and popular music studies, and to formulate possible directions for future research. Representative topics include music and gender, music and the media, music and power, and performance and performers.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 542: Ethnomusicology and Social Theory**

An introduction to major schools of social theory as they may be applied to the analysis of music and related performance forms. Theoretical writings in sociology, anthropology, philosophy, cultural studies and related fields will be paired with case studies that situate musical creation, performance and dissemination within the unfolding of societal processes.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 543: Topics in Medieval Music**

Study of a focused area in medieval music, such as the works of Guillaume de Machaut, transmission processes, and the Notre Dame repertory.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 545: Topics in Renaissance Music**

Historical, analytical, and critical issues related to Renaissance music. Recent topics have included early 15th-century song repertoires, the boundaries of the Renaissance, and the works of Ockeghem. May be repeated if topic is sufficiently different.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 547: Topics in Baroque Music**

Historical problems in music of the Baroque era. Recent topics have included German Passion settings, theories of expression and representation, and musical rhetoric.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 549: Topics in 18th-Century Music**

Investigation of critical, analytical, and historical issues in 18th-century music, such as the interpretation of sketches and fragments, counterpoint teaching in the 1790s, and the music of Mozart.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 553: Topics in 19th-Century Music**

Historical, analytical, and critical issues in the music of the 19th century. Recent topics have included Italian opera, the unfinished works of Schubert, and genre in Chopin's oeuvre.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 555: Topics in 20th-Century Music**

Focused study of selected issues in music of the 20th century. Recent topics have included primitivism and exoticism; quotation, borrowing, and collage; the music of Roger Sessions; and the Second Viennese school.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 557: Topics in Theory**

Studies in the writings of music theorists from the Middle Ages through the present day in the context of contemporary repertoires. Recent topics have included modal theory as a model for melodic construction; efforts to adapt modal theory to polyphonic practice; rhythm in theory and practice; theories of tonality from Rameau to Schenker; theoretical approaches to post-tonal and 12-tone music; and theories of timbre and texture.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 559: Topics in Analysis**

Intensive analytical study of selected works and exploration of analytical problems. Recent topics have included analysis and performance, melody, Xenakis and Ligeti, Beethoven's late quartets, Berg's Lulu, and the string quartet since 1945.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 562: Dalcroze Method: Music Pedagogy for Children**

A focus on the unique approach of Emile Jacques-Dalcroze, which takes into consideration his approach in light of recent developments in early childhood music education. The idea that students experience music physically before they wrestle with symbols and theoretical abstraction is at the heart of Dalcroze work. The Dalcroze music pedagogy includes: Eurhythmics-developing a sense of rhythm and musical expression through whole-body movement; Solfège-developing a sense of harmony and rhythm through singing games; and Improvisation. This class is designed primarily for music teachers, elementary school classroom teachers and professional musicians. Participants are expected to be able to read and notate simple rhythms and melodies. (formerly: Musical Learning, the Body, and Eurhythmics)

*3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 563: Advanced Choral Conducting A**

Advanced training in preparing and conducting choral works. Students spend a semester in score study, receive individual private instruction, and are expected to participate in the rehearsing of the University Chorus, the University Chorale, and the Chamber Singers.

Open only to students enrolled in graduate conducting programs.

*Fall and Spring, 3-6 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 564: Advanced Choral Conducting B**

Advanced training in preparing and conducting choral works. Not open to students enrolled in the graduate conducting programs.

*Prerequisite: Instructor consent*

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 565: Large Ensemble (Orchestral Instruments)**

Study and performance of ensemble works from the Baroque period to the present.

*1-2 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **MUS 566: Camerata Singers**

Study and performance of choral works for chamber chorus from all periods of music history.

*May be repeated.*

*Fall and Spring, 1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 567: Master Class in Orchestral Repertory**

Study of orchestral parts for sections (brass, strings, woodwinds) or for individual instruments. The course emphasizes overall ensemble skills and audition preparation. Different sections directed toward specific groups. See the course listing for offerings in any particular semester.

*Fall and Spring, 1-2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 568: Jazz Big Band**

Study and performance of works for jazz ensemble from the early 20th century to the present.

*Fall, 1-2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 569: Perspectives on the Performance of Music Since 1945**

The course focuses on issues of performance of music written after 1945 from technical, conceptual and aesthetic perspectives.

Weekly assignments will be focused around topics such as: notation; extended techniques; rhythmic practices; performing with electronics; structure and analysis; the theatricality of performance; music and the

political; interpretation and style, including cross-cultural and cross-genre works; and indeterminacy/choice/improvisation.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 570: Introduction to the History and Performance of the String Bass in Jazz**

Study of the historical development of the string bass in jazz and other related improvised musics through a selection of reading and listening projects. Practical assignments will include making transcriptions of classic records and then learning to play them on bass, employing the time-proven method of "copying the masters."

*1-2 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 571: Masters Instruction in Performance**

Individual guidance in technique and repertory, with 30 practice hours required each week. Each student is required to perform at least one solo piece per semester, unless excused by the instructor in a written note to the department's graduate program committee.

*Fall and Spring, 1-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 572: Improvisation**

Practical study of the skills and sources of musical improvisation, including playfulness, emotion, courage, concentration, risk, instrumental and vocal technique, patience and trust. Improvisational skills will not be limited to any single musical style. All students will be required to improvise vocally or instrumentally.

*Fall, 1-2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 573: Chamber Music**

Chamber ensembles such as the string quartet, wind quintet, solo vocal ensemble, two-piano team, and other special groups meet, each under the direction of a member of the performance faculty, for the study of works from the repertoires of the respective groups, with particular attention given to the music of the 20th and 21st centuries.

*Required: Presence at coaching sessions, at least three hours per week of uncoached rehearsal, and at least one performance per semester*

*Fall and Spring, 1-2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 575: Master Class in Solo Repertory for Instrument or Voice**

Performance techniques and problems in works for instrument or voice, drawn from all historical periods. The instructor is a teacher of the specific instrument in each case, except that his or her section may be open to students of certain other instruments with his or her permission. Not offered each semester in every instrument.

*Fall and Spring, 1-2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 576: Instrumental Repertoire before 1750**

Exploration of instrumental repertoire in the 17th and 18th centuries.

*Fall or Spring, alternate years, 2 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 577: Master Class in Performance Pedagogy**

Guidance and supervision in the teaching of an instrument or voice.

*2 credits, Letter graded (A, A-, B+, etc.)*

### **MUS 579: Opera Workshop**

Study and performance of scenes and complete operas from the standard and 20th-century repertoires. An interdisciplinary approach involving the departments of Music and Theatre Arts.

*Fall and Spring, 1-2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 580: Vocal Diction**

A thorough study of the rules of pronunciation and International Phonetic Alphabet transcription in a major language of the voice repertory: Italian, French, or German. Special attention to lyric projection of the language as it relates to voice production, listener comprehension, and musical values. Course work includes coaching in appropriate song and operatic literature. The specific language studied rotates from semester to semester.

*Fall and Spring, 0-2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **MUS 581: Harpsichord for Pianists (Beginning)**

Fundamentals of harpsichord techniques, touch, and repertoire for students already possessing a keyboard background.

*Fall, alternate years, 2 credits, Letter graded (A, A-, B+, etc.)*

**MUS 582: Harpsichord for Pianists (Advanced)**

Continuation of MUS 581: Further exploration of techniques and repertoire.

*Prerequisite: Piano major or strong keyboard background.*

*Spring, alternate years, 2 credits, Letter graded (A, A-, B+, etc.)*

**MUS 583: Continuo Realization**

Practical and theoretical instruction in figured bass realization, based on the study of vocal and instrumental scores from 1600-1750.

Required of students in harpsichord. Open, with consent of the instructor, to other qualified students who have some knowledge of figured bass realization.

*Fall or Spring, alternate years, 2 credits, Letter graded (A, A-, B+, etc.)*

**MUS 584: Baroque Chamber Ensemble**

Study and performance of instrumental and vocal music, 1600-1750. Participants work from scholarly editions and original sources whenever possible and have the possibility of performing on replicas of early instruments. A concert is given at the end of the class term. Acceptance by audition.

*Fall and Spring, 1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**MUS 585: Early Music Performance Practice**

Study and implementation of Renaissance and Baroque performance practices. Areas include brass ensemble music and lute and guitar repertoires.

*Fall and Spring, 2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**MUS 586: Collaborative Keyboard Performance**

Study and performance of the keyboard parts of instrumental and vocal recital repertoire.

*1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**MUS 587: Collaborative Keyboard**

Study and performance of the keyboard parts of instrumental and vocal recital repertoire.

*1 credit, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**MUS 588: Advanced African Drumming**

Students will gain greater skills and insight into effectively performing Kakagbó, Poem Drumming (Adì), and Agbadja pieces (drumming) collaborating with each other and

increasing their stage presence and confidence. At the end of the semester we will have prepared together a concert of west African drumming music to be given at least once. Students will also acquire valuable information about the history of those drummings and how they changed forms through time and space.

*1 credit,*

*May be repeated for credit.*

**MUS 590: Masters Practicum in Professional Skills**

Practical training in activities related to the professional work of a performing musician, including teaching, solo and ensemble performance, conducting, internships and related musical work, both on and off-campus. Required of all full-time students in the M.M. performance program. All off-campus activities in fulfillment of this course must be approved by the Graduate Program Director, who acts as supervisor for this course. Fall and Spring only, 1 credit, S/U grading May be repeated for credit.

*1 credit, S/U grading*

*May be repeated for credit.*

**MUS 591: Practicum in Teaching**

Instruction in the department under the supervision of the faculty. (MUS 591 may not be included in the courses taken in fulfillment of degree requirements.)

*Fall and Spring, 1-3 credits, S/U grading*

*May be repeated for credit.*

**MUS 592: Seminar on the Teaching of Music**

Discussion of fundamental problems in teaching music. Topics may include the explanation of musical processes; communication to nonprofessionals; and integration of aspects of performance, theory, history, and analysis with one another. Required of all students who teach one of the introductory undergraduate courses in musicianship, theory, or literature; to be taken during the first semester of teaching.

*Fall, 1 credit, S/U grading*

*May be repeated for credit.*

**MUS 593: Practicum in Performance**

Individual instruction and/or coaching for professional performing experience.

*Fall and Spring, 0-1 credits, S/U grading*

*May be repeated for credit.*

**MUS 594: Masters Intersession Practicum**

Practical training in activities related to the professional work of a performing musician, including teaching, solo and ensemble

performance, conducting, internships and related musical work, both on and off-campus. All off-campus activities in fulfillment of this course must be approved by the Graduate Program Director, who acts as supervisor for this course. This course is only to be used for Winter and Summer sessions. Winter and Summer only, S/U grading May be repeated.

*S/U grading*

*May be repeated for credit.*

**MUS 596: Contemporary Chamber Players**

The study and performance of music of the 20th and 21st centuries for ensemble, ranging from duos to larger conducted groups. Repertoire includes 20th-century classics as well as new works, including compositions written by Stony Brook students. A full schedule of public performances takes place.

*Prerequisite: Permission of instructors*

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**MUS 597: Jazz Chamber Ensemble**

Study and performance of works for jazz ensemble. Prerequisites: Permission: Audition required. Fall and Spring

*0-1 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**MUS 599: Independent Studies**

Individual studies under the guidance of a faculty member. Each student must submit to the graduate studies committee of the department a written prospectus of the work he or she intends to pursue, with the amount of credit proposed, together with the written endorsement of the prospective instructor. Approval of the graduate studies committee is required; hence this material should be submitted as soon as possible, and in any case within the first two weeks of the semester (or the first week of a summer session).

*0-16 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**MUS 615: Seminar in Electronic Music Composition**

Individual compositions of substantial proportions in electronic or concrete music media. The course may be repeated. Open only to qualified students in a music degree program.

*Prerequisite: MUS 516 or the equivalent*

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*



**MUS 623: Directed Study in Composition**

Intended for doctoral students in composition.  
*Fall and Spring, 1-12 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

**MUS 661: Directed Study in Conducting**

Intended for doctoral students in conducting.  
*Fall and Spring, 1-12 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

**MUS 671: Doctoral Instruction in Performance**

Intended for doctoral students in instrumental and vocal performance.  
*Fall and Spring, 1-12 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

**MUS 690: Doctoral Practicum in Professional Skills**

Practical training in activities related to the professional work of a performing musician, including teaching, solo and ensemble performance, conducting, internships and related musical work, both on and off-campus. Required of all full-time students in the D.M.A. performance program, except for students taking MUS 701. All off-campus activities in fulfillment of this course must be approved by the Graduate Program Director, who acts as supervisor for this course.  
*1 credit, S/U grading*  
*May be repeated for credit.*

**MUS 694: Doctoral Intersession Practicum**

Practical training in activities related to the professional work of a performing musician, including teaching, solo and ensemble performance, conducting, internships and related musical work, both on and off-campus. All off-campus activities in fulfillment of this course must be approved by the Graduate Program Director, who acts as supervisor for this course. This course is only to be used for Winter and Summer sessions. Winter and Summer only, S/U grading May be repeated.  
*S/U grading*  
*May be repeated for credit.*

**MUS 695: Doctoral Essay Tutorial**

Development of an essay to fulfill requirements in either DMA or PhD programs. Students may enroll in this course only after completing the required graduate seminars or proseminars (see program requirements) with a

grade of "B" or better in both the seminar and the essay to be developed.

*Prerequisite: MUS 502, 503, 504, 507, 535, 537-555, 557, or 559*  
*Fall and Spring, 1-2 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

**MUS 696: Doctoral Colloquium or Lecture-Recital**

Students are required to enroll in MUS 696 in the semester in which the Ph.D. colloquium or the D.M.A. lecture-recital is given. The instructor, chosen in consultation with the directing committee, acts as an advisor or tutor, and signals to the graduate program committee that the colloquium or lecture-recital may be given.

*Fall and Spring, 1 credit, S/U grading*  
*May be repeated 2 times FOR credit.*

**MUS 697: Directed Reading**

Intended for preparation for the preliminary examinations and related requirements.  
*Fall and Spring, 1-12 credits, S/U grading*  
*May be repeated for credit.*

**MUS 699: Dissertation Research on Campus**

Intended for work in the area of the dissertation.

*Prerequisite: Advancement to candidacy (G5).*  
*Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.*  
*Fall, Spring, and Summer, 1-9 credits, S/U grading*  
*May be repeated for credit.*

**MUS 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.  
*Fall, Spring, 1-9 credits, S/U grading*  
*May be repeated for credit.*

**MUS 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are

in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.*  
*Fall, Spring, 1-9 credits, S/U grading*  
*May be repeated for credit.*

**MUS 800: Summer Research**

Students who receive support for summer research must register for this course, which gives them full-time status.  
*S/U grading*  
*May be repeated for credit.*

**MUS 850: Summer Teaching**

Students who receive support for summer teaching must register for this course, which gives them full-time status.  
*S/U grading*

# NEU

## Neuroscience

**NEU 501: Introduction to Neuroscience Research**

A series of talks, discussions, and practical exercises to address topics related to research in neurobiology including laboratory etiquette, the laboratory notebook, experimental design and basic experimental techniques used in neuroscience research including electrophysiology, behavioral testing, molecular and cellular techniques, imaging and computational approaches. Prerequisites: Matriculation in MS program or permission of instructor Summer 3 credits, Letter graded (A, A-, B+, etc.)  
*3 credits, Letter graded (A, A-, B+, etc.)*

**NEU 502: Reading, Writing, and Speaking Neurobiology**

Seminar course for master's students in Neuroscience that will provide the student with practical instruction in analyzing the literature, written and oral presentation skills. Course exercises will focus on the student's thesis research.  
*2 credits, Letter graded (A, A-, B+, etc.)*

**NEU 517: Principles of Cell Signaling**

Nervous system function is dependant on the ability of signals to flow between and within cells. The basic principles of cellular signaling and maintenance of cellular and organismic homeostasis through intra and intercellular signaling mechanisms will be covered. Emphasis will be placed on relationships between nuclear events and ongoing processes of the cell. The roles of membrane receptors and second-messenger pathways in mediating such diverse events as bacterial chemotaxis, protozoan locomotion, and secretion are discussed. Semesters Offered: Summer  
*3 credits, Letter graded (A, A-, B+, etc.)*

### **NEU 521: Introduction to Cellular Neuroscience**

The course introduces students to basic principles of cellular neuroscience. Topics covered include the ionic basis of resting potentials and electrical excitability, the structure, function and molecular biology of voltage- and ligand-gated ion channels. Semesters Offered: Fall  
*2-3 credits, Letter graded (A, A-, B+, etc.)*

### **NEU 522: Introduction to Molecular Neuroscience**

The course introduces students to basic principles of molecular neuroscience. Topics covered include the signal transduction, regulation of neural gene expression and human neural genetic diseases. Semesters Offered: Fall  
*2-3 credits, Letter graded (A, A-, B+, etc.)*

### **NEU 531: Sensory and Motor Systems**

This course introduces students to current debates on sensory and motor systems. Topics and areas covered include: general principles of sensory and motor coding, sensory systems (somatosensation, audition, vision, taste and olfaction), voluntary control of movement, modulation of movement by cerebellum and basal ganglia.  
*2 credits, Letter graded (A, A-, B+, etc.)*

### **NEU 532: Neural Plasticity Learning and Memory**

This course introduces students to the link between plasticity, learning and memory. Topics covered include: synaptic plasticity, synaptic homeostasis, brain connectivity, neurogenesis, aversive and reward learning, addiction.  
*2 credits, Letter graded (A, A-, B+, etc.)*

### **NEU 534: Principles of Neurobiology**

Neuroscience investigates how the brain functions. This course begins with a review of cellular and molecular mechanisms of

brain function, considers brain systems for motor control and sensory processing, and then finishes with a description of the cellular and molecular underpinnings of higher brain functions such as learning, emotion, and cognition. Semester Offered: Summer  
*3 credits, Letter graded (A, A-, B+, etc.)*

### **NEU 536: Introduction to Computational Neuroscience**

This course will introduce students to the fundamental principles and methods underlying computational modeling of neurobiological systems, spanning a range of topics from the biophysics of excitable membranes to models of learning and memory. A major focus of the course will be on the process by which a model of a neurobiological system is developed. Students will be introduced to the mathematical methods required for the modeling of such systems, as well as to tools for numerical and computational simulation. The students will also learn programming skills in the Matlab computing environment and will be required to perform Matlab projects to complement the material learned in the lectures.  
*2-3 credits, Letter graded (A, A-, B+, etc.)*

### **NEU 537: Neurotransmission and Neuromodulation**

Exploration of fundamental concepts of neurotransmission and neuromodulation of synaptic transmission. The subject matter includes an overview of the basic principles of neurotransmission and of the neuromodulatory systems in the brain. The involvement of these systems in behavior and neurological disorders is emphasized. We will discuss how specific neurological disorders can be investigated experimentally and how experimental results can contribute to understanding and treating these disorders.  
*3 credits, Letter graded (A, A-, B+, etc.)*

### **NEU 547: Introduction to Neural Computation**

A broad introduction to neural computation. This course will discuss what counts as "computation" and in what sense the brain computes, how it computes, and whether those computations look anything like those performed by digital computers. These ideas and concepts will be introduced through examples of computation in the brain, including the neural bases of sensory perception, decision making, learning and memory, and motor control. Students will learn through in-class demonstrations and activities, as well as homework assignments that give students the opportunity to analyze real neural recordings relevant to each of the

topic modules. Students taking this class will be expected to have basic working knowledge in undergraduate-level calculus and statistics.  
*3 credits, Letter graded (A, A-, B+, etc.)*

### **NEU 548: MS Research Practicum in Neuroscience**

The student will be introduced to modern neuroscience research techniques through participation in ongoing research in the laboratory of a Program in Neuroscience Faculty member for one semester. Student must obtain permission to register from the sponsoring faculty member. Prerequisite: Matriculation in MS program or permission of instructor Semesters Offered:  
*Fall, Spring, Summer, 0-9 credits, S/U grading May be repeated for credit.*

### **NEU 549: MS Thesis Research**

The student will conduct Neuroscience research in the laboratory of a program in Neuroscience Faculty. Student must obtain permission to register from the sponsoring faculty member. Prerequisite: Matriculation in MS program or permission of instructor.  
*0-9 credits, S/U grading May be repeated for credit.*

## **NUR**

### **Nursing**

### **NUR 630: Philosophical Foundations of Nursing Science**

This course explores historical and current views of knowledge development underpinning philosophies of science, social science, and nursing science. Underlying ontological and epistemological assumptions of philosophical views and how they influence scientific inquiry in nursing will be addressed. A key component of these discussions will be the implications of diverse perspectives on theoretical thinking, scientific inquiry, and knowledge development in nursing.  
*3 credits, Letter graded (A, A-, B+, etc.)*

### **NUR 631: Concepts, Theories and Knowledge Development in Nursing Science**

This course will provide doctoral students with a systematic overview of concepts and theories as a foundation for knowledge development in nursing. Conceptual and analytical skills are developed through analysis and critique of nursing concepts, clinical phenomena and science-based theories. The course examines the theoretical and empirical foundation of nursing, approaches to the analysis and development of nursing concepts,

the role of concepts in nursing science, and the applicability of nursing concepts and theories to clinical practice. Focus will be on development and use of conceptual language, critical thinking skills, and in analyzing literature portraying key nursing concepts.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **NUR 635: Biostatistics**

This course will provide the student with knowledge of statistical approaches used in research. Applying statistical methods to critically evaluate & evidence used in clinical decision making will be an important aspect of this course.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **NUR 636: Advanced Statistical Methods**

This course will build on the foundations of NUR 635 and extend the doctoral student's exposure to more complex inferential statistics used in healthcare research. Statistical applications will be explored in the context of nursing research. Practical application of these statistical methods will be conducted using SPSS statistical software.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **NUR 647: Doctoral Research Seminar**

This course builds on research and nursing core in the development of doctoral-level academic skills essential for conducting a thorough literature search in the development of a scholarly paper on the state of the science on a selected topic. Emphasis is placed on establishing a scientific foundation of nursing practice, policy, and research.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **NUR 660: Quantitative Designs and Methods in Nursing Research**

Students will explore and analyze quantitative research methods used in the biomedical, behavioral, social and nursing sciences that are appropriate for the investigation of nursing research questions. This course explores the major designs and methods used for the investigation of problems requiring quantitative approaches. Types of research designs are analyzed including major strengths and limitations of each. Population sampling, participant selection, data collection and analysis methods are compared and contrasted. Data analysis will be incorporated using SPSS and other software programs.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **NUR 661: Qualitative Designs and Methods in Nursing Research**

This course explores the major approaches to qualitative inquiry. Philosophical or theoretical underpinnings specific to each approach are analyzed. Selected frameworks for data collection and analysis are presented. Selection of participants, data collection and analysis of each tradition are compared and contrasted. The elements of rigor in qualitative inquiry are explored.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **NUR 662: Data Management and Informatics for Clinical Scientists**

The aims of this course will be achieved by participation in a 45-hour (3 credit) course consisting of lectures, hands-on computer application training/labs, hands-on exercises/assignments, discussions and quizzes, and an individual final presentation. The course will provide training in questionnaire design, the use for REDCap for data input and managements, Excel for budget management, SPSS for data processing and analysis, and Power Point for print/slide presentations and report generation. Trainees will be instructed in the conduct for good clinical practice as it relates to data collection and data management. Trainees will be introduced to available comprehensive systems for collaborations, data management and data capture (e.g., REDCap, on Core) and issues of data security as it relates to clinical research. The hands-on exercises/assignments, discussions, quizzes, and homework assignments will help to develop skills in questionnaire design, methods of data study collection, data capture, and data management while enforcing skills for data analysis and presentation of study results. This course includes issues related to data management and data collection for a clinical research project to meet the needs of this group of trainees. Trainees will be evaluated by participation in the class exercises, homework assignments, quizzes, on-line course discussions through Blackboard, development of an individual simulated project, and an individual oral presentation of the student's simulated project describing their choices for data management methods and results to be presented during the last two classes. The individual project will include development of a questionnaire, codebook, database and creation of a test data set for use in conducting analyses and the final presentation.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **NUR 670: Independent Studies**

This student-initiated elective course provides an opportunity to use enhance the depth of a student's chose area of research. The independent student can be in specific

content areas or methodological or analytical approaches. Independent Studies cannot replace courses for a degreee.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 4 times FOR credit.*

#### **NUR 680: Integrating Big Data to Evaluate Population Health**

This course will focus on available sources of population data, how to access them, and begin to explore geographic regions through data. Students will be introduced to the field of Biomedical Informatics. Innovative tools developed at Stony Brook by informaticians to evaluate population health will be presented. Students will learn how to use data to identify populations at risk: who they are, where they live and to identify key focus areas to target intervention. With this knowledge students will be able to outline programs that may reduce health disparities, as well as evaluate other health risks in regional populations.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

#### **NUR 690: Dissertation Seminar I**

This course focuses on the development of the doctoral dissertation proposal. Students will apply their theoretical knowledge and research proficiency to transform their general ideas about their dissertation topic into a research strategy. Students will prepare key elements of the dissertation proposal, including Statement of the Problem, Research Questions and/or Hypotheses Conceptual/Theoretical Framework, Literature Review, and Research Methods. Using a seminar format, teaching-learning strategies are designed to promote critical/analytical thinking and scholarly discourse.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **NUR 691: Dissertation Seminar II**

This course focuses on the conduct of the doctoral dissertation under the guidance of the student's dissertation committee. Students will secure applicable human subjects protection, carry out their research methodologies, and complete analyses of data. The course culminates in a scholarly paper (Dissertation) that exemplifies the student's expertise and their new and creative contribution to nursing. Using a seminar format, teaching-learning strategies are designed to promote critical/analytical thinking and scholarly discourse. Students are required to provide regular updates of the study's progress to the dissertation committee chairperson.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**NUR 697: Seminar Series: Investigator Role and Research Practicum**

The course introduces graduate students to significant and methodologically rigorous research. School of Nursing faculty and affiliated faculty from Stony Brook Medicine and Stony Brook University will serve as preceptors as students engage in a supervised, hands-on practicum with ongoing research. Students will develop contracts that identify individualized learning outcomes of the practicum that will be facilitated by direct advisement and mentorship of School of Nursing and affiliated faculty. Opportunities during the practicum will include subject recruitment and screening, data collection and analyses, interpretation of results, research report writing a preparation of products for scholarly dissemination. While the research practicum may not necessarily expose students to the specific population or problem of greatest interest to them, the skills or competencies mastered can prepare students methodologically to carry out their dissertation research strategy.

3 credits, S/U grading

**NUR 698: Seminar Series: Academic Role and Teaching Practicum**

The course introduces graduate students to the major pedagogical theories and practices in academia. Students will develop contracts that identify individualized learning outcomes of the practicum that will be facilitated by direct advisement and mentorship of School of Nursing faculty. The practicum will include the student teaching part of a course, developing learning modules and student assignments, evaluating student performance, and evaluating their own teaching performance.

3 credits, S/U grading

**NUR 699: PhD Dissertation Research - On Campus**

May be repeated for credit.

**NUR 700: PhD Dissertation Research- Off Campus**

May be repeated for credit.

**NUR 701: PhD Dissertation Research- Off Campus (International)**

May be repeated for credit.

## OAE

### Oral Academic English

**OAE 590: Oral Academic English (Intermediate)**

The purpose of this course is to do intensive work in aural and oral language skills. Emphasis is on the segmental level: vowel/consonant work, syllable work and word stress as well as rhythm on the sentence level. Summarizing and questioning are practiced with work on learning styles. Students' awareness of American teaching and cultural patterns are stressed. Observing American professors and students in class is encouraged. A student will receive a diagnostic assessment of her/his language segmental and suprasegmental difficulties from the instructor and will be expected to work on improvement in these speech areas both in the classroom and independently in the language laboratories. Successful completion (A- or higher) of the course leads to OAE 594; B+ or below leads to OAE 592. Prerequisite: IELTS score of 5-5.5 or iBT Speak score of 15-17

3 credits, Letter graded (A, A-, B+, etc.)

**OAE 592: Oral Academic English (High Intermediate)**

The emphasis of this course is threefold: developing language skills, teaching skills and cultural awareness. Language skills will focus on sentence stress, phrasing, linking and pausing with field specific language practice. Teaching skills stressed include questioning techniques for discussion and assessment, leading effective discussions and assessing student learning. The cultural awareness focuses on idioms, American cultural values and norms as well as non-verbal communication. Successful completion of this course (B or higher) leads to OAE 594. Prerequisites: IELTS score of 6.0 or iBT Speak score of 18-20.

3 credits, Letter graded (A, A-, B+, etc.)

**OAE 594: Oral Academic English (Advanced)**

This course further develops language skills at the supra segmental level, teaching skills, cultural awareness and presentation skills. Intonation is taught with self-monitoring strategies. The teaching skills examine strategies for introducing yourself, your syllabus, explaining a visual, defining terms, giving presentations and giving successful lectures. Analysis of presentations is given to each student throughout the semester. Cultural awareness is centered on some assumptions affecting teaching in the American classroom. Successful completion of this course (a B or better) clears the student from the oral/aural ESL requirements. Prerequisites: IELTS score of 6.5 or iBT Speak score of 21-22)

3 credits, Letter graded (A, A-, B+, etc.)

## PHI

### Philosophy

**PHI 500: Feminist Theories**

This course is designed to introduce students to the most recent developments in feminist theory, covering different currents as well as traditions. The seminar may focus on moral and political questions, the intersection between the social and the psychological, or culture and representation as it is negotiated in different cultural media (film, literature, architecture, music, etc.)

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**PHI 501: Theories of Race**

This course is designed to introduce the student to different currents of analyses of race and racism. It focuses particularly on the relationship between philosophy and the development, legitimacy and legitimation of racial categories. The seminar may focus on moral and political philosophy, questions of epistemology or metaphysics, the intersections between the social and the psychological, or culture and representations of raced subjects as they are negotiated in different cultural media (film, literature, architecture, music, etc.)

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**PHI 502: Art Criticism and Theory**

This course deals with the theoretical approaches to the study of art that cross historical boundaries. Topics vary from semester to semester. They may be an expansion of one of the areas generally covered in ARH 540, such as psychology of art or the iconography of architecture. Other investigations may focus on subjects requiring a special methodological approach, such as the theory and history of ornament and design or the role of public art.

Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

**PHI 503: Theories of Ethnicity**

This course focuses on the category of ethnicity. Using an inter-cultural, comparative and historical approach, it seeks to expose the student to the uses and misuses of this category. The category of ethnicity will also be studied in conjunctions with questions relating to individual identity, national, cultural and civilizational identities. Ethnicity, like Race

and Gender, is one of the most fundamental markers of identity. Using interdisciplinary and comparative methods and perspectives, ethnicity's role in the constitutions of identities will be studied.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **PHI 504: Intersections of Race, Ethnicity, and Gender**

This course, which is analogous to an honors senior seminar, seeks to integrate into a productive dialogue the different methods, traditions and perspectives used to analyze Race, Ethnicity, and Gender, while also juxtaposing and comparing the similarities and differences between them. The approach, as in the whole program, will be interdisciplinary and comparative.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **PHI 505: Core Course in Philosophy and the Arts: History of Aesthetic Theory**

The basic course will investigate some of the most important and influential theories of art in the West from Plato to the present. Readings and discussion in depth of major figures will make up the content of the course: e.g., Plato, Aristotle, Kant, Hegel, Schopenhauer, Nietzsche, Heidegger, Collingwood, Langer, Merleau-Ponty, Dufrenne. The focus throughout will be on central issues in aesthetics such as imitation, truth, beauty, expression, emotion, and imagination.

*Fall, Spring, every year, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **PHI 506: Art and Its Problems**

A consideration of basic problems in the creation and appreciation of art. What is the creative process? Who is the artist? How is art to be compared with other symbolic forms (e.g. language, science, technology)? What does art offer that philosophy does not, and vice-versa? In what ways does the gender or racial identity of the artist affect the creation of the work? What are the cultural, social, and political dimensions of the art work and its reception?

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **PHI 507: Aesthetic System**

A concentrated reading of a single major work, with attention both to its detailed structure and to its larger significance. Candidates for such reading include Aristotle's Poetics, Kant's Critique of Judgement, Hegel's Lectures on

The Philosophy of Art, Adorno's Aesthetic Theory, Collingwood's Principles of Art, Langer's Feeling and Form, Dewey's Art as Experience, Heidegger's "The Origin of the Work of Art", and Danto's Transfiguration of the Commonplace.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **PHI 508: Contemporary Issues in the Arts**

With an eye on artworks accessible in the public sphere - museums, galleries, concerts, readings, dance performances, film - philosophical questions will be raised: Why these works now? How do they compare with their predecessors? What do they portend for the future of art? Visits to the sites and performances of such works will be integrated into an ongoing discussion of the issues they raise within the context of aesthetic theory - and what new theories they suggest. This course will be co-scheduled with ITL571, FRN571, and EGL603

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **PHI 509: Special Seminar in Aesthetics**

This is an advanced seminar in aesthetics that focuses on a single question that arises in the philosophy of art. This question may be approached through the writings of a single author, or else by consulting texts of several thinkers (including practicing artists as well as philosophers). Examples of such questions would be: What is the place of form in art? How does emotion figure into the creation or appreciation of art? To be taught on the main campus by a regular faculty member. Ideally, this course would be taken during the second year of master's degree work at Stony Brook Manhattan.

*Fall, Spring, every year, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **PHI 510: Ancient Philosophy**

An in-depth reading of few fundamental texts of classical antiquity that conceptualize mind/soul as object of rational investigation. These ancient theories contain within themselves all the principal elements of later philosophies of mind. This course aims at making these elements explicit through the study of the following: Anaxagoras, selected fragments on "mind"; Plato, Republic (selection) and Phaedo; Aristotle, De Anima (Peri Psyche); Marcus Aurelius, The Meditations; Lucretius, On the Nature of Things. 3 credits, ABCF grading, offered Fall/Spring alternate years

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **PHI 511: Modern Philosophy**

This is an advanced course that investigates pivotal connections between seventeenth and eighteenth-century theories of knowledge, metaphysics, aesthetics, and ethics. It surveys key developments in these areas of philosophic inquiry during the sixteenth and seventeenth centuries. It also involves careful explicative work on texts written by major thinkers of the period, e.g., Descartes, Locke, Leibniz, Spinoza, Malebranch, Shaftesbury, Hutcheson, Hume, Rousseau, and Kant.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **PHI 520: Advanced Studies in Philosophy**

Investigations into specialty areas led and directed by accomplished philosophers in the discipline involved. Instructor consent required. No more than six credits of PHI 520 may count towards the fulfillment of degree requirements in the MA program.

*Offered:*

*Fall, Spring, Summer, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **PHI 521: Contemporary Moral Issues**

This examination of the radical nature of traditional moral theory in its contemporary applications will look at the ideas of Mill, Kant, and Aristotle as variations on traditional Judeo-Christian moral theory. Students will write short papers on contemporary moral issues as these are portrayed in short fiction.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **PHI 535: Political Philosophy**

This course will take up classics of political philosophy and discuss contemporary social life and ideologies in the light of the theoretical frameworks they have achieved. Readings and assignments will be drawn from such exemplary works as Plato's Republic, Aristotle's Politics, Machiavelli's The Prince, Hobbes's Leviathan, Locke's Second Treatise of Government, and Marx's Communist Manifesto.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **PHI 553: Philosophy of Education**

The purpose of the course is to develop curricula which not only bridge educational gaps but which also develop within all students a sense of civil responsibility toward community issues and problems. This course critically examines such issues of ethnicity and race, family systems, affirmative action, and multiculturalism through the vehicle of Asian American studies.

*3 credits, Letter graded (A, A-, B+, etc.)*

**PHI 555: Perspectives on the Person**

The focus of this course will be the question of how the results of current research are related to our understanding of human development and whether they require us to revise our understanding of what a person is. Readings from classic philosophical texts, such as Plato, Locke, Kant, and from contemporary research in philosophy, psychology and other relevant sciences will be used. Offered as both CEI 587 and PHI 555

*3 credits, Letter graded (A, A-, B+, etc.)*

**PHI 562: Concepts and Methods in Evolutionary Biology**

The course aims at achieving two related objectives: first, to provide graduate students in Ecology & Evolution and other biology departments, as well as Philosophy, with a basic understanding of the varied methods (both experimental and statistical) that make up the body of evolutionary quantitative biology. The focus will be in particular on quantitative genetics and its interface with more modern approaches, including QTL mapping, bioinformatics and the various "omics" (genomics, proteomics, etc.). Second, students will become familiar with the fundamental concepts of philosophy of science particularly as they relate to the conceptual analysis of the ideas that shape modern evolutionary and ecological theory. In this respect, the focus will be both on philosophical concepts such as falsificationism, induction, deduction, hypothesis testing and the nature of evidence, as well as on the meaning of key ideas in evolutionary ecology, like natural selection, genetic drift, and constraints.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

**PHI 571: American Philosophy: Philosophical Foundations of American Politics**

Readings from Emerson, C.S. Peirce, G.H. Mead, W. James, G. Santayana, J. Dewey, J.H. Randall, and J. Buchler will give the student a grasp of the classic American tradition in philosophy and the plural strands that go to make it up, such as: the turn from idealism to semioticism, neo-realism and critical realism, pragmatism and pragmaticism, the historical interest and the social interest, individualism and voluntarism, and the centrality of art and science in human affairs.

*3 credits, Letter graded (A, A-, B+, etc.)*

**PHI 572: ORIENTAL PHILOSOPHY****PHI 575: Philosophy of Religion**

Several aspects of the Judeo-Christian tradition raise philosophical questions worthy of further reflection and consideration. The first is the relation of religious faith to other sorts of knowledge and commitment: is religious belief more like belief in scientific experts or more like belief in one's spouse? A second is what sort of God is worth believing in and whether we can talk intelligibly about the deity. The third is whether and how any God worth believing in could be compatible with the obvious ills of our world.

*3 credits, Letter graded (A, A-, B+, etc.)*

**PHI 576: ETHICS AND VALUES****PHI 582: Philosophy of Art**

The purpose of this course is to encourage students to explore and enrich their aesthetic experience through reading, analyzing, discussing, and writing about various theories put forth by philosophers in the western tradition. Among topics to be considered are representation, expression, form, the aesthetic attitude, beauty, taste, criticism and interpretation of art, and the relation of art to other areas of experience. The course does not assume previous familiarity with philosophy or art; however, it does assume an intellectual commitment to the examination of difficult ideas. This course is offered as both CEI 573 and PHI 582.

*3 credits, Letter graded (A, A-, B+, etc.)*

**PHI 587: DIRECTED READINGS****PHI 588: DIRECTED RESEARCH****PHI 590: DIRECTED READINGS****PHI 595: DIRECTED RESEARCH**

*May be repeated 1 times FOR credit.*

**PHI 599: Master's Thesis Research**

*May be repeated 2 times FOR credit.*

**PHI 600: Ancient Philosophy**

*May be repeated for credit.*

**PHI 601: Medieval and/or Renaissance Philosophy**

*May be repeated for credit.*

**PHI 602: Modern Philosophy**

*May be repeated for credit.*

**PHI 603: 19th-Century Philosophy**

*May be repeated for credit.*

**PHI 604: Special Topics in the History of Philosophy**

*May be repeated for credit.*

**PHI 610: Philosophy and the Arts**

*May be repeated for credit.*

**PHI 611: Philosophy and Literature**

*May be repeated for credit.*

**PHI 612: Philosophy and Psychology**

*May be repeated for credit.*

**PHI 613: Philosophy and Politics****PHI 614: Philosophy and Linguistics****PHI 615: Philosophy and Feminism**

Co-scheduled with WST 611.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**PHI 616: Philosophy and Technology**

Co-scheduled with WST 611.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**PHI 617: Philosophy and Environmental Studies****PHI 618: Philosophy and the Sciences****PHI 619: Special Topics in Interface Studies**

*May be repeated for credit.*

**PHI 620: Advanced Problems in Philosophy**

Delivery: Variable and repetitive credit

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**PHI 621: Independent Study**

*May be repeated for credit.*

**PHI 622: Supervised Teaching**

*May be repeated for credit.*

**PHI 623: Teaching Practicum**

*May be repeated for credit.*

**PHI 624: New York Consortium Study**

This course designation should be used by students who enroll in seminars at participating universities of the New York Consortium of Graduate Schools. No more than six credits of consortium study (and none for first-year students at Stony Brook) may count toward

the fulfillment of requirements in the doctoral program.

*Prerequisite: Completion of first year in doctoral program (Philosophy)*  
*Fall, 1-4 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

#### **PHI 625: Prospectus Seminar**

This seminar is taken by all doctoral students in the Spring semester of their third year. The primary goal is to have each write a dissertation proposal.

*Spring, 3 credits, S/U grading*

#### **PHI 630: Seminar in Continental Philosophy**

*May be repeated for credit.*

#### **PHI 631: Seminar in Analytic Philosophy**

*May be repeated for credit.*

#### **PHI 632: Seminar in Comparative Philosophy**

#### **PHI 633: American Pragmatism and Naturalism**

*May be repeated 1 times FOR credit.*

#### **PHI 634: Eastern Philosophy**

#### **PHI 635: Philosophy of Science and Logic**

#### **PHI 636: Metaphysics**

#### **PHI 637: Epistemology**

A study of selected conceptions of the nature, structure and content of knowledge, as found in classical and contemporary theories of knowledge.

*3 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

#### **PHI 638: Philosophical Psychology**

*May be repeated for credit.*

#### **PHI 639: Social and Political Philosophy**

*May be repeated for credit.*

#### **PHI 640: Ethics**

#### **PHI 641: Aesthetics**

#### **PHI 642: Philosophy of Religion**

#### **PHI 643: Semiotics**

#### **PHI 644: Special Topics in Contemporary Philosophy**

*May be repeated for credit.*

#### **PHI 699: Dissertation Research on Campus**

*Prerequisite: Advancement to candidacy (G5).* Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

*Fall, Spring, 1-9 credits, S/U grading*  
*May be repeated for credit.*

#### **PHI 700: Dissertation Research off Campus - Domestic**

*Prerequisite: Must be advanced to candidacy (G5).* Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading*  
*May be repeated for credit.*

#### **PHI 701: Dissertation Research off Campus - International**

*Prerequisite: Must be advanced to candidacy (G5).* Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.*  
*Fall, Spring, 1-9 credits, S/U grading*  
*May be repeated for credit.*

#### **PHI 800: Full Time Summer Research**

0 credits, S/U grading

*S/U grading*  
*May be repeated for credit.*

## **PHY**

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### **Physics**

#### **PHY 501: Classical Mechanics**

Analytical classical mechanics including Lagrangian and Hamiltonian formulations and the Hamilton-Jacobi theory. Variational principles, symmetries and conservation laws. Selected advanced problems such as parametric and nonlinear oscillations, planetary motion, classical theory of scattering, rigid body rotation, and deterministic chaos. Basic notions of elasticity theory and fluid dynamics.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **PHY 503: Methods of Mathematical Physics I**

A selection of mathematical techniques useful for physicists. Topics are selected from: linear algebra, complex variables, differential equations, asymptotic analysis, special functions, boundary value problems, integral transforms, perturbation theory as applied to linear and nonlinear systems. This course should be taken by entering graduate students seeking enrichment in these areas.

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PHY 504: Computational Methods in Physics and Astrophysics**

An introduction to procedural and object-oriented programming in a high-level language such as C++ or modern Fortran with examples and assignments consisting of rudimentary algorithms for problems in physics and astronomy. Students will use the UNIX/Linux operating system to write programs and manage data, and the course will include an introduction to parallel computing and good programming practices such as version control and verification. The course will prepare students for courses in algorithms and methods that assume a knowledge of programming.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PHY 505: Classical Electrodynamics**

Electrostatics and Magnetostatics in vacuum and medium; Green's functions; Maxwell's equations and gauge invariance; Electromagnetic wave propagation; Radiation, scattering, interference, and diffraction; Special relativity; Radiation by relativistic charges; Additional topics as time permits. Three lecture hours plus two recitation hours per week.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PHY 510: Introduction to Nonlinear Dynamics**

This course concentrates on developing the tools used to analyze models of dynamical

systems associated with physical phenomena, such as coupled electrical mechanical, chemical and biological oscillators, amplitude equations, symplectic maps, etc. There is a discussion of the basic theorems, as well as methods used to derive perturbation solutions for differential equations and maps using the method of normal forms.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 511: Quantum Mechanics I

First course in a two-part sequence.

Topics include basic quantum physics and mathematical apparatus; application to one dimensional examples and simple systems. Symmetries, angular momentum, and spin. Additional topics as time permits.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 512: Quantum Mechanics II

Second course in a two-part sequence, covering variational principles, perturbation theory, relativistic quantum mechanics, quantization of the radiation field, many-body systems. Application to atoms, solids, nuclei and elementary particles, as time permits.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 514: Current Research Instruments

In a series of distinct units, various members of the experimental research faculty describe the nature of their work, explain the major principles of their laboratory instruments, discuss how these instrument systems function, and conduct tours of their laboratories showing the apparatus in action. The student becomes familiar with most of the experimental research instrumentation in the department.

*Fall or Spring, 3 credits, S/U grading*

### PHY 515: Methods of Experimental Research I

An experimental course required for all graduate students. The goal of the course is to provide firsthand experience with the nature of experimental work. For students oriented toward theory, the course gives a background for reading and evaluating experimental papers. The course is based on classic measurements in nuclear, particle, atomic, condensed matter physics, and astronomy. Students can gain experience in handling cryogenic liquids, vacuum systems, lasers, pulse counting and coincidence methods, resonance measurements, and electronic instrumentation, such as lock-in amplifiers, particle detectors, coincidence counters, computer control, etc. Numerical analysis of

data, presentation of results in written, graphic, and oral form, and meaningful comparison of experiments and theory are part of the course. Working alone or with, at most, one partner, each student must do one experiment from each of four different groups.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### PHY 517: Laboratory Course in Astronomical Techniques

A course designed to introduce the theory, design, and operation of modern astronomical instrumentation and to familiarize the student with the use of telescopes. Current astronomical techniques will be discussed with emphasis on methods of observational measurements and reduction of data. Emphasis is given on optical techniques appropriate for wavelengths shorter than one micron. Extensive laboratory and observing exercises may be expected.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 518: Applications of Synchrotron Radiation

An introduction to the principles of synchrotron radiation is followed by a series of lectures given by graduate faculty and guest lecturers with expertise in using synchrotron radiation for research in physics, chemistry, materials science, biology and medicine. Most of these presentations are followed by hands-on experience with synchrotron instrumentation at Brookhaven National Laboratory. Access to user facilities, including safety requirements, preparation of user proposals, user training and other issues, and also covered.

*Spring, 1-3 credits, S/U grading*

### PHY 521: Stars

A study of the atmospheres, interiors, and evolution of stars. The contact between theory and observations is emphasized. Stellar atmospheres in hydrostatic and radiative equilibrium described. Models for the calculation of stellar spectra are discussed. Stellar winds are studied. Next, theoretical studies of stellar interiors and evolution, including equations of state, energy transport, and nuclear energy generation, are developed. Structures of main sequence, red giant, pre-main sequence, and white dwarves are studied and compared to observations. The evolution of single stars up to supernovae and the peculiar evolution of close binary systems are also studied.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 522: Interstellar Medium

A study of the interstellar medium with emphasis on physical processes. Topics include kinetic theory, equation of transfer, spectral lines, non-thermal emission, ionization effects of dust, and formation and spectroscopy of molecular clouds. The components of the interstellar medium and the interactions between them are discussed in detail, as well as the process of star formation.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 523: Galaxies

A basic course on the observational and theoretical aspects of the content, morphology, kinematics, and dynamics of galaxies. Topics include the size, shape, and location of the sun in the Milky Way; stellar populations; the disk and spheroidal components; galactic rotation; distance determination in the Milky Way and to external galaxies; galaxy classification and the Hubble Law. Theoretical topics center on stellar dynamics, including potential theory; stellar orbits; and spiral structure. The course also includes a brief introduction to cosmology.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 524: Cosmology

A basic course on cosmology: Hubble expansion, Friedmann universes, age of the universe, microwave background radiation, big-bang nucleosynthesis, inflation, growth of gravitational instabilities and galaxy formation, correlation functions, local density and velocity perturbations, and dark matter.

*Prerequisite: PHY 523 or permission of instructor*

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 529: Quantum Electronics

Introduction to modern atomic physics for the laser era for graduate students. Emphasis on the interaction between atoms and light, as well as on atomic structure and how it affects this interaction. Modern applications such as laser cooling, atom trapping, precision spectroscopy with frequency comb, quantum information, and others will be discussed. Not for satisfying physics Ph.D. breadth course requirements. Spring every year, 1-3 credits, ABCF grading

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 534: Radio Astronomy

Topics covered include continuum and spectral-line radio astronomy. Within the Milky Way Galaxy topics include



the interstellar medium, the physics and kinematics of molecular clouds, star formation in giant molecular clouds, chemistry of molecular clouds, galactic structure, spiral structure, and pulsars. Extragalactic topics include radio galaxies and jets, radio loud quasars, molecular and atomic gas in galaxies, luminous infrared galaxies, the missing mass problem in spiral galaxies, and cosmic microwave background radiation. Radio astronomy measurement techniques for single telescopes and aperture synthesis techniques are also covered, although the emphasis is on scientific results.

*Fall or Spring, alternate years, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 536: The Physics of Free Electron Lasers**

The purpose of this course is to introduce the students to the physics of Free Electron Lasers and Synchrotron Radiation. This course is suitable for graduate students who want to learn more about Free Electron Lasers and Synchrotron Radiation physics.

*Offered: Summer, 1-2 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 537: Measurement and Control of Charged Particle Beams**

The course provides a comprehensive and systematic review of the methods used for measurement, correction, and control of charged particle beams in modern particle accelerators. By way of illustration, theoretical principles are applied in the evaluation of experimental data obtained at various accelerator laboratories including CERN, BNL, DESY, SLAC, IUCF, KEK, LBNL, and FNAL. This course aims to bridge the link between experimental observations and theoretical principles in accelerator physics. Upon completion of this course, the students are expected to be able to apply the principles and methods presented to their research.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 538: Cyclotrons: Beam Dynamics and Design**

Cyclotrons are circular machines where a fixed magnetic field bends particles through a spiraling path that maintains resonance with RF accelerating fields. They are attractive for particle acceleration where efficiency of conversion from electric power to beam power is a figure of merit. Cyclotrons historically drove many advances in high energy and nuclear physics and have seen a recent resurgence for radioisotope production, medical treatment facilities, and industrial applications. This course provides students with an introduction to the physics of charged

particle dynamics in cyclotrons and their design. Students will learn how to calculate cyclotron orbits from a given magnetic field configuration, predict the space charge and brightness limits, and devise mitigation for betatron resonances.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 539: Laser Applications to Particle Accelerators**

Lasers have become essential tools widely used in the world of accelerators and particle beams with applications ranging from high quality electron and ion sources, to sophisticated beam diagnostics. This course is an introduction to the basic laser technology, with the focus on applications of the laser techniques in areas of particle accelerators. Upon completion of this course, the students are expected to understand the basic laser techniques, laser beam interactions, become familiar with use of lasers for beam diagnostics and beam manipulations, and gain useful hands-on experience with laser simulations and lab work.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 540: Statistical Mechanics**

Brief review of thermodynamics, principles of physical statistics, systems of non-interacting particles: Boltzmann, Fermi-Dirac, and Bose-Einstein statistics. Applications to ideal gases, electrons and phonons in solids, and black body radiation. Approximate treatment of non-ideal gases. First-order and second-order phase transitions. Ising model, transfer matrix, and renormalization group approach. Fluctuations in thermal equilibrium, fluctuation-dissipation theorem, brief review of non-equilibrium fluctuations. Basic notions of ergodicity, classical and quantum chaos.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 541: Advanced Statistical Mechanics**

Topics are selected from cluster expansions, elementary theory of quantum fluids, phase transitions, transfer matrix, Ising and ferroelectric models, polymers and membranes, disordered systems, and fluctuation and nonequilibrium phenomena.

*Fall, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 542: Fundamentals of Accelerator Physics and Technology with Simulations and Measurements Lab**

This course is an introduction to the underlying principles and uses of the nearly 14,000 particle accelerators that are used worldwide

in medicine, industry, and scientific research. The course is suitable for senior undergraduate and entry-level graduate students in physics and engineering or students from other fields with a particular interest in accelerator-based science.

*Summer, 1-2 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 543: RF Superconductivity for Particle Accelerators**

This graduate level course covers application of superconducting radio frequency (SRF) technology to contemporary high- $\beta$  accelerators: storage rings, pulsed and CW linacs, including energy recovery linacs (ERLs). The course will address physics and engineering aspects of using SRF in accelerators. It will cover beam-cavity interactions issues specific to superconducting cavities, a systems approach to designing SRF systems and engineering of superconducting cavity cryomodules. The course is intended for graduate students pursuing accelerator physics and graduate engineers and physicists who want to familiarize themselves with superconducting RF systems.

*Fall, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 544: Spin Dynamics in Particle Accelerators**

Polarization is a possible property of charged particle beams, which has been used and developed from the early times of particle accelerator developments. It is a property of paramount interest in future nuclear and high energy physics accelerator projects, as well as in several existing accelerator facilities. Polarization requires sophisticated beam and spin manipulations, from production to utilization, based on dedicated accelerator design rules and technological components. This course will introduce students to the dynamics of spin in charged particle accelerators, and to the accelerator components and spin manipulation techniques which enable and allow preserving beam polarization. The course material will provide the basic tools for the design of practical polarized beam accelerator components and structures, and will convey an understanding of the essential underlying physics of polarized beams.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 545: Practical Issues in Cyclotron Design and Construc.**

Cyclotrons are versatile accelerators whose use continues to expand in basic research, industry, medicine, and education. This course provides students with an introduction to the physics and technology of cyclotrons and their design.

Issues associated with the construction of practical facilities for prototypical applications are reviewed. Upon completion of this course, students are expected to apply cyclotron theory and practical constraints to propose a complete cyclotron design for a prototypical application.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 546: Python for Scientific Computing**

Python has seen wide adoption in the scientific community for data analysis, simulation, prototyping and visualization. It provided a simple, yet powerful means to build applications. This seminar introduces python and its use in scientific computing. Students will learn the standard python libraries for array manipulation, visualization, numerical analysis and symbolic mathematics, as well as how to interface python with other languages, build applications, and good software engineering practices (including version control and testing). Students are encouraged to share examples for their discipline

*0-1 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 547: Classical Mechanics and E&M in Accelerator Physics**

The course focuses on the topics of classical mechanics and electrodynamics that are of importance for accelerator physics. On completion of this course, students are expected to have a broad understanding of the dynamics of particles in electromagnetic fields as well as the physical principles that underpin particle accelerator technology. Along with the graduate-level PHY554 Fundamentals of Accelerator Physics course, this course is intended to prepare students for specialized USPAS courses and advanced study of cutting-edge accelerator topics.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 548: Timing and Synchronization for Accelerators**

Course Description: This course is intended for accelerator physicists who are interested in the design of timing systems and synchronization techniques for particle accelerators and light sources. The course focuses on transmission, measurement and control of highspeed electromagnetic signals in transmission lines or waveguides, whether RF/microwave or optical. These systems are important in the distribution of timing reference information in accelerating systems, and diagnostic techniques to measure beams with respect to RF or ultrafast pulse signals. Examples include ultrafast pump/probe experiments in accelerator-based light sources, or diagnostics for short particle bunches. The course enables students to understand how precise timing

signals are transmitted and used in state-of-the-art systems. Concepts and technology for subpicosecond, and even sub-femtosecond synchronization of ultrafast pulse optical sources, RF, and particle beams will be discussed.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 549: Optimization and Machine Learning for Accelerators**

Optimization techniques are key to both the design and operation of contemporary charged particle accelerator systems. In addition, machine learning techniques are now being increasingly used, either to augment the capabilities of standard optimization (e.g. through surrogate modeling), or to address entirely new tasks (e.g. anomaly detection, fault classification). This course will introduce a number of optimization and machine learning techniques that are commonly used for particle accelerators, as well as their range of applicability and limitations.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 551: Nuclear Physics I**

Nucleon structure, conservation laws and the static quark model; nuclear force and the two nucleon system; bulk properties of nuclear matter, charge distribution, spin, isospin, mass, alpha decay, nuclear fission; electromagnetic and weak interaction; collective motion; microscopic models of the nucleus; nuclear matter under extreme conditions, high rotational states, heavy ion physics at RHIC, nuclear astrophysics.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 552: Nuclear Physics II**

Nucleon-nucleon scattering and effective range approximation; the nucleon-nucleon interaction calculated from meson exchange; effective forces between nucleons in nuclei and nuclear matter; the renormalization group approach to these interactions; Fermi-liquid theory of the nuclear many-body problem; thermodynamics of hadrons at high temperature; RHIC physics with heavy ions including transition from hadrons to quark gluon plasma, restoration of chiral symmetry, equation of state, initial conditions, thermodynamics of hadrons at high temperature.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 554: Fundamentals of Accelerator Physics**

History of accelerators, basic principles including centre of mass energy, luminosity, accelerating gradient; Characteristics of

modern colliders: RHIC, LEP, LHC, b-factories; Transverse motion, principles of beam cooling, Strong focusing, simple lattices; Circulating beams, synchrotron radiation; Longitudinal dynamics; Non-linearities and resonances; Radio Frequency cavities, superconductivity in accelerators; Applications of accelerators: light sources, medical uses, Future Accelerators: eRHIC, ILC, neutrino factories, muon collider, laser plasma acceleration.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 555: Solid-State Physics I**

This course concentrates on the basic notions of solid state physics, treated mostly within the single-particle approximation. Main topics include: crystal lattices and symmetries, reciprocal lattice and state counting, phonons, electron energy band theory, bonding and cohesion (semi-quantitatively), electron dynamics and electron transport in metals and semiconductors, screening, optical properties of solids, and an introduction to superconductivity and magnetism.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 556: Solid State Physics II**

The course focuses on the many-particle aspects of solid state physics addressing classical topics such as superconductivity and the transport properties of disordered conductors, as well as more modern subjects including the fractional quantum Hall effect, dissipative quantum mechanics, and problems of mesoscopic physics. Both phenomenological and theoretical descriptions are discussed.

*Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 557: Elementary Particle Physics**

Introduction to elementary particle physics. Symmetries and invariance in particle physics. The properties of particles in terms of quarks and leptons and their interactions. An introduction to the electroweak and for strong interactions. Interactions at high energies. Interactions between particles and matter, experiments in particle and experimental results. Survey of particle accelerators.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 558: Physical Biology**

Topics of this course include but are not limited to: Time and space in cells; Structural basis of biology; Molecular solvation and lattice models; Chemical potential; Electrostatics, potentials, dipoles,

electrochemical potentials; Poisson-Boltzmann and Born models; Acids, bases and salts; Intermolecular potentials and force fields; Phase transitions; Lattice and Ising models; Adsorption; Binding polynomials; Binding cooperativity; Semigrand ensemble, molecular machines; Molecular motors, energy conversion and transduction; Polymer theory; Flory-Huggins; Random flights; Elasticity; Helix-coil theory; Collapse transitions; Protein folding equilibria; Protein folding kinetics; Sequence space; Protein evolution; Protein elasticity and biological mechanics of proteins; Biophysics of the cell; Proteome stabilities, aggregation, kinetics.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 559: Biological Dynamics and Networks**

This course will provide a solid foundation in key theoretical concepts for the study of dynamics in biological systems and networks at different scales ranging from the molecular level to metabolic and gene regulatory networks. Topics of this course include but are not limited to: Physical kinetics; Diffusion/Smoluchowski; Random flights; Waiting times; Poisson; Brownian ratchets; Chemical kinetics; Transition states; Stability, bifurcations, pattern development; Noise in cells: intrinsic and Extrinsic; Feedback; Biological Oscillators; Recurrence, period doubling, chaos; Networks; Topologies; Degree distribution, betweenness; Models of nets: Erdos-Renyi, scale-free, social, Watts-Strogatz, agents; Robustness, highly-optimized tolerance, bowties, epidemics; Biological networks: Protein-protein nets, regulatory and metabolic nets; Known biological circuits and their behaviors; How networks evolve: Preferential attachment, rewiring; Power laws; Fluxed through networks; Information and communication, entropy; Metabolic flux analysis; Artificial and Natural selection for traits; Darwinian evolution; Population dynamics.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 560: Frontiers of Physics and Astrophysics**

This course complements the graduate physics courses in particle physics, particle astrophysics and cosmology, concentrating on interrelationships between these areas of research in understanding the physics of the universe. The course will introduce advanced physics students to the key issues, experimental facilities and prospects for the future. The present status and future major experiments will be reviewed from

the perspective of both the technologies and science. In addition to the assigned readings and class participation, students will investigate in depth a specific area of their choice, producing a ~ 10 page paper on the subject, as well as give an oral presentation. *0-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 561: Biology for Physical Scientists**

Topics of this course include but are not restricted to: Overview of living things; Six kingdoms, animal phyla. Physiology and organs; Chemistry of life; Noncovalent interactions; Hydrogen bonds; Solvation; Biochemistry: reactions, catalysis, ATP amino acids, nucleic acids, lipids; Cell structures: Nucleus, mitochondria, chromosomes, membranes; Basic paradigm: DNA makes RNA makes protein; How cell machines and circuits work; Cell cycle; The processes of evolution; Genetics and heredity; Diseases: how biological systems fail; How drugs are discovered; Tight-binding inhibitors; Antibodies; Current research: Cell division and cancer, genomics, bioinformatics, high throughput sequencing, systems and synthetic biology.

*Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 562: Atomic Physics and Lasers**

Introduction to the theory of lasers including resonance conditions, normal modes, optical cavities and elementary quantum mechanics. Description of types of lasers, methods of control, limitations of power, precision, wavelength, etc. Applications to research and industry. Throughout the course, there will be many problems that involve writing computer programs to solve simple differential equations and model different aspects of laser operation. Not for satisfying physics Ph.D. breadth course requirements.

*Fall, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 564: Advanced Accelerator Physics**

Types and Components of Accelerators, Relativistic Mechanics and EM for Accelerators, Accelerator Hamiltonian and N-dimensional phase space, Poincare diagrams, Lie algebras and symplectic maps and matrices; exact parameterization of linear motion in accelerators; matrix functions, Sylvester's formula; non-linear effects, Collective instabilities & Landau Damping, Radiation damping and Excitation, natural Emission; Spin motion in accelerators.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 565: Quantum Electronics I: Atomic Physics**

Quantum electronics is a synthesis of quantum physics and electrical engineering, and is introduced in two independent semesters. A description of simple atoms and molecules and their interaction with radiation includes atoms in strong and/or weak external fields, two-photon spectroscopy, superradiance, Rydberg states, lasers and laser spectroscopy, coherent transients, etc.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 566: Quantum Electronics II: Quantum Optics**

Quantum electronics is a synthesis of quantum physics and electrical engineering, and is introduced in two independent semesters. This course focuses on the quantum properties of light. The quantized electromagnetic field and its correlations are used to understand nonclassical states from various sources such as two-level atoms and nonlinear systems interacting with radiation fields.

*Fall, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 567: Theoretical Chemical Physics**

This course stresses the physical theory underlying chemical phenomena. Special emphasis is given to advanced topics in electronic structure theory, molecular dynamics, condensed matter and surfaces, many-body and quantum ensemble theory, and the interaction of light and molecules.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 568: Quantum Information Science**

This is a survey of the fast evolving field of quantum information, ranging from Bell inequality, quantum teleportation to quantum algorithms and quantum programming frameworks. It aims to cover the essential knowledge of quantum information science and helps to bridge the gap to the current research activities of the field. Emphasis will be placed on solid-state platforms of quantum computers, topological error correction codes, and applications. Some illustration of quantum programming will be done on IBM's transmon-type cloud quantum computers.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 569: Quantum Information Science/Technology Laboratory**

This is an experimental course that consists of several modules of experiments designed to enhance students' experimental skills used in

quantum information science and technology. Students will work individually or with at most one partner on five modules and write their lab reports.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 570: Introductory Physics Revisited for Teachers**

This seminar allows students to explore the fine points of topics normally covered in high school physics. Not for PhD credit.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 571: Electromagnetic Theory for Teachers**

The course reviews vector calculus and develops Maxwell's equations relating electric and magnetic fields to their sources. Applications for time-independent fields are developed for solving boundary value problems and the interactions of fields in bulk matter. An oral presentation of a relevant topic suitable for a high-school class is required. Not for PhD credit.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 573: Mechanics for Teachers**

The Newtonian formulation of classical mechanics is reviewed and applied to more advanced problems than those considered in introductory physics. The Lagrangian and Hamiltonian methods are then derived from the Newtonian treatment and applied to various problems. An oral presentation of a relevant topic suitable for a high-school class is required. Not for PhD credit.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 576: Thermodynamics and Statistical Mechanics for Teachers**

This course consists of two parts. Those relations among the properties of systems at thermal equilibrium that are independent of a detailed microscopic understanding are developed by use of the first and second laws of thermodynamics. The concepts of temperature, internal energy and entropy are analyzed. The thermodynamic potentials are introduced. Applications to a wide variety of systems are made. The second portion of the course, beginning with the kinetic theory of gases, develops elementary statistical mechanics, relates entropy and probability, and treats simple examples in classical and quantum statistics. An oral presentation of a relevant topic suitable for a high-school class is required. Not for PhD credit.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 577: Physical and Mathematical Foundations of Quantum Mechanics for Teachers**

Physical and mathematical foundations of quantum mechanics. Maxwell waves and their properties: intensity, energy density, and momentum density. Planck-Einstein relation between energy and frequency for light quanta. De Broglie relation between momentum and wavelength. Number density and probability density of photons. One-photon quantum mechanics, with Maxwell field as wave function. Diffraction phenomena. Uncertainty relation between wavelength and position, hence between momentum and position. In addition to the requirements for the undergraduate course PHY 307, students taking this course must prepare and present a talk on quantum physics suitable for a general (non-physics) adult audience. This course cannot be taken for credit toward the PhD degrees in Physics. Approval of the Program Director is required for taking this course for credit toward a Master Degree.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 578: Quantum Physics for Teachers**

The concepts, historical development and mathematical methods of quantum mechanics. Topics include Schroedinger's equation in time-dependent and time-independent forms, and one- and three-dimensional solutions, including the treatment of angular momentum and spin. Applications to simple systems, especially the hydrogen atom, are stressed. An oral presentation of a relevant topic suitable for a high school class is required. Not for PhD credit.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 579: Special Topics for Teachers**

Topics of current interest to high school teachers are discussed in order to bring the teachers up to date on the latest developments in various areas of research. Examples could include the standard model of particle physics, nanofabrication techniques, atomic force microscopy, etc. Not for PhD credit.

*Fall or Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **PHY 580: Special Research Projects**

Research under the direction of a faculty member. Not open to Ph.D. candidates.

*Fall and Spring, 1-18 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **PHY 582: Optics Rotation**

Optical science students experience three to eight week periods in each of several appropriate research groups. At the end of each period a report is required that describes the topics studied or project done. May not be taken for credit more than two semesters.

*Fall and Spring, 0-2 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **PHY 584: Rotation in Physical Biology**

A two-semester course in which students spend at least 8 weeks in each of three different laboratories actively participating in the research of faculty associated with the Laufer Center. At least one of the rotations must be in experimental physical biology. Participants will give a research talk at the end of each eight week period.

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **PHY 585: Special Study**

Reading course in selected topics.

*Fall and Spring, 1-18 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **PHY 595: Master's Degree Thesis Research**

Independent research for Master's degree students. Open only to those approved by individual faculty for thesis work. This course also includes a minimum of two hours person to person discussion of ethics and conduct in research and scholarship which addresses among others integrity in scholarship, academic honesty, authorship, plagiarism, mentoring and collaborations. These topics will be illustrated with case studies and issues that arise in current research projects.

*1-18 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **PHY 598: Graduate Seminar I**

Special research topics centered on monographs, conference proceedings, or journal articles. Topics include solid-state physics, atomic physics, quantum optics and applications of synchrotron radiation. Required for all first-year graduate students.

*Fall and Spring, 0-1 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **PHY 599: Graduate Seminar II**

Special research topics centered on monographs, conference proceedings, or journal articles. Topics include elementary

particles, nuclear physics, galactic and extragalactic astronomy, and cosmology and accelerator physics. Required for all first-year graduate students.

*Fall and Spring, 0-1 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### PHY 600: Practicum in Teaching

This course provides hands-on experience in teaching. Activities may include classroom teaching, preparation and supervision of laboratory experiments, exams, homework assignments, and projects.

*Fall and Spring, 0-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### PHY 601: Group Theory for Physicists

This course provides an introduction to group theory and discusses topics that are important for applications in physics. Topics that will be discussed include but are not restricted to the following: finite groups, Lie groups, Lie algebras, Clifford algebras, Cartan generators, Dynkin diagrams, Young tableaux, noncompact groups such as the Poincaré group, invariant measures and coset manifolds. Additional topics such as Kac-Moody algebras, Virasoro algebras, symmetric spaces, supergroups and their invariant measure may be discussed as well. PS. The accent on the "e" of Poincaré is and acute accent denoted by  $\acute{e}$ . Offered Fall or Spring

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 604: Computational Methods in Physics and Astrophysics II

This course discusses numerical methods used in physics and astrophysics. Topics include but are not limited to the following: Numerical integration and differentiation, differential equations, interpolation, root-finding, linear algebra, eigenvalues, Fourier transforms, Monte Carlo methods, hyperbolic and parabolic partial differential equations, parallel computing. All methods will be illustrated by examples from physics or astrophysics. Familiarity with Computational Methods in Physics and Astrophysics (PHY 504) is assumed.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 605: Quantum Programming

The field of quantum information and computation has evolved to a stage where there are quantum devices that can be programmed and various tasks and algorithms can be tested on these devices. This course introduces various quantum programming

frameworks. It aims to provide a more practical approach of learning quantum computing by programming, via software developed using Python. Important basic quantum algorithms will be reviewed and learned by programming them and simulating their action. Moreover, an emphasis will be paid to the so-called Variational Quantum Eigensolver that has already been used on many problems, from molecular energies and optimization to financial applications and quantum machine learning. Some illustration of quantum programming will be done on IBM's transmon-type cloud quantum computers. Beyond the circuit-based quantum computers, programming quantum annealers will provide an alternative approach to solve a wide family of optimization problems.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 610: Quantum Field Theory I

Quantization of relativistic fields: Lorentz and gauge symmetries, relativistic spin, the S-matrix and scattering; the standard model; perturbation theory, renormalization and effective field theories; path integrals and relations to condensed matter physics.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 611: Quantum Field Theory II

Quantization of relativistic fields: Lorentz and gauge symmetries, relativistic spin, the S-matrix and scattering; the standard model; perturbation theory, renormalization and effective field theories; path integrals and relations to condensed matter physics.

*Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 612: Theoretical Particle Physics

Applications of quantum field theory to interactions between elementary particles. Topics are chosen from perturbative quantum chromodynamics, the standard electro-weak model, lattice field theory, grand unified models, supersymmetry, and current research problems.

*Fall, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 613: Advanced Particle Theory

This course is a continuation of PHY 612 and prepares students for research in theoretical particle physics. Topics that will be discussed include the properties of Quantum Chromodynamics, Electroweak Symmetry Breaking, Cabibbo-Kobayashi-Maskawa quark mixing, Effective Field theory, Neutrino masses, the hierarchy problems, dark matter, early universe cosmology and primordial nucleosynthesis. Physics beyond the standard

model will be discussed as well including models of quark and lepton masses, grand unified theories and baryon number violation.

*Semesters Offered: Spring and Fall, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 620: Modern General Relativity

General theory of relativity; tensor analysis, Einstein's field equations, experimental tests, black holes, gravitational waves, cosmology. May also include topics such as spinor methods, conformal invariance, and introduction to string theory or supergravity.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### PHY 621: Advanced Quantum Field Theory

Proofs of renormalizability and unitarity on non-Abelian gauge theories using modern methods of Becchi-Rouet-Store-Tyutin (BRST) symmetry; descent equations for anomalies; classical instantons and their quantum corrections, including integration over zero modes; background field methods, other topics if time permits. PHY 610/611 or equivalent is prerequisite.

*Fall or Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### PHY 622: String Theory I

This course is intended for graduate students who have familiarity with gauge & quantum field theory. Topics will be selected from: Free bosonic & spinning strings and heterotic & Green-Schwarz superstrings; conformal field theory; tree-level and one-loop amplitudes; partition functions; spacetime supersymmetry and supergravity; compactification & duality; winding & Kaluza-Klein modes; 11-dimensional supergravity; branes in supergravity; D-branes in string theory; T-duality; M-theory; complex geometry and Calabi-Yau manifolds; string field theory; other advanced topics if time permits. PHY 610/611 or equivalent is prerequisite.

*Fall or Spring, 1-3 credits, S/U grading May be repeated for credit.*

### PHY 623: String Theory II

This course is intended for graduate students who have familiarity with gauge & quantum field theory. Topics will be selected from: free bosonic & spinning strings and heterotic & Green-Schwarz superstrings; conformal field theory; tree-level and one-loop amplitudes; partition functions; spacetime supersymmetry and supergravity; compactification & duality; winding & Kaluza-Klein modes;

11-dimensional supergravity; branes in supergravity; D-branes in string theory; T-duality; M-theory; complex geometry and Calabi-Yau manifolds; string field theory; other advanced topics if time permits. PHY 610/611 or equivalent is prerequisite.

*Fall or Spring, 1-3 credits, S/U grading  
May be repeated for credit.*

### **PHY 631: Quantum Information Physical Systems and Materials**

Quantum computing is fast evolving and soon provide real applications that supersede classical computers. However to build quantum computers relies on an understanding of physical systems, materials and the functioning of devices. This course will cover various important physical systems and materials currently used for quantum information processing. It is divided into a few modules, including superconducting qubits, solid-state spin qubits, photons, trapped ions, and topological qubits (p-wave superconductors, fractional quantum Hall systems, topological insulators, etc.) This course aims to bridge the gap from the physical principles to the potential functioning of devices.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

### **PHY 655: Advanced Graduate Seminar in Theoretical Physics**

A weekly seminar on advanced theoretical concepts. The discussion starts with a graduate student presentation and it is conducted under the guidance of a faculty supervisor.

*0-3 credits, S/U grading  
May be repeated for credit.*

### **PHY 664: Astronomy Journal Club**

Presentation of preliminary research results and current research problems by students and faculty. Required every semester of all astronomy graduate students.

*0-1 credits, S/U grading  
May be repeated for credit.*

### **PHY 665: Journal Club in Computational Biology**

The goal of this course is for students to hone critical reading and analytic skills through discussions of literature in the area of Computational Biology. Participants take turn being a "discussion leader" who informally guides the group through a peer-reviewed manuscript for which all Journal Club members will have to read in advance of the meeting. Meetings in the Spring semester will include in Person Training (IPT) in Responsible conduct of Research and Scholarship (RCRS) on topics that comprise

(1) Integrity in Scholarship, (2) Scientific Misconduct, (3) Mentoring, (4) Ownership and Authorship, (5) Plagiarism, (6) Data Management, (7) Journalism and Science, (8) Human Subjects, and (9) Laboratory Animals.

*0-1 credits, S/U grading  
May be repeated for credit.*

### **PHY 666: Cool Stars**

A weekly seminar concentrating on observational and theoretical studies of cool stars and related objects. Emphasis is on ongoing research and recent results in this area. Speakers include faculty, students, and visitors. Topics anticipated in the near future include results from the Hubble Space Telescope and ROSAT. Students registering for one credit will be expected to present at least one seminar.

*Fall and Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

### **PHY 668: Seminar in Astronomy**

A weekly series of research seminars presented by visiting scientists as well as by the faculty. Required every semester of all astronomy graduate students.

*Fall and Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

### **PHY 669: Nuclear Astrophysics Seminar**

A weekly seminar concentrating on topics in nuclear astrophysics, including dynamics of supernova collapse, structure and evolution of neutron stars, equation of state, the role of neutrinos in nucleosynthesis, etc.

*0-1 credits, S/U grading  
May be repeated for credit.*

### **PHY 670: Seminar in Theoretical Physics**

*Fall and Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

### **PHY 672: Seminar in Elementary Particle Physics**

*Fall and Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

### **PHY 673: Seminar in Cosmology**

This seminar discusses current topics in cosmology. Each semester consists of a formal talk followed by an informal discussion of active areas of cosmology research.

*Fall and Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

### **PHY 674: Seminar in Nuclear Physics**

*Fall and Spring, 0-1 credits, S/U grading*

### **PHY 676: Seminar in Solid-State Physics**

*Fall and Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

### **PHY 678: Atomic, Molecular and Optical Physics Seminar**

*Fall and Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

### **PHY 680: Special Topics in Theoretical Physics**

Fall and Spring

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **PHY 681: Special Topics in Statistical Mechanics**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **PHY 682: Special Topics in Solid-State Physics**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **PHY 683: Special Topics in Astronomy**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **PHY 684: Special Topics in Nuclear Physics**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **PHY 685: Special Topics in Mathematical Physics**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **PHY 686: Special Topics in Elementary Particles**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **PHY 687: Topics in Biological Physics**

The "Topics" courses in the 680 sequence do not have specific description, since the subject matter within the broadly defined topic may change from one semester to the next.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**PHY 688: Special Topics in Astrophysics**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**PHY 689: Special Topics in Accelerator Physics**

Recently we established the Center for Accelerator Physics with Vladimir Litvinenko appointed as Director (with a shared appointment at BNL), and with a second faculty position in accelerator physics being added in the near future, we expect that the number of students working on accelerator physics will increase significantly and there will be much more demand for courses in this area. For a long time accelerator physics courses have been taught as "PHY 584: Special Topics in Nuclear Physics", but this is improper use of the course listing. The purpose of this course is two-fold. First, it is a special topic course that is taught full time at Stony Brook. Second, it is special topics course which is taught in collaboration with the United States Particle Accelerator School (USPAS), which is taught on a rotating basis at various universities and National Laboratories in the US. If that is the case, students will prepare for the USPAS course during the semester, and will participate in the USPAS school in the following Winter or Summer break. The grade for the course will be determined by the grade in the USPAS school. Funding to participate in the USPAS course will be provided by USPAS if students are registered for such course at their local university.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**PHY 690: Special Topics in Atomic and Optical Physics**

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**PHY 691: Computational Accelerator Physics**

The course prepares graduate students in a comprehensive and systematic way for applying numerical methods to solve problems for which analytical methods have limitations. This knowledge will be applied to producing, collecting, analyzing and understanding numerical simulation data, and presenting and reporting results using appropriate media. This course will allow students to attain the level of knowledge needed to thrive in the field of particle accelerators, including cyclotrons,

synchrotrons, storage rings, linear accelerators, colliders and industrial accelerators.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

**PHY 692: Physics and Engineering of Large Accelerators**

The course will include discussions of accelerator physics and engineering topics, and phenomena specific to large accelerators: conceptual differences in accelerator physics resulting from the large scale of accelerators, high field superconducting magnets and gigantic SRF linacs, high power RF, large cryogenic and utility systems, vibration, support structures and alignment, large computer network and real-time controls, personal safety and machine protection challenges, large UHV systems, etc. The course will use examples of prior and existing facilities (RHIC, TEVATRON, APS/NSLS II, SLAC linac, LEP, LHC, CEBAF) as well as challenges in future facilities (EIC, PIP II, FRIB, FCC, ILC, neutrino factories, and muon colliders) to emphasize their problems and to describe either existing or possible solutions.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

**PHY 693: High Power RF Engineering**

The course starts with an essential review of the properties of low and medium power RF waves and components including transmission lines, waveguides and cavities, and then proceeds to highlight the properties and limitations under high power RF conditions. The principal deleterious effects taking place at high power levels are caused by arcing (a high peak power effect) and the ohmic dissipation in the metal walls (a high average power effect). Exceeding the power handling capacity of the RF components can result in expensive repairs. Methods of mitigating or avoiding these expensive repairs are discussed. Important applications of high power rf are discussed in depth. Finally the students are given an extended project on implementing a particle accelerator using the traditional method of placing cylindrical cavities in tandem and using the longitudinal electric field in the TM010 cavity mode to pump RF power into a particle beam and cause the desired acceleration of the charge particles.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

**PHY 694: Plasma and Wakefield Accelerators**

This course provides an introduction to the physics of laser-driven and beam-driven plasma wakefield accelerators. Topics include the description of the motion of a single particle in the fields of a laser or relativistic particle beam, coupling of intense drivers to plasma waves, description of linear and

nonlinear plasma waves in 1D and 3D, injection of particles into plasma waves and beam loading, as well as other advanced topics such as the directions of present research as time permits. In addition to the theoretical concepts, the students will also be introduced to the computational and experimental tools used to explore the relevant physical phenomena.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

**PHY 695: Cryogenic Systems and their Design**

This course covers fundamental aspects of cryogenics system and engineering properties of materials and fluids at low temperatures. Cryogenic heat transfer and fluid dynamics, low temperature refrigeration and system engineering, application of helium cryogenic technology to contemporary particle accelerators, detectors and sensors. The course will address physics and engineering aspects of using helium cryogenics. It will cover fundamentals of normal and superfluid cryogenics. The course is intended for graduate students pursuing accelerator physics and graduate engineers and physicists who want to familiarize themselves with cryogenics.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

**PHY 696: Components of Accelerators**

The courses teaches students both the understanding and the practical experience of real accelerator hardware: magnets, RF cavities, vacuum chambers, controls, diagnostics, particle sources and other accelerator hardware and software. The course is taught in the control room of the Accelerator Lab in the basement of the SBU Physics department, where a state-of-the-art polarized electron gun is currently located. It will use cut-offs of real scale superconducting magnets, RF cavities, and vacuum chambers. The course also includes a tour of operational hardware at BNL facilities

*1-3 credits, Letter graded (A, A-, B+, etc.)*

**PHY 698: Colloquium**

*Fall and Spring, 0-1 credits, S/U grading  
May be repeated for credit.*

**PHY 699: Dissertation Research on Campus**

Independent research for Ph.D. degree candidates. Open only to students who have advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab. This course also includes a minimum of two hours person to person discussion of ethics and conduct in research

and scholarship which addresses among others integrity in scholarship, academic honesty, authorship, plagiarism, mentoring and collaborations. These topics will be illustrated with case studies and issues that arise in current research projects.

*Fall, Spring, and Summer, 1-9 credits, S/U grading  
May be repeated for credit.*

### **PHY 700: Dissertation Research off Campus - Domestic**

Independent research for Ph.D. degree candidates. Open only to students who have advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. This course also includes a minimum of two hours person to person discussion of ethics and conduct in research and scholarship which addresses among others integrity in scholarship, academic honesty, authorship, plagiarism, mentoring and collaborations. These topics will be illustrated with case studies and issues that arise in current research projects. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*1-9 credits, S/U grading  
May be repeated for credit.*

### **PHY 701: Dissertation Research off Campus - International**

Independent research for Ph.D. degree candidates. Open only to students who have advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver before the second week of classes. The charge will only be removed if other plan is deemed comparable. This course also includes a minimum of two hours person to person discussion of ethics and conduct in research and scholarship which addresses among others integrity in scholarship, academic honesty, authorship, plagiarism, mentoring and collaborations. These topics will be illustrated with case studies and issues that arise in current research projects. All

international students must receive clearance from an International Advisor.

*1-9 credits, S/U grading  
May be repeated for credit.*

### **PHY 800: SUMMER RESEARCH**

*May be repeated for credit.*

## **POL**

### **Political Science**

#### **POL 501: Introductory Statistics**

This course acquaints students with statistics. It begins with the basics of applied statistical analysis, including probability and hypothesis testing, and builds to simple regression analysis. Requires use of computer packages.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POL 502: Intermediate Statistics**

This course utilizes multiple regression analysis and explores violations of the linear model. Requires use of computer.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POL 503: Survey Research Methods**

This course studies the techniques of survey research and their application in the development of public policies. Topics include survey design, survey population sampling, use of survey data to frame policy choices and attitudes towards existing policies.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POL 504: Research Design**

This course will cover a variety of research methods that can be used to study attitudes and opinions: Experimental methods (in laboratory and field settings), quasi-experimental designs, surveys and questionnaires, and methods for studying various psychological characteristics of attitudes such as reaction time and lexical decision tasks.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POL 508: State and Local Public Budgeting and Finance**

This course develops the rationale for public taxation and spending programs with a focus on state and local governments. It examines the role of public finance in the economy, and explores the use of program and functional budgets, capital and operating budgets, intergovernmental expenditures, etc.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POL 509: National and International Public Budgeting and Finance**

This course develops the rationale for public taxation and spending programs with a focus on national and international finance. It examines the role of public finance in the economy, and explores the use of program and functional budgets, capital and operating budgets, intergovernmental expenditures, etc.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POL 514: Personnel Systems & Bureaucracies**

This course examines the development of civil service and other bureaucratic personnel systems in American government. It focuses on the knowledge that managers must have to utilize human resources appropriately in the constrained public sector environment. Focuses mainly on state and local government.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POL 515: Health Economics**

The course provides an overview of general economic principles, an understanding of how markets function, and why markets fail in order to understand the effects of economic principles on health care and the effect of health policy and economic forces on the health care delivery system. Students will be taught to use economic concepts to analyze health policy in its ability to improve the delivery of health care services.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POL 516: Storms & Seas: Coastal Land Management**

Many areas of the world, like Long Island, are surrounded by water and are vulnerable to increasing weather -related threats and sea-level rise. This course dives into the challenges related to public policy design and implementation as climate changes force planners to consider novel solutions to increasingly complex situations.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POL 519: State & Local Politics**

States are frequently described as "laboratories of democracy" because there is great variation in the policies and practices of state governments across the United States. This course examines political institutions, actors, and issues within American state and local governments. Among other topics, the class will discuss federalism, political culture, state campaigns and elections, political parties, constitutional provisions, and government branches (legislative, executive, and judicial).

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POL 520: Applied Economics & Public Policy**



Public policies are often created to address private market failures or imbalances. This course focuses attention on how economic concepts manifest in public policy planning, delivery, and outcomes.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 521: Behavioral Economics & Public Policy**

People often behave in ways that deviate from classical economic theories. This course helps students learn about these deviations and to construct public policies around such empirical regularities.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 522: Economic Issues & Public Policy**

Many public policies have their roots in economic decisions or outcomes. This course considers recurring and important aspects of the economy in relation to public policy.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 524: Housing Policy**

Where and how people live is one of the most basic and important considerations when it comes to government planning and action. This course explores the evolution of housing policies, their effects, and future directions. Special consideration will be devoted to recent issues as well as housing issues affecting the New York metropolitan area.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 530: Topics in Public Affairs**

Specially organized seminars are offered on topics of particular importance to students of public affairs. These courses are led by distinguished experts in those policy areas.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **POL 531: Planning and Public Affairs**

This course addresses the planning process as a decision-making tool in the implementation of public policy in areas related to housing, land use, transportation, environmental management, and resiliency. The course also explores intergovernmental relations and the impact of citizen participation on the policymaking process.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 532: Moral Politics & Public Policy**

Many public policy issues are moral issues, such as capital punishment, same-sex marriage, gun control, public health care, affordable housing, and progressive taxation. This class examines how moral judgment differs from judgments based on self-interest,

economics, or altruism. It also examines how moral condemnation affects policy debates and how moral accusations clash with arguments based on non-moral considerations such as economics, group loyalty, or authority.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 534: Intergovernmental Relations and Policy Delivery**

The examination of the formulation, implementation, and impact of intergovernmental policy are the core concepts to be covered in this course. Several policies are examined in-depth, including grant-in-aid programs, General Revenue Sharing, housing and community development, and employment programs. The historical, economic, and political foundations of intergovernmental policy delivery systems are examined.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 535: Public Policy Analysis and Evaluation**

This course concentrates on the strategies and methods of public policy analysis and evaluation. Students debate the merits of proposed solutions to various policy issues and discover the political constraints on the policy making process. Skills stressed in the course include cost-benefit analysis, program evaluation, and basic microeconomics.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 536: Public Management and Organizational Behavior**

This course examines how public sector organizations work and how managers can operate in the public sector environment. A range of theoretical perspectives, including sociological, economic, and institutional, will be employed as real public organizations are examined and analyzed. Public agencies will also be compared to their private sector counterparts, and the nature of organizational efficiency will be explored.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 537: Administrative Law for Policy Analysts**

This course examines the role of administrative law in the formulation, implementation and evaluation of public policy. The role of legislation such as the Administrative Procedures Act is explored. Actual cases are analyzed, as well as the broader set of precedents that have emerged in federal, state, and local administrative law proceedings.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 538: The Politics of Local Economic Development**

This course examines the economic development process with an emphasis on the interaction of political and economic factors. It explores the extent to which local, state, and federal officials can influence business performance and decisions, the specific strategies often utilized to nurture economic growth, and the way they have changed over time. It also studies economic winners and losers using relevant real-world examples and case studies, with a focus on policies local to both New York State and Long Island.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 539: Introduction to International Law**

This course is designed to offer a broad overview of international law and its various areas, its relations to politics, and current challenges of the international legal environment. The focus will be on the theoretical background of international law as well as its practical implications in our globalized world. POL 539 will not count towards the fulfillment of the PPLMA degree requirements if you have taken POL 311.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 540: Data Applications in Public Policy**

This course studies the strategic use of data to support public policy proposal design and implementation. With a focus on U.S. domestic policy, the class will gain proficiency in the application of data to identify policy problems, determine causative factors, develop and implement persuasive policy proposals, and evaluate the policy effectiveness.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 542: Regional Planning**

This course addresses the planning process as a decision-making tool in the implementation of public policy in housing, land-use, transportation, and environmental management. The course also investigates intergovernmental relations and the impact of citizen participation on policy changes.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 543: Environmental Politics and Policy**

Federal environmental policies, such as the National Environmental Policy Act, the Coastal Zone Management Act, and the Federal Pure Waters Management Act are examined in this course. The policies, politics and administrative activities of federal, state, and local levels are considered.

Finally, the interaction of the public sector, the private sector, and citizen groups in the implementation of environmental policy is discussed.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 561: Dynamics of Public Opinion**

This course provides an overview of the literature on public opinion. The course will start by considering the micro-foundations of opinions and the psychology of opinion holding. How much do people know about politics and other aspects of the social world? What are the consequences of differences in knowledge and attitude strength? Building from there, we will discuss the structure of attitudes and opinions, specifically, the nature of political ideology. A number of determinants of opinions will be discussed including values and personality. Finally, the course will examine the dynamics of attitudes and opinions and their relationship to government policy and larger social trends. Offered

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 562: Passionate Politics: Mobilization, Interest Groups, and Social Movements**

This course discusses political mobilization: the factors that motivate political involvement and the consequences that high levels of public engagement have on elections and the development of public policy. The course begins with several high profile examples of citizen engagement that have had noticeable impact on American politics. This first section also includes a discussion of the various ways in which Americans can be mobilized from involvement in election campaigns to the distribution of political information via social networks. The course then shifts focus to cover the psychology of political mobilization in detail, including the importance of group memberships and identities, emotions, and values. An entire unit of the course is devoted to psychology of group membership in which the mobilizing power of identities and the role of politically motivating emotions are discussed at length. Finally the last section of the course is devoted to specific examples of political mobilization in the U.S. including the environment/green movement, issue groups such as the right-to-life movement, racial politics, and highly polarized partisan politics. Overall, the course is designed to illuminate the psychology of political mobilization and apply these principles to contemporary American politics.

*Offered*

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 565: Persuasion and Propaganda**

Politics at its core is about persuasion. It is about argumentation and debate, and about bringing citizens to a particular way of thinking about an issue, candidacy, or event. Given its centrality in the political process, understanding the dynamics of political persuasion should be a high priority for the discipline. In a more theoretical vein, the concept of "attitude" is among the most indispensable in the social sciences. This course is intended to provide a survey of contemporary theory and research on attitude formation and change. It is not intended to be a general course on the mass media, but rather is concerned only with mass media research as it pertains to individual-level political attitude processes. The course is divided into the following three sections: (1) A consideration of basic concepts (e.g., what is an "attitude"), methodological challenge, and recent developments (e.g., the distinction between implicit and explicit attitudes); (2) An overview of major psychological theories of persuasion that attempt to answer Harold Lasswell's classic question: Who says what, in which channel, to whom, and with what effect? (3) An examination of the major agents of political persuasion - the mass media, political elites, social context, and interpersonal processes.

*Offered*

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 567: Culture, Values, and Public Opinion**

This course investigates the evolution of values, cleavages, political space, and issues in cross-national perspective (with particular focus on the advanced industrialized countries of the US, Europe, Israel, Japan, and Australia). We begin our study with the analysis of traditional socio-economic cleavages in determining issue positions, and the 'end of ideology' theses propounded by comparative political scientists, such as Daniel Bell and Francois Fukuyama, and elaborated by scholars of the behavioral revolution such as Inglehart, Dalton, and Franklin. We then explore the strengths and weaknesses of paradigm shifts to values, buttressed by public opinion data. Bringing in cultural and neo-institutional explanations of political behavior and change, the course weds individual level analysis and group behavior theories with rigorous empirical testing. We will look at cross-national and longitudinal data sets to examine the evolving political

space stemming from new politics, identity politics, immigration, and "new security" threats in a global era. Finally, the course will conclude by looking at how different levels of analyses (individual, group, and institutions) contribute to explain contentious politics, `boundary-making ("us" and "them"), and the `politics of difference across cultures.

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 568: Master's Thesis**

This course entails a student thesis paper under supervision of a faculty member on a research project related to methods used to study the dynamics of public opinion.

*1-6 credits,*

### **POL 569: Internship in MA in Political Science**

The internship for the Political Science M.A. is designed to provide first-hand experience with the major research methods used to study the dynamics of public opinion. The student is expected to work in the organization and prepare a daily journal of activities, as well as paper at the conclusion of the course, apply program knowledge to the internship activities. Permission of Program Director is required.

*1-6 credits,*

### **POL 571: Moral Politics**

Many political issues ranging from capital punishment to same-sex marriage to wealth redistribution are moral issues. This course will use moral psychology to better understand public opinion, political debates, and political behavior. We will examine how moral judgement differs from judgments based on self interest and altruism. We will address the role of moral condemnation in political debates and how moral accusations clash with arguments based on non-moral considerations such as economics, group loyalty, or authority. Topics include alternative moral frames, liberal-conservative differences, moral metaphors, and moral emotions. We will apply these concepts to understand public opinion about political issues surrounding property, fairness, sexuality, religion, and violence. Semesters offered- Fall and Spring Must be a student in POLMA program

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 591: Directed Policy Research**

Student works under supervision of faculty member on research project related to public policy.

*1-6 credits, Letter graded (A, A-, B+, etc.)*

**POL 596: Capstone Preparation Seminar**

This course introduces students to the various paths students may take to complete the M.A. in Public Policy (MAPP) program. This course is a prerequisite for POL 597 and POL 598.

*1 credit, S/U grading*

**POL 597: Capstone Internship in Public Policy**

This course is an applied internship in a public, not-for-profit, or private sector organization that deals with public policy. The student works in the organization and prepares a daily journal of activities, as well as a paper at the conclusion of the course, applying program knowledge to the internship activities.

*6 credits, S/U grading  
May be repeated for credit.*

**POL 598: Capstone Thesis Project in Public Policy**

This course is primarily for students already employed in related field. In lieu of internship, student completes a Master's project which goes beyond their normal employment duties to apply theory and methods to a particular policy issue.

*6 credits,  
May be repeated for credit.*

**POL 600: Research Project**

A two-semester introduction to research for first-year students. The course introduces issues of research design through lectures and presentations of current research by faculty members. Each student designs his or her own research paper under the guidance of a faculty member familiar with his or her area of interest. Final papers are due in the beginning of May.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**POL 601: Foundations: Public Policy and Political Economy**

A systematic introduction to the principles of political economy. Develops a microeconomic model and approach to public policy analysis. A major part of the course is devoted to student projects that analyze the political economy of a governmental policy.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 602: Applied Data Analysis I**

The application of statistical and mathematical models to the analysis of political data: introduction to the research process and to topics in measurement, basic descriptive statistics, and inferential statistics.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 603: Applied Data Analysis II**

The application of statistical and mathematical models to the analysis of political data: regression analysis.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 604: Applied Data Analysis III**

The application of statistical methods to the analysis of political data. The emphasis is on diagnosing and dealing with violations of assumptions of statistical models. Topics covered include advanced regression, models for discrete dependent variables, systems of equations, and selection bias.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 605: Foundations: American Politics**

A review of the basic political science literature on American politics, with emphasis on American political institutions.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 606: Time Series Analysis**

This seminar will consider statistical models for political processes observed over time. The major topics will include cointegration, time varying parameter models and duration models.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 607: Social Survey in Contemporary Society**

This course on political socialization focuses on continuity and change in political attitudes and behavior across the life span. Topics include the stability of political attitudes-contrasting the greater durability of political partisanship and basic values with the relative instability of issue positions; the social psychology of attitude change, which lends some insight into the conditions under which attitudes are most likely to change; the importance of political period or era as a determinant of political attitudes and behavior; and the existence and coherence of distinct political generations. Some attention is also given to the political changes that accompany old age, including changes in attitude and behavior linked to growing dependency on the Social Security and Medicare systems.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 608: Foundations: Political Psychology, Behavior**

A review and analysis of the political behavior literature, including such topics as attitude formation and change, belief systems, political socialization, demographic and small group influences on political beliefs and conduct, political leadership, electoral behavior, elite vs.

mass politics, decision making, personality and politics, political conformity, and protest.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 609: Advanced Research Design**

A practical application of topics in the philosophy of science to research design. Students prepare their dissertation proposal as a part of this course.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 610: Foundations II: Experimental Design and Methods**

An overview of experimental research with an emphasis on experimental design, data analysis, and interpretation. Students develop the ability to critically evaluate experimental research. Students also participate in the development, implementation, and analysis of a laboratory experiment.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 611: Behavioral Economics**

This course introduces students to behavioral economics. Behavioral economics seeks to build empirically realistic models of human decision making that are better integrated with insights from psychology. Will examine theoretical alternatives to the purely self-interested, optimizing, and cognitively unlimited caricature of homo-economicus, including bounded and ecological rationality, prospect theory, hyperbolic discounting, and reference dependence. Topics explored will include status and positional goods, altruism and social preferences, intertemporal choice, risk preferences, behavioral game theory, and heuristics and biases. Emphasis will be placed on applications to political behavior and decision making.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 612: Computational Modeling**

This course is a practical introduction to computational modeling, with a focus on agent-based modeling using Python (with extensions). By the end of the course, students are expected to complete an original modeling project.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 613: Game Theory for Political Science**

Introduction to formal models of strategic behavior in static, dynamic, and repeated games. Technical emphasis is formulation and solution of games of complete and incomplete information; a variety of equilibrium concepts will be introduced. Substantive applications include spatial models of candidate behavior in elections; agenda control and bargaining

in legislatures; lobbying by interest groups; common pool resource problems; and cooperation between rivals.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 614: American Judiciary**

A seminar on judicial process and behavior. Emphasis is placed on the Supreme Court, but trial courts and other appellate courts are examined as well. Topics include constitutional interpretation and both legal and extra-legal models of decision making. Students should possess basic methodological skills.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 615: Legislative Process**

A seminar on the legislative process, focusing on current research on the United States Congress.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 616: Political Parties and Groups**

A seminar on parties, campaigns, and elections in the United States. Topics covered include party organization and leadership, nomination and general election campaigns, and the role of parties in government.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 617: Electoral Behavior**

Models of voting choices; key attitudes such as party identification, issue orientations, and ideology; the impact of group affiliations, economic conditions; campaign strategies of candidates; congressional vs. presidential elections; historical change, e.g., party realignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 618: American Political Ideology**

This course examines American political ideology as it is reflected in public opinion, political debate, and public policy. The goal is to understand the underlying bases of conflict and consensus in American politics and the ways in which they influence and constrain debate over public policy. The course traces the development of political conflict in the United States and examines the basis of contemporary political debate.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 619: Political Opinion**

This class consists of an overview and analysis of the public opinion literature, including the nature of public opinion, factors that shape public opinion, micro-level opinion dynamics, macro-level opinion dynamics, and the role of public opinion democracy. It is designed to be a collaborative enterprise in which we, as

a class, consider the role of public opinion in American politics.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 620: Government Regulation of Business**

An examination of the scope of government regulation of business in the United States today—regulation at both the federal and state levels and by both economic and social agencies. The course compares market vs. regulatory policies as well as possible explanations for why some regulatory agencies change over time. Finally, the course considers proposed reforms, such as clearer legislative standards, curbs on "revolving door" practices, greater citizen participation in agency proceedings, and deregulation.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 621: Theories of Policy Making**

An introduction to theories of policy making, especially policy formulation, stressing reading and thinking about classics and acquiring skills necessary for theorizing, including mathematical modeling and formal theory. Laboratories focus on improving special skills (e.g., optimization) and theorizing about particular policy areas (e.g., pork barrel politics).

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 622: Bureaucracy and the Policy Process**

An examination of bureaucracy as part of the policy-making process. This course reviews theoretical explanations for the bureaucracy as a political institution and implications of its rapid growth since the New Deal. It also looks inside bureaucratic organizations, examining factors that influence the exercise of discretion and policy implementation.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 623: Moral Politics**

Many political issues from poverty to same-sex marriage to the death penalty are moral issues. This course will apply moral psychology to understand public opinion, political debates, and political behavior. We examine how moral judgment differs from judgments based on self-interest and altruism. We will study moral condemnation in political debates and how moral accusations clash with arguments based on other considerations such as economics, loyalty, and authority. The topics include moral frames, metaphors, emotions, and differences between liberals and conservatives. We apply these concepts to political debates surrounding property, fairness, sexuality, religion, and violence.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 624: Psychology of Race and Ethnic Politics**

An introduction to the study of race and ethnic politics through the lens of political psychology. It focuses primarily on applications of psychological theories and insights to questions involving racialized groups, but also engages with key literatures in race and ethnic politics to identify synergies across theoretical approaches. Likewise, even as content privileges the United States, it includes select comparative work to highlight principles and research design options. Throughout, it encourages consider when and among whom a given theoretical perspective holds, and whether the "whys" or "hows" behind reported opinions and observed behavior are similar, or different, across groups.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 625: Ecological Rationality**

Students will learn about the major theories of ecological rationality and how they compare to classical conceptions of rationality and to bounded rationality. Students will learn how this approach has influenced research in political science, psychology, and economics. Course topics will include: theoretical foundations of ecological rationality, political decision making as a manifestation of ecological rationality, application to heuristics, the relationship between ecological rationality and prospect theory, applications to risk-taking, applications to behavioral economics, applications to trust and cooperation. At its core, ecological rationality is a vision of human psychology. Thus, this course provides a foundational perspective for our students who are emphasizing political psychology in their studies. The nature of human rationality is also a core topic in behavioral economics and political economy. Thus, this course is also foundational for students emphasizing BPE.

*3 credits, Letter graded (A, A-, B+, etc.)*

**POL 626: Social Networks**

The course is designed to introduce students to the process of analyzing interdependent political actors. We will ultimately discuss using whole network data to conduct social network analysis; note, these networks need not be social; they could be international networks of countries, for example. It is important to realize, however, that whole network data is often not available and, further, it is very difficult to collect. We begin, therefore, by considering methods that take account of the interdependence of political actors without analyzing the entire network within which

those actors operate. The different methods and measures we discuss in this class could be incorporated into almost all areas of political science. Thus, the ultimate goal of this class is to give students a lexicon and a toolkit to use in their own research.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 627: Legislative Behavior**

This course provides an overview of the theoretical and empirical studies of legislative politics. The course will place a particular emphasis on rational choice institutional perspectives. Briefly, this paradigm suggests that individual-level strategic calculations are paramount in understanding political phenomena, and institutions both emerge from and serve to constrain these rational, utility maximizing political actors. While the main focus of the course is the U.S. Congress, much of what we cover will have direct relevance to the study of legislatures more generally (both cross-nationally and American state legislatures). We will discuss congressional elections, the nature of congressional representation, positive theories of congressional organization, political parties, the committee system, institutional change, bicameralism, inter-branch relations, and comparative legislatures.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 628: Cooperation**

The course is a multi-disciplinary and inter-disciplinary examination of the puzzle of human cooperation.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 629: Experimental Game Theory**

Surveys experimental tests of formal models derived from political economy and game theory, and applies behavioral and social-psychological theories to explain deviations from equilibrium behavior. The methodologies of psychological and economic experiments are contrasted and explored. Substantive applications include social trust, bargaining power, agenda control, committee decision making, common pool resource problems, and political persuasion.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 630: Statistical Analysis of Big Data**

This course covers a variety of topics useful for the analysis of 'Big Data' including Bayesian Statistics, Machine Learning, Text Analysis, Neural Networks, Nonparametrics, and Ideal Point Estimation.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 631: Political Cognition**

Surveys the contemporary psychological literature on human memory and cognition, with emphasis on applications to political information processing.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 632: Mass Communication and Political Persuasion**

In-depth examination of the role of mass media in the political process and the psychological dynamics of media influence. Effects of the media on public opinion and voting. Implications of media influence on democratic theory.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 633: Social Influence and Group Processes in Political Decision Making**

Review of contemporary theories of social influence processes and group decision making, with emphasis on applications to decision making in politics. Special focus on small-group methods and research applications.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 634: Behavioral Decision Theory**

Emphasizes psychological theories of judgment and choice and prediction of the errors that individual decision makers are likely to make. These ideas are applied to a variety of political contexts.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 635: Evolutionary Psychology**

This course introduces students to evolutionary psychology. It is based on two core ideas: evolution and computation. The human mind evolved by natural selection. An evolutionary perspective focuses on the functions performed by the mind. In general, the mind processes information and can therefore be understood as a computational system. We examine a variety of mental processes, asking what computations they perform and how they function to solve adaptive problems. The topics include perception, tools, family, mates, language, fighting, trade, culture, morality, emotions, and politics.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 636: Measurement, Scaling, and Covariance Structure Models**

This course will discuss major contemporary approaches to social and political measurement, with extensions to deal with issues like measurement invariance (multiple group and cross-national data), and longitudinal data. Topics will include classical measurement theory, estimation of reliability,

item response theory, factor analysis, general latent variable models (structural equation modeling), and latent class (mixture) models. The lectures and readings will examine the statistical models, substantive applications, and the practical problems of applying these models to data (including the software available in each case). Empirical examples in class will demonstrate the utility of various R packages and other major software for estimating measurement models.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 661: Formal Models in American Politics**

This course surveys research in the field of American Politics that employs the tools and concepts of formal theory (predominately noncooperative game theory) to address contemporary questions. The objective of the course is to solidify students' understanding of game theory as a modeling technique in political science, and to enable students to use formal methods in their own research.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 664: Advanced Institutions**

#### **POL 670: Advanced Topics: Political Economy I**

An intensive examination of major substantive and methodological concerns involved in the study of political economy.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **POL 671: Advanced Topics: Political Economy II**

Reading and research in the area of political economy.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POL 673: Advanced Topics: American Politics I**

A seminar in American institutions and processes, focusing on current research in such areas as Congress, the Supreme Court, the presidency, political parties, or bureaucracy.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **POL 674: Advanced Topics: American Politics II**

A continuation of POL 673.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **POL 675: Advanced Topics: Comparative Politics I**

Readings and research papers on topics in comparative politics. Particular attention is given to concepts and methods identified with the field.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **POL 676: Advanced Topics: Methods I**

A course reviewing the literature and methodology of specific areas of political science research. The course relates directly to research applications and provide students with an opportunity to apply advanced research tools to selected substantive problems.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **POL 678: Political Decision Making**

Review of the literature and methods related to a topic or problem in contemporary political science, voting behavior, issue formation, interest groups, political economy, or personality.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **POL 679: Advanced Topics: Political Psychology/Behavior I**

Reading and research in the area of political psychology and behavior.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 680: Directed Study**

Individual studies under the guidance of a faculty member. Subject matter varies according to the needs of the student.

*1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **POL 681: Directed Study**

Individual studies under the guidance of a faculty member. Subject matter varies according to the needs of the student.

*1-9 credits, S/U grading  
May be repeated for credit.*

### **POL 690: Research Colloquium**

Students participate in weekly departmental colloquia where they serve as discussants of research reports presented by individual faculty members or outside investigators reporting on current research.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **POL 691: Research Practicum I**

A course actively involving students in an ongoing research project under the direction of a principal investigator. Students participate in all stages of the research project and are

required to prepare a research report on one aspect of the project.

*3 credits, S/U grading*

### **POL 692: Research Practicum II**

A continuation of POL 691. Students actively participate in either a second research project, where they will again prepare a research report, or continue their participation in the same project, where they are then assigned a subset of data for analysis or carry out a specific research aim of the project.

*3 credits, S/U grading  
May be repeated for credit.*

### **POL 693: Practicum in Teaching**

A tutorial in which students attend workshops to learn pedagogy, and practical and professional skills with regard to classroom instruction. Typically taken the semester before their first time as a classroom instructor.

*0 credit, S/U grading  
May be repeated for credit.*

### **POL 699: Dissertation Research on Campus**

Dissertation research under direction of advisor.

*Prerequisite: Advancement to candidacy (G5);  
permission of graduate program director.  
Major portion of research must take place on  
SBU campus, at Cold Spring Harbor, or at the  
Brookhaven National Lab.  
Fall, Spring, and Summer, 1-9 credits, S/U  
grading  
May be repeated for credit.*

### **POL 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **POL 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by

mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver be second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received  
clearance from an International Advisor.  
Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **POL 800: Summer Research**

*May be repeated for credit.*

### **POL 801: Detecting & Addressing Bias Traineeship Practicum**

This research practicum is for Ph.D. students in the NRT training program, "Detecting and Addressing Bias in Data, Humans, and Institutions," and will be shaped by the needs and interests of participants.

*0-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

## **POR**

### **Portuguese**

#### **POR 500: Reading Portuguese**

Systematic instruction in the fundamentals of reading comprehension and in specialized subject-oriented vocabulary.

*Prerequisite: Permission of instructor  
Fall or Spring, 3 credits, Letter graded (A, A-,  
B+, etc.)*

#### **POR 511: Portuguese for Spanish Speaker**

A one semester accelerated course in Brazilian Portuguese for students with a native of near-native command of Spanish. This course uses Spanish as a base for study of Portuguese grammar, vocabulary and pronunciation. By the end of the semester students will be prepared to read advanced materials and will have acquired a basic proficiency in speaking, writing and comprehension of standard Brazilian Portuguese. A grade of B- or above will satisfy the graduate language proficiency requirement in Portuguese for the MA or PhD. Department consent is required for enrollment.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **POR 575: Luso-Brazilian Readings**

Major literary works from 19th-and 20th-century Portugal and Brazil, especially narratives.

*Prerequisite: Reading proficiency in Portuguese and permission of instructor Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*  
*May be repeated for credit.*

### **POR 591: Portuguese Language Acquisition I**

Elementary Portuguese I for graduate students with no previous study of the language. The course is designed to introduce the basics of the language promoting the development of all language skills. 4 credits Letter graded  
*4 credits, Letter graded (A, A-, B+, etc.)*

## **PSY**

### **Psychology**

#### **PSY 501: Analysis of Variance and Experimental Design**

The design and analysis of factorial experiments having a single dependent variable. Topics include between- and within-subjects designs, mixed-factor designs, interactions, trend analysis, and planned comparisons. Emphasis on applications in psychological research. Required of all Ph.D. students in psychology. Prerequisite: Undergraduate statistics, Co-requisite: PSY 508

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 502: Correlation and Regression**

Correlation, regression, multiple correlation, multiple regression, partial correlation, and introductions to some of the following topics: factor analysis, mediational analysis, structural equation modeling, relation of regression to analysis of variance, analysis of covariance, discriminant function analysis, and multivariate analysis of variance. Required of all Ph.D. students in psychology. Spring  
*3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 504: First Year Seminar**

This course includes discussion of current research and research practices by faculty and visiting speakers. This course is required of all first-year Ph.D. students and Masters students. 0-3 credits, S/U grading May be repeated for credit.

*0-3 credits, S/U grading*  
*May be repeated for credit.*

#### **PSY 505: Structural Equation Modeling and Advanced Multivariate Methods**

Thorough coverage of structural equation modeling and brief coverage of other specialized techniques used in data analysis in psychology, such as multi-level modeling and

cluster analysis (topics for brief coverage vary from year to year). The course emphasizes hands-on work with real data sets, using standard statistical software packages.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 506: Psychometric Methods**

This course surveys traditional and evolving views on item design, reliability, and validity, reviews statistical methods related to test construction, and applies this material to the design and evaluation of observational, rating, and self-report methods in domains of interest to psychologists. The course also examines the impact of test characteristics on data analysis and the role of test design in theory construction.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 507: Meta-Analysis**

This course is an introduction to research synthesis and the use of meta-analytic techniques. The content is intended to be a thorough yet practical coverage of basic principles, with an emphasis on leading students through the steps of conducting their own meta-analytic project. A basic knowledge of statistics commonly used in the social and behavioral sciences is essential. Class meetings will involve both didactic instruction and discussion of readings and homework assignments.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 508: Introduction to Computer Applications in Statistics**

Computer protocol and introduction to statistical packages and necessary utility programs. Fall and Spring

*0-1 credits, S/U grading*  
*May be repeated for credit.*

#### **PSY 510: History of Psychology**

Intensive reading in the history of psychology from original sources. Emphasis is on class discussion and relation to modern problems.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 511: Learning**

A consideration of the basic principles of learning. Analysis of the leading theories of learning as well as areas of controversy and dispute.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 513: Theories of Attention**

This course covers some of the major theoretical perspectives that have shaped the attention literature, starting with historical distinctions of early versus late selection and ending with more contemporary mathematical, neurophysiological, and neurocomputational theories. Specific questions will include: "What is attention?" (is it a unitary thing or a grab-bag of assorted processes), "How does it work," and "What paradigms have researchers used to study attention?" (dichotic listening, priming, search, etc.).

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 514: Sensation and Perception**

This course covers the sensory mechanisms that change physical stimuli (e.g., a picture of your friend) into neural information, the major brain areas involved in processing this sensory information for various perceptual abilities (eg., motion perception, color perception, object perception, etc.), and the different theoretical approaches to analyzing a given perceptual phenomenon.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 516: Judgment and Decision Making**

This course provides an overview of empirical and theoretical work on

*judgment and decision making. Topics include what decision making is,*

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 518: Memory**

Review of theory and phenomena related to human memory. Topics include representation of schemas and categories, encoding, forgetting, implicit learning, and memory for procedures. Several recent models of long-term memory representation are discussed and compared.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 520: Psycholinguistics**

The psychology of language, including the mental lexicon, sentence processing, pragmatics, discourse, production and comprehension of utterances in conversation, language and thought, first-language acquisition, and computational approaches.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **PSY 524: Cognitive Development**

This course presents the developmental perspective as applied to human cognition.

Topics include (1) characteristics and constraints on cognitive abilities in infancy, childhood, and adolescence, (2) mechanisms of developmental change, and (3) links between cognitive development and selected applied topics.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 530: Intervention Science**

This course focuses on key questions, methods, issues, and debates in psychological intervention science, emphasizing the relationship between treatment research and evidence-based clinical practice. The topics covered include whether evidence-based interventions work in everyday clinical practice; whether it matters what therapy approach is used; what and how much we know about how, and for whom, existing interventions are effective; developing new interventions and evaluating whether they work; optimizing the dissemination of effective interventions; determining whether interventions can be effective if delivered via nontraditional formats; ascertaining when and whether clinical interventions cause harm; and issues of replicability, scientific integrity, and competing interests in intervention science.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 533: Principles Applicable to Clinical Psychology: Historical/systemic perspectives**

A critical review of how principles of general psychology apply to clinical psychology. The course material will be discussed within the context of the history of ideas and major systems of thought as they relate to conceptualization, assessment, and intervention.

*Prerequisite: Psychology doctoral student. Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 534: Assessment: General Principles, Clinical Interviews, and Adult Psychotherapy**

General principles of assessment; clinical interviewing; structured interviews for assessing axis-I and axis-II psychopathology; ethics and cultural diversity. Prerequisite: Clinical psychology doctoral student

*Fall, 2 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 535: Advanced Research Methods**

Advanced research methods employed in clinical, personality, social, and behavioral research. Fall or Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 537: Methods of Intervention: Treatment of Internalizing Disorders**

This course covers the theory and research associated with the treatment of internalizing disorders of adults, adolescents, and children. Among the topics covered are the treatment of phobias, school refusal, panic disorder, general anxiety disorder, social anxiety, post-traumatic stress disorder, complicated grief, obsessive compulsive disorder, and mood disorders. In the treatment of each, particular emphasis is placed on how therapy needs to be modified depending on whether one is working with a child, adolescent or adult.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 538: Method of Intervention: Treatment of Externalizing Disorders and Relationship Problems**

This course focuses on the treatment of externalizing disorders of adults and children as well as intimate partner problems like relationship discord and partner abuse. A developmental focus is taken as exemplified by coverage of child externalizing problems such as Oppositional Defiant Disorder, Conduct Disorder, and Attention Deficit Disorder, Borderline Personality Disorder and Partner Abuse. Treatments of alcohol abuse and eating disorders in both teens and adults are presented. Finally, treatment of schizophrenia is addressed along with coverage of the course of schizophrenia across the lifespan. Individual, couple, and family treatments are reviewed.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 541: Social Psychology of Close Relationships**

High level overview of current theory and research on the social psychology of close relationships.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 542: Psychology of Addictive Behaviors**

Study of psychological, behavioral and biological theories of addiction.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 543: Attachment**

This course examines current psychological theories of infant-parent and child parent relationships and adult-adult attachment with special attention to assessment methods, clinical applications and controversy regarding the importance of early experience.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 544: Emotion & Cognition**

This course focuses on fundamental questions regarding the interaction between emotion and cognition, and how such this interaction can be measured. Key topics will include: differentiating emotions from other affective states, understanding the functions of discrete emotions, the role of the consciousness in emotional experience, and whether emotions can be controlled ; additionally, the course will address emotion-cognition interactions in the domains of memory, attention, perception and reasoning/decision-making. We will also address developmental changes and cross-cultural differences in emotion and cognition. The goal of the course is to be able to develop a translational research proposal rooted in basic research on emotion and cognition.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 545: Psychopathology: Conceptual models and internalizing disorders**

Theory and research on abnormal behavior in children, adolescents, and adults. A lifespan development approach is taken, with a focus on classification, conceptualizations and models of psychological disorders, and the phenomenology, epidemiology, course, etiology, pathogenesis, psychopathology, and pathophysiology of internalizing disorders such as mood and anxiety disorders.

*Fall, 2 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 546: Measurement and Scaling**

An historical introduction to the measurement of psychological variables and survey of contemporary scaling methods with an emphasis on psychophysical scaling and experimental applications.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 549: Prejudice and Discrimination**

This course will provide an overview of theoretical perspectives, research methods, empirical findings, and practical applications of psychological research on prejudice, stigma, and intergroup relations. Critical thinking about theorizing and research in this area will be emphasized during class discussions and through a course project. Students are admitted with permission by instructor.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 552: Social and Personality Development**



A survey of milestones and processes of social development in infancy and childhood. Relevance to understanding adult personality and social relationships is emphasized.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 555: Social Psychology**

An introduction to social psychology, a field of study examining how people feel about, think about, and influence others. Topics include attitudes, motivation, social judgements, and interpersonal behaviors. Coursework focuses on identifying basic principles that transcend particular content domains.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 556: Stress and Coping**

In this course, we examine current issues, challenges, and questions in two related areas of psychology: stress and coping. We will cover classical approaches in addition to recent empirical research and theoretical development. Students are not expected to have prior familiarity with the topic areas. We will begin by reviewing definitions and major theoretical orientations. In subsequent weeks we will concentrate on issues relevant to stress, coping, and related topics such as social support, across a broad range of circumstances, rather than focusing on specific stressful contexts such as chronic illness or bereavement. For example, we will examine ways to define successful and maladaptive coping. We will also consider whether social support is better conceptualized as a commodity or as an individual perception. We will compare contradictory evidence about the benefits of perceived control, and we will discuss problems of generalizing research findings to different ethnic, cultural, and other groups.

*Offered: Fall, Spring alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 558: Theories of Social Psychology: Health Applications**

This course provides an overview of the ways in which social psychological theories and perspectives can be used to understand thoughts and behavior relevant to health and illness. It covers social influence, social comparison, pluralistic ignorance, social support, cognitive dissonance, message framing, and fear communication. The course also covers links between personality characteristics and health and how broader social and cultural environment affects health and illness.

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 559: Psychology of Women's Health**

This course covers a variety of psychologically-important topics in women's health based on current research findings. We address psychological contributors to and consequences of women's health and illness, focusing on diseases that affect women differently or disproportionately than men (including coronary heart disease, cancer, AIDS, and autoimmune diseases), women's reproductive health (including menstruation, contraception, pregnancy, infertility, and menopause), health behaviors (including substance abuse, exercise, and eating), and other topics such as violence against women, women's mental health, and women as health care providers and health researchers.

*Co-scheduled with WST 559.*

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 560: Human Brain Function**

Cognitive neuroscience is an interdisciplinary field, at the interface of systems neuroscience, computational neuroscience, and cognitive psychology. In this course, we examine the current theories and empirical research findings on the neural basis of cognition. We will cover anatomical, neurophysiological and pharmacological correlates of behavioral functions such as perception, attention, motivation, learning, memory, cognitive control, and communication. We will evaluate the strengths and weaknesses of various approaches used to student the neural substrates of higher-order cognition.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 1 times FOR credit.*

### **PSY 561: Cognitive and Behavioral Neuroscience I**

This course introduces students to neural elements responsible for processing information supporting sensation, perception, cognition and movement. Starting with the philosophy of the mind and the history of neuroscience, the course proceeds with an introduction of cells, neural signaling, transmitters and receptors. How these elemental units are integrated to support emergent properties, such as object recognition, is illustrated. Conversely, examples of complex behavioral impairments resulting from dysfunction in elemental units illustrated. The course proceed to cover neural metabolism, and its relation to disorders of memory and motor dysfunction. Last, stress and its role in neuropsychological disorders is discussed.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 562: Cognitive and Behavioral Neuroscience II**

Cognitive and Behavioral Neuroscience illustrates how cellular circuits support function. Classic experiments demonstrating function from the use of electrophysiological data, lesions and transmitter manipulations are discussed. Students interested in understanding how individual neurons and neural circuits and integrated regional systems directly support specific behaviors will find this course of interest. A textbook is used for the readings.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 563: Neuropsychological Assessment**

Classroom discussions of issues in neuropsychological assessment and design of assessment batteries are combined with practical experience in the assessment of clinical populations. Each student is assigned to a supervisor to learn assessment techniques for research and/or clinical practice.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 564: Neuropsychopharmacology**

This course covers the mechanisms of transmitters and related drug action in the nervous system. In addition to exploring transmitter/receptor relationships, the course covers the sequence of events initiated by this action. Through understanding of these processes, the course then links drug action to nervous system outcomes such as movement, cognition, pain and mood.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 565: Functional Neuroanatomy**

Just as a function can be derived from the structure of everyday objects, so too can function be derived from the study of brain architecture and neural connectivity. Accordingly, this course takes a structural approach to the understanding of the nervous system and behavior. To complement a disciplinary focus on cognition, affect and emotions, this course will emphasize the connectivity of higher order brain regions. Students will first be introduced to the global organization of the nervous system and a general framework for information processing. Then sensory and motor pathways will be discussed in more detail. The course will end with topics such as the neurocircuitry of addiction, emotion, and memory.

*Offered*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 581: Integrative Neuroscience Seminar I**

This course includes discussion of current research in Integrative Neuroscience by faculty, students, and visiting scientists. This sequence is required of all students in the Integrative Neuroscience Program.

*Fall, 0-3 credits, S/U grading  
May be repeated for credit.*

### **PSY 582: Integrative Neuroscience Seminar II**

This course includes discussions of current research in Integrative Neuroscience by faculty, students, and visiting scientists. This sequence is required of all students in the Integrative Neuroscience program.

*Spring, 0-3 credits, S/U grading  
May be repeated for credit.*

### **PSY 583: Cognitive Science Seminar I**

This course includes discussions of current research in Cognitive Science by faculty, students, and invited scientists. This sequence is required of all students in the Cognitive Science program.

*Fall, 0-3 credits, S/U grading  
May be repeated for credit.*

### **PSY 584: Cognitive Science Seminar II**

This course includes discussions of current research in Cognitive Science by faculty, students, and invited scientists. This sequence is required of all students in the Cognitive Science program.

*Spring, 0-3 credits, S/U grading  
May be repeated for credit.*

### **PSY 585: Social and Health Psychology Seminar I**

This course includes discussions of current research in Social and Health Psychology by faculty, students, and visiting scientists. This sequence is required of all students in the Social and Health Psychology Program.

*Fall, 0-3 credits, S/U grading  
May be repeated for credit.*

### **PSY 586: Social and Health Psychology Seminar II**

This course includes discussions of current research in Social and Health Psychology by faculty, students, and visiting scientists. This sequence is required of all students in the Social and Health Psychology Program.

*Spring, 0-3 credits, S/U grading  
May be repeated for credit.*

### **PSY 587: Clinical Psychology Seminar I**

This course includes discussions of current research in Clinical Psychology by faculty, students, and visiting scientists.

*Fall, 0-3 credits, S/U grading  
May be repeated for credit.*

### **PSY 588: Clinical Psychology Seminar II**

This course includes discussions of current research in Clinical Psychology by faculty, students, and visiting scientists.

*Spring, 0-3 credits, S/U grading  
May be repeated for credit.*

### **PSY 594: Psychology of Gender**

This class examines how gender affects and is affected by behavior, thoughts, and emotions. We investigate gender differences and similarities across the lifespan and consider various perspectives on the study of gender, including psychobiology, social cognitive theory, social role theory, and cross-cultural research.

*Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)*

### **PSY 595: Human Development**

An examination of the biological and psychological development of children and adolescents and its relationship to teaching and curriculum development for diverse learners. The course will focus on special education programs, childhood and adolescent psychiatric disorders, and societal issues.

*Offered:  
Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 596: Psychopathology: Externalizing & Psychotic Disorders**

Theory and research of abnormal behavior in children, adolescents, and adults. A lifespan development approach is taken, with a focus on the phenomenology, epidemiology, course, etiology, pathogenesis, psychopathology, and pathophysiology of externalizing disorders (e.g., conduct, disorder, personality disorders, substance use disorders) and psychotic disorders.

*Prerequisite: Must be Psychology Graduate Student  
Spring, 2 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 602: Assessment: Personality Testing, Intellectual/Cognitive Testing; and Child Parent Assessment**

Self-report and projective measures of personality and psychopathology; targeted

assessments and measures; intellectual and cognitive assessment; assessment of children and parents; ethics and cultural diversity.

*Spring, 2 credits, Letter graded (A, A-, B+, etc.)*

### **PSY 603: Ethics and Professional Issues**

Ethics and professional issues. Required of all first-year clinical students. Prerequisite: Clinical psychology doctoral student

*Spring, 2 credits, S/U grading*

### **PSY 604: Intervention Practicum**

Exposure of the application of clinical intervention procedures.

*Prerequisite: PSY 537 or PSY 538, Must be Psychology Graduate Student  
Fall, 2 credits, S/U grading*

### **PSY 605: Advanced Clinical Practicum**

Exposure to the application of advanced intervention procedures.

*Prerequisite: PSY 604 and Clinical psychology doctoral student  
Fall and Spring, 2 credits, S/U grading*

### **PSY 606: Supervised Practice**

Clinical Psychology faculty meet with students as a group with follow-up individual recitation sessions to cover topics such as assessment and treatment conceptualization of specific cases that students are seeing in Psychological Center. In addition, methods of providing documentation of change in individual cases are discussed as well as means of obtaining corroborating evidence to support self-reported information. Students present case material to the group and receive peer and faculty feedback about case conceptualization and treatment.

*Prerequisite: Clinical psychology doctoral student  
Summer, 3 credits, S/U grading  
May be repeated for credit.*

### **PSY 608: Clinical Psychology Internship**

Qualified clinical students carry out supervised clinical responsibilities in settings approved by the faculty.

*Prerequisite: Clinical psychology doctoral student  
Fall and Spring, 1 credit, S/U grading  
May be repeated for credit.*

### **PSY 610: Seminars in Selected Topics**

Topics selected on the basis of the needs of the graduate program and research interests of the staff. Prerequisite: Permission of instructor

*Fall, 0-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **PSY 620: Seminars in Selected Topics**

Topics selected on the basis of the needs of the graduate program and research interests of the staff. Prerequisite: Permission of instructor

*Spring, 0-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **PSY 621: Seminar in Teaching Methods**

Theory and pragmatics of good college teaching. Topics include lecturing, use of discussion, types of evaluation of students and teachers, factors affecting undergraduate learning, ethics, student-faculty relations, course administration, and audio-visual devices. Prerequisites: Matriculated psychology graduate student; permission of instructor 0-3 credits, ABCF grading

*0-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **PSY 695: Graduate Academic and Professional Skills Practicum**

Students enrolled in the M.A. program in Psychology may gain degree-relevant practical experience under the supervision of the program advisor. This experience may include participation in public and private agencies and organizations and experience in teaching support roles. Students are required to submit written progress reports and a final written report on their experience to the faculty sponsor and department.

*Offered*

*Fall, Spring, and Summer, 1-6 credits, S/U grading*

*May be repeated for credit.*

### **PSY 696: Readings**

Prerequisite: Permission of instructor

*1-12 credits, S/U grading*

*May be repeated for credit.*

### **PSY 698: Research**

Prerequisite: Permission of instructor

*1-12 credits, S/U grading*

*May be repeated for credit.*

### **PSY 699: Dissertation Research on Campus**

Dissertation research under direction of advisor.

*Prerequisite: Advancement to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.*

*Fall, 1-9 credits, S/U grading  
May be repeated for credit.*

### **PSY 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 0-9 credits, S/U grading*

*May be repeated for credit.*

### **PSY 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.*

*Fall, Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **PSY 800: Full Time Summer Research**

0 credits, S/ grading

*S/U grading*

*May be repeated for credit.*

### **PSY 820: Summer Teaching-CED**

## **RUS**

### **Russian Language and Literature**

#### **RUS 500: Reading Russian**

Intensive introductory Russian for graduate students in other programs. Practice in reading and translation; Russian prose; use of dictionaries and reference materials; as much attention as possible to special problems of various disciplines.

*Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

### **RUS 504: Introduction to Cultural History**

Russian cultural history focusing on recurrent values and ideas. Topics explored include issues of cultural identity, responses to the West and Asia (in such movements as Slavophilism, pan-Slavism, and Eurasian theory), gender, and ethnicity.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **RUS 508: Russian Authors**

A seminar in selected Russian authors, focusing on one or two of the following: Pushkin, Gogol, Dostoevsky, Turgenev, Tolstoy. May be repeated.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **RUS 509: Dostoevsky and the West**

Dostoevsky's major texts viewed in cross-cultural perspective with particular emphasis on literary and philosophical traditions common to Russia and Europe.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **RUS 511: Studies in Literary Genres**

A seminar devoted to a specific genre (poetry, novel, short fiction, drama) in Russian literature. May be repeated.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **RUS 513: 19th-Century Russian Literature**

A seminar on 19th-century Russian literature. The course deals with prose, poetry, and drama in the context of literary movements and traditions.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **RUS 514: 20th-Century Russian Literature**

A seminar in turn-of-the-century, Soviet post revolutionary, and emigre Russian literature. The course deals with prose, poetry, and drama in the context of literary movements and traditions.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **RUS 520: Russian Syntax**

A course in Russian syntax and advanced grammar from various theoretical frameworks.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **RUS 591: Language Acquisition I**

Elementary Russian I intended for graduate students from other programs.

*1-4 credits, Letter graded (A, A-, B+, etc.)*

### **RUS 592: Language Acquisition II**

Elementary Russian II intended for graduate students from other programs.

*1-4 credits, Letter graded (A, A-, B+, etc.)*

### **RUS 593: Language Acquisition III**

Intermediate and Advanced Russian intended for graduate students from other programs. The requirements for the course will include a graduate-level component to be determined by the instructor. May be repeated for credit.

*1-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **RUS 595: Practicum in Teaching**

*Fall and Spring, 1-3 credits, S/U grading  
May be repeated for credit.*

### **RUS 599: Thesis Research**

RUS 599 Thesis Research. One to six credits. S/U grading. May be repeated for credit.

*1-6 credits,*

*May be repeated 6 times FOR credit.*

### **RUS 601: Studies in Cultural Genres**

Explorations in different forms of Russian cultural representation offered by written texts, the arts, architecture, and popular media such as puppet theatres, the bard tradition, and cinema. Interaction among aesthetic genres will be explored with particular emphasis on the roles of literature in the other arts. Fall

*3 credits, Letter graded (A, A-, B+, etc.)*

### **RUS 602: Literature and Theatre**

The relationship of literature and theatre with specific examples taken from Russian cultural history. The stage adaptations of Stanislavsky, Meyerhold, and contemporary directors will be studied as forms of aesthetic conjunction and as responses to the social-ideological context. Spring

*3 credits, Letter graded (A, A-, B+, etc.)*

### **RUS 603: Seminar in Cultural Theory**

Studies in cultural theory with particular reference to the works of formalism, structuralism, the Tartu school of semiotics, and Bakhtinian theory. Fall

*3 credits, Letter graded (A, A-, B+, etc.)*

## **SCI**

### **Science Teacher Preparation**

### **SCI 510: Introduction to Science Teaching**

This course introduces the pre-service teacher to the requisite skills, culture, and demands of the profession. The pre-service teacher learns to design curriculum, write lesson plans, orchestrate classroom activity, probe student thinking and assess student progress within the context of a pedagogy that promotes an inquiry approach to learning. This course requires one-half day per week of clinical practice with follow-up seminar in the campus Discover Lab, out-of-class meetings with classmates, and periodic visits to local public schools.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SCI 520: Science Instructional Strategies and Techniques**

In this course, the pre-service teacher builds on the pedagogical foundations set in SCI 510 and prepares for student teaching in the following semester. Greater leadership in Discover Lab programs and teaching assignments in local public schools is expected. Greater emphasis is placed on the integration of theory and practice, extension of scientific inquiry for diverse learners and assessment of student progress within the context of teaching. This course demands an inquiry into the nature of science and the nature of knowing. It requires one-half day per week of clinical practice with follow-up seminars, out-of-class meetings with classmates, and micro-teaching assignments in selected public schools. Prerequisite: SCI 510; entrance interview with the Science Education Committee; 3.0 cumulative graduate GPA; matriculation in degree (MAT, MS, Ph.D or MA/LS) program; permission Science Education program 631.632.7075 Remark:

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SCI 530: Applied Research in Educational Settings**

This course offers the pre-service teacher the opportunity to conduct a place of original research that will inform future practice. With guidance from the PEP faculty and/or affiliated departmental faculty, pre-service teachers will formulate a question, design a protocol, collect data and analyze within research traditions appropriate to the question.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SCI 540: Clinical Experience and Action Research**

Within this course, students will engage in weekly clinical practice experiences in campus teaching labs, outreach programs or regional schools. In addition, students will design, implement, and present an action research project. This course is intended to be taken as a

two-semester co-requisite of SCI 510 and SCI 520.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SCI 549: Science Field Experience I**

This course requires teacher candidates to complete 50 hours of supervised field experience at various sites and with diverse learners, including: high needs schools, students with disabilities or special needs, English language learners, and diverse age groups. The field experience will involve: observing instruction by sponsoring teacher and other teachers using a structured observation protocol, assisting sponsoring teacher with class activities, tutoring students, planning curriculum and negotiating curriculum with students, assessing student knowledge, and preparing written assignments for the methods courses on the basis of the above activities.

*1 credit, S/U grading*

### **SCI 550: Science Field Experience II**

This course requires teacher candidates to complete 50 hours of supervised field experience at various sites and with diverse learners, including: high needs schools, students with disabilities or special needs, English language learners, and diverse age groups. The field experience will involve: observing instruction by sponsoring teacher and other teachers using a structured observation protocol, assisting sponsoring teacher with class activities, tutoring students, planning curriculum and negotiating curriculum with students, assessing student knowledge, and preparing written assignments for the methods courses on the basis of the above activities. Prerequisite: Matriculation in Science Education Program, SCI 549, SCI 510

*1 credit, S/U grading*

### **SCI 551: Supervised Student Teaching High School Grades 10-12: Science**

Prospective science teachers will participate in a supervised student teaching experience in selected Long Island secondary schools, grades 10-12. The student teacher reports to the school to which he/she is assigned each full school day. Frequent consultation with the supervising teacher helps the student interpret and evaluate the teaching experience. Applications must be filed in the semester preceding student teaching.

*3 credits, S/U grading*

### **SCI 552: Supervised Student Teaching Middle School Grades 7-9: Science**

Prospective science teachers will participate in a supervised student teaching experience

in selected Long Island secondary schools, grades 7-9. The student teacher reports to the school to which he/she is assigned each full school day. Frequent consultation with the supervising teacher helps the student interpret and evaluate the teaching experience. Applications must be filed in the semester preceding student teaching. Prerequisite: SCI 510, 520, 541, 542 CEE 505 and CEE 565; matriculation in degree (MAT, MS, Ph.D or MA/LS) program, 3.0 cumulative GPA; submission of portfolio and interview with and permission of Science Education Committee 631.632.7075

3 credits, S/U grading

### SCI 554: Supervised Teaching of Science Seminar

This seminar, which will focus on problems encountered by student teachers and public school teachers at the secondary level, will include study and analysis of science teaching issues, including classroom management, school culture, and social issues affecting the schools and student performance. Prerequisite: SCI 510, 520, 541, 542, CEE 505 and CEE 565; submission of portfolio and interview with and permission of Science Education Committee 631.632.7059; matriculation in degree (MAT, MS, Ph.D or MA/LS) program; completion of any content area deficiencies

3 credits, Letter graded (A, A-, B+, etc.)

## SLV

### Slavic Languages and Literature

#### SLV 501: Special Topics in Slavic Literature

Special topics in Slavic literature investigating an author, period, genre, or theoretical issue. Designed to provide a forum for advanced research in critical methodology.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

#### SLV 502: Problems of Literary Translation

The course addresses theoretical and practical problems of translation from the Slavic languages. Published translations of literary texts as well as translations prepared by participants of the seminar will be compared and analyzed.

Prerequisite: Advanced knowledge of Slavic languages

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

#### SLV 571: Comparative Slavic Linguistics

An investigation of the major West, East, and South Slavic languages with particular attention to their historical development. The course includes comparative and contrastive studies in the areas of phonology, morphology, and syntax.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

#### SLV 578: Directed Independent Studies

Fall

May be repeated for credit.

#### SLV 579: Directed Independent Studies II

Spring

May be repeated for credit.

#### SLV 580: Special Topic in Slavic Languages I

The study of the phonology, morphology, and syntax of a Slavic language other than Russian, e.g., Polish, Czech, Ukrainian, Serbo-Croatian, or Bulgarian. May be repeated if different language studied.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

#### SLV 581: Special Topic in Slavic Languages II

A continuation of the study of a Slavic language other than Russian. May be repeated if different language is studied.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

## SOC

### Sociology

#### SOC 501: Multivariate Statistics for Social Science

This course is an advanced treatment of descriptive and inferential statistics with emphasis on the latter. Students will gain practical experience in analyzing current data from the social sciences through the use of statistical computer programs. Topics include: sampling, measures of central tendency and dispersion, probability theory, hypothesis testing, point and interval estimation, the normal, binomial, and chi-square distributions, parametric and non-parametric measures of association and correlation, and bi-variate regression.

3 credits, Letter graded (A, A-, B+, etc.)

#### SOC 502: Multivariate Regression Techniques

This course provides an in-depth overview of regression analysis, primarily focused on OLS modeling. Topics include: inferences in regression analysis, dummy variables, interaction terms, and diagnostics and remedial measures. The course concludes with an introduction to other regression techniques such as logistic and probability modeling.

3 credits, Letter graded (A, A-, B+, etc.)

#### SOC 504: Logic and Practice of Sociology

This course provides an introduction to the logic of empirical research in sociology. It takes a broad overview of both quantitative and qualitative methods; inductive and deductive reasoning; and the process of theory construction and testing, with an emphasis on research design and the logic of causal analysis. A knowledge of advanced statistics is not assumed. Topics covered include survey research, participant observation and field methods, the comparative method, experimental and quasi-experimental design, content analysis, and the logic of multivariate analysis.

3 credits, Letter graded (A, A-, B+, etc.)

#### SOC 505: Classical Sociological Theory

A review of the intellectual development of the discipline, its epistemological foundations, and classical theoretical statements.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

#### SOC 506: Contemporary Sociological Theory

A review of the current major theoretical orientations and newly developing theoretical perspectives.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

#### SOC 509: The Practice of Ethnography

This course has four major objectives: (1) to become familiar with contemporary ethnographies; (2) to acquaint students with the methodological literature on qualitative sociology; (3) to consider theoretical and epistemological issues in qualitative research; and (4) to put some data production techniques (observant participation, in-depth interviews, and life stories) into practice.

This course is co-scheduled with WST 610.

Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)

May be repeated 2 times FOR credit.

**SOC 510: Historical Methods in Sociology**

Major approaches, philosophical problems of, and methods used in historical sociology. Topics covered include causal analysis, macrosociological comparisons, case-oriented versus variable-oriented approaches, ideal types, comparative typologies, narrative, and issues of significance and objectivity. Special attention is given to the problem of concept formation.

*3 credits, Letter graded (A, A-, B+, etc.)*

**SOC 512: Global Sociology, Identities and Organizations in Global Perspective**

This course examines how increasing global integration impacts human societies. It reviews the broad trends that foster globalization in the economic, political, cultural, and social spheres, as well as the consequences global change has had on how individuals and communities identify themselves and how they organize for collective goals. Core issues on the global agenda such as conflict, environment, technological and economic development, demographic change, gender, and human rights will be addressed; research methods for the study of global society will be introduced.

*3 credits, Letter graded (A, A-, B+, etc.)*

**SOC 514: Advanced Topics in Global Sociology**

This course provides an advanced treatment of major topics and debates in the increasingly globalized social sciences. The course is based on research activities of the faculty and students. Topics may include global inequality; globalization and gender; sociology of human rights; war and revolution; transnational social movements; comparative political economy; globalization and immigration; globalization and work; issues in global culture.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**SOC 516: Social Inequality**

Causes, consequences, and explanations of a prevailing social, political, and economic phenomenon. The course assesses long-run trajectories of inequalities in their various forms and dimensions, and analytically and theoretically considers the topic at the local, national, and global levels.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

**SOC 518: Sociology of Gender**

This course will familiarize students with the field through a broad survey. Topics include theoretical debates about construction of gender identity, conceptual and empirical issues in the study of gender dynamics and empirical studies of the way gender constituted by social institutions such as family, education, workplace, and media.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

**SOC 519: Advanced Topics in Gender Studies**

This advanced course will continue the discussion of the graduate seminar on Sociology of Gender, by examining theoretical debates or controversies, examining specific gender identities, examining the gender of a specific institution (i.e., labor, law), or the gendered dynamics of social interaction (in for example, romantic relationships or sexuality). Co-scheduled with WST 602.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**SOC 521: Social Psychology**

An analysis of the three major domains of social psychology: (1) symbolic interactionism with a focus on the topic of identity; (2) psychological social psychology with a focus on the topics of personal perception and attitudes; and (3) social structure and personality with a focus on the topics of norms, roles and socialization.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

**SOC 523: Sociology of Education**

Relationships between education and other institutions. Internal dynamics of the school and the classroom.

*3 credits, Letter graded (A, A-, B+, etc.)*

**SOC 531: Economic Sociology**

This course reviews the fundamental principles of economic sociology and looks carefully at the main areas of research in the resurgence that began in the 1970's. The course covers classic texts and considers key areas that have animated the field in the recent era. Subjects would include the rise of the large corporation, ownership and control debate (including the overlapping issues of corporate interlocks and finance capital), the issue of markets and transactions costs, the development of the embeddedness perspective, labor markets and the nature and extent of globalization.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

**SOC 532: Organizations**

This course will review classic and current research in the area of organizations. It will cover internal dynamics of organizations, beginning with classic Weberian theory, and continue by reviewing contemporary approaches to human relations theory. It will address key debates about the dynamics of management-worker relations, and it will scrutinize the debate of corporate control. Also it will survey the literature on interorganizational relations and dynamics, such as interlock research to new institutionalism.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

**SOC 542: Deviance**

Survey of recent research literature on various kinds of deviance (crime, delinquency, and morally stigmatized behavior). Controversial issues in theory and research methods.

*3 credits, Letter graded (A, A-, B+, etc.)*

**SOC 545: Social Movements**

Unorganized collectives and their role in change. Studies of specific social movements and other collective behavior episodes.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

**SOC 549: Social Change**

The image of technological, generational, and cultural forces on social organization from historical and comparative perspectives.

*3 credits, Letter graded (A, A-, B+, etc.)*

**SOC 555: War and the Military**

A comparative and historical study of the social organization of war and the military; causes, conduct, and consequences of war.

*3 credits, Letter graded (A, A-, B+, etc.)*

**SOC 556: Political Sociology**

The study of political institutions and of the politically relevant actions and attitudes of individuals and groups. Particular stress is placed on the reciprocal relationship between social movements and political institutions.

*3 credits, Letter graded (A, A-, B+, etc.)*

**SOC 561: Cultural Sociology**

Cultural sociology is a multi-faceted approach used to analyze phenomena as varied as the arts and popular culture, social identities,

social movements, markets, and politics. In this course the major theoretical approaches are presented along with the most significant empirical work done in recent years. Classical as well as contemporary texts are considered.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **SOC 562: Sociology of the Arts**

The relations between social structure, social change, and the development of major art forms.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SOC 566: Funding and Grant Writing in Sociology**

This course will provide students with the skills necessary to write grant proposals for both government and private agencies. The main requirement will be to prepare a proposal suitable for submission to a particular agency that funds the kind of research the student plans to do.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **SOC 568: Dissertation Seminar**

Under the direction of the seminar leader, students help one another (1) prepare for the Preliminary Specialty Field Exam (which includes putting together a reading list) and (2) work on a dissertation proposal and its defense. The details of selecting a dissertation committee and writing a dissertation are also explored.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **SOC 590: Independent Study**

Intensive reading, under supervision of one or more instructors, of material not covered in the formal curriculum.

*1-12 credits, S/U grading*

*May be repeated for credit.*

### **SOC 591: Special Seminars**

Topics to be arranged. The seminar is built around actual research activities of students and faculty. The following topics have been covered: Cultural Theory; Sociology of Technology; Micro-sociology; Advanced Topics in Marxist Theory; Sociology of Emotions; Historical Methods; Ethnic Relations; Biosociology; Comparative Stratification; Max Weber; Sociology of the Future; Science of Sociology and Everyday Life; The Study of the World's Advanced Societies; Methods of Behavioral Observation;

Social Structure; Sociology of the Family; Cognitive Sociology; Sociology of Work; Transnational Social Movements; Economic Sociology; War and Revolution; Sociology of Gender; Sociology of Culture; Development of Capitalism; Film as a Sociological Research Tool; Funding and Grant Writing; The Three Faces of Social Psychology; A Structural Approach to Organizational Behavior; Professionals and Professionalism; Sociology of Modernity; Globalization and Immigration; Research Support in Sociology; Sociology of Sexual Behavior; Global Sociology; Gender and the Law; Poverty and Homelessness.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **SOC 595: Special Seminars**

Topics to be arranged. The seminar is built around actual research activities of students and faculty. The following topics have been covered: Cultural Theory; Sociology of Technology; Micro-sociology; Advanced Topics in Marxist Theory; Sociology of Emotions; Historical Methods; Ethnic Relations; Biosociology; Comparative Stratification; Max Weber; Sociology of the Future; Science of Sociology and Everyday Life; The Study of the World's Advanced Societies; Methods of Behavioral Observation; Social Structure; Sociology of the Family; Cognitive Sociology; Sociology of Work; Transnational Social Movements; Economic Sociology; War and Revolution; Sociology of Gender; Sociology of Culture; Development of Capitalism; Film as a Sociological Research Tool; Funding and Grant Writing; The Three Faces of Social Psychology; A Structural Approach to Organizational Behavior; Professionals and Professionalism; Sociology of Modernity; Globalization and Immigration; Research Support in Sociology; Sociology of Sexual Behavior; Global Sociology; Gender and the Law; Poverty and Homelessness.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **SOC 598: Research**

Execution of a research project under the supervision of one or more faculty members.

*1-12 credits, S/U grading*

*May be repeated for credit.*

### **SOC 603: Advanced Topics in Quantitative Analysis**

Mathematical and statistical methods in the analysis of quantitative data.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **SOC 604: Advanced Topics in Qualitative Analysis**

The use of personal documents, official records, field observations, and interviews.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SOC 691: Practicum for Teaching and Graduate Assistants**

Individualized supervision of initial (first two semesters) teaching assistance. Discussion, examination construction, student consultation, and grading. Register for section of supervising instructor.

*3 credits, S/U grading*

*May be repeated 2 times FOR credit.*

### **SOC 692: Practicum in the Teaching of Sociology**

The exploration of teaching goals, processes, and outcomes. Practice lectures are videotaped and discussed; classroom visits; planning, outlining, selection of course material; writing of syllabus for Introductory Sociology section to be taught as part of SOC 693 in following semester.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SOC 693: Practicum for Graduate Teaching Interns**

Supervised teaching of a section of Sociology 105 using the outlines, materials, and techniques developed in SOC 692. Includes weekly meetings of all persons registered for SOC 693 and observation of classes by both faculty and fellow graduate students.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SOC 699: Dissertation Research on Campus**

Dissertation research under direction of advisor.

*Prerequisite: Advancement to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.*

*Fall, Spring, and Summer, 1-9 credits, S/U grading*

*May be repeated for credit.*

### **SOC 700: Dissertation Research off Campus - Domestic**

*Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.*

*Fall, Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

**SOC 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must receive clearance from an International Advisor. Fall, Spring, 1-9 credits, S/U grading May be repeated for credit.*

**SOC 800: SUMMER RESEARCH**

*May be repeated for credit.*

**SPN****Hispanic Languages and Literature****SPN 500: Reading Spanish**

Through an intensive study of language structures and idiomatic usage, with extensive practice in written translation of literary and scholarly texts, candidates for advanced degrees are able to obtain the proficiency level of the graduate Spanish reading requirement. Several programs grant exemption from further examination for successful completion of this course (not for M.A. or Ph.D. candidates in Spanish).

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**SPN 501: Historical Linguistics**

General processes of language change, as exemplified by the development of the Romance languages, with particular reference to Spanish.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**SPN 502: Methods in Linguistics Research**

Methods for elicitation and collection of linguistic data and their analysis. Relation between theory and research design, and between qualitative and quantitative analysis.

Introduction to commonly used tests of statistical significance, and to reasoning and argumentation from limited data.

*Prerequisite: Permission of instructor  
Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**SPN 503: Spanish Linguistics**

Major issues related to the general structure of the Spanish language (phonetics, phonology, morphosyntax, semantics, etc.)

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**SPN 504: Contrastive Analysis: Spanish and English**

Topics vary, and may include linguistic interference and its basis and manifestations, in-depth discussion of specific syntactic/semantic areas with reference to possible Spanish/English interference, major phonological differences between Spanish and English and consequent learning difficulties, and nonlinguistic factors that may affect learning in different groups in different situations.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**SPN 505: Hispanic Dialectology and Sociolinguistics**

Major theoretical issues involved in analysis of geographical and social variation and with the principal methods used in its investigation, as applied to varieties of Spanish, Portuguese, Catalan, and Galician.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**SPN 506: Bilingualism**

This course studies the phenomenon of bilingualism both at the individual and at the social level. It examines the nature of bilingual competence, theories of the representation/storage of bilingual knowledge, the acquisition/learning of multiple languages, social attitudes towards bilingualism, the consequences of language contact, and bilingual education policies and their effects.

*3 credits, Letter graded (A, A-, B+, etc.)*

**SPN 510: Hispanic Cultures**

An introduction to the essential aspects of Hispanic cultures both globally and within the U.S., designed to provide incoming graduate students with sufficient background

to undertake the advanced study of Hispanic languages and literature.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**SPN 513: Spanish as a Second Language Acquisition**

This course examines how language development in bilingual individuals is different from that of monolinguals, how individuals learn their first language (L1), how they learn their second language (L2), and the relationship between both languages, including how L1 affects the understanding of L2 in the user's mind.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**SPN 514: Spanish Grammar**

The student will be introduced to important concepts in the study of grammar and syntax of Spanish in view of modern linguistics theories about our language facility. This course also will describe the grammar of Spanish spoken in Spain and Latin America. Offered in

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**SPN 515: Spanish Composition and Translation**

Theory and practice of problems in composition and translation with revision of difficult points in advanced Spanish grammar. Classroom analysis and discussion.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**SPN 523: Golden Age Literature**

Major literary works within the Renaissance and/or baroque periods are read and analyzed in depth, and their interrelation with the cultural context is discussed.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**SPN 532: Interdisciplinary Approaches to Hispanic Studies**

The critical analysis of selected themes in Spanish and/or Latin American culture and society as represented across different discourses and disciplines including literary and cultural studies, film and media, documentary and historical sources. Offered in

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**SPN 542: Studies in Modern Spanish Literature**



Major literary works of the 19th and 20th centuries will be read and analyzed in depth in relation to their broader cultural and historical content.

*Offered in  
Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 551: Early Latin American Literature and Culture**

An introduction to the analysis of major works and concepts of the colonial period and their relevance for contemporary debates in Latin American literary and cultural studies.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 573: Studies in Modern Latin American Literature**

Major literary works of the 19th and 20th centuries will be read and analyzed in depth in relation to their broader cultural and historical context. Offered in

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 582: The Hispanic Tradition in the United States**

A general historical analysis of the influence of Hispanic culture in the United States as a consequence of the continuous interaction between Spanish- and English-speaking people. Special attention is given to cultural manifestation in a bicultural setting.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 585: Caribbean Literature**

A course devoted to major writers and works of the Caribbean area. Readings will be analyzed in relation to cultural contexts.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 588: Directed Master's Research**

For work toward the M.A. thesis or preparation for the M.A. comprehensive examination only. This course is mainly intended for students who are not continuing toward the Ph.D.

*Prerequisite: Permission of graduate program director, M.A. thesis director, and, or director of the M.A. comprehensive examination committee.*

*Fall and Spring, 1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 591: Spanish Language Acquisition I**

Elementary Spanish I Intended for graduate students of other programs

*4 credits, Letter graded (A, A-, B+, etc.)*

### **SPN 592: Spanish Language Acquisition II**

Elementary Spanish II intended for graduate students from other programs.

*4 credits, Letter graded (A, A-, B+, etc.)*

### **SPN 593: Spanish Language Acquisition III**

Intermediate Spanish I intended for students of other programs.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SPN 594: Spanish Language Acquisition IV**

Intermediate Spanish II intended for graduate students from other programs.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SPN 595: Directed Independent Individual Studies**

For M.A. and Ph.D. candidates only.

Requires a written proposal signed by the faculty member involved and the approval of the graduate program director and the departmental chairperson. No more than a total of nine credits may be applied toward a Spanish graduate degree or combination of degrees.

*Prerequisite: Permissions mentioned above  
Fall and Spring, 1-6 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 609: Literary and Cultural Theories: Latin American and Iberian Contexts**

An introduction to literary and cultural theory centered on the central questions that animate theoretical discussion among literary and cultural scholars today. Special emphasis is placed on theoretical discourses and practices originating in Latin America and Spain as well as how scholars in these regions have incorporated, modified and enhanced theories produced elsewhere. A required course for students in the Spanish Ph.D. program.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SPN 612: Topics Seminar**

A seminar course designed primarily for doctoral students about any of the various areas of Latin American and Iberian literatures and cultures. Recent topics include Latina fiction, Cuba/Spain, Postdictadura, Fictions

of Power, A World of Cinemas, Art and literature, Politics and literature. Prerequisite: Admission to the Spanish Ph.D. program or permission of instructor

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 613: Medieval Iberian Cultures**

Reading and analysis of literary and historiographical works of the medieval period within their cultural and political context.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 623: Early Modern Iberian Cultures**

Reading and analysis of literary, theatrical, and historiographical works of the 16th and 17th centuries within their historical and cultural contexts. Special attention will be devoted to Spanish literature, theater and art of the era and its relationship with the literary and historical texts. Prerequisite: M.A. or permission of instructor

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 641: 19th-Century Iberian Cultures**

This course will focus on major issues regarding the multicultural and multilingual characteristics of Iberian spaces that necessarily entail their transatlantic dimension. We will study both canonical and less-studied cultural objects, including literature, music, and visual culture in general. Special attention will be given to the materiality of those objects e.g. newspapers, literature in installments, manuscripts, digital communication, etc. Recent topics include Art and Resistance in Times of Uprisings.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SPN 643: Contemporary Iberian Cultures**

A course dedicated to the analysis of twentieth and twenty-first century literary and cultural production and practices in Spain in relation to the social and political context of the period. Recent topics include Spain and its Others, tourists and immigrants, cultural and historical memory, the 1960s Spanish novel and the Latin American Boom.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SPN 645: Topics in Transatlantic Studies**

Analysis of cultural, political and economic relations between the Americas, Europe and Africa, in a comparatist and transnational

frame. The course examines debates from both sides of the Atlantic, paying attention to the multidirectional flow of ideas, unequal power relations and hegemonic discourses regarding war, nation, and experience that shape cultural production and define the field of Transatlantic Studies. Topics include relations between colony and metropolis in empire, exile, diaspora, and migration. The aim is to move from a standard, avant-gardist approach to a more theoretical notion of transatlanticism that incorporates gender and sexuality, the postcolonial world and decolonial thought.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 652: Colonial Latin-American Cultures**

This seminar studies the textural culture of colonial Latin America, dealing with a diversity of genres, from legal writing, historiography, autobiography and epic poetry to visual materials, such as drawings, textiles, decorated vases, etc. The course explores the transatlantic Ibero-American traditions in relation to native and local cultures. Major authors and historical events will be studied in depth along with current criticism and theories.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 662: 19th-Century Latin-American Cultures**

Course includes canonical literary works as well as lesser known writers and genres. Readings will be analyzed within specific national and cultural contexts, but will also engage with transnational movements and cultural productions. Recent topics include "Desertificaciones: War and Representation in 19th century Latin America" and "Queer fin de siglo: Modernity, Sexuality, and Gender in the Southern Cone (1880-1910)."

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 671: Contemporary Latin-American Cultures**

Course draws comparatively from the multiple literary and cultural traditions of Latin American countries, taking into account significant aesthetic and political developments throughout the region. Focus on time periods varies.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **SPN 675: Topics in Hispanic Cinema and Media**

A course featuring diverse approaches to the history, theory, and practice of film, television and other audio-visual media in Latin America, Spain, and the Latino US. Recent topics include Women's cinema in Spain and Latin America; Bunuel; Ripstein; Almodovar, Documentary Cinema in Spain and Latin America, Cinema and Inter-American Relations.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **SPN 681: Directed Readings**

For students who have completed all doctoral requirements and wish to dedicate themselves to full-or part-time preparation for the comprehensive examination.

*Prerequisite: Coursework toward the Ph.D. must be completed; permission of the dissertation director, graduate studies director, or department chairperson  
Fall and Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **SPN 685: Caribbean Cultures**

Course focuses on the modern cultural productions of Cuba, Puerto Rico and the Dominican Republic, with some attention to the Anglophone and Francophone Caribbean. Topics include imperialism and colonialism, neocolonialism and postcolonialism, and raced and gendered aesthetics.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 1 times FOR credit.*

### **SPN 691: Practicum in the Teaching of Spanish Language**

Theory and practice of language teaching. Applied methodology and linguistics in classroom situations. A required course for teaching assistants.

*Prerequisite: Permission of instructor, department chairperson, or graduate program director  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **SPN 693: Practicum in the Teaching of Spanish Language**

This course is to be taken in conjunction with the student's teaching assignment. Each week's discussion centers on problems of applied linguistics or grammar. Discussion will also be focused on methodology (audio-lingual method, pattern drills, language laboratory, and preparation of examinations).

*Fall and Spring, 3 credits, S/U grading  
May be repeated for credit.*

### **SPN 695: Dissertation Prospectus**

Required of all advanced PhD students at or near the end of their course work. The course offers extensive practice in advanced

academic writing skills. The aim of the course is to prepare the dissertation prospectus and a fellowship proposal. The various components of a strong proposal will be addressed: the narrative, keywords, the methodological or theoretical frame, the research plan, the bibliography, and the personal statement.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **SPN 699: Dissertation Research on Campus**

For students who have already passed the Ph.D. comprehensive examination and need to devote their time to preparation of their dissertation.

*Prerequisites: Ph.D. comprehensive examination completed and advanced to candidacy (G5); permission of the dissertation director, graduate program director, or department chairperson. Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.*

*Fall, Spring, and Summer, 1-9 credits, S/U grading  
May be repeated for credit.*

### **SPN 700: Dissertation Research off Campus - Domestic**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor.

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **SPN 701: Dissertation Research off Campus - International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by second week of classes. The charge will only be removed if other plan is deemed comparable.

*All international students must received clearance from an International Advisor.*

*Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **SPN 800: Summer Research**

*May be repeated for credit.*

### **SPN 850: Summer Teaching**

Summer Teaching

*S/U grading*

*May be repeated for credit.*

## **SUS**

### **Sustainability Studies**

#### **SUS 502: Perspectives on Sustainability**

In this seminar course, students will analyze and discuss works that underpin research and practice in the interdisciplinary field of Sustainability. The scope of challenges and the ways in which they are interconnected will be highlighted.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **SUS 503: Research Methods in Sustainability**

This course will provide a survey of quantitative and qualitative methods used in sustainability research in the natural sciences, social sciences, and humanities. Students will read primary literature and analyze the research design. Students will formulate research questions, identify appropriate methods to investigate the question, and develop a research proposal.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **SUS 506: Coastal Housing Resilience**

This course addresses the pressing problem of increasing magnitude and inequalities of risk in coastal communities as it relates to housing vulnerability. With the increasing frequency of coastal hazards, middle income and affordable housing is disproportionately at risk and damaged, while the tourism industry that is the backbone of many coastal areas also loses revenue. These perilous dynamics are worsening availability and vulnerability of housing that for both low-moderate income permanent residents of coastal communities and seasonal residents and tourists threatening economic viability of many places. Through case studies and community-engaged learning, this course will engage students in learning the forces and mechanisms such as local economy, funding, development regulations, disaster policies that shape the vulnerability, recovery and resilience of housing in coastal communities. Further, students will exercise translation of knowledge into policy to help

resolve the critical problems of coastal housing vulnerability and inequality.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **SUS 543: Age of the Anthropocene**

Anthropocene is the term coined to explain the current geologic era of our planet as shaped and defined by human activity. This course provides a deeper understanding of the ways in which humans have interacted with and transformed the planet during recent geologic time, including the Holocene, Industrial Revolution, and into the present. We consider Earth as a global ecosystem, characterized by interacting and dynamic systems, including biophysical and anthropogenic systems. This course critically examines the current interpretations and applications of the term Anthropocene, and identifies the key tenants and societal outcomes of this powerful and sometimes conflicting idea as applied today in science, socio-political discourse, sustainability, and beyond.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **SUS 548: Urban Climate Change Mitigation and Adaptation**

Climate change, with its anthropogenic causes and devastating effects on human societies, is the grand challenge of our age. This course will consider how urbanized areas, especially coastal communities, can reduce their negative environmental impact while simultaneously working to adapt to the harmful effects of climate change that are already "baked in" to earth's systems. Along the way we will develop a better understanding of the feedback loops that connect human activity with natural systems and human well-being, analyze which varieties of urbanization actually have the worst environmental impacts, consider both incremental and extreme varieties of risk, and delve deeply into strategies and tactics for addressing the intertwined mitigation and adaptation challenges of climate change. Our focus will be on public sector actions and the public policy, urban planning and governance responses that will need to be made to regain equilibrium in our natural systems and adapting our social systems to new realities of life on Earth.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **SUS 550: Topics in Sustainability Studies**

This is used to present special interest courses, including intensive short courses by visiting and adjunct faculty and courses requested by students. Topics can range from those that are relatively specific (e.g., Environmental Inequality), new methodological approaches, or other relevant skill development specific to

the needs of Sustainability Studies graduate students.

*Fall and Spring, 1-4 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

#### **SUS 551: Soil Ecotoxicology Research**

Design and implement a unique project in ecotoxicology. Course covers literature review, experimental design, hypothesis formulation, data collection, data analysis, hypothesis testing and write up. Students will communicate their research orally and in writing. Projects vary by year and will involve ecotoxins such as acid rain, heavy metals, pesticides, plastics or herbicides and organisms such as soil microbes or earthworms. Course may be repeated once with instructor

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

#### **SUS 562: Resilient Communities**

As population and investment increase in hazard-prone areas across the world, risks and vulnerability are increasing as well. Responding to increased risk and vulnerability involves enhancing resilience or our ability to withstand major shocks without long-term, debilitating physical, social, or economic damage. Resilience as a process can be embodied by communities who proactively prepare for, absorb, recover from, and adapt to actual or potential future adverse events, instead of bearing repeated damage and continuously demand for federal disaster assistance. This course explores the idea of resilience as an outcome and as a process from different perspectives and in different contexts. We will first study resilience through the lens of sociopolitical ecology of risk and vulnerability. Then we will explore resilience in the face of natural, social and economic instabilities or shocks. Finally, we will discuss long term risk management, governance models, policies and politics involved in making our communities more resilient.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **SUS 566: Philosophy and the Environment**

Philosophical questions raised by human relations with the natural world, ranging from basic concepts such as nature, ecology, the earth, and wilderness, to the ethical, economic, political, and religious dimensions of current environmental problems, including the question of whether there are values inherent in nature itself beyond those determined by human interests alone.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **SUS 580: Research Seminar**

A weekly series of seminars presented by visiting sustainability researchers, SBU researchers, and sustainability graduate students.

*S/U grading*

*May be repeated for credit.*

## TAF

### Theatre

#### TAF 500: Introduction to Graduate Theatre

This seminar course will introduce graduate theatre students in all tracks to each other, to graduate faculty across disciplines, and will encourage new collaborations and projects for development during the students' graduate careers. Theatre students will meet to discuss the role of each artist, with emphasis on the changing nature of collaboration and the expanding art form in today's theatre profession. Readings, written assignments and collaborative projects are required.

*3 credits, Letter graded (A,B,C, etc.).*

*Prerequisite: Permission of the Instructor, Southampton and Manhattan, Semesters offered:*

*Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.).*

#### TAF 505: Dramaturgy I: Production Dramaturgy

An introduction to production dramaturgy in which students explore the types of research and concept development necessary to prepare already produced scripts for performance. Research tools and methods, investigations of cultural and social history, critical writing, and issues in adaptation and translation are discussed. Means of facilitating communication within a production team and between actors, designers, and directors are examined. Other topics include season planning, promotion and publicity, educational outreach materials, preparation of protocols, post-play discussion, and other audience development techniques.

*Prerequisite: Permission of instructor*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.).*

#### TAF 506: Dramaturgy II: Literary Management

Examining the roles of the literary manager in the contemporary theatre, this course explores the process of new play development and the preparation of a new play for production. The ability to read and write sensitively about new plays, reading new plays and preparing sophisticated play reports, how to talk to playwrights about their plays, and how to

facilitate discussions with directors and actors as they encounter a play for the first time are issues examined in this course. New plays from a variety of venues, including professional theatres in New York City, are read and discussed, and the process of developing new plays from staged readings through public performances are studied.

*Prerequisite: Permission of instructor*

*Spring, 3 credits, Letter graded (A, A-, B+, etc.).*

#### TAF 507: Dramaturgy of Process: New Play Development Workshop

This course for advanced students of Dramaturgy allows them to apply practical theatre skills to the development of new work. Students will assist in the workshop production of a new play. This will explore NPD process as it exists in the American Regional Theatre, and learn the practical skills of running a play-reading series, commissioning new plays, communicating with playwrights, casting and marketing. 3 credits, ABCF Grading

*3 credits, Letter graded (A, A-, B+, etc.).*

#### TAF 510: Western Theatre History

Theatre forms in the Western tradition, from ancient to modern. This course is centered on a particular critical or theoretic problem or theme. It may be repeated as an independent study with the permission of the instructor.

*3 credits, Letter graded (A, A-, B+, etc.).*

*May be repeated for credit.*

#### TAF 510: Western Theatre History

Theatre forms in the Western tradition, from ancient to modern. This course is centered on a particular critical or theoretic problem or theme. It may be repeated as an independent study with the permission of the instructor.

*3 credits, Letter graded (A, A-, B+, etc.).*

*May be repeated for credit.*

#### TAF 511: Far Eastern Theatre and Drama

Course surveys the traditional theatre of three Far Eastern (China, Korea, and Japan) as related to: its history, dramatic literature (Yuan drama and Beijing Opera of China; Pongsan Korean Masked Dance-Drama; a Noh play cycle, Kabuki, and Joruri Puppet Theatre of Japan), point of departure will be: the Eastern world view (namely Shamanism, Confucianism, Daoism, and Buddhism) and theatre; the concept of the actor's body and mind as a microcosmic presentation of a macrocosmic universe; his performance as an act of becoming one with the macrocosm; and the total nature of all performing arts elements

harmoniously operating together in creating beauty on stage.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.).*

*May be repeated 2 times FOR credit.*

#### TAF 520: Western Dramatic Literature

Course surveys forms of Western drama, with particular reference to theatrical performance. Focus is placed on key periods and themes such as gender issues, political violence, death and dying, love, etc. May be repeated once.

*Spring, odd years, 3 credits, Letter graded (A, A-, B+, etc.).*

*May be repeated 2 times FOR credit.*

#### TAF 520: Western Dramatic Literature

Course surveys forms of Western drama, with particular reference to theatrical performance. Focus is placed on key periods and themes such as gender issues, political violence, death and dying, love, etc. May be repeated once.

*Spring, odd years, 3 credits, Letter graded (A, A-, B+, etc.).*

*May be repeated 2 times FOR credit.*

#### TAF 521: South and Southeast Asian Theatre and Drama

Surveying the traditional and modern theatre of South and Southeastern Asian (India, Sri Lanka, Thailand, Indonesia, Tibet, Nepal, and Bhutan) as related to: its mythic origins, history, dramatic literature, aesthetic theory, ritual functions, conventions of productions and actor training. The point of departure will be cosmology, especially that of Hinduism, and world view of the people.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.).*

*May be repeated 2 times FOR credit.*

#### TAF 523: Theatre in New York

A workshop seminar on contemporary, alternative performance forms and mainstream theatre. Emphasis on the development of critical perspectives and the writing skills needed to articulate them through seminar discussions and writing workshops relevant to performances seen on trips to theatres in New York and the region.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.).*

#### TAF 525: Topics in Theatre and Drama

Intensive studies of selected forms of theatre and drama from various countries and periods, designed to supplement rather than repeat areas of study already undertaken in the curriculum. May be repeated.

*Prerequisite: Permission of instructor*

*Fall or Spring, alternate years, 1-3 credits, Letter graded (A, A-, B+, etc.).*

*May be repeated for credit.*

### **TAF 530: Directed Reading in Theatre and Drama**

Students read and evaluate the literature on a topic of special academic interest under the supervision of a faculty member. May be repeated. Prerequisite: Permission of instructor

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **TAF 535: Theories of Theatre**

Theories of the theatre, from the ancient to the contemporary, are read critically to develop a complex and varied conception of the philosophical basis underlying approaches to the theatre. Theorists read might include Aristotle, Plato, Diderot, Rousseau, Nietzsche, Artaud, Brecht, Stanislavski, Grotowski, Barba, Mnouchkine, Suzuki, and Zeami.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **TAF 550: Teaching Seminar**

Supervised student teaching of undergraduate courses accompanied by a seminar in methods and strategies of teaching theatre arts at the University level. An independent teaching project, in which the student works with a particular faculty member, may be substituted.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **TAF 570: Directing Theory and Practice**

Course surveys the art and craft of the Director, with focus on contemporary practices of directing and approaches to pedagogy. Students will write papers and develop projects in conjunction with advanced reading and instruction.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **TAF 575: Adaptation Workshop**

This course is an intense examination of a playwright or group of plays with the object of preparing a new adaptation or stage version. The course will study a text or group of texts, important criticism, notable or significant translation and/or adaptations, stage productions and/or film versions. Students will submit an outline or rough draft of their new version at the end of the course.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **TAF 576: Theatre Workshop**

The workshops at Southampton Arts are intensive classes in various aspects of the craft of theatre and film, including playwriting,

screenwriting, directing, acting, solo performance, interdisciplinary collaboration (devising), and digital filmmaking, together with lectures, readings, seminars, and panels featuring nationally distinguished artists. These workshops encourage participation by visiting students, new theatre and film artists, established artists, and teachers who will be admitted by application and may receive academic credit upon request. Graduate students may take any Theatre Workshop sponsored by the MFA program for academic credit. Study may occur in Southampton, Manhattan, or abroad. A submission of a workshop application, and permission of instructor are required. May be repeated for credit.

*1-6 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **TAF 590: M.A. Thesis**

Independent study and research for M.A. students, on special topics, theoretical or cultural issues, or problems. Development of material for research paper.

*1-3 credits, S/U grading*

*May be repeated for credit.*

### **TAF 591: Independent Project**

Special project allowing advanced individual work in an area of theatre study or practice. Must be scheduled by arrangement with instructor. Should result in an advanced paper or project report. May be repeated.

*1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **TAF 635: Theories of Performance**

This course examines different theories of performance as they relate to theatre and everyday life. Students explore ways of thinking about the performing body and different modes of cultural expression. There is a performing component to the course in addition to a final paper.

*3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **TAF 638: Directing I - Principles of Directing**

This course will focus on the analytical, organizational and creative processes necessary to be a director. Topics include: the role of the director and the collaborative process; the history of directing; script analysis and interpretation/ concept; stage, space and composition; visual interpretation and working with designers; casting and working with actors; working with dramaturges; and rehearsal and technical process.

*Offered*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **TAF 639: Directing II - Advanced Directing**

This course will build upon the work covered in Directing I and will focus on advanced problems in Directing, including advanced scene work, period styles, alternative forms, and the challenges of contemporary drama and or alternative performance. Prerequisite: THR638 Offered

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **TAF 640: Theatre Design Workshop**

Advanced assignments in theatre design. May include design work on departmental productions. May be repeated once.

*Prerequisite: Permission of instructor*

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated 2 times FOR credit.*

### **TAF 650: Playwriting Workshop**

Students write and discuss original plays, evaluate their work, study techniques of composition and formal organization, and develop strategies for audience communication. Advanced students may study techniques for revision and the development of material for performance. Some plays may be selected for department production.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **TAF 651: Playwriting Workshop II**

With the instructor of record, the student will develop a plan for addressing problems or the boundaries of approaches to creative work specific to his or her needs for continued development as a playwright. As deemed appropriate by the instructor, the student will work on a full length or one-act play or scenes.

*Offered in Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **TAF 660: Acting Workshop**

Intensive advanced study in a particular acting technique, such as Kutiyattam, Suzuki, musical theatre, Brecht, etc. Offered in conjunction with departmental productions. May be repeated.

*Prerequisite: Permission of instructor*

*Fall or Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **TAF 670: Directing Workshop**

Advanced training in directing, which may involve concentrated scene work, formal experiments in performance, work on period styles and problems, or preparation of

performances for public showing. May be repeated once.

*Prerequisite: Permission of Instructor  
Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **TAF 680: Dramaturgy Workshop**

Students serve as dramaturgs for the production of a play, providing research support, studying editorial and interpretive techniques, attending rehearsals, and developing program materials for the audience.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **TAF 690: Professional Internship**

A full-term internship at a professional theatre. Students should submit an internship description in the first month of work, then a journal or evaluation of their work experience.

*Prerequisite: Permission of graduate studies director  
Spring, 3 credits, S/U grading*

### **TAF 691: M.F.A. Project**

The project is to be undertaken at a professional theatre or as part of the mainstage production season at Stony Brook University. Students submit a proposal for a project in which they have a major responsibility as an assistant dramaturg on a production or an equivalent position. All proposals for projects outside of the university must be submitted in writing to the faculty supervisor and graduate program director for approval.

*Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **TAF 692: M.F.A. Thesis**

Independent study and research for M.F.A. students, on special topics, theoretical or cultural issues, or problems. Development of material for research paper.

*1-3 credits, S/U grading  
May be repeated for credit.*

## **THR**

### **Theatre Arts**

#### **THR 500: Introduction to Graduate Study in Dramaturgy**

This course surveys the field of theatre scholarship, introducing students to research tools, research methods, critical writing, and scholarly values. Discussions include reference to basic texts in dramatic literature and representative research problems.

*Prerequisite: Admission to graduate program  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **THR 505: Dramaturgy I: Production Dramaturgy**

An introduction to production dramaturgy in which students explore the types of research and concept development necessary to prepare already produced scripts for performance. Research tools and methods, investigations of cultural and social history, critical writing, and issues in adaptation and translation are discussed. Means of facilitating communication within a production team and between actors, designers, and directors are examined. Other topics include season planning, promotion and publicity, educational outreach materials, preparation of protocols, post-play discussion, and other audience development techniques.

*Prerequisite: Permission of instructor  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **THR 506: Dramaturgy II: Literary Management**

Examining the roles of the literary manager in the contemporary theatre, this course explores the process of new play development and the preparation of a new play for production. The ability to read and write sensitively about new plays, reading new plays and preparing sophisticated play reports, how to talk to playwrights about their plays, and how to facilitate discussions with directors and actors as they encounter a play for the first time are issues examined in this course. New plays from a variety of venues, including professional theatres in New York City, are read and discussed, and the process of developing new plays from staged readings through public performances are studied.

*Prerequisite: Permission of instructor  
Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

#### **THR 507: Dramaturgy of Process: New Play Development Workshop**

This course for advanced students of Dramaturgy allows them to apply practical theatre skills to the development of new work. Students will assist in the workshop production of a new play. This will explore NPD process as it exists in the American Regional Theatre, and learn the practical skills of running a play-reading series, commissioning new plays, communicating with playwrights, casting and marketing.

*3 credits, Letter graded (A, A-, B+, etc.)*

#### **THR 510: Western Theatre History**

Theatre forms in the Western tradition, from ancient to modern. This course is centered on

a particular critical or theoretic problem or theme. It may be repeated as an independent study with the permission of the instructor.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

#### **THR 511: Far Eastern Theatre and Drama**

Course surveys the traditional theatre of three Far Eastern (China, Korea, and Japan) as related to: its history, dramatic literature (Yuan drama and Beijing Opera of China; Pongsan Korean Masked Dance-Drama; a Noh play cycle, Kabuki, and Joruri Puppet Theatre of Japan), point of departure will be: the Eastern world view (namely Shamanism, Confucianism, Daoism, and Buddhism) and theatre; the concept of the actor's body and mind as a microcosmic presentation of a macrocosmic universe; his performance as an act of becoming one with the macrocosm; and the total nature of all performing arts elements harmoniously operating together in creating beauty on stage.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

#### **THR 520: Western Dramatic Literature**

Course surveys forms of Western drama, with particular reference to theatrical performance. Focus is placed on key periods and themes such as gender issues, political violence, death and dying, love, etc. May be repeated once.

*Spring, odd years, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

#### **THR 521: South and Southeast Asian Theatre and Drama**

Surveying the traditional and modern theatre of South and Southeastern Asian (India, Sri Lanka, Thailand, Indonesia, Tibet, Nepal, and Bhutan) as related to: its mythic origins, history, dramatic literature, aesthetic theory, ritual functions, conventions of productions and actor training. The point of departure will be cosmology, especially that of Hinduism, and world view of the people.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

#### **THR 523: Theatre in New York**

A workshop seminar on contemporary, alternative performance forms and mainstream theatre. Emphasis on the development of critical perspectives and the writing skills needed to articulate them through seminar discussions and writing workshops relevant to performances seen on trips to theatres in New York and the region.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **THR 525: Topics in Theatre and Drama**

Intensive studies of selected forms of theatre and drama from various countries and periods, designed to supplement rather than repeat areas of study already undertaken in the curriculum. May be repeated.

*Prerequisite: Permission of instructor  
Fall or Spring, alternate years, 1-3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **THR 530: Directed Reading in Theatre and Drama**

Students read and evaluate the literature on a topic of special academic interest under the supervision of a faculty member. May be repeated.

*Prerequisite: Permission of instructor  
Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **THR 535: Theories of Theatre**

Theories of the theatre, from the ancient to the contemporary, are read critically to develop a complex and varied conception of the philosophical basis underlying approaches to the theatre. Theorists read might include Aristotle, Plato, Diderot, Rousseau, Nietzsche, Artaud, Brecht, Stanislavski, Grotowski, Barba, Mnouchkine, Suzuki, and Zeami.

*Fall, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **THR 540: Design Theory and Practice**

Course surveys principal design areas, providing information about aesthetic theory and methods of stage design. Students address design problems and analyze a topic in design theory in conjunction with readings and instruction.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **THR 550: Teaching Seminar**

Supervised student teaching of undergraduate courses accompanied by a seminar in methods and strategies of teaching theatre arts at the University level. An independent teaching project, in which the student works with a particular faculty member, may be substituted.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **THR 560: Acting Theory and Practice**

Course surveys the field of acting-its history, formal principles, primary techniques, and contemporary practice. Students develop

course papers and, or projects in conjunction with advanced readings and instruction.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)*

### **THR 570: Directing Theory and Practice**

Course surveys the art and craft of the Director, with focus on contemporary practices of directing and approaches to pedagogy. Students will write papers and develop projects in conjunction with advanced reading and instruction.

*3 credits, Letter graded (A, A-, B+, etc.)*

### **THR 575: Adaptation Workshop**

This course is an intense examination of a playwright or group of plays with the object of preparing a new adaptation or stage version. The course will study a text or group of texts, important criticism, notable or significant translation and/or adaptations, stage productions and/or film versions. Students will submit an outline or rough draft of their new version at the end of the course.

*Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **THR 589: M.F.A. Thesis**

Independent study and research for M.F.A. Dramaturgy students, on practical or theoretical topics related to the field of dramaturgy. Development of materials for this research paper may be related to the students M.F.A. Project or other dramaturgical pursuits.

*3 credits, S/U grading  
3 credits, S/U grading  
May be repeated for credit.*

### **THR 590: M.A. Thesis**

Independent study and research for M.A. students, on special topics, theoretical or cultural issues, or problems. Development of material for research paper.

*1-3 credits, S/U grading  
May be repeated for credit.*

### **THR 591: Independent Project**

Special project allowing advanced individual work in an area of theatre study or practice. Must be scheduled by arrangement with instructor. Should result in an advanced paper or project report. May be repeated.

*1-3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **THR 625: Theory and Criticism**

Study of major issues in dramatic theory and criticism and in performance theory. May be

repeated for up to six credits with instructor's permission.

*Spring, alternate years, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **THR 630: Dramaturgy Colloquium**

Through interaction with theatre professionals, students develop independent projects around topics of common concern to the profession, and develop strategies for implementing alternate plans for improving and developing theatre. May be repeated.

*Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **THR 635: Theories of Performance**

This course examines different theories of performance as they relate to theatre and everyday life. Students explore ways of thinking about the performing body and different modes of cultural expression. There is a performing component to the course in addition to a final paper.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **THR 636: Topics in Performance Studies**

The history and theories of performance are explored. Seminars may focus on the performing body, performance and political change, avant-garde performance, performing and cognitive science, virtual performance, performance and identity. Depending on the topic, there may be a performance component and/or computer based projects.

*Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **THR 638: Directing I - Principles of Directing**

This course will focus on the analytical, organizational and creative processes necessary to be a director. Topics include: the role of the director and the collaborative process; the history of directing; script analysis and interpretation/ concept; stage, space and composition; visual interpretation and working with designers; casting and working with actors; working with dramaturges; and rehearsal and technical process.

*Offered  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **THR 639: Directing II - Advanced Directing**

This course will build upon the work covered in Directing I and will focus on advanced

problems in Directing, including advanced scene work, period styles, alternative forms, and the challenges of contemporary drama and or alternative performance. Prerequisite: THR638 Offered

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **THR 640: Theatre Design Workshop**

Advanced assignments in theatre design. May include design work on departmental productions. May be repeated once.

*Prerequisite: Permission of instructor  
Fall, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **THR 650: Playwriting Workshop**

Students write and discuss original plays, evaluate their work, study techniques of composition and formal organization, and develop strategies for audience communication. Advanced students may study techniques for revision and the development of material for performance. Some plays may be selected for department production.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

### **THR 651: Playwriting Workshop II**

With the instructor of record, the student will develop a plan for addressing problems or the boundaries of approaches to creative work specific to his or her needs for continued development as a playwright. As deemed appropriate by the instructor, the student will work on a full length or one-act play or scenes.

*Offered in Fall, 3 credits, S/U grading  
May be repeated for credit.*

### **THR 660: Acting Workshop**

Intensive advanced study in a particular acting technique, such as Kutiyattam, Suzuki, musical theatre, Brecht, etc. Offered in conjunction with departmental productions. May be repeated.

*Prerequisite: Permission of instructor  
Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **THR 670: Directing Workshop**

Advanced training in directing, which may involve concentrated scene work, formal experiments in performance, work on period styles and problems, or preparation of performances for public showing. May be repeated once.

*Prerequisite: Permission of Instructor  
Fall or Spring, alternate years, 3 credits,  
Letter graded (A, A-, B+, etc.)  
May be repeated 2 times FOR credit.*

### **THR 680: Dramaturgy Workshop**

Students serve as dramaturgs for the production of a play, providing research support, studying editorial and interpretive techniques, attending rehearsals, and developing program materials for the audience.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **THR 690: Professional Internship**

A full-term internship at a professional theatre. Students should submit an internship description in the first month of work, then a journal or evaluation of their work experience.

*Prerequisite: Permission of graduate studies director  
Spring, 3 credits, S/U grading*

### **THR 691: M.F.A. Project**

The project is to be undertaken at a professional theatre or as part of the mainstage production season at Stony Brook University. Students submit a proposal for a project in which they have a major responsibility as an assistant dramaturg on a production or an equivalent position. All proposals for projects outside of the university must be submitted in writing to the faculty supervisor and graduate program director for approval.

*Fall, Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **THR 692: M.F.A. Thesis**

Independent study and research for M.F.A. students, on special topics, theoretical or cultural issues, or problems. Development of material for research paper.

*1-3 credits, S/U grading  
May be repeated for credit.*

### **THR 800: Summer Research**

Independent study and research on special topics or problems related to work on the M.A. or M.F.A. degree. May be repeated.

*S/U grading  
May be repeated 2 times FOR credit.*

### **THR 850: Summer Teaching**

Supervised student teaching of undergraduate courses accompanied by a tutorial in methods and strategies of teaching theatre arts at the University level.

*S/U grading*

## **TMP**

### **Technology Management Prog**

#### **TMP 541: MANAGERIAL ECONOMICS**

The techniques and approaches of microeconomic reasoning are applied to issues of managerial decision making in the corporation. The theory of the market and the price system are closely examined for the purpose of identifying those areas where neoclassical economics is helpful to the analyst and manager. Special attention is paid to cost-benefit analysis and models of economic behavior. Summer

*1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 542: International Business, Technology and the Economy**

International trade and investment in technology-intensive fields is examined from the perspective of economic theory. Theories of foreign direct investment and international competitive advantage will be examined in the context of the changing global economy. Summer

*1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 543: Leadership, Team Effectiveness and Communication**

This course focuses on business leadership, teamwork and communications. It seeks to answer the following three questions: What do leaders really do? What makes teams effective? How do you create persuasive communications? The course addresses such topics as power and influence, leading organizational change, managing corporate crises, building motivated teams, and developing strategic communications. It examines these topics with a goal of not only imparting knowledge about these managerial practices but also assisting students to acquire the skills necessary to become business leaders, team builders and articulate communicators. We will seek to bridge theory and managerial practice by using case studies and inviting business executives to the class. The readings for the course come largely from Harvard Business Review articles and case studies on these topics.

*Spring, 1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 544: Organizational Behavior**

An approach to understanding the behavior of individuals in organizations is developed with emphasis on implications for effective management. This approach is used to analyze decision problems encountered in managing human resources. Topics include individual and group decision-making skills, recruitment and selection, employee ability, motivation and incentive systems, job satisfaction, performance assessment and management, retention, training, and employee development.



*Summer, 1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 545: Basic Financial Accounting**

Introduction to financial accounting which includes the accounting cycle, analysis and preparation of financial statements, cash flow analysis, corporate accounting, investment in stocks, and international transactions.

*Summer, 1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 546: Managerial Accounting for High Technology Organizations**

Development and presentation of accounting information for managerial decision making in a global technological environment. Topics include budgeting, forecasting, profit analysis and planning, performance evaluation, transfer pricing, capital budgeting, performance measurement, and cost control. Special emphasis will be given to accounting issues pertinent to high technology companies, such as valuation of intangible assets. Summer

*1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 547: Business Strategy**

A capstone course that enlists a student's general business knowledge in developing corporate strategy. Essential to performing this task is the introduction of guidelines and concepts of Strategic Thinking Strategic Planning and Implementation. As often stated, "Behind every successful company is a superior strategy". Whether this strategy is due to luck, position, incumbency, vision, instinct or a host of other internal & external conditions will be discussed throughout the course. Utilizing a simulation to create an industry of successful corporations will provide an insight into the dynamics of competitive analysis, industry analysis, the value chain, the integrative nature of a corporation and the strategic process.

*1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 548: Ethics, Corporate Governance and Control Systems**

This course explores the values that govern corporate behavior. Topics include understanding ethical behavior, corporate ethics programs, employees responsibilities, and codes of conducts and governance. Sarbanes-Oxley (SOX) is examined as watershed legislation that has implications for U.S. companies and non-U.S.-based, multinational companies doing business in the U.S. Examples of similar legislation in the EU and elsewhere are covered. Related topics are corporate social responsibility (CSR) (with cases and examples from U.S. and abroad), ways to promote employee

engagement, human resource management risk assessment, and human resource information systems. The course also covers mechanisms for developed a positive organizations culture and engaged workforce. This includes review of employee relations programs, developing and learning a high performing team, and developing a continuous learning organizational culture. Case discussions and exercises (e.g., developing a code of conduct) provide hands-on learning experiences.

*Spring, 1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 549: Negotiation Strategy**

This course is designed to equip students with the basic theories and skills of negotiation. Accordingly, it consists of several parts. The first part is the introduction to the newly development approaches to negotiation; how you can improve your negotiation skills and outcomes. Also some commonly encountered negotiation tactics will be introduced, not to make you victims of those tactics. The second is simulation; students will engage in several negotiation simulations with other students under specific negotiation mandates and the outcomes will be reviewed. The last is a brief introduction to the game theory with an emphasis on the cooperative games; this part deals with the theoretical foundations of bargaining and dispute resolution. Knowledge from economics and mathematics will be helpful but not required.

*Offered in Spring, 1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 551: Data Analysis for Technology Managers**

The use and limitations of mathematical and statistical techniques, especially for the use of data in choosing between alternative strategies for companies. Probability, estimation, hypothesis testing, analysis of variance, and regression analysis are among the topics covered. Summer

*1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 552: Management Science for Technology Managers 1**

An introduction to the use of modeling in management, particularly in high technology contexts. Basic concepts of management science are covered, and various models are examined for application in quantitative decision making. Topics include optimization, linear programming, and their applications, say network modeling, integer linear programming, and goal programming.

*1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 553: Management Science for Technology Managers 2**

An introduction to mathematical models useful in the analysis of management problems. We motivate each topic by managerial applications, and we analyze problems using modern software. Topics include nonlinear optimization, regression analysis, and simulation.

*1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 554: Data Mining for Technology Management 1**

The recent advances in the Internet and information technologies have resulted in an explosion of demand for "big data" analytics. The importance of data mining has already been recognized widely in the industry including many business areas, such as marketing science, financial analysis, and corporation management. In this course, we will be focusing on both key concepts and models in data mining and their implementations based on real-world data in business. The key objectives are two-fold: (1) to help students understand different data-driven predictive models and their applications in business, and (2) to provide students with necessary technical skills for a career in data analytics. At the end of the course, students are expected to understand fundamental skills to apply data mining techniques to their own fields in research and/or practice. The courses will be delivered as two modules. In the first module, we will focus on fundamental concepts of data mining and classification models. In the second module, we will discuss clustering, association analysis, outlier detection approaches, and the data mining applications business and management.

*1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 555: Technology, Government and Business**

Examines the role of government as a regulator of technological business activity, a customer for technological products and services, a source of funding for technological development, and a facilitator of technological innovation. Special topics include technology assessment, technology transfer, and frameworks for national and regional technology policy.

*Summer, 1.5 credits, Letter graded (A, A-, B+, etc.)*

#### **TMP 556: Data Mining for Technology Management 2**

Following the first module of data mining, this class module will provide students more advanced data mining topics and on-

hand experience of data mining projects. The key objectives are two-fold: (1) to help students understand advanced topics in data mining (e.g., clustering, association analysis, and outlier detection) and their business applications, and (2) to provide students with the necessary technical skills for a career in data analytics. Prerequisite: TMP 554: Data Mining for Technology Management 1

*1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 573: Basic Marketing Principles and the Information Economy**

Introduction to the basic principles of marketing, including: the influence of the marketplace and the marketing environment on marketing decision making; the determination of a firm's product, prices, channels, and communication strategies; and the firm's system for planning and controlling its marketing effort. Special emphasis will be given to marketing in information industries and knowledge intensive industries. Prerequisites: TMP 552

*Summer, 1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 574: Marketing of Technology Based Products**

Adaptation and extension of basic marketing concepts for technological products. Topics include: understanding unarticulated user needs, demand forecasting and strategic planning in technology markets, product design and architecture, product platform strategy, managing new product realization programs, and managing the technology adoption lifecycle. Summer

*1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 575: Introduction to Management Information Systems**

The analysis and design of information systems to aid in managerial decision making and the effective operation of corporations. Pertinent computing, telecommunication and systems technologies will be surveyed. Summer

*1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 576: Management Information Systems for Accounting, Budgeting and Human Resources Management**

Examination of recent MIS options for specialized functions in an organization, such as accounting, budgeting and human resources. Includes review and assessment of integrated multi-function software suites for organizational management, and comparison of packaged software systems versus web-based subscription software services. Summer

*1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 577: Business Project A**

First part of course-pair TMP577 & TMP578. Students choose a project that focuses on technology management issues in their own industry or organization and apply tools learnt in other courses to analyze the issues. Part A of this pair of courses concentrates on problem formulation and the planning of research and analysis. This course is intended to commence mid-way through the program and be taken concurrently with the next several courses in the program. Prerequisites: TMP 552

*Summer, 1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 578: Business Project B**

Second part of course-pair TMP577 & TMP578. Students take the issues formulated during Part A of this pair of courses and proceed to implement the research plan also developed in that course. Part B of this pair of courses involves detailed data collection, analysis, and reporting of results. This course is intended to commence three-quarters of the way through the program and to be taken concurrently with the next several courses. Submission of the project report and a formal presentation of results are required near the end of the program. Summer

*1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 585: Operations Management for Technology Organizations**

Introduction to the analysis and measurement of processes for creating and delivering goods and services. Covers trade-offs in operations management decisions, product and process planning, layout and location strategy, production scheduling, inventory control, quality management, computer integrated manufacturing, and cost justification, especially in the adoption of new technologies.

*Summer, 1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 586: Human Resources Management for High Technology Environments**

Survey of issues in personnel recruitment, employee selection and classification, workforce evaluation, wages, benefits, regulations, unionization, training, quality management, and employee performance in high technology settings.

*Summer, 1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 591: Technology Management and Emerging Industries**

First part of course-pair TMP591 & TMP592. Introduction to salient issues facing managers of enterprises involved in the development and implementation of new technologies. Usp will be made of case histories and presentations b- technological managers and innovators, wherever possible. Part A of this pair of courses will concentrate on the relationship between technological innovation and emerging industries. Summer

*1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 592: Role of Technology Standards**

Second part of course-pair TMP591 & TMP592. Introduction to salient issues facing managers of enterprises involved in the development and implementation of new technologies. Use will be made of case histories and presentations by technological managers and innovators, wherever possible. Part B of this pair of courses will concentrate on the role of technical standards in the dynamics of competition between firms in high technology industries. Summer

*1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 593: Developing Technology Management Solutions (A)**

First part of course-pair TMP593 & TMP595. Special course customized each year to address current trends and solutions to management problems in technological enterprises. Examples would include trends in electronic commerce, new approaches to product development strategy for technology, information security and privacy, or trends in the biotechnology industry. The course will involve field to companies and guest lectures by executives from technology companies wherever possible.

*Summer, 1.5 credits, Letter graded (A, A-, B+, etc.)*

### **TMP 594: Finance A**

The goal of the Finance course sequence is to introduce students to the modern finance theory and its application to the real world financial decision-making. Finance A is the first part of the sequence that focuses on the first fundamental corporate finance issue: how to make investments that benefit shareholders. We will start with the analysis of financial statements to better understand measures of a company's financial performance. We will then introduce the concept of time value of money and valuation of cash flows. Then we will apply the valuation concepts to learn how to choose investment opportunities that maximize shareholders' wealth.

*1.5 credits, Letter graded (A, A-, B+, etc.)*

**TMP 595: Developing Technology Management Solutions (B)**

Second part of course-pair TMP593 & TMP595. Special course customized each year to address current trends and solutions to management problems in technological enterprises. Examples would include trends in electronic commerce, new approaches to product development strategy for technology, information security and privacy, or trends in the biotechnology industry. The course will involve field to companies and guest lectures by executives from technology companies wherever possible. Summer

*1.5 credits, Letter graded (A, A-, B+, etc.)*

**TMP 596: Finance B**

The goal of the Finance course sequence is to introduce students to the modern finance theory and its application to the real world financial decision-making. Finance B is the second part of the sequence that focuses on the second fundamental corporate finance issue: how to finance investment opportunities. We will start with bond and stock valuation, recognizing that debt and equity are the main sources of funds for a company. We will then learn how to estimate the cost of debt and equity for a company that wants to finance its investments. Finally, we will combine the cost of debt and equity into a unified framework that estimates a company's overall cost of capital.

*1.5 credits, Letter graded (A, A-, B+, etc.)*

**TMP 597: Technology Management and Strategy**

Concepts and techniques of strategic management are examined and applied to relevant cases involving technology management. The class synthesizes all elements of the program and examines how an organization can plan and develop initiatives, evaluate their effectiveness, and manage the change process with an emphasis on corporate strategy.

*1.5 credits, Letter graded (A, A-, B+, etc.)*

**TMP 598: Technology and Entrepreneurship**

Concepts and techniques of strategic management are examined and applied to relevant cases involving technology management. The class synthesizes all elements of the program and examines how an organization can plan and develop initiatives, evaluate their effectiveness, and manage the change process with an emphasis on entrepreneurial strategy.

*1.5 credits, Letter graded (A, A-, B+, etc.)*

**TMP 599: Intellectual Property Strategy**

Concepts and techniques of intellectual property strategy are examined and applied to relevant cases involving technology management. The class synthesizes all elements of the program and examines how an organization can plan and develop initiatives, evaluate their effectiveness, and manage the change process with an emphasis on managing and deploying intellectual property.

*1.5 credits, Letter graded (A, A-, B+, etc.)*

**VIP****Vertically Integrated Projects****VIP 595: Graduate Multidisciplinary Project**

Students participate in a multi-term, multidisciplinary project, working with team members ranging from sophomores through seniors and graduate students. Projects are advised by one or more faculty on topics of research, design, innovation and entrepreneurship. While a project is framed within a faculty member's area of expertise, contributions are needed from a diverse array of disciplines. This course is intended for master's students who can take a leadership role in a project subtask. Students are expected to maintain involvement with the same project team for multiple terms. Students may add up to 2-credits towards their effort by co-registering for VIP 596. Prerequisites: VIP Program participant.

*1 credit, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**VIP 596: Graduate Multidisciplinary Project Practicum**

The course is a supplement to VIP 595 for team members wishing to commit more effort towards their multidisciplinary project. Students who enroll in 1-credit of VIP 595 may register up to 2-credits of VIP 596 in a semester for a total of 3 VIP credits. This course may be repeated for credit.

*1-2 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**VIP 695: Multidisciplinary Project Leadership**

Students participate in a multi-term, multidisciplinary project, working with team members ranging from sophomores through seniors and graduate students. Projects are advised by one or more faculty on topics of research, design, innovation and entrepreneurship. While a project is framed within a faculty member's area of expertise, contributions are needed from a diverse array

of disciplines. This course is intended for doctoral students who dissertation research is directly related to a project led by his or her faculty advisor. Students registered for this course will take a leadership role and assist the faculty advisor in management of the team. May be repeated for credit. Prerequisites: Permission of Faculty Project Mentor.

*0-3 credits,*

*May be repeated for credit.*

**WNS****Women's Studies: Social Sciences****WNS 559: Psychology of Women's Health**

This course covers a variety of psychologically-important topics in women's health based on current research findings. We address psychological contributors to and consequences of women's health and illness, focusing on diseases that affect women differently or disproportionately than men (including coronary heart disease, cancer, AIDS, and autoimmune diseases), women's reproductive health (including menstruation, contraception, pregnancy, infertility, and menopause), health behaviors (including substance abuse, exercise, and eating), and other topics such as violence against women, women's mental health, and women as health care providers and health researchers.

*Co-scheduled with WST 559.*

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**WRT****Writing****WRT 506: Studies in Literary Theory**

Prerequisite: Matriculation in a graduate program or the composition studies certificate.  
*3 credits, Letter graded (A, A-, B+, etc.)*

**WRT 509: Studies in Language and Linguistics****WRT 592: Problems in Teaching Writing or Composition**

This course provides an overview of writing pedagogy as applied to tutoring in a Writing Center or in an English classroom. Included in the course is fieldwork in the campus Writing Center.

*Fall, 3 credits, Letter graded (A, A-, B+, etc.)*

**WRT 605: Scientific Writing for Chemists**

This course, taught primarily in a workshop format, will prepare students to write graduate papers, communications, journal articles, and dissertations. Rhetorical principles of organization, attention to audience, conciseness, cogency, clarity, and using an appropriate scientific voice will be stressed, as will correctness of grammar and punctuation, including grammatical issues particular to non-native speakers of English. The class will examine in detail models of clear writing from scientific journals. Students will also bring their writing to class frequently for review by both the instructor and their classmates so that students will gradually internalize standards for writing and be able to write effectively in all genres typically used by chemists. Offered *Spring, 3 credits, S/U grading*

**WRT 612: Theories in Composition**

This course explores the relationship between reading and writing skills, the differences between speech production and writing production, and the relationship between literacy, culture, and language politics. *Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**WRT 613: Research in Composition**

This course provides an introduction to the nature of empirical research in Composition Studies. Students will survey landmark research studies, learn how to read research reports critically, and conduct a mini-research project in their own classrooms or tutoring situations to analyze underlying causes of students' writing problems.

*Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**WRT 614: Topics in Composition and Writing**

This course will consist of directed readings in particular areas of interest in rhetoric, the history of rhetoric and pedagogy, and teaching strategies for teachers.

*Offered*

*Fall and Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**WRT 621: Graduate-Level Writing**

This course, designed for a mixture of students from any of our graduate programs or departments, is a workshop in writing academic papers, theses, or dissertations, with attention to research methods, drafting, organizing, revising, and editing work that the

students have already been assigned in their primary departments.

*1-3 credits, S/U grading  
May be repeated for credit.*

**WRT 687: Independent Study**

A student and faculty member agree on a topic of student's interest which may not be offered in any seminars, creating a reading list to focus on. A final research paper or major annotated bibliography will be required to demonstrate substantive knowledge of the field and/or topic. A program form must be completed and submitted to the PWR by the student before the add/drop period ends.

*0-12 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

**WRT 690: Directed Readings**

*May be repeated for credit.*

**WRT 698: Practicum in Teaching Writing**

This course provides hands-on experience and instruction in the basics of writing pedagogy, including designing writing assignments, sequencing assignments, motivating writing, writing skill development and evaluating writing. Students will also be given a preliminary overview of the major theories driving composition pedagogy.

*3 credits, Letter graded (A, A-, B+, etc.)*

## WST

### Women's Studies

**WST 510: Gender and Culture**

A variable topics course on the many ways in which culture and gender interact. Possible topics include women in multiethnic America, women in the labor movement, and women and social policy.

*Co-scheduled with HIS 515.*

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**WST 511: Gender and Culture**

A variable topics course on the many ways in which culture and gender interact. Possible topics include women in multiethnic America, women in the labor movement, and women and social policy.

*Prerequisite: Permission of instructor*

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**WST 512: Advanced Topics in Gender Studies**

This advanced course will continue the discussion of the graduate seminar on Sociology of Gender, by examining theoretical debates or controversies, examining specific gender identities, examining the gender of a specific institution (i.e., labor, law), or the gendered dynamics of social interaction (in for example, romantic relationships or sexuality). Co-scheduled with WST 602.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**WST 550: Women of Color in The Modern World: Shifting Identities and Feminist Visions**

This course explores the various ways in which gender, race, and class, along with other aspects of identity, shape the lives and experiences of women of color in the United States and globally. It presents the ongoing debates concerning the interconnections of gender, race, and shifting identities. It will examine the relationships between the construction of personal identities, identity statuses, cultural and ideological meaning systems, and the search for alternative images. Permission from advisor required.

*3 credits, Letter graded (A, A-, B+, etc.)*

**WST 559: Gender and Health**

This course explores gender differences in physical and mental health through the study of psychology, sociology, medicine, and epidemiology.

*Co-scheduled with PSY 559.*

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

**WST 595: Reading Colloquium in Women's History**

A topics course dealing with such subjects as women in social movements, the place of gender in particular historical circumstances, imperialism and woman, changing views of sexuality, or relations between family policies and other political programs. This course offered as both HIS 595 and WST 595.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

**WST 597: Directed Readings for M.S. Students**

Directed Readings must be approved in writing by the Advisor, Director of Graduate Studies, and the supervising professor. 1-3 credits each semester, repetitive credit.

*Fall or Spring, 1-3 credits, S/U grading*

*May be repeated for credit.*

### **WST 598: Thesis Research**

Research and writing of M.A. thesis supervised by faculty advisor.

*Offered Fall, Spring, 1-9 credits, S/U grading  
May be repeated for credit.*

### **WST 599: Independent Study**

A student and faculty member agree on a topic not offered in any seminars and a reading list to study at weekly or biweekly meetings. A final research paper or major annotated bibliography will be required. The syllabus must be filed with the program's form before the add/drop period ends.

*Fall and Spring, 1-3 credits, Letter graded (A, A-, B+, etc.)*

*May be repeated for credit.*

### **WST 600: Feminist Interdisciplinary Histories and Methods**

Rather than beginning with an overview of the history of feminism or the feminist methodology, this course explores how feminist knowledges both settle and unsettle understandings of what counts as history, theory, method, and evidence. Since its emergence as a distinct academic field, feminism(s) have raised questions about how we know what we know, who gets to speak and for whom, and what constitutes a legitimate site or object of analysis. What makes research trans, queer, feminist, anti-racist, decolonial, or transnational? In this course, instructors and students do not seek definite answers to these questions. Instead, they trace the ways feminist thinkers intervene in debates about interdisciplinary knowledge production. They examine the relationship between power and knowledge: the ethics of representation, questions of accountability, the importance of self-reflexivity, and the recognition of knowledge production as an embodied and emotional practice. By centering subjects and knowledges often relegated to academic peripheries, this course challenges the situating of the west as feminisms epicenter and the racism, coloniality, and cisheteronormativity often embedded in feminist methods and histories.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **WST 601: Feminist Theories**

This course examines concepts and conversations that have played a key role in constituting the field of women's, gender, and sexuality studies and queer, feminist, and trans scholarship more broadly. Far from promising a definitive or comprehensive overview of feminist theory, each iteration of this course

focuses on particular topics, themes, and/or theoretical frameworks. As such, instructors model for students how to build reading lists that track conceptual debates within the field or trace the contestations and contradictions of particular feminist genealogies. Together, instructors and students situate these concepts and conversations within broader historical, geopolitical, and intellectual contexts in order to question the purpose of specific theories at the moment of their emergence and to evaluate their current usefulness for developing transnational and intersectional understandings of gender and sexuality. At its core, this course attends to the ways in which the legacies of slavery, colonialism, and cisheteronormativity have conditioned western feminist thought and seeks to support students in developing theoretical tools for practicing distinctly anti-racist and decolonial women's, gender, and sexuality studies.

*3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **WST 602: Social Perspectives on Feminist Theory**

This course introduces students to the main currents of feminist social, political, and intellectual theory. It will explore theories and texts and the linkages between developing feminism and such fields as economics, sociology, history, and philosophy. Prerequisite: Admission to the Graduate Certificate Program in Women's Studies Co-Scheduled with SOC 519.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **WST 610: Advanced Topics in Women's Studies**

A variable topics seminar course in women's studies for the advanced student. Topics might include feminist peace politics, women in Third World cinema, feminist theology, or feminist philosophy. Course may be repeated as topic varies. Sections of this course are co-scheduled with SOC 509, PHI 615, and PHI 616.

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)  
May be repeated for credit.*

### **WST 680: Interdisciplinary Research Design**

This seminar is designed as a workshop to apply knowledge of methods and methodologies in the interdisciplinary area of Women's and Gender Studies to students' own research. Course topics will include formulating and refining research questions; developing appropriate theoretical

frameworks; articulating scholarly value; and thinking critically about the methods used in feminist interdisciplinary research, across the Humanities, Social Sciences and Sciences. Students are expected to work collaboratively, presenting their individual works-in-progress to the class for constructive critique. Over the semester, students will develop either a research proposal for funding agencies and/or their dissertation proposal (prospectus).

*Fall or Spring, 3 credits, Letter graded (A, A-, B+, etc.)*

### **WST 690: Directed Readings for Doctoral Candidates**

A student and faculty member agree on a corpus of texts to read and discuss at weekly or biweekly meetings. The reading list must be filed with the program's form before the add/drop period ends.

*Fall and Spring, 1-12 credits, S/U grading  
May be repeated for credit.*

### **WST 696: Self-Directed Readings**

For doctoral students who have completed all course requirements and wish to dedicate themselves to full- or part-time preparation for the Comprehensive Examination.

*Fall and Spring, 3-9 credits, S/U grading  
May be repeated 6 times FOR credit.*

### **WST 698: Practicing Women's, Gender, and Sexuality Studies**

This teaching practicum is designed for PhD, MA, and graduate certificate students in Women's, Gender, and Sexuality Studies who anticipate teaching interdisciplinary trans, queer, or feminist studies courses. Students will consider the development and institutionalization of our rich, yet relatively nascent field by taking seriously the responsibilities we have to recount and challenge white western-centric feminist genealogies upheld in the Euro-American academy. Together, instructors and students center feminist pedagogical practices that attend to the imperial and ableist legacies that underscore mainstream conceptualizations of teaching and learning. They reflect on how, as educators, their unequal relationships to colonialism, racial capitalism, and socially constructed identity categories inform their teaching philosophies and approach to designing courses, syllabuses, and assessments. This course also examines the changing politics and economics of contemporary academia and how these shifts impact the production, distribution, and consumption of academic knowledge. Ultimately, students will uncover the historical implications of women's, gender, and sexuality

studies and start considering the role they wish to play in mapping the futures of the field.

*3 credits, Letter graded (A, A-, B+, etc.)*

**WST 699: Dissertation Research on Campus**

Prerequisite: Advancement to candidacy (G5). A portion of dissertation research must take place on SBU campus.

*Fall, Spring, 3-9 credits, S/U grading*

*May be repeated for credit.*

**WST 700: Dissertation Research off Campus**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place off-campus, but in the United States and/or U.S. provinces. Please note, Brookhaven National Labs and the Cold Spring Harbor Lab are considered on-campus. All international students must enroll in one of the graduate student insurance plans and should be advised by an International Advisor. Semesters Offered:

*Fall, 1-9 credits, S/U grading*

*May be repeated for credit.*

**WST 701: Dissertation Research off Campus-International**

Prerequisite: Must be advanced to candidacy (G5). Major portion of research will take place outside of the United States and/or U.S. provinces. Domestic students have the option of the health plan and may also enroll in MEDEX. International students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed. International students who are not in their home country are charged for the mandatory health insurance. If they are to be covered by another insurance plan they must file a waiver by the second week of classes. The charge will only be removed if other plan is deemed comparable. All international students must have received clearance from an International Advisor. Semesters offered: Fall,

*Spring, 1-9 credits, S/U grading*

*May be repeated for credit.*

**WST 800: Summer Research**

May be repeated for credit. Semesters offered: Summer

*S/U grading*

*May be repeated for credit.*

**WST 850: Summer Teaching**

May be repeated for credit Semesters Offered: Summer

*S/U grading*

*May be repeated 1 times FOR credit.*