



# **Graduate School Catalog**

Vanderbilt University

2024/2025

Containing general information and courses of study for the 2024/2025 session

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## Calendar

# Graduate School Calendar 2024/2025

### **FALL SEMESTER 2024\***

Open enrollment begins / Wednesday 17 July

Convocation for new Graduate School students / Monday 19 August

Classes begin / Wednesday 21 August

Open enrollment ends / Friday 30 August

Graduation Intent for Fall graduation opens in YES / Monday 16 September

Fall break / Thursday 10 October - Friday 11 October

Last day to withdraw with academic penalty / Friday 25 October

Last day to submit Graduation Intent for Fall graduation / Sunday 3 November

Deadline to submit theses and dissertations for December graduation / Monday 18 November

Thanksgiving holidays / Saturday 23 November–Sunday 1 December

Fall classes end / Thursday 5 December

Final grading open / Saturday 7 December - Monday 16 December

Fall Graduation / Saturday 14 December

### **SPRING SEMESTER 2025\***

Open enrollment begins / Monday 2 December

Classes begin / Monday 6 January

Graduation Intent for Spring graduation opens in YES / Monday 13 January

Open enrollment ends / Wednesday 15 January

Martin Luther King, Jr. Holiday / Monday 20 January

Last day to submit Graduation Intent for Spring graduation / Sunday 23 February

Spring holidays (classes do not meet) / Saturday 8 March–Sunday 16 March

Last day to withdraw with academic penalty / Friday 21 March

Deadline to submit theses and dissertations for May graduation / Monday 24 March

Spring classes end / Monday 21 April

Final grading open / Wednesday 23 April - Saturday 3 May

Spring graduation / Friday 9 May

Commencement / Friday 9 May

### **SUMMER SESSION 2025\***

Open enrollment begins / Monday 24 March

Maymester classes begin / Monday 5 May

End of student change period (Maymester) / Tuesday 6 May  
Maymester classes end / Friday 30 May  
Regular and Session I classes begin / Tuesday 3 June  
End of student change period (Regular and Session I) / Thursday 5 June  
Graduation Intent for Summer graduation opens in YES / Monday 2 June  
Session I classes end / Thursday 3 July  
Session II classes begin / Tuesday 8 July  
End of student change period (Session II) / Thursday 10 July  
Last day to submit Graduation Intent for Summer graduation / Friday 11 July  
Deadline to submit theses and dissertations for August graduation / Monday 14 July  
Regular Session and Session II classes end / Thursday 7 August  
Final grading open / Friday 8 August - Sunday 10 August  
Summer graduation / Friday 8 August

\*subject to change

## **Graduate School Administration and Faculty**

For information about Graduate School administration and staff, please visit <https://gradschool.vanderbilt.edu/about/staff/>.

For information about the Graduate Faculty Council, please visit <https://gradschool.vanderbilt.edu/about/graduate-faculty-council/>.

For a list of current graduate faculty, please visit [vanderbilt.edu/faculty-affairs/faculty-registry/](https://vanderbilt.edu/faculty-affairs/faculty-registry/).

## **Graduate Study at Vanderbilt**

Graduate education has held a central place in the program of Vanderbilt University since it opened in 1875. The first doctor of philosophy degree was granted in 1879; the 2,000th in 1975, the university's centennial year. The 3,000th was given in 1985. As of 2023, more than 9,000 doctor of philosophy degrees have been awarded. By way of comparison, the first Ph.D. given by an American university was awarded in 1861, and the second American institution to offer the degree did so in 1870.

A separate Graduate School was established at Vanderbilt in 1935 by action of the Board of Trust, with an official faculty selected from various schools of the university. Selection is based on the individual faculty member's administrative responsibility or substantial participation in graduate instruction.

Vanderbilt offers to able and serious students a faculty that is active in research and deeply committed to the development of scholars. Students participate in classroom, tutorial, and collegial modes of learning and in systematic independent inquiry, in a setting that allows them to see scholars at work, day in and day out, as an important means of learning the scholar's art. Students are in situations in which they are known personally and well, and concern for what happens to them is very strong.

Vanderbilt is a member of the Association of American Universities, a sixty-five-member organization of research-intensive universities. The Doctor of Philosophy especially, but also master of arts and master of science, are research degrees, offered by a faculty of research scholars.

The mission of the Graduate School at Vanderbilt University is to promote excellence in research, scholarship and creative expression such that graduates are optimally prepared for successful careers in academia, industry, and related fields. We do so by recruiting the most promising students from a diverse set of backgrounds and creating an inclusive and stimulating environment that fosters intellectual growth and development. We emphasize intensive, disciplinary-specific, and interdisciplinary training, taking advantage of Vanderbilt's uniquely collaborative and collegial culture.

The Graduate School enrolls about 2,100 students across 58 distinct academic programs. General program groups include Biomedical & Biological Sciences (non-M.D.); Education; Engineering; Humanities; Master of Liberal Arts and Science; Natural and Physical Sciences; Religion; and Social Sciences. The Graduate School confers the degrees of Ph.D., Master of Arts, Master of Fine Arts, Master of Science, and Master of Liberal Arts and Science. Of the current graduate student body, about 50 percent are women, and 29 percent are international students. More information and statistical updates are available at: <https://gradschool.vanderbilt.edu/students/prospective/statistics.php>.

## **Facilities**

The Graduate School is located in Alumni Hall on campus. Alumni Hall is designed to be a robust hub for student life within the Graduate School community. This inviting space provides opportunities for graduate students not only to study and socialize, but also to explore potential collaborations across diverse disciplines.

Vanderbilt has many special facilities for study and research in particular areas, as well as the traditional classroom and laboratory facilities associated with graduate instruction.

Graduate instruction in the humanities, the biological sciences, and the social sciences is conducted in Benson, Buttrick, Calhoun, Furman, Garland, and Wilson halls. Graduate work in religion uses the full facilities of Vanderbilt Divinity School. The E. Bronson Ingram Studio Arts Center, which opened in fall 2005, has studios for sculpture, ceramics, photography, computer arts, painting, and drawing. Gallery space is designated for exhibits primarily of students' work.

The Stevenson Center for the Natural Sciences, a complex of seven connected buildings, includes laboratory and lecture facilities for biological sciences, chemistry, geology, mathematics, and physics.

Classrooms and laboratories of Peabody College are used for graduate instruction in education and psychology and human development.

Laboratories for the biomedical sciences—biochemistry, bioinformatics, cancer biology, cell and developmental biology, cellular and molecular pathology, microbiology and immunology, molecular physiology and biophysics, and pharmacology—are in the Vanderbilt University Medical Center in Medical Center North, Light Hall, Preston Research Building, Robinson Research Building, and Medical Research Building IV. The A. B. Learned Laboratories and Medical Research Building III provide additional facilities for biological sciences. Graduate students in neuroscience use facilities across campus with a home in the Vanderbilt Brain Institute.

Graduate work in engineering uses the laboratories of the School of Engineering, including those in the Olin Hall of Engineering, Featheringill Hall, Jacobs Hall, the Stevenson Center, and the new Engineering and Science Building.



The facilities of Owen Graduate School of Management are used for graduate study in management. Graduate students in nursing science use the facilities of Godchaux and Frist Halls, and those in hearing and speech sciences use classrooms and laboratories in the Vanderbilt Bill Wilkerson Center.

## **Graduate School Resources**

### **Russell G. Hamilton Graduate Leadership Institute**

For information about the Russell G. Hamilton Graduate Leadership Institute (GLI), please visit <https://gradschool.vanderbilt.edu/gli/>

### **Graduate and Postdoctoral Academic Success (GPAS) Program**

For information about the Office of Graduate and Postdoctoral Academic Success (GPAS) program, please visit <https://gradschool.vanderbilt.edu/gpas/>.

### **Graduate Student Council**

For information about the Graduate Student Council, please visit [studentorg.vanderbilt.edu/gsc](http://studentorg.vanderbilt.edu/gsc).

## **Special Programs**

# Interdisciplinary Graduate Program in Biomedical Sciences

Director Barbara Fingleton

COURSES OFFERED: [IGP](#)

Eleven programs participate in the Interdisciplinary Graduate Program (IGP): [Biochemistry](#), [Biological Sciences](#), [Cancer Biology](#), [Cell and Developmental Biology](#), [Molecular Pathology and Immunology](#), [Chemical and Physical Biology](#), [Microbe-Host Interactions](#), [Molecular Physiology and Biophysics](#), [Neuroscience](#), [Pharmacology](#), and [Human Genetics](#). During their first year, students take a core curriculum, which includes central dogma, cell signaling mechanisms, Python programming and quantitative biology, as well as professional development, wellness and rigor, and reproducibility coursework. The primary goal of the curriculum is to ensure all students attain core competencies important for graduate research. In addition to classwork, students will rotate through four laboratories conducting research before selecting the discipline in which they will earn the Ph.D. degree. Additional coursework during subsequent years is appropriate to each discipline and the student's interests and is the responsibility of the relevant Ph.D. program.

Ph.D. dissertation research may be conducted in any one of over 250–300 laboratories. Research opportunities are available in the following areas: biochemistry, biological sciences, cancer biology, cell biology, developmental biology, genetics, microbiology, immunology, pharmacology, molecular biology, molecular pathology, molecular toxicology, molecular neuroscience, reproductive biology, signal transduction, structural biology, molecular biophysics, and vascular biology.

Please refer to the relevant graduate program for specific degree requirements, including the required number of credit hours and required courses. All Ph.D. programs require a minimum of 72 total and 24 formal, didactic credit hours.

## RESPONSIBLE CONDUCT OF RESEARCH (RCR) REQUIREMENT

IGP 8004

### REQUIRED COURSES:

#### CORE COURSES (16 credit hours)

IGP 8001 (8)

IGP 8002 (8)

*\*Remaining credit hours are based on the requirements of the relevant Ph.D. program*

## Medical Scientist Training Program (M.D./Ph.D.)

A combined course of study leading to the M.D. and Ph.D. degrees is offered through Vanderbilt School of Medicine and Vanderbilt Graduate School. The program facilitates the development of physician scientists leaders in clinical and basic medical sciences. Seven calendar years are usually required for completion of the combined degree program.

All candidates must meet both School of Medicine and Graduate School requirements for matriculation and graduation. Candidates are admitted into the program by the deans of the two schools upon the recommendation of the Medical Scientist Training Program subcommittee. After their acceptance in the program, students must select and be accepted into the graduate program of an affiliated department. The graduate programs currently affiliated with the Medical Scientist Training Program are biochemistry, biological sciences, biomedical engineering, biomedical informatics, cancer biology, cell and developmental biology, chemical and physical biology, epidemiology, health policy, human genetics, mechanical engineering, microbe-host interactions, molecular pathology and immunology, molecular physiology and biophysics, neuroscience, and pharmacology.

M.D./Ph.D. students must pass the qualifying examination for the Ph.D. degree and present an acceptable dissertation within their field of study as required by the Ph.D. Program. Most M.D./Ph.D. students begin full-time study and research for the Ph.D. degree after the second year in medical school and complete the dissertation research before entering the final year of medical study.

For more information, visit the program's catalog listing, [here](#).

## Quantitative and Chemical Biology

**Director Ray Blind**

The Quantitative and Chemical Biology program is an interdepartmental umbrella graduate program seeking students who have earned undergraduate degrees in the quantitative and/or physical sciences (e.g., chemistry, computer science, engineering, mathematics, or physics) who wish to pursue a doctoral degree in biomedical sciences at the interface of the chemical, physical, engineering and biological sciences.

In the first year, students will complete four laboratory rotations each of about 2 months, as well as take courses related to their interests. The curriculum is designed to familiarize students from a quantitative sciences background with the concepts and nomenclature of modern biomedical research in an expeditious and efficient fashion. Following the completion of the first year, students may enter any of the following Ph.D. programs: [Biochemistry](#), [Biological Sciences](#), [Cancer Biology](#), [Cell and Developmental Biology](#), [Chemical and Physical Biology](#), [Chemistry](#), [Human Genetics](#), [Mathematics](#), [Microbe-Host Interactions](#), [Molecular Pathology and Immunology](#), [Molecular Physiology and Biophysics](#), [Neuroscience](#), [Pharmacology](#).

### RESPONSIBLE CONDUCT OF RESEARCH (RCR)

IGP 8004

### CORE COURSES (8 credit hours)

CPBP 8306-1 Introduction to Chemical, Physical and Systems Biology (8)

*This required course of the QCB umbrella program first year Fall curriculum introduces 1 st year Ph.D. students already equipped with strong backgrounds in computational biology, computer science, applied math, physics, and/or chemistry, in the quantitative biomedical science and research opportunities that are robustly represented at Vanderbilt.*

#### CPBP 8306-2 Information Science (0)

*This required course of the QCB umbrella program first year Fall curriculum introduces 1 st year PhD students already equipped with strong backgrounds in computational biology, computer science, applied math, physics and/or chemistry, in information science through the Stevenson Engineering library.*

#### CPBP 8306-3 Practical Data Analysis for Biomedicine (0)

*This required course of the QCB umbrella program first year Fall curriculum introduces 1 st year Ph.D. students already equipped with strong backgrounds in computational biology, computer science, applied math, physics, and/or chemistry, in computational biomedical data analysis, designed as an introduction to the use of computation to facilitate scientific inquiry and communication. Students will become familiarized with the use of computational tools (using R and Python) to manipulate, analyze and visually represent biological data. Topics will include principles of data structure and management, basics of version control using Git, organizing code and data in digital notebooks, different types of data visualization, and analysis of common forms of biological data (e.g., digital images and RNA-seq) using public datasets. Some basic coding experience and familiarity with command line execution is recommended and a laptop computer is required.*

#### CPBP 8306-4 Becoming a Scientist (0)

*This required course of the QCB umbrella program first year Fall curriculum allows students to build competencies that contribute to growth as a well-rounded scientist. It is designed to allow students to reflect on their own professional journey and understanding of science while learning from peers and facilitators in Peer Learning Core (PLC) groups.*

#### CPBP 8306-5 Discourse and Disquisitions (0)

*This required course of the QCB umbrella program first year Fall curriculum introduces 1 st year Ph.D. students already equipped with strong backgrounds in computational biology, computer science, applied math, physics, and/or chemistry, in how to read, interpret and understand primary literature in the biomedical sciences.*

## **Combined B.A./M.A. (4+1) Program**

[Programs of Study](#)

[Admissions Overview](#)

[Scholarships and Financial Aid](#)

The College of Arts and Science in collaboration with the Graduate School offers students in most departments and programs the opportunity to earn both the bachelor's degree and the master's degree in a shorter period of time and at less cost than is normally the case. Exceptional students in the College of Arts and Science can obtain both degrees in an expedited period, typically within but not less than five years.

The usual period of study for both the bachelor's and the master's degree is six years. Through the 4+1 option, the student and her or his adviser plan a five-year program of study. It is important to note that there is no provision for obtaining both degrees in a period shorter than five years.

The program is intended for selected students for whom the master's degree is sufficient preparation for their career goals, is desirable as a goal in itself, or is viewed as additional preparation before pursuing a doctorate or a professional degree.

The areas of study available for the Combined B.A./M.A. (4+1) option within Arts and Science are determined by individual departments and programs, who also determine the policies and guidelines to be followed. Students will be admitted to the Combined B.A./M.A. program only by approval of the department or program.

### **Programs of Study**

The 4+1 option is available in the following departments and programs: English; History; History of Art; Latin American, Caribbean, or Latinx Studies; Mathematics; Medicine, Health, and Society; and Philosophy. Students are welcome to discuss the Combined B.A./M.A. (4+1) option with any of these departments and programs.

### **Admissions Overview**

The Integrated B.A./M.A. program allows Vanderbilt University students to study for both degrees often, but not necessarily, in the same department. Undergraduates with strong academic records may apply for admission to the program after the first semester of their junior year. Qualifying students are normally accepted into the program in the second semester of their junior year.

To apply for admission, students will first consult with Roger Moore, Senior Associate Dean of Undergraduate Education, and then submit to the prospective graduate department or program a “Petition to Apply to the Combined B.A./M.A. (4+1) Degree Program” (available at [as.vanderbilt.edu/academics/specialdegree/4plus1.php](https://as.vanderbilt.edu/academics/specialdegree/4plus1.php)), a statement of purpose, a formal application to the Graduate School, a preliminary program proposal, two letters of recommendation from Vanderbilt faculty, and a current transcript. Application forms can be completed online at <https://apply.vanderbilt.edu/apply/>. GRE scores or other admissions requirements may be specified by the prospective department. Admission to the 4+1 option is highly selective. An accomplished academic record, a demonstrated commitment to pursuing graduate study, and a strong endorsement from Vanderbilt faculty are key elements of a successful applicant. Students will be provisionally accepted as Graduate School students, pending completion of all undergraduate requirements.

Graduate student status will apply in the fifth year.

### **Scholarships and Financial Aid**

Students who are receiving scholarships or other forms of financial aid as a Vanderbilt undergraduate are advised that such aid applies in most cases only toward the completion of the bachelor’s degree or the first four years of their studies (which may include their taking some graduate courses during their senior year). Students wishing to pursue the 4+1 option should seek support for their fifth year of study through student loans and other financial aid.

For additional information, consult the website [as.vanderbilt.edu/academics/fourplusone.php](https://as.vanderbilt.edu/academics/fourplusone.php).

## Accelerated Graduate Program in Engineering

Students who enter Vanderbilt with a significant number of credit hours (20 to 30 hours), earned either through Advanced Placement tests or in college courses taken during high school, may be eligible for the Accelerated Graduate Program in Engineering. Through this program, a student is able to earn both a bachelor's degree and a Master of Science in approximately the same time required for the bachelor's degree.

To be eligible for the program, a student must complete 86 hours (senior standing) by the end of the sophomore year with at least a 3.5 grade point average. With the approval of the student's adviser, the director of graduate studies in the student's major department, and the senior associate dean for undergraduate studies, students apply through the associate dean for graduate education for admission to this accelerated dual degree program.

Upon admission to this program, a second "career" will be set up for the student which will allow the student to start taking graduate courses (course numbers > 5000) during the junior and senior years. These courses will be credited toward the Master of Science. Note that no double counting of courses is allowed (i.e., the student must meet the degree requirements for each degree independent of the other degree).

The student receives the bachelor's degree at the end of the fourth year and typically spends the summer finishing a master's thesis to complete the Master of Science. Further information can be obtained from the director of graduate studies of the student's major department.

## Certificate Programs Overseen by the Graduate School

Several departments/programs offer graduate certificates. These are open to students already enrolled in a Vanderbilt University post-baccalaureate-degree program. Each certificate requires at least 12 credit/semester hours of interrelated graduate-level coursework supporting a specified theme. No more than 50% of coursework may be transferred to a graduate certificate program. The courses form an intellectually cohesive whole. The certificate programs include: African American and Diaspora Studies, American Studies, Asian Studies, Global Health, Gender and Sexuality Studies, Jewish Studies, Latin American Studies, Latino and Latina Studies, Medicine, Health, and Society, Neurodiversity Inspired Science & Engineering, Religion, Gender, and Sexuality Studies, Second Language Studies, Surgical & Interventional Engineering, and Technological Entrepreneurship. If interested in one of these certificate programs, a student should contact the director of the program.

Additional information on the available certificate programs is available at [Certificate Programs | Graduate School | Vanderbilt University](#).

## Admission

For information about Graduate School Admission, please visit [Prospective Students | Graduate School | Vanderbilt University](#).

## Financial Information

For information about Graduate School Financial Information, please visit [Cost and Funding | Graduate School | Vanderbilt University](#).

## Academic Regulations

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Vanderbilt's students are bound by the Honor System inaugurated in 1875. Fundamental responsibility for the preservation of the system inevitably falls on the individual student. It is assumed that students will demand of themselves and their fellow students complete respect for the Honor System. All work submitted as a part of course requirements is presumed to be the product of the student submitting it unless credit is given by the student in the manner prescribed by the course instructor. Cheating, plagiarizing, or otherwise falsifying results of study are specifically prohibited under the Honor System. The system applies not only to examinations but also to written work and computer programs submitted to instructors. The student, by registration, acknowledges the authority of the Graduate Honor Council.

The university's Office of Student Accountability has original jurisdiction in all cases of non-academic misconduct involving graduate and professional students.

Students are expected to become familiar with the Rules Governing the Graduate Honor Council of Vanderbilt University, available at the time of registration. It contains the constitution and bylaws of the Graduate Student Honor Council, Appellate Review Board, and related regulations.

Detailed descriptions of Honor System violations and procedures are also available on the web at [studentorg.vanderbilt.edu/gsc/honor-council](http://studentorg.vanderbilt.edu/gsc/honor-council).

## **ACADEMIC REQUIREMENTS**

Candidates for graduate degrees must have satisfactorily completed all residency, academic courses, and thesis or dissertation requirements, have passed all prescribed examinations, and be free of indebtedness to the university at the time of graduation.

The academic requirements described on the following pages have been established by the Graduate Faculty and are applicable to all graduate students at Vanderbilt.

Individual degree programs may have additional requirements. Students are advised to refer to the various program descriptions listed in this catalog and consult their major advisers for requirements in the specialty of interest.

Students who were completing undergraduate or advanced degrees at the time of their admission must provide to Vanderbilt University, before initial registration, an official final transcript showing that the degree has been received and date it was granted.

## **Responsible Conduct in Research**

Vanderbilt University has an obligation to model, teach, and actively promote the responsible conduct of research (RCR) in scholarship and science. Research integrity is fundamental to good research and crosses all disciplines and



areas of focus. Vanderbilt's approach incorporates online and discussion-based content based on the individual's experience level and discipline. In addition to online education, individuals are expected to participate in discussion-based sessions to further explore the issues and challenges in conducting ethical research and scholarship. All new graduate students are required to complete (1) the online Collaborative Institutional Training Initiative (CITI) course for their discipline during their first semester of study, and (2) a discussion-based RCR course determined by the graduate program, prior to completing their degrees. Each graduate program has defined the content of the discussion-based course for its students, based on the discipline-specific training needed. To find out more about your department's requirements, please check with the department chairman or director of graduate studies.

## Requirements for the Master's Degree

The following master's degrees are awarded in the Graduate School: master of arts, master of science, master of fine arts, and master of liberal arts and science. Students should check regulations of their particular program; many have requirements in addition to those listed here.

## Residence

The candidate for the master's degree shall successfully complete at least one academic year of Vanderbilt graduate study. Online versus in person course requirements vary by program.

## Coursework

For thesis and non-thesis programs, a minimum of 30 total hours is required for the master's degree. This includes successful completion of at least 24 semester hours of formal, didactic coursework plus enrollment in 6 additional hours of formal, didactic coursework or 6 credit hours of research. All requirements for the master's degree must be completed within a six-year period calculated from the student's first semester of enrollment in the Graduate School. Students should check regulations of their particular program; some programs require degree requirements to be completed in less than 6 years. International students should contact the Office of International Student and Scholar Services concerning time limitations for completion of master's degrees.

"Formal, didactic coursework" is approved courses taken for credit other than thesis and dissertation research courses. Students should check departmental regulations for the number of formal, didactic course hours required for their particular program. On the recommendation of the student's program and approval of the Graduate School, credit up to 6 semester hours toward the master's degree may be transferred from graduate schools in accredited institutions, or other schools of the university.

An incoming graduate student deficient in areas the major department considers prerequisite to a graduate program shall take such coursework without graduate credit, in addition to the courses required for the advanced degree.

## Thesis Programs

Electronic thesis submission is required through the [VIREO Electronic Theses and Dissertations \(ETD\) website](#).

Theses will be placed in the Vanderbilt University Institutional Repository. The student must provide the Graduate School with copies of the title page and the abstract. The title page must contain the original signatures of at least two graduate faculty members in the student's program. The abstract must contain the original signature of the thesis adviser.

Additional information on the submission process and required format can be found on the Graduate School webpage, [Checklist for Graduation](#). Due dates are listed on the academic calendar.

Students should check regulations for their particular program; some programs require an examination or defense in addition to the thesis.

## Non-Thesis Programs

Certain programs offer non-thesis master's degree programs and may require additional didactic coursework or scholarly activities in lieu of a thesis. Students should check requirements for their particular program.

## Master's Degree in Passing

Certain programs offering the Ph.D. degree will award a master's degree in passing. The minimum requirements are 30 hours of graduate study and a GPA of 3.0 or better. Students should check with their program to determine if this option is available and if additional course work and/or a thesis are required. Students must complete the Graduation Intent in YES for the master's in passing (see [Graduation Intent](#) section).

## Final Examination

The candidate for the master's degree may, at the discretion of the program faculty, be required to take a final examination in the field of specialization. Such examination shall be completed not later than fourteen days before the end of the term in which the degree is to be granted.

## REQUIREMENTS FOR THE PH.D. DEGREE

The degree of Doctor of Philosophy is awarded in recognition of high attainment in a special field of knowledge, as evidenced by examination and by a dissertation presenting the results of independent research. General requirements are listed below. In many programs there are additional requirements, and students should carefully check regulations in their particular programs.

## Residence and Coursework

The Ph.D. degree requires at least three academic years of Vanderbilt graduate study. Online versus in person course requirements vary by program. A student must successfully complete 72 hours of graduate work for credit, of which a minimum of 24 hours in formal, didactic course and seminar work in the Vanderbilt Graduate School is required, unless otherwise specified by the program. Exceptions include, but are not limited to, Vanderbilt bridge programs or other special circumstances with Graduate School approval. In most programs, students are required to present considerably more hours in formal coursework than the 24-hour minimum. The remainder of the 72 hours, above the program requirements in formal course hours, may be in dissertation research hours, special readings, and transfer credit if applicable. Performance in dissertation research does not affect the grade point average.

"Formal, didactic coursework" is approved courses taken for credit other than thesis and dissertation research courses. Students should check departmental regulations for the number of formal, didactic credit hours required for their particular program.

All students working full time toward the Ph.D. must register each fall and spring semester. When the required 72 hours of coursework have been completed, registration for dissertation research without hourly credit applies; this reflects full-time effort on research and confers full-time student status. The minimum tuition of \$200 is charged.

## Ph.D. Committee

The Ph.D. committee is appointed by the Graduate School on the advice of the chair or director of graduate studies of the program. The committee consists of not fewer than four members of the Graduate Faculty who possess a terminal degree (e.g., Ph.D., M.D., Ed.D.). Three of the members must be Graduate Faculty from within the student's department/program and one from outside the program. The outside member may be anyone outside of the student's department/program and from any academic field.

Faculty members, or others carrying out research or scholarship from outside universities, may also be appointed to serve on a specific student's Ph.D. committee without being considered for Graduate Faculty status, e.g., a faculty member from outside of Vanderbilt University, a faculty member from a professional school such as law or medicine, or a scientist working in a national laboratory, with the approvals of the director of graduate studies or chair of the

student's department and of the Graduate School. The request to appoint someone in this manner must be accompanied by a short letter of justification explaining what expertise this person brings to the student's committee along with a copy of the faculty member's curriculum vitae. Any variation of the committee makeup must be approved by the Graduate School. The committee must be appointed by the Graduate School no less than two weeks before the time the student expects to take the qualifying examination.

The functions of the Ph.D. committee are to (a) administer the qualifying examination, (b) to approve the dissertation subject, (c) to aid the student and monitor the progress of the dissertation, and (d) to read and approve the dissertation and administer the final oral examination.

## Graduate Faculty

Graduate Faculty include all full-time tenured and tenure-track Vanderbilt University faculty members with primary appointments in departments or programs offering the M.A., M.S., and/or Ph.D. degrees. Those tenured or tenure-track faculty having secondary appointments in departments offering the M.A., M.S., and/or Ph.D. degrees will also be considered Graduate Faculty members.

Appointment of other Vanderbilt University faculty members to the Graduate Faculty can occur upon recommendation by the faculty member's department and with the approval of the Graduate School. Such appointment would require a majority vote by the Graduate Faculty of the department/program, plus the recommendation of the chair/director of graduate studies and approval by the Graduate School. Such appointments are restricted to full-time faculty members with the rank of assistant professor or above, with a primary or secondary appointment in programs offering the M.A., M.S., and/or Ph.D. degree. Faculty members appointed to the Graduate Faculty in this manner have all the privileges of Graduate Faculty, including supervising graduate students' research.

Other Vanderbilt University faculty can be assigned some duties normally reserved for Graduate Faculty on the recommendation of the chair and/or director of graduate studies of the department and with the approval of the Graduate School. The duties assigned must be specified and time-limited, e.g., membership on a Ph.D. committee or teaching a graduate-level class/seminar in a particular semester. On occasion, these duties within a program or department may be specified without a specific time limit, e.g., standard graduate teaching duties or membership on any Ph.D. committee in the program. Faculty with limited responsibilities will not be permitted to direct theses or dissertations.

## Admission to Candidacy

To be admitted to candidacy, the student must satisfy the language requirements, if any, in the program, and must pass a qualifying examination. The examination will be administered by the student's Ph.D. committee, which will supervise subsequent work toward the degree. Upon successful completion of these requirements, the student is admitted to candidacy. The examination must be scheduled and passed within four years of the student being admitted to the program. Upon director of graduate studies and Graduate School approval, a one-year extension may be granted to complete this requirement.

## Qualifying Examination

The purpose of the qualifying examination is to test the student's knowledge of the field of specialization, to assess familiarity with the published research in the field, and to determine whether the student possesses those critical and analytic skills needed for a scholarly career.

A Ph.D. committee conducts the qualifying examination. The qualifying examination may be administered at any time during the school year and shall be completed within a period of four weeks. **Before a qualifying examination can be scheduled, the student must have completed all formal, didactic coursework required for the degree** (minimum 24 formal, didactic hours, but some programs require more) and the language requirement, if any. In some programs, the student may be required to demonstrate basic competence in the discipline through a written preliminary examination prior to the actual qualifying examination.

All departments and other units offering Ph.D. programs must set a maximum time limit within which a student, under normal circumstances, is required to take the qualifying examination. That maximum time limit must not exceed four years.

The qualifying examination may be written or oral, or both. The Graduate School must be notified of the time and place of the in-person qualifying examination at least two weeks in advance. The qualifying examination is not a public examination, and recordings of it are not permitted. A student is allowed only two opportunities to pass the qualifying examination. Results of the Qualifying Exam, signed by the committee members and the director of graduate studies, shall be submitted to the Graduate School immediately after the examination. The student is admitted to candidacy for the degree after passing the qualifying examination.

## Dissertation

A candidate for the Ph.D. degree must present an acceptable dissertation. The dissertation demonstrates that the candidate has technical competence in the field and has done research of an independent character. It must add to or modify what was previously known or present a significant interpretation of the subject based upon original investigation. The subject of the dissertation must be approved by the student's faculty adviser and Ph.D. committee.

The dissertation must be completed within four years after a student has been admitted to candidacy for the degree. Upon director of graduate studies and Graduate School approval, a one-year extension of candidacy may be granted. If the candidacy period has expired without successful completion of the dissertation, the student may be dismissed from the Graduate School. Readmission to the Graduate School and to candidacy requires application to the Graduate School, with approval of the program faculty. In such cases, the student may be required, by the Graduate School or by the Ph.D. committee, to demonstrate competence for readmission by taking a qualifying examination or additional coursework.

At least two weeks prior to the dissertation defense, students must submit a copy of the completed dissertation to the Ph.D. committee and upload the dissertation for required format review in the VIREO Electronic Thesis and Dissertation website, [vireo.library.vanderbilt.edu](http://vireo.library.vanderbilt.edu). The final dissertation and accompanying requirements must be submitted through VIREO by the appropriate deadline specified on the academic calendar. Requirements include the title page with signatures of at least a majority of the Ph.D. committee, a properly formatted 350 word or less abstract signed by the student's advisor(s), a Curriculum Vitae, and the Survey of Earned Doctorates completion certificate.

Style specifications templates and VIREO submission instructions are listed at [gradschool.vanderbilt.edu/academics/theses](http://gradschool.vanderbilt.edu/academics/theses).

Students in foreign language departments may submit manuscripts in a language other than English. The abstract, however, must be in English.

## Multi-Part and Journal Article Format

You may use a multi-part presentation format for combining original research that has been conducted in two or more related or non-related areas, or for presentation of combined journal articles (published or submitted for publication). You should organize the parts or articles into chapters, with well-defined subheadings, including an introduction, methods, results and discussion. Each chapter may contain its own list of references and appendices, or you may list them all at the end, depending on the custom of your discipline.

When using this format, the thesis or dissertation should nonetheless consist of an integrated argument that binds the chapters together. You should include the appropriate preliminary pages, an introduction presenting the general theme of the research, and a conclusion summarizing and integrating the major findings. Any additional appendices related to the dissertation as a whole or any general references from the introduction, conclusion or transitional

sections should come at the end of the dissertation.

## **Permission to Include Your Own Previously Published or Co-Authored Material**

When you have previously published portions of your thesis or dissertation as an article or book chapter, you must ensure the work may also be published as part of the dissertation or thesis. The standard provisions of copyright law [<https://researchguides.library.vanderbilt.edu/copyright>] regarding quoted and previously published material under copyright apply to the publication of theses and dissertations. Many publishers provide exceptions to work published as part of graduation requirements and this is often clearly outlined as part of the publication agreement signed by the author. To include your own previously published or co-authored material in your thesis or dissertation, please note the following:

1. You must be the first author, or obtain permission from your committee, to be uploaded as an Administrative file in Vireo (email approval is acceptable).
2. The article must be based on research completed while you were enrolled at Vanderbilt University.
3. You must have permission from the publisher to reuse the work, which should be uploaded to Vireo as an Administrative file. The record of permission may take the form of the publishing agreement, a copy of the publisher's webpage describing reuse rights, or an email approval from the publisher. You should also identify which chapters are associated with which articles when prompted within Vireo.
4. If there are co-authors, you must obtain the permission of all co-authors to include the work in the thesis or dissertation both as a matter of copyright law and professional courtesy. Include these permission (email approval is acceptable) as an Administrative file in Vireo.
5. You must properly acknowledge previously published material and any co-authors within the text of your manuscript. This would typically take the form of a statement beneath the relevant chapter heading, such as "This chapter is adapted from [Title] published in [Journal] and has been reproduced with the permission of the publisher and my co-authors [List co-authors]" and include the full citation required by the publisher, if any, or appropriate to your discipline.

If the work is submitted to the ProQuest database, ProQuest will scan the document to ensure it contains no copyrighted material without consent and proper citation.

## **Inclusion of Third-Party Content in Your Dissertation; Copyright & Fair Use Issues**

If you include content in your dissertation not authored or created by you, consider copyright issues. If your use of the content would exceed fair use under the Copyright Act, then you will need to seek the copyright holder's permission to use the material. Obtaining copyright permissions often takes time and should not be left until the last minute.

You should discuss questions about copyrighted material with your dissertation advisor or contact the VU Librarian for Copyright and Scholarly Communications at [digital.lab@vanderbilt.edu](mailto:digital.lab@vanderbilt.edu) for help evaluating fair use or obtaining permissions.

## **Copyright of Your Thesis or Dissertation**

Your thesis or dissertation is automatically protected by copyright as soon as it is fixed in a tangible form, such as being saved as an electronic file. Although not required, it is good practice to include the copyright symbol, your name, and the year on the title page of your work (© 2023 by [your name]).

You also may choose to register your copyright, which will gain you additional protections in case of litigation for copyright infringement. You can file a copyright registration online directly with the U.S. Copyright Office. The U.S. Copyright Office charges a fee of \$45.00.

## **Publishing Agreements**

You will be asked to agree to the license to deposit your submission to the Vanderbilt Institutional Repository. The Library, with the Vanderbilt Institutional Repository, enhances the metadata provided with your dissertation and adds your record to discovery tools like the Library Catalog and WorldCat, making it easily findable for scholars

worldwide. The library also maintains the technical infrastructure of the repository. If you plan to make your dissertation open access, we can assist you in understanding the options for licensing. If your dissertation makes use of copyrighted content, you will want to think early on about whether you may rely on fair use or need to acquire licenses. We will be glad to meet with you to discuss the requirements of your particular project.

Ph.D. students also have the option to request deposit of your submission with ProQuest, at no additional cost to you. If you elect to deposit your submission with ProQuest, you must also agree to the ProQuest license. This agreement is entirely between you and ProQuest. Vanderbilt's sole responsibility is to pass on the license agreement and your work to ProQuest. Please contact ProQuest Dissertation Publishing, at 1(800) 521-0600 or [disspub@proquest.com](mailto:disspub@proquest.com) with any questions.

## Embargos

Dissertations are intended to be of benefit to the academic community and to society in general, and thus are required to be publicly available. This is accomplished by placing a copy in the Vanderbilt Institutional Repository. In some instances, students may request a delay in the release or posting of their dissertations for a limited time. This can be done, for example, to protect intellectual property, to allow time to file a patent application, or to coordinate with the timing of publication in another form. In most circumstances, the release of the dissertation will be delayed for no more than two years. Extended embargos may be requested in special circumstances with adviser approval by petition to the Graduate School. Unless requested for a shorter period of time or an extension has been granted (see section below) the embargo will expire at the end of two years and the Graduate School will proceed with the public release through the library. Metadata, including the abstract about your submission will still be visible in the Vanderbilt Institutional Repository, thereby indicating your submission was accepted. You should discuss any anticipated hold on publication with your advisor. If selecting the ProQuest publishing option, be sure that you make the same embargo selection under the Vanderbilt options. Once your submission has been released to ProQuest, we have no ability to retract it.

If, after consultation with your advisor, you would like to request a temporary embargo, you can elect from the following: — No embargo and release immediately for worldwide access — Six (6) month embargo — Twelve (12) month embargo — Twenty-four (24) month embargo.

If, after consultation with your advisor, you determine that you need to extend your embargo beyond your initial selection, you can only do so with permission from the Graduate School. If you have questions about your embargo, you may email [etdadmin@vanderbilt.edu](mailto:etdadmin@vanderbilt.edu).

## Extra Copies

The Graduate School recommends Campus Copy for procuring bound copies of theses and dissertations. You may contact them directly at 615-936-4544, or online at [printingservices.vanderbilt.edu](http://printingservices.vanderbilt.edu).

## Dissertation Defense

The candidate must pass the dissertation defense by the appropriate deadline for the date the degree is to be conferred. All conferral dates and deadlines are listed on the academic calendar. The final oral examination is administered by the student's Ph.D. committee and on the dissertation and significant related material; the student is expected to demonstrate an understanding of the larger context in which the dissertation lies. The public is invited to attend the final examination, expected to take place in person at Vanderbilt announced in advance in Vanderbilt's electronic calendar.

**Before a dissertation defense can be scheduled, the student must have completed all credit hours required for the degree.** A Request to Schedule Final Defense should be submitted at least two weeks in advance regarding the place and time of the examination and title of the dissertation. The Graduate School then formally notifies the Ph.D. committee and submits the defense notice to Vanderbilt's electronic calendar. The Results of Dissertation Defense, signed by the committee members and the director of graduate studies for the program, should be forwarded immediately to the Graduate School.

## FURTHER REQUIREMENTS

The requirements stated above are minimum, and individual programs may add others. Students are urged to consult individual program entries in this catalog and departmental chairs and directors of graduate studies to learn the requirements of programs in which they are interested.

## LANGUAGE REQUIREMENTS

Language requirements, if any, for the master's and Ph.D. degrees in each graduate program are determined by the program faculty and are set forth in this catalog in program descriptions (see [Programs of Study](#)).

Foreign language requirements are usually met by demonstration of proficiency in one or more of the following: French, German, or Spanish. Certain programs either permit or require proficiency in other languages; others restrict the choice to certain combinations within this group. Students should refer to the various program statements in this catalog and should consult their advisers regarding specific requirements.

Examinations in languages are usually administered by the appropriate language faculty by arrangement with the program. As an alternative to certification of proficiency by examination, the Graduate School may accept certification from the program that the minimum requirement in a language has been met if the student is able to present an acceptable academic record of the equivalent of at least 12 semester hours in the language.

A student who has fulfilled the language requirement at another graduate school prior to entering Vanderbilt may, at the discretion of the program and the Graduate School, transfer the certification if the student does so within three years after having received it.

International students may petition the Graduate School through the program to substitute their native language for one of the usual languages required for the Ph.D. degree.

## RECORDING POLICY

Per the [Vanderbilt University Student Handbook](#), graduate students must obtain appropriate authorization prior to the creation, use, and/or distribution of recordings - video or audio - of any activities, including but not limited to, lectures, thesis/dissertation committee meetings, and qualifying exam or defense-related meetings. Failure to do so may be an Honor Code violation or result in corrective action through the University's accountability process depending on the circumstances. Students should check departmental regulations for additional recording policies.

## REGISTRATION

The normal academic load for full-time registration is 9 to 13 hours in the fall and spring semesters. Students registered for 9 or more credit hours in fall or spring are defined as full time. Those registered for 7 or 8 hours in fall or spring are considered three-quarter time, those registered for 6 hours in fall or spring are half time, and those registered for less than 6 hours in fall or spring are less than half time. In the summer term, 6 or more hours is defined as full time, 5 hours is three-quarter time, 3 to 4 hours is half time, and less than 3 hours is less than half time. After completing the hourly requirements for the degree, full-time students register for master's (7999) or Ph.D. (8999, 9999) research without hourly credit to reflect full-time effort on research. Certain programs offer a half-time Ph.D. research course (9995) for students who are able to devote only half-time effort to dissertation research.

Currently enrolled students should meet with their advisers and directors of graduate studies each semester to plan their schedules for the coming semester. All students must register at the appropriate time using YES (Your Enrollment Services).



All full-time graduate students, including those receiving scholarship, assistantship, fellowship, or traineeship support through the university, must register each fall and spring semester with no breaks in registration to remain in good standing.

## CHANGES IN REGISTRATION

Changes in registration may be made through YES during the open enrollment period (the first ten class days of the semester) with consent of the major department. Students are not permitted to add or drop a course, change the number of hours in a variable-credit course, or change the audit status after the end of the open enrollment. A student may formally withdraw from a course after the end of the open enrollment with the permission of the department, and a grade of W will be given. Students are not permitted to withdraw from the course after the Last Day to Withdraw (see [Graduate School calendar](#)) except under certain circumstances. Failing the course is not considered one of the circumstances. Students should note, in the section on tuition and fees, the regulations concerning tuition obligations for courses dropped after the first week of the term.

Courses in which there is a significant change in subject matter each semester (e.g., special topics courses) may be repeated for credit within limits noted in the course listings of this catalog.

## GRADING SYSTEM

The grading system in the Graduate School includes the letter grades A, B, C, and F. Students will not be granted graduate credit for any course in which a grade less than C- is received. Courses not designated as eligible to be repeated for credit may be repeated for grade replacement purposes. If a course was previously failed, credit is awarded when the course is repeated with a passing grade. If a course was previously passed, no new credit will be earned. If a course previously passed is repeated and failed, credit originally earned for it is lost. In any case all grades earned are shown on the transcript. The most recent grade in a course replaces the previous grade in determining credit, in computing the grade point average, and in verifying the completion of degree requirements and progress toward the degree. Passed courses may be repeated only once. Failed courses may be repeated any number of times until passed. A grade point average of 3.0 is required for graduation.

Letter grades are assigned grade point values as follows:

A+ = 4.0	B- = 2.7
A = 4.0	C+ = 2.3
A- = 3.7	C = 2.0
B+ = 3.3	C- = 1.7
B = 3.0	F = 0.0

Grades of satisfactory (S), low pass (LP), and unsatisfactory (U) are available for research courses (7999, 8999, and 9999). S/LP/U grades are given every semester for all research courses, regardless of the number of hours registered. The accumulation of three (3) U grades over the course of study can lead to dismissal from the program and the Graduate School. No credit will be granted for courses in which a grade of U is received. Research courses with unsubmitted grades default to S three months after the grading period.

Students receive grades in all courses except those approved for credit/non-credit, audits, and some seminars. For didactic and research courses, a temporary incomplete (I) may be used at the discretion of the instructor in those cases in which the student is not able to complete work in the normal time. Temporary incompletes must be updated to a permanent grade no later than 30 days after the due date indicated when the temporary grade was assigned by the instructor. The maximum due date is 1 year. An I that is not replaced by a letter grade within 30



days after the established due date will be changed by the URO to the default grade indicated by the instructor. A permanent incomplete (PI) may be used as a final grade by assigning as an initial grade in the grade roster or as a default grade as a part of a temporary grade assignment. The notation W is entered onto the transcript when a student withdraws from a course or from the Graduate School.

Certain courses approved by the graduate faculty for credit/non-credit or Pass/Fail count toward total hours. Courses that are strictly no-credit, however, do not count toward total hours or in calculating grade point average, although grades for such courses are entered on the student's record.

With the instructor's permission, students are permitted to audit certain courses. Students who audit are expected to attend the course regularly. Students must be registered for regular courses to audit. Audits are listed on the student's transcript and limited to two per semester. Request to audit forms may be found [here](#).

## **GRADE CHANGE POLICY**

For a student enrolled in the Graduate School, a grade recorded in the Office of the University Registrar may be changed only upon the written request of the instructor, endorsed by the appropriate official (usually an associate dean) within the school/college that offered the course, and then the approval of the Graduate School Associate Dean for Academic Affairs. An instructor's petition to change a grade must include a brief rationale for the change.

Changing a recorded grade is a serious matter and, in general, petitions will be approved only upon certification that the original grade was in error or, in the case of an Incomplete, that the outstanding requirement(s) have been completed. Requests for exceptions to this policy should be directed to the Graduate School Associate Dean for Academic Affairs and will be considered on an individual basis; these may require additional certifications and approvals.

## **ACADEMIC PROBATION**

A grade point average of 3.0 is necessary for graduation. Students who fall below an average of 3.0 are placed on probation for one semester. If the student's performance does not improve during that semester, the Graduate School and the appropriate department chair will decide whether to dismiss the student or to allow the continuation of probation. If at the end of the second semester the grade point average is still below 3.0, the student may be advised to withdraw or face dismissal. Students who earn a grade point average of 2.0 or less during their first semester of residence are subject to dismissal at the end of that semester. Accumulation of three U grades in research courses can lead to dismissal.

## **STUDENT GRIEVANCES AND APPEALS**

Students who believe their academic performance has not been judged reasonably or fairly, or who believe their intellectual contributions have not been fairly acknowledged should discuss their concerns with the director of graduate studies in their program or, as necessary, the chair of the department. If the student's concerns cannot be resolved at the program or departmental level, the student may then request a further review of the issues in question by the associate dean for graduate studies or similar official in their school dean's office. The student may appeal the outcome of the school-level review to the Graduate School.

## **CREDIT**

Courses not listed in this catalog that are numbered from 5000 to 9999 may be taken for credit by graduate students on the recommendation and consent of the faculty adviser and the director of graduate studies, unless some limit is noted in the description. Not all courses offered by various divisions of the university have been approved by the Graduate Faculty for graduate credit. In these cases, students should complete a Request for Graduate Credit. In arranging schedules, students should consult their advisers and carefully check the Graduate School catalog for approved courses.

Students may include in their programs of study certain professional degree courses offered by other schools in the

university. They register for these courses through the Graduate School and often do additional work appropriate for a research degree. Six hours of such credit may be applied to a master's degree program and 12 hours to a Ph.D. program. Students should submit a Request for Graduate Credit. The courses may constitute part of the major or minor field, as approved by the student's adviser.

Students may register for graduate courses or other courses in the university on a non-credit basis—either to fulfill their own interests or to meet certain prerequisites and requirements. The designation “no-credit” presupposes the student's participation in the course, including written assignments and examinations. Grades are received and recorded in no-credit courses and tuition is billed at the regular hourly rate.

## **CREDIT POLICY**

Credit hours are semester hours; e.g., a three-hour course carries credit of 3 semester hours. One semester credit hour represents at least three hours of academic work per week, on average, for one semester. Academic work includes, but is not necessarily limited to, lectures, laboratory work, homework, research, class readings, independent study, internships, and practica. Some Vanderbilt courses may have requirements that exceed this definition.

## **TRANSFER CREDIT**

Graduate credit may be transferred from graduate schools in accredited institutions, including prior graduate degrees at Vanderbilt University. Only those hours in which the student has achieved the grade B or better will be considered. Credits must have been earned within 10 years of matriculation to be eligible for transfer. Pass/fail and audited credits are not allowed for transfer. Grades earned on transferred credit do not affect the student's GPA unless such courses are transferred as quality hours. Transfer is made only on the recommendation of the chair or director of graduate studies of the major department and approval of the Graduate School.

A maximum of 6 semester hours of transfer credit may be applied toward the master's degree and 36 hours toward the Ph.D.

Students who want to transfer to the Graduate School from professional degree programs offered by other schools at Vanderbilt must submit a formal application for admission no later than the end of their first year of graduate-level studies at Vanderbilt.

Credits earned through the Division of Unclassified Studies cannot generally be used toward a graduate degree at Vanderbilt University.

## **Credit for Graduate Courses Taken as an Undergraduate**

A qualified Vanderbilt University senior undergraduate may enroll in graduate courses and receive credit which, upon the student's admission to the Graduate School, may be applicable toward a graduate degree.

Undergraduate seniors interested in this option should review the regulations appearing in the Undergraduate Catalog and consult their advisers and the Graduate School. Undergraduates should note that those wanting to take 5000-level courses or above, whether under this option or not, must obtain the written approval of their academic adviser, the instructor of the course, and the Graduate School.

In certain special cases, credit may be transferred for graduate-level coursework completed during undergraduate degree studies by a student at another accredited institution. The course hours must be in excess of the minimum required for the undergraduate degree and the course(s) must not be a required part of the undergraduate degree or

major. Requests for such transfer of credit must be carefully justified by the student's major department and approved by the Graduate School.

## Special Non-Degree Students

Special non-degree student status is reserved for limited circumstances. It is not intended for students who seek regular admission or to be admitted later as degree-seeking students. Examples appropriate for special non-degree status include a student enrolled in an accredited university but will be in residence at Vanderbilt for up to one year, such as a student participating in an approved exchange program. Another example is a student enrolled for a degree at another accredited university and whose adviser becomes a faculty member at Vanderbilt. In those instances, the special student status at Vanderbilt is to maintain a connection to that faculty member and/or receive financial support while at Vanderbilt and completing the degree at their home university. Other circumstances may be considered on a case-by-case basis.

Students admitted as non-degree students may register for selected courses in areas where they are qualified. Such students must submit an application and transcript(s) of their previous academic work with the Graduate School. Approval of the instructor, the department in which the course is offered, and the Graduate School is required.

GRE scores are not required. Status as a non-degree student is expected to last no longer than one year.

In special circumstances with Graduate School approval, no more than 6 semester hours earned as a non-degree graduate student may be applied to graduate degrees at Vanderbilt.

## Leave of Absence

The Graduate School requires continuous registration except for summer sessions. Students who want to interrupt their graduate study must petition the department, who on their behalf may request an authorized leave of absence from the Graduate School. A memo from the student's director of graduate studies or department chair should be addressed to the Graduate School Associate Dean for Academic Affairs and emailed [gradrecords@vanderbilt.edu](mailto:gradrecords@vanderbilt.edu). The memo should include the student's full name, commadore ID and requested beginning and end dates. If approved, the student will receive an official notification via the student messaging system in YES.

## Personal Leave

Personal leaves of absence are granted for a maximum of one year. Students without authorized leave who do not register are dismissed from the Graduate School and are not considered students. If they want to resume graduate study at Vanderbilt, they must petition for reinstatement.

A leave of absence is required for students enrolling at another university to conduct research or take courses. Leave of absence may be requested for personal reasons other than health and parental accommodation for up to 12 months and renewable for a maximum of four years.

## Medical Leave

Graduate School students seeking a Medical Leave of Absence should refer to additional guidelines from the Office of Student Care Coordination: <https://www.vanderbilt.edu/carecoordination/sample-page/medical-leave-of-absence/>.

## Parental Leave

### ELIGIBILITY

All students enrolled full-time in the Graduate School and supported by funding from either internal or external

sources are covered by this policy. This includes students with funding through stipends, such as training grants or service-free fellowships, and students compensated for services, such as teaching or research assistants. Students supported by external funding sources may be subject to additional rules of the granting agency regarding parental leave. Students are not employees and thus are not subject to the provisions of the Family and Medical Leave Act (FMLA).

## **PERIOD OF LEAVE**

Prior to and/or following childbirth or adoption of an infant, the parent caregiver (mother or father) will be allowed to take six weeks of parental leave, unless otherwise specified by the program. During this period, the student's current stipend, and, if applicable, funding for health insurance and tuition, will be continued without interruption. The student's enrollment status will be continued during this period as well.

## **LIMITATIONS**

If both parents are Vanderbilt graduate students, only one may take parental leave. The parental leave provided by this policy may be taken during the semester in which the child is born or adopted, or during any subsequent semester that begins no later than six months after the birth or adoption.

## **Advance notice and approval**

The student must request a parental leave from her or his departmental chair, through the Director of Graduate Studies, at least three months prior to the beginning of the anticipated leave or, in the case of adoption, as soon as the adoption is confirmed. Once approved by the department chair and Director of Graduate Studies, the program should email the request to the Graduate School at [gradrecords@vanderbilt.edu](mailto:gradrecords@vanderbilt.edu). Students should make appropriate arrangements as needed with their course instructors to make up any missed coursework during the parental leave period.

## **Documentation upon return**

As soon as possible, the student must provide her or his departmental chair with (a) a copy of a birth certificate or, (b) in the case of adoption, written certification of child adoption from the adoption agency.

## **Extended leave**

Students who wish or need to take a longer period of leave, without continuation of funding, may request a leave of absence for up to one year through the established policy of the Graduate School. Graduate students who are not receiving funding through Vanderbilt should request a leave of absence for childbirth or adoption if they anticipate an interruption in progress toward their degree.

This policy is applicable to all students enrolled in the Graduate School and establishes minimum standards for parental leave for graduate students. However, paternal leave policies may vary by school. Students should contact their program for their specific parental leave policy.

## **WITHDRAWAL**

Students who intend to withdraw from the university should inform the department, who then informs the Graduate School in writing. Memos to the Graduate School should include written documentation/approval from the student and be sent to [gradrecords@vanderbilt.edu](mailto:gradrecords@vanderbilt.edu). Improper notification may result in academic and financial penalties.

## **GRADUATION INTENT**

A Graduation Intent form must be submitted during the semester in which the student expects to receive a degree. Students will receive a notification when the electronic Intent form for the end-of term conferral dates becomes available in the student's landing site in YES. Graduation dates and deadlines are posted on the academic calendar on the [Graduate School academic calendar](#).

# DEGREE VERIFICATION

Prior to the date of graduation, the Graduate School can provide official degree verification letters (e.g., for employers, etc.) for students who have successfully completed all degree requirements, including the final submission and approval of the thesis or dissertation, if applicable. Email requests to [graduateschool@vanderbilt.edu](mailto:graduateschool@vanderbilt.edu).

# INTRA-TERM GRADUATION

Intra-Term graduation is available to students with extenuating circumstances (e.g., needed for employment, academic program, fellowship) requiring a diploma sooner than one of the three regular graduation dates in May, August, and December. Applications should be submitted at least fifteen days prior to the conferral date and may be requested by emailing [graduateschool@vanderbilt.edu](mailto:graduateschool@vanderbilt.edu).

# Commencement

The university holds its annual Commencement ceremony following the spring semester. Degree candidates must have completed successfully all curriculum requirements and passed all prescribed examinations by the published deadlines to be allowed to participate in the ceremony. A student completing degree requirements in the summer or fall semester will be invited to participate in Commencement the following May; however, the semester in which the degree was earned will be the one recorded on the diploma and student's permanent record. Students unable to participate in the graduation ceremony will receive their diplomas by mail. Please refer to the [Commencement webpage](#) for complete information on the May ceremony.

# Programs of Study

<a href="#">African American and Diaspora Studies</a>	<a href="#">Global Health</a>
<a href="#">American Studies</a>	<a href="#">Health Policy &amp; Health Services Research</a>
<a href="#">Anthropology</a>	<a href="#">Hearing and Speech Sciences</a>
<a href="#">Asian Studies</a>	<a href="#">History</a>
<a href="#">Astrophysics</a>	<a href="#">History of Art and Architecture</a>
<a href="#">Biochemistry</a>	<a href="#">Human Genetics</a>
<a href="#">Biological Sciences</a>	<a href="#">Interdisciplinary Materials Science</a>
<a href="#">Biomedical Engineering</a>	<a href="#">Jewish Studies</a>
<a href="#">Biomedical Informatics</a>	<a href="#">Latin American Studies</a>
<a href="#">Biomedical Sciences</a>	<a href="#">Latino and Latina Studies</a>
<a href="#">Biostatistics</a>	<a href="#">Law and Economics</a>
<a href="#">Cancer Biology</a>	<a href="#">Learning, Teaching, and Diversity</a>
<a href="#">Cell and Developmental Biology</a>	<a href="#">Liberal Arts and Science</a>
<a href="#">Chemical and Biomolecular Engineering</a>	<a href="#">Mathematics</a>
<a href="#">Chemical and Physical Biology</a>	<a href="#">Mechanical Engineering</a>
<a href="#">Chemistry</a>	<a href="#">Medicine, Health, and Society</a>
<a href="#">Civil Engineering</a>	<a href="#">Microbe-Host Interaction</a>
<a href="#">Cognitive Psychology in Context</a>	<a href="#">Molecular Pathology and Immunology</a>
<a href="#">Community Research and Action</a>	<a href="#">Molecular Physiology and Biophysics</a>
<a href="#">Comparative Media Analysis and Practice</a>	<a href="#">Neurodiversity Inspired Science and Engineering</a>
<a href="#">Computer Science</a>	<a href="#">Neuroscience</a>
<a href="#">Creative Writing</a>	<a href="#">Nursing Science</a>
<a href="#">Data Science</a>	<a href="#">Pharmacology</a>
<a href="#">Earth and Environmental Sciences</a>	<a href="#">Philosophy</a>
<a href="#">Economics</a>	<a href="#">Physics</a>
<a href="#">Economic Development</a>	<a href="#">Political Science</a>
<a href="#">Education Policy and Leadership</a>	<a href="#">Psychological Sciences</a>
<a href="#">Electrical and Computer Engineering</a>	<a href="#">Religion</a>
<a href="#">English</a>	<a href="#">Religion, Gender, and Sexuality Studies</a>
<a href="#">Environmental Engineering</a>	<a href="#">Second Language Studies</a>
<a href="#">Epidemiology</a>	<a href="#">Sociology</a>
<a href="#">French and Italian</a>	<a href="#">Spanish and Portuguese</a>
<a href="#">Gender and Sexuality Studies</a>	<a href="#">Special Education</a>
<a href="#">German, Russian and East European Studies</a>	

## Graduate School Courses

## Explanation of Symbols

**5000-level courses** listed in this catalog may be taken by graduate students for credit unless a specific restriction is indicated in the course description and provided there is no duplication of the student's previous courses.

**6000-level courses and above** listed in this catalog are graduate courses. They are on a level normally considered too high for undergraduates and are not open to undergraduates without consent of the instructor, the adviser, and the Graduate School.

**Length** of a course is one semester.

**The semester** in which a one-semester course is offered is indicated by the word FALL (or SPRING) in the course description.

**Hours** referred to are semester hours, and figures in brackets always indicate semester hours credit.

**Formal course work** means all courses taken for credit except thesis and dissertation research courses. The university reserves the right to change the arrangement or content of courses, to change texts and other materials used, or to cancel any course on the basis of insufficient enrollment or for any other reason.

# Campus Resources

## Life at Vanderbilt

### Accommodations for Students with Disabilities

Student Access provides accommodations to students with disability-related limitations. Common accommodations include, but are not limited to, extended time for testing, assistance with locating sign language interpreters, audio textbooks, physical adaptations, supplemental notes, and reading services. Students may also request accommodations related to housing, dining, and transportation. Accommodations are determined on an individual, case-by-case basis. Specific concerns pertaining to student accommodations or access on campus should be directed to the Office for Student Access ([studentaccess@vanderbilt.edu](mailto:studentaccess@vanderbilt.edu)) or by calling (615) 343-9727. For additional information please visit the Student Access website: [vanderbilt.edu/student-access](http://vanderbilt.edu/student-access).

### Nondiscrimination, Anti-Harassment, Anti-Retaliation, and Sexual Misconduct

The Title IX Office ([vanderbilt.edu/title-ix](http://vanderbilt.edu/title-ix)) and/or the Equal Opportunity and Access Office ([vanderbilt.edu/ea](http://vanderbilt.edu/ea)) investigate allegations of prohibited discrimination, harassment, and retaliation involving members of the Vanderbilt community. This includes allegations of sexual misconduct and other forms of power-based personal violence.

If you believe that a member of the Vanderbilt community has engaged in prohibited discrimination, harassment, or retaliation, based on a protected identity other than sex please contact the Equal Opportunity and Access Office. If the offense is criminal in nature, you may file a report with Vanderbilt University Police Department.

The Title IX Office also facilitates the provision of supportive measures and other accommodations for students affected by sexual misconduct and power-based personal violence. Some examples of these supportive measures are mutual no contact directives, adjusted course schedules, and housing adjustments.

Specific concerns pertaining to prohibited discrimination, harassment, or retaliation should be directed to the Equal Opportunity and Access Office at (615) 343-9336. Allegations of sex discrimination, sexual misconduct and other forms of power-based personal violence, should be directed to the Title IX Office at (615) 343-9004.

### Official University Communications

Certain federal statutes require that information be delivered to each student. Vanderbilt delivers much of this information via email. Official electronic notifications, including those required by statutes, those required by university policy, and instructions from university officials, will be sent to students' Vanderbilt email addresses: [user.name@vanderbilt.edu](mailto:user.name@vanderbilt.edu). Students are required to be familiar with the contents of official university notifications, and to respond to instructions and other official correspondence requiring a response. Some messages will include links to the YES Message Center, which is a secure channel for official communication of a confidential nature. However, students should not wait to receive such a message, and should check YES frequently to remain current on official, confidential communications.

The university makes every effort to avoid inundating students with nonessential email (often called "spam"), and maintains separate lists from which students may unsubscribe for announcements of general interest.

Directory information should be kept current. Students may report address changes, emergency contact information, and missing person contact information via the web by logging in to YES (Your Enrollment Services) <https://yes.vanderbilt.edu> and clicking on the Personal Information link.

### Prior Degrees



It is the policy of Vanderbilt University to verify prior educational credentials for all admitted students who intend to matriculate. All matriculated students must provide official copies of transcripts and any other required supporting documentation to Vanderbilt University as part of the prior degree verification process. For more information, see [registrar.vanderbilt.edu/academic-records/external-degree-verifications.php](http://registrar.vanderbilt.edu/academic-records/external-degree-verifications.php).

## **Student Records (Family Educational Rights and Privacy Act)**

Vanderbilt University is subject to the provisions of federal law known as the Family Educational Rights and Privacy Act (also referred to as FERPA). This act affords matriculated students certain rights with respect to their educational records. These rights include:

1. The right to inspect and review their education records within 45 days of the day the University receives a request for access. Students should submit to the Office of the University Registrar written requests that identify the record(s) they wish to inspect. The Office of the University Registrar will make arrangements for access and notify the student of the time and place where the records may be inspected. If the Office of the University Registrar does not maintain the records, the student will be directed to the University official to whom the request should be addressed.
2. The right to request the amendment of any part of their education records that a student believes is inaccurate or misleading. Students who wish to request an amendment to their educational record should write the University official responsible for the record, clearly identify the part of the record they want changed, and specify why it is inaccurate or misleading. If the University decides not to amend the record as requested by the student, the student will be notified of the decision and advised of his or her right to a hearing.
3. The right to consent to disclosures of personally identifiable information contained in the student's education records to third parties, except in situations that FERPA allows disclosure without the student's consent. These exceptions include:
  - Disclosure to school officials with legitimate educational interests. A "school official" is a person employed by the University in an administrative, supervisory, academic or research, or support-staff position (including University law enforcement personnel and health staff); contractors, consultants, and other outside service providers with whom the University has contracted; a member of the Board of Trust; or a student serving on an official University committee, such as the Honor Council, Student Conduct Council, or a grievance committee, or assisting another school official in performing his or her tasks. A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility.
  - Disclosure to parents if the student is a dependent for tax purposes
  - Disclosure to appropriate individuals (e.g., parents/guardians, spouses, housing staff, health care personnel, police, etc.) where disclosure is in connection with a health or safety emergency and knowledge of such information is necessary to protect the health or safety of the student or other individuals.
  - Disclosure to a parent or legal guardian of a student, information regarding the student's violation of any federal, state, or local law, or of any rule or policy of the institution, governing the use or possession of alcohol or a controlled substance if the University has determined that the student has committed a disciplinary violation with respect to the use or possession and the student is under the age of 21 at the time of the disclosure to the parent/guardian.
  - Disclosure to various authorized representatives of government entities (such as, compliance with Student and Exchange Visitors Information System [SEVIS], Solomon Amendment, etc.).

FERPA provides the university the ability to designate certain student information as "directory information." Directory information may be made available to any person without the student's consent unless the student gives notice as provided for, below. Vanderbilt has designated the following as directory information: the student's name, address, telephone number, email address, student ID photos, major field of study, school, classification, participation in officially recognized activities and sports, weights and heights of members of athletic teams, dates of attendance, degrees and awards received, the most recent previous educational agency or institution attended by the student, and other information that would not generally be considered harmful or an invasion of privacy if disclosed. Any student who does not wish disclosure of directory information should notify the Office of the University Registrar in writing. No element of directory information as defined above is released for students who request nondisclosure except as required by statute.

The request for nondisclosure does not apply to class rosters in online class management applications, or to residential rosters—or rosters of groups a student may join voluntarily—in online, co-curricular engagement applications, or rosters of other information on the websites of student organizations that a student may join. Neither class rosters in online class management applications, nor residential rosters in online co-curricular

engagement applications, are available to the public.

As of January 3, 2012, the U.S. Department of Education's FERPA regulations expand the circumstances under which students' education records and personally identifiable information (PII) contained in such records—including Social Security Numbers, grades, or other private information—may be accessed without consent. First, the U.S. Comptroller General, the U.S. Attorney General, the U.S. Secretary of Education, or state and local education authorities ("Federal and State Authorities") may allow access to student records and PII without consent to any third party designated by a Federal or State Authority to evaluate a federal- or state-supported education program. The evaluation may relate to any program that is "principally engaged in the provision of education," such as early childhood education and job training, as well as any program that is administered by an education agency or institution.

Second, Federal and State Authorities may allow access to education records and PII without consent, to researchers performing certain types of studies, in certain cases even when the University objects to or does not request such research. Federal and State Authorities must obtain certain use-restriction and data security promises from the third parties that they authorize to receive PII, but the Authorities need not maintain direct control over the third parties.

In addition, in connection with Statewide Longitudinal Data Systems, State Authorities may collect, compile, permanently retain, and share without student consent, PII from education records, and may track student participation in education and other programs by linking such PII to other personal information that they obtain from other Federal or State data sources, including workforce development, unemployment insurance, child welfare, juvenile justice, military service, and migrant student records systems.

If a student believes the university has failed to comply with FERPA, he or she may file a complaint using the Student Complaint and Grievance Procedures as outlined in the *Student Handbook*. If dissatisfied with the outcome of this procedure, students may file a written complaint with the Family Policy Compliance Office, U.S. Department of Education, 400 Maryland Avenue SW, Washington, DC 20202-5920.

Questions about the application of the provisions of the Family Educational Rights and Privacy Act should be directed to the Office of the University Registrar or to the Office of General Counsel.

## **VA Compliance Statement**

Any covered individual will be able to attend or participate in the course of education during the period beginning on the date on which the individual provides to the educational institution a certificate of eligibility for entitlement to educational assistance under chapter 31 or 33 (a "certificate of eligibility" can also include a "Statement of Benefits" obtained from the Department of Veterans Affairs' (VA) website - eBenefits, or a VAF 28-1905 form for chapter 31 authorization purposes) and ending on the earlier of the following dates:

1. The date on which payment from VA is made to the institution.
2. 90 days after the date the institution certified tuition and fees following the receipt of the certificate of eligibility.

Vanderbilt University will not impose any penalty, including the assessment of late fees, the denial of access to classes, libraries, or other institutional facilities, or the requirement that a covered individual borrow additional funds, on any covered individual because of the individual's inability to meet his or her financial obligations to the institution due to the delayed disbursement funding from VA under chapter 31 or 33.

## **Vanderbilt University**

### **Accreditation**

Vanderbilt University is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) to award baccalaureate, masters, and doctorate degrees. Vanderbilt University also may offer credentials such as certificates and diplomas at approved degree levels. Questions about the accreditation of

Vanderbilt University may be directed in writing to the Southern Association of Colleges and Schools Commission on Colleges at 1866 Southern Lane, Decatur, GA 30033-4097, by calling (404) 679-4500, or by using information available on SACSCOC's website ([www.sacscoc.org](http://www.sacscoc.org)).

## **Modification Policy and Nondiscrimination Statement**

The university reserves the right, through its established procedures, to modify the requirements for admission and graduation and to change other rules, regulations, and provisions, including those stated in this bulletin and other publications, and to refuse admission to any student, or to require the withdrawal of a student if it is determined to be in the interest of the student or the university. All students, full time or part time, who are enrolled in Vanderbilt courses are subject to the same policies.

Policies concerning noncurricular matters and concerning withdrawal for medical or emotional reasons can be found in the Student Handbook, which is on the Vanderbilt website at [vanderbilt.edu/student\\_handbook](http://vanderbilt.edu/student_handbook).

### **NONDISCRIMINATION STATEMENT**

In compliance with federal law, including the provisions of Title VI and Title VII of the Civil Rights Act of 1964, Title IX of the Education Amendment of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990, the ADA Amendments Act of 2008, Executive Order 11246, the Vietnam Era Veterans Readjustment Assistance Act of 1974 as amended by the Jobs for Veterans Act, and the Uniformed Services Employment and Reemployment Rights Act, as amended, and the Genetic Information Nondiscrimination Act of 2008, Vanderbilt University does not discriminate against individuals on the basis of their race, sex, sexual orientation, gender identity, religion, color, national or ethnic origin, age, disability, military service, covered veterans status, or genetic information in its administration of educational policies, programs, or activities; admissions policies; scholarship and loan programs; athletic or other university-administered programs; or employment. In addition, the university does not discriminate against individuals on the basis of their gender expression. Requests for information, inquiries or complaints should be directed to these offices: Equal Opportunity and Access Office, [eoavanderbilt.edu](mailto:eoavanderbilt.edu), telephone (615) 343-9336; Title IX Office, Title IX Coordinator, [titleix@vanderbilt.edu](mailto:titleix@vanderbilt.edu), telephone (615) 343-9004, 110 21st Avenue South, Suite 975, Nashville TN 37203; Student Access Office, [studentaccess@vanderbilt.edu](mailto:studentaccess@vanderbilt.edu), telephone (615) 343-9727.

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## **Obtaining Information about the University**

*Notice to current and prospective students:*

In compliance with applicable state and federal law, the following information about Vanderbilt University is available:

Institutional information about Vanderbilt University, including accreditation, academic programs, faculty, tuition, and other costs, is available in the catalogs of the colleges and schools on the Vanderbilt University website at [vanderbilt.edu/catalogs](http://vanderbilt.edu/catalogs).

Information about financial aid for students at Vanderbilt University, including federal and other forms of financial aid for students, is available from the Office of Student Financial Aid and Scholarships on the Vanderbilt University website at [vanderbilt.edu/financialaid](http://vanderbilt.edu/financialaid). The Office of Student Financial Aid and Scholarships is located at 2309 West End Avenue, Nashville, Tennessee 37240-7810, (615) 322-3591 or (800) 288-0204.

Information about graduation rates for students at Vanderbilt University is available on the Vanderbilt University website at [vanderbilt.edu/faculty-affairs/oapraa/student-achievement](http://vanderbilt.edu/faculty-affairs/oapraa/student-achievement). Paper copies of information about graduation rates may be obtained by writing the Office of the University Registrar, Vanderbilt University, PMB

407701, 110 21st Avenue South, Suite 110, Nashville, Tennessee 37240-7701 or by calling (615) 322-7701.

The Vanderbilt University Annual Security Report on university-wide security and safety, including related policies, procedures, and crime statistics, is available from the Vanderbilt University Police Department on the university website at [police.vanderbilt.edu/crimeinfo/annual-security-report.pdf](http://police.vanderbilt.edu/crimeinfo/annual-security-report.pdf). A paper copy of the report may be obtained by writing the Vanderbilt University Police Department, 2800 Vanderbilt Place, Nashville, Tennessee 37212, or by calling (615) 343-9750. For more information, see the "Vanderbilt University Police Department" section of this catalog.

A copy of the annual Equity in Athletics Disclosure Act Report on the Vanderbilt University athletic program participation rates and financial support data may be obtained by writing the Vanderbilt University Office of Athletic Compliance, 2601 Jess Neely Drive, P.O. Box 120158, Nashville, Tennessee 37212 or by calling (615) 322-7992.

Information about your rights with respect to the privacy of your educational records under the Family Educational Rights and Privacy Act is available from the Office of the University Registrar on the Vanderbilt University website at [registrar.vanderbilt.edu/ferpa](http://registrar.vanderbilt.edu/ferpa). Paper copies of this information about educational records may be obtained by writing the Office of the University Registrar, Vanderbilt University, PMB 407701, 110 21st Avenue South, Suite 110, Nashville, Tennessee 37240-7701, or by calling (615) 322-7701. For more information, see the "Student Records (Family Educational Rights and Privacy Act)" section of this catalog.

## The University

Commodore Cornelius Vanderbilt, who gave a million dollars to build and endow Vanderbilt University in 1873, expressed the wish that it "contribute . . . to strengthening the ties which should exist between all geographical sections of our common country."

A little more than a hundred years later, the Vanderbilt Board of Trust adopted the following mission statement: "We reaffirm our belief in the unique and special contributions that Vanderbilt can make toward meeting the nation's requirements for scholarly teaching, training, investigation, and service, and we reaffirm our conviction that to fulfill its inherited responsibilities, Vanderbilt must relentlessly pursue a lasting future and seek highest quality in its educational undertakings."

Today as Vanderbilt pursues its mission, the university more than fulfills the Commodore's hope. It is one of a few independent universities with both a quality undergraduate program and a full range of graduate and professional programs. It has a strong faculty of more than 4,200 full-time members and a diverse student body of more than 12,800.

The 334-acre campus is about one and one-half miles from the downtown business district of the city of Nashville, combining the advantages of an urban location with a peaceful, parklike setting of broad lawns, shaded paths, and quiet plazas.

The schools of the university offer the following degrees:

**College of Arts and Science.** Bachelor of Arts.

**Blair School of Music.** Bachelor of Music, Bachelor of Musical Arts.

**Divinity School.** Master of Divinity, Master of Theological Studies, Master of Theology, Doctor of Ministry.

**School of Engineering.** Bachelor of Engineering, Bachelor of Science, Master of Engineering.

**Graduate School.** Master of Arts, Master of Fine Arts, Master of Liberal Arts and Science, Master of Science, Doctor of Philosophy.

**Law School.** Master of Laws, Master of Legal Studies, Doctor of Jurisprudence.

**School of Medicine.** Master of Education of the Deaf, Master of Genetic Counseling, Master of Imaging Science, Master of Public Health, Master of Science in Clinical Investigation, Master of Science in Medical Physics, Master of Science (Applied Clinical Informatics, Speech-Language Pathology), Doctor of Audiology, Doctor of Medical Physics, Doctor of Medicine.

**School of Nursing.** Master of Nursing, Master of Science in Nursing, Doctor of Nursing Practice.

**Owen Graduate School of Management.** Master of Accountancy, Master of Business Administration, Master of Management in Health Care, Master of Marketing, Master of Science in Finance.

**Peabody College.** Bachelor of Science, Master of Education, Master of Public Policy, Doctor of Education.

No honorary degrees are conferred.

## **Vanderbilt University Administration**

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Martha R. Ingram (Nashville, TN)  
J. Hicks Lanier (Atlanta, GA)  
Edward A. Malloy, C.S.C. (Notre Dame, IN)  
Jackson W. Moore (Memphis, TN)  
Courtney Clark Pastrick (Bethesda, MD)  
David W. Patterson, M.D. (Washington, D.C.)  
Ross Perot, Jr. (Dallas, TX)  
Joe L. Roby (New York, NY)  
Robert C. Schiff, Jr., M.D. (Cincinnati, OH)  
Eugene B. Shanks Jr. (Greenwich, CT)  
Richard H. Sinkfield (Atlanta, GA)  
Cal Turner (Franklin, TN)  
J. Stephen Turner (Nashville, TN)  
Dudley Brown White (Nashville, TN)  
W. Ridley Wills II (Nashville, TN)  
J. Lawrence Wilson (Bonita Springs, FL)  
William M. Wilson (Nashville, TN)  
Rebecca Webb Wilson (Memphis, TN)

# Courses by Subject Areas

## African American Diaspora Studies

### **AADS5002 - Theories of Diaspora**

#### **Title**

Theories of Diaspora

#### **Catalog Description**

Interdisciplinary introduction to materials, methods, debates, and theoretical language of scholarly research in Diaspora Studies. [3]

### **AADS5095 - Directed Study**

#### **Title**

Directed Study

#### **Catalog Description**

[3]

### **AADS5228 - Black Girlhood: History, Performance and Counter-Narratives**

#### **Title**

Black Girlhood: History, Performance and Counter-Narratives

#### **Catalog Description**

Historical and current social, political, and cultural constructions of black girlhood in the United States. Performances in which black girls engage to deconstruct and interrupt these constructions. Scholarly works, poetry, film, photography, and novels. [3]

### **AADS5580 - The Black Studies Movement**

#### **Title**

The Black Studies Movement

#### **Catalog Description**

Black Studies and student movements of the 1960s and early 1970s. Intellectual traditions, precedents, and political ideologies of movements. Issues that sparked the call for Black Studies at different college campuses and public school systems. [3]

### **AADS5654 - Memoirs and Biographies**

#### **Title**

Memoirs and Biographies

#### **Catalog Description**

(Also listed as AADS 2654) Biographies and autobiographies as lenses for the study of historical trends and events; development of gender, sexual, and racial identities in subjects. No credit for students who have earned credit for 2654. [3]



**AADS5890 - Special Topics****Title**

Special Topics

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

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## American Studies

**AMER5883 - Independent Study****Title**

Independent Study

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3]

**AMER5884 - Independent Study****Title**

Independent Study

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3]

**AMER8000 - Graduate Workshop In American Studies****Title**

Graduate Workshop In American Studies

**Catalog Description**

Issues, methodologies, traditions, approaches, and problems in the interdisciplinary field of American Studies. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

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## Anthropology

**ANTH5101 - Theories of Culture and Human Nature****Title**

Theories of Culture and Human Nature

**Catalog Description**

(Also listed as ANTH 3900) Survey of the views of anthropological thinkers, from the late nineteenth century to the present, about the basic attributes of humankind and human culture. Comparison of different ideas of how people create culture and in turn are molded by culture. No credit for students who have earned credit for 3900. [3]

## **ANTH5102 - Problems in Anthropological Theory**

### **Title**

Problems in Anthropological Theory

### **Catalog Description**

(Also listed as ANTH 3901, ANTH 6901) Seminar in anthropological theory: cultural evolution, cultural history, ethnic relations, cultural ecology, archaeological method and theory, social structure, political organizations, and religious institutions. Repeat credit for students who have earned credit for 6901. [3] (SBS)

## **ANTH5106 - Culture and Power in Latin America**

### **Title**

Culture and Power in Latin America

### **Catalog Description**

(Also listed as ANTH 2106) Survey of native cultures and Spanish and Portuguese heritage. Fundamental traditions, including marriage and the family, the relationship between men and women, racial and ethnic identity, social class, and religion. Peasant communities and contemporary urban life. No credit for students who have earned credit for 2106. [3]

## **ANTH5108 - Indigenous Peoples of Lowland South America**

### **Title**

Indigenous Peoples of Lowland South America

### **Catalog Description**

(Also listed as ANTH 2108) Native societies of Amazonia, the Orinoco basin, and other forest, savanna, and coastal regions of South America. Ecology, cosmology, social organization, and political relations in historical and contemporary populations. Government policies, human rights, environmentalism, sustainable development, and indigenous activism and advocacy. [3]

## **ANTH5109 - Food Politics in America**

### **Title**

Food Politics in America

### **Catalog Description**

(Also listed as ANTH 2109) The cultural, social, political, and economic contexts of the contemporary food system. Issues of health and nutrition. Land use, ecological relations, food chains, and links to climate change. Ethics of food production, distribution, and consumption. Agricultural policy, immigration, work conditions, animal welfare, and local economies. Roles of citizens and consumers. Rise of movements seeking sustainable alternatives. No credit for students who have earned credit for 2109. [3]

## **ANTH5110 - Gender and Cultural Politics**

### **Title**

Gender and Cultural Politics

### **Catalog Description**

(Also listed as ANTH 2110) Cross-cultural comparison of women's roles and status in western and non-Western societies. Role of myths, symbols, and rituals in the formation of gender identities and the politics of sexual cooperation, conflict, and inequality. Case studies from Africa, the Middle East, Europe, North and South America, Asia, and Melanesia. No credit for students who have earned credit for 2110. [3]

## **ANTH5112 - Psychological Anthropology**

### **Title**

Psychological Anthropology

### **Catalog Description**

(Also listed as ANTH 2112) How personality and culture affect each other. Socialization and the life cycle, the definition of sex roles, individual psychology and group aggression, religion and group personality, and the nature of mental illness and normalcy in non-Western societies. No credit for students who have earned credit for 2112. [3]

## **ANTH5120 - The Archaeology of Agriculture: A Technological Approach**

### **Title**

The Archaeology of Agriculture: A Technological Approach

### **Catalog Description**

Agricultural technologies and their impacts on socio-environmental transformations through time in the Andes and elsewhere. Theories of technology emergence and innovation, path dependence, actor network theory, resilience, and antifragility models. Classic works on agriculture, smallholder farmers, intensification, and landscape capital. Interdisciplinary approaches and policy perspectives on farming, ecosystem services, and agroecosystems. [3]

## **ANTH5130 - Global Infrastructure and Everyday Life**

### **Title**

Global Infrastructure and Everyday Life

### **Catalog Description**

Relations between infrastructure and society around the world, past and present. Analysis of large technical systems as sites of cultural meaning, political struggle, and everyday social interaction. Water, energy, communication, and transportation networks in Africa, Asia, and the Americas, with an emphasis on Latin America. [3]

## **ANTH5211 - Archaeology**

### **Title**

Archaeology

### **Catalog Description**

(Also listed as ANTH 2211) An introduction to the methods used by archaeologists to study the nature and development of prehistoric societies. Approaches to survey, excavation, analysis, and interpretation are explored through lectures, case studies, and problem assignments. No credit for students who have earned credit for 2211. [3]

## **ANTH5220 - Anthropological Approaches to Human Landscapes**

### **Title**

Anthropological Approaches to Human Landscapes

### **Catalog Description**

(Also listed as ANTH 2220) Anthropological approaches to sociocultural processes and human-environment interactions in the formation of landscapes and settlement systems. Relationship of archaeology and cultural anthropology in the understanding of social space, sacred landscapes, urban plans, and historical ecology. Cross-cultural comparisons. Methods of interpretation and quantification. No credit for students who have earned credit for 2220/2220W. [3]

**ANTH5221 - Old World Archaeology****Title**

Old World Archaeology

**Catalog Description**

(Also listed as ANTH 2221) Ancient Cultures of the Old World. Archaeology of the Near East, Africa, Asia, and Oceania. The origins of the great civilizations of Egypt and Mesopotamia. The beginnings of cities, agriculture, trade, and empires in light of recent archaeological discoveries. No credit for students who have earned credit for 2221. [3]

**ANTH5223 - Native North Americans****Title**

Native North Americans

**Catalog Description**

(Also listed as ANTH 2223) Indian societies of North America; their archaeological origins, development, and changing adaptation to white society. No credit for students who have earned credit for 2223. [3]

**ANTH5225 - Climate Change, Collapse, and Sustainability in History****Title**

Climate Change, Collapse, and Sustainability in History

**Catalog Description**

The Holocene until 1600 AD. Archaeological perspectives on human society and relation to the environment over time. Historical ecology, anthropogenic climate change, domestication, colonial ecosystems, environmental justice. Case studies of cultures and peoples: Maya, Easter Island, Andes, Norse, American Southwest. Application of ancient innovations to address present concerns. [3]

**ANTH5226 - Modern-World Archaeology****Title**

Modern-World Archaeology

**Catalog Description**

Historical archaeology, investigation of the post-1500 world, origins of modernity, and global networks. Colonialism, capitalism, racialization, and Eurocentrism. Social inequality. Structural history, network theory, world-systems analysis, dialectical thinking, epochal structures, microhistory, material culture, and socio-spatial analysis. [3]

**ANTH5230 - South American Archaeology****Title**

South American Archaeology

**Catalog Description**

(Also listed as ANTH 2230) From 12,000 years ago to the present. Archaeology, ethnohistory, and ethnography. No credit for students who have earned credit for 2230. [3]

**ANTH5231 - Ancient Andean Civilizations****Title**

Ancient Andean Civilizations

**Catalog Description**

(Also listed as ANTH 2231) Introduction to the archaeology and peoples of ancient South America. Early hunters and gatherers, origins of agriculture and urbanism, and the rise and fall of the Huari and Inca empires. No credit for students who have earned credit for 2231. [3]

**ANTH5275 - Untimely People and Matters****Title**

Untimely People and Matters

**Catalog Description**

Time's effects on people and societies. Culturally constituted temporalities; notions of embodiment and alterity. Study of social change; process of innovation through invention and adaptation. Othering non-Western societies as traditional and unchanging. [3]

**ANTH5342 - Biology of Inequality****Title**

Biology of Inequality

**Catalog Description**

(Also listed as ANTH 2342) Biological and health consequences of racial and social inequalities. Psychosocial stress and measurement of its health impact. Effects on disease and precursors to disease. Measures of molecular biology, such as epigenetics and gene expression. Biomarkers of inflammation, cardiometabolic health, and immune function. No credit for students who have earned credit for 2342. [3]

**ANTH5370 - Death and the Body****Title**

Death and the Body

**Catalog Description**

(Also listed as ANTH 2370) Cross-cultural study of death rituals. Mortuary archaeology and anthropology of death and the body. Biological and social perspectives on the corpse and living body, and their treatment in ritual and everyday life. The body as biological specimen and social artifact. Nature of beauty, body modification, and adornment. No credit for students who have earned credit for 2370. [3]

**ANTH5400 - Public Health, Language, Media, and Risk Management****Title**

Public Health, Language, Media, and Risk Management

**Catalog Description**

Role of language in the politics and ethics of expert, government, and community stakeholder responses to epidemics, environmental pollution, and natural disasters. Theory and case studies of communication in U.S. and global crises. Uses of science, narrative, and metaphor in formation of health policy and health inequalities based in race, ethnicity, sexuality, and geographic marginalization. [3]

**ANTH5601 - Introduction to Linguistics****Title**

Introduction to Linguistics

**Catalog Description**

(Also listed as ANTH 2601) Systematic study and analysis of human language. Formation of language sounds, sound systems, the structure of words, the structure of sentences, meaning, language change. Data from diverse languages of the world. No credit for students who have earned credit for 2601. [3]

**ANTH5602 - The Social life of Language****Title**

The Social life of Language

**Catalog Description**

(Also listed as ANTH 2602) Study of language in cultural social contexts; methods of linguistic inquiry; linguistic analysis as tool for ethnographic investigation. Language in global and local contexts. No credit for students who completed 2602/2602W. [3] (SBS)

**ANTH5603 - Comparative Writing Systems****Title**

Comparative Writing Systems

**Catalog Description**

(Also listed as ANTH 2603) The origins, development, and social uses of writing in the ancient Middle East, Mediterranean, and Mesoamerica. Decipherments of hieroglyphic systems. Literacy, historiography, and cross-cultural translation. No credit for students who have earned credit for 2603. [3]

**ANTH5604 - Introduction to Language Contact****Title**

Introduction to Language Contact

**Catalog Description**

(Also listed as ANTH 2604) Structural, social, and cultural issues involved in protracted contact between speakers of different languages. Bilingualism and multilingualism, lexical and structural borrowing, nativization, code switching, and Pidgins and Creoles. Linguistic psychosocial theories regarding common contact patterns. The sociocultural meaning of language contact in different societies. Case studies. No credit for students who have earned credit for 2604. [3]

**ANTH5612 - Introduction to a Maya Language****Title**

Introduction to a Maya Language

**Catalog Description**

(Also listed as ANTH 2612) Beginning instruction in Kaqchikel, K'iche', or Q'eqchi'. Basic speaking, reading, and writing skills. No credit for students who have earned credit for 2612. [3]

**ANTH5614 - Conversational K'iche' Maya****Title**

Conversational K'iche' Maya

**Catalog Description**

(Also listed as ANTH 2614) Intermediate level course with advanced grammar. Counterfactual constructions, deixis, verbal derivations of positional roots, sound symbolic verbs, and verbal nominalizations. Vocabulary and idioms. Various literary genres. No credit for students who have earned credit for 2614. [3]

**ANTH5800 - Theatre and Social Change: Theatre as Applied Activism****Title**

Theatre and Social Change: Theatre as Applied Activism

**Catalog Description**

Role of theatre in social justice and social change movements, including Playback Theatre and Theatre of the Oppressed. Conducting improv theatre in class or in collaboration with a local / campus organization. Not open to students who have earned credit for 3890 section 05 offered spring 2020. [3]

**ANTH5866 - Archaeological Excavation****Title**

Archaeological Excavation

**Catalog Description**

(Also listed as ANTH 3866) Excavation techniques and field recording methods through participation in an archaeological dig. Excavation unit layout, digging techniques, feature and artifact identification. Mapping and field instrumentation. Data registry, statistical analysis, artifact curation, and conservation. Stratigraphy, relative and absolute dating, sampling strategies and techniques, data management. Research design and archaeological ethics. [4]

**ANTH5867 - Digital Archaeology: Analysis and Curation of Material Culture****Title**

Digital Archaeology: Analysis and Curation of Material Culture

**Catalog Description**

Laboratory analysis of archaeological artifacts using digital methods. Three dimensional modeling of artifacts, digital photography, artifact technical diagramming. Virtual Reality and other representational frameworks. PXRF compositional analysis. Artifact cleaning, labeling, and preservation techniques. Assemblage curation and integration with databases. Preparation of artifacts for exhibition. Ethics of curation, representation, repatriation. [3]

**ANTH6120 - Sociocultural Field Methods****Title**

Sociocultural Field Methods

**Catalog Description**

(Also listed as ANTH 3120) Research design and proposal writing, access to data, ethical issues, sampling techniques, interviewing questionnaire design and question writing, data analysis. No credit for students who have earned credit for 3120. [3]

**ANTH6121 - Global Wealth and Poverty****Title**

Global Wealth and Poverty

**Catalog Description**

(Also listed as ANTH 3121) The production of inequality. How wealth is accumulated, lost, exchanged, and displayed; how poverty is created, endured, and overcome. Explanations in terms of luck, hard work, immorality, occult forces, and public policies. Case studies. No credit for students who have earned credit for 3121. [3]

**ANTH6122 - The Anthropology of Globalization****Title**

The Anthropology of Globalization

**Catalog Description**

(Also listed as ANTH 3122) Perspectives on globalization based on ethnographic case studies. The impact of new technologies on native cultures; different cultural meanings of global commodities; creation of new diaspora cultures; effects of neoliberal reforms on local economies; ethnic movements and terror networks. No credit for students who have earned credit for 3122. [3]

**ANTH6123 - Maya Culture and Ethnography****Title**

Maya Culture and Ethnography

**Catalog Description**

(Also listed as ANTH 3123) Survey of the different cultural groups of the Maya peoples of Mexico and Guatemala. Comparison of cultural features and social and political history. Relationship of culture and language. Introduction to the Maya language family with a focus on Tzotzil. No credit for students who have earned credit for 3123. [3]

**ANTH6125 - Public Scholarship Practicum in Community Research****Title**

Public Scholarship Practicum in Community Research

**Catalog Description**

Theory and methods for publicizing research to policy makers, organizations, and the public. Uses of media. Communicating research in civil rights; environmentalism; and advocacy on gender, sexuality, health, and religion. Translating original scholarship into pieces for newspapers, blogs, websites, video resources, and public presentations. Prior research experience is expected. Consent of instructor is required. [3]

**ANTH6130 - Andean Culture and Society****Title**

Andean Culture and Society

**Catalog Description**

(Also listed as ANTH 3130) Historical and archaeological background, languages, economy, environment, and cultural adaptation of Andean peoples. Spanish and native American heritage. Religion, family structure, political organization, contemporary social issues, and economic background. Urban and rural traditions, social movements, and change. No credit for students who have earned credit for 3130. [3]



## **ANTH6132 - Social Movements**

### **Title**

Social Movements

### **Catalog Description**

(Also listed as ANTH 3132) Collective action, past and present. Class- and identity-based movements, transnational activism, and networks. The early U.S. labor movement; 1960s gay, women's and civil rights movements. Global struggles for social justice. No credit for students who have earned credit for 3132. [3]

## **ANTH6133 - Political Anthropology: States and Their Secrets**

### **Title**

Political Anthropology: States and Their Secrets

### **Catalog Description**

Development, workings, and techniques of the ancient and modern state. Bureaucracy, state secrecy, diplomacy, organization of warfare, surveillance. Anthropological theories of power, state formation, nationalism, authority, influence, and coercion. Case studies of atrocities, disclosure of secrets, and whistleblowing. Ethics and responsibility in complex power structures. [3]

## **ANTH6135 - Development, Social Enterprise, Social Justice**

### **Title**

Development, Social Enterprise, Social Justice

### **Catalog Description**

Theories of economic and human development. Multidimensional approaches to poverty and well-being. Roles of inequality, discrimination, and social justice. Practical focus on social entrepreneurship in international context. [3]

## **ANTH6140 - Myth, Ritual, Belief: The Anthropology of Religion**

### **Title**

Myth, Ritual, Belief: The Anthropology of Religion

### **Catalog Description**

(Also listed as ANTH 3140) Cross-cultural survey of religious and ritual beliefs in light of theories of religion. Topics include sacrifice, myth, witchcraft, divination, religious change, and millenarian movements. No credit for students who have earned credit for 3140. [3]

## **ANTH6141 - Anthropology of Healing**

### **Title**

Anthropology of Healing

### **Catalog Description**

(Also listed as ANTH 3141) Ritual, symbols, belief, and emotion in health, illness, and therapeutic processes. Practices and politics of healing in western and non-western societies, including shamanism, faith healing, ecstatic religious experience, alternative medicine, and biomedicine. Mind-body interactions, medical pluralism, relations between patients and healers, and implications for improving medical care. No credit for students who have earned credit for 3141. [3]

## **ANTH6142 - Medicine, Culture, and the Body**

### **Title**

Medicine, Culture, and the Body

### **Catalog Description**

(Also listed as ANTH 3142) Concepts of the human body from historical and cross-cultural perspectives. Exploration of experiences, representations, and medical theories of the body in birth, death, health, and illness in Western and non-Western societies. Comparison of methodologies of anthropology and history. No credit for students who have earned credit for 3142 or HIST 2830 or 5830. [3]

## **ANTH6143 - Medical Anthropology**

### **Title**

Medical Anthropology

### **Catalog Description**

(Also listed as ANTH 3143) Biocultural aspects of human adaptations to health, disease, and nutrition. Non-Western medical and psychiatric systems. Effects of cultures on the interpretation, diagnosis, and treatment of illness. Case studies from Africa, Oceania, Latin America, and the contemporary United States. No credit for students who have earned credit for 3143. [3]

## **ANTH6144 - Politics of Reproductive Health**

### **Title**

Politics of Reproductive Health

### **Catalog Description**

Reproductive health politics, with focus on the United States. Role of broader social, economic, and cultural concerns in diverse positions and public debates. How sexuality, race, class, gender, and disability shape experiences of conception, pregnancy, childbirth, kinship, and new medical technologies. [3]

## **ANTH6150 - Cognitive Anthropology**

### **Title**

Cognitive Anthropology

### **Catalog Description**

(Also listed as ANTH 3150) A survey of methods and approaches in linguistics and the cognitive sciences. Exploration of culture and thought; how culture affects our ways of reasoning. No credit for students who have earned credit for 3150. [3]

## **ANTH6152 - Activism and Social Change: Theory, Experience, and Practice**

### **Title**

Activism and Social Change: Theory, Experience, and Practice

### **Catalog Description**

(Also listed as ANTH 4152) Introduction to theory and ethics of social activism and advocacy. Roles of academics and scholars. Theories of political organizing and mobilization. Application of anthropological research methods. Case studies in local, national, and global social issues, processes of civic mobilization, and social change. No credit for students who have earned credit for 4152. [3]

**ANTH6153 - Economic Anthropology****Title**

Economic Anthropology

**Catalog Description**

(Also listed as ANTH 4153) Modern and postmodern cultural organization of Western and non-Western economies. Cross-cultural comparison of concepts of self-interest and rationality. Relation of the growth of post-industrial (service and information) economies to economic strategies of ethnic groups. Survey of indigenous alternatives to development. Theoretical issues grounded in case studies from our own and other cultures. No credit for students who have earned credit for 4153. [3]

**ANTH6154 - Environmental Anthropology****Title**

Environmental Anthropology

**Catalog Description**

(Also listed as ANTH 4154) The relationship between human beings and the environments that sustain them. Global diversity of human ecological adaptations. Hunter-gatherers, pastoral nomads, slash-and-burn agriculturalists, and irrigation agriculturalists. Human impact on the environment. Theories of human ecological interaction. No credit for students who have earned credit for 4154. [3]

**ANTH6156 - Racial Experience and Politics****Title**

Racial Experience and Politics

**Catalog Description**

Politics in liberal democracies. Intellectual history and theory of racial experience; ethnographic studies of peoples' experience of race in everyday life; global and cross-cultural perspectives on processes of racialization. [3]

**ANTH6160 - Creating Community****Title**

Creating Community

**Catalog Description**

(Also listed as ANTH 3160) Creation, maintenance, and transformation of communities through time. Community as a village or settlement, and as an "imagined" or virtual aspect of social identity. Behaviorist, interactionist, discursive, and identity-oriented anthropological approaches to community. Community organization and the built environment. Ancient and modern case studies. No credit for students who have earned credit for 3160. [3]

**ANTH6161 - Colonial Encounters in the Americas****Title**

Colonial Encounters in the Americas

**Catalog Description**

(Also listed as ANTH 3161) Theoretical discussion of colonialism as a sociocultural process. Comparative colonialism in pre- and post-Hispanic contexts. Methodological consideration of archaeological and archival analyses and their complementary epistemological statuses. Pan-American case studies. No credit for students who have earned credit for 3161. [3]

**ANTH6200 - Ancient Cities****Title**

Ancient Cities

**Catalog Description**

(Also listed as ANTH 3200) Comparative examination of early cities in the Old World and pre-Columbian America. Analysis of social and economic processes supporting preindustrial urbanism. Role of geography, ideology, trade, and settlement systems in the rise of early urban societies. No credit for students who have earned credit for 3200. [3]

**ANTH6202 - The Collapse of Civilizations****Title**

The Collapse of Civilizations

**Catalog Description**

(Also listed as ANTH 3202) Causes of the decline or collapse of complex societies. Old World and New World examples. Historical, anthropological, and paleoecological theories and controversies. No credit for students who have earned credit for 3202. [3]

**ANTH6240 - Ancient Mesoamerican Civilizations****Title**

Ancient Mesoamerican Civilizations

**Catalog Description**

(Also listed as ANTH 3240) Development of pre-Hispanic civilization in Mesoamerica from the beginnings of village life to the rise of the great states and empires: Olmec, Maya, Toltec, and Aztec civilizations. No credit for students who have earned credit for 6240. [3]

**ANTH6241 - The Aztecs****Title**

The Aztecs

**Catalog Description**

(Also listed as ANTH 3241) Origins of the Aztec peoples of central Mexico and their culture; history and structure of the Aztec empire; pre-Columbian social, political, and economic organization; warfare and religion; the Spanish conquest; colonial society in central Mexico; ethno-graphic study of modern descendants of the Aztecs. No credit for students who have earned credit for 3241. [3]

**ANTH6242 - The Archaeology of the Ancient Maya Civilization****Title**

The Archaeology of the Ancient Maya Civilization

**Catalog Description**

Archaeological evidence and social theory on the enigmatic origins, complex nature, and sudden collapse of the ancient Maya civilization. May be repeated for credit more than once if there is no duplication in topic. Open to advanced undergraduates with consent of the instructor. [3]

**ANTH6243 - Ancient Maya Gods and Rulers****Title**

Ancient Maya Gods and Rulers

**Catalog Description**

(Also listed as ANTH 3243) Anthropology of politics and religion in Classic Maya culture, A.D. 100-1000. Interpretation of Classic Maya iconography and epigraphy. No credit for students who have earned credit for 3243. [3]

**ANTH6250 - The Inca Empire****Title**

The Inca Empire

**Catalog Description**

(Also listed as ANTH 3250) The rise and fall of the Inca state in the Southern American Andes. Inca society, agriculture, economy, warfare, ancestor worship, mummies, and royal wealth. Imperial expansion, the role of the feasting in Inca politics, and place of ecology in Inca religion. Destruction of the empire during the Spanish conquest; persistence of pre-Columbian culture among Inca descendants in Peru and Bolivia. No credit for students who have earned credit for 3250. [3]

**ANTH6260 - Crafting Pottery in the Ancient World****Title**

Crafting Pottery in the Ancient World

**Catalog Description**

Pottery as craft or locally-grounded knowledge of making. Phenomenological issues of perception, objectification, and embodiment. Practice-based versus formal textbook learning. Hands-on experience making and studying ceramic vessels. Qualitative and quantitative analysis of ceramic forms, fabrics, and decorations. [3]

**ANTH6261 - Introduction to Geographic Information Systems and Remote Sensing****Title**

Introduction to Geographic Information Systems and Remote Sensing

**Catalog Description**

(Also listed as ANTH 3261) Computerized graphics and statistical procedures to recognize and analyze spatial patterning. Spatial data-collection, storage and retrieval; spatial analysis and graphic output of map features. Integration of satellite imagery with data from other sources through hands-on experience. Assumes basic knowledge of computer hardware and software. [3]

**ANTH6262 - Ethics in Anthropology, Archaeology, and Development****Title**

Ethics in Anthropology, Archaeology, and Development

**Catalog Description**

(Also listed as ANTH 3262) Ethical perspectives on contemporary problems of archaeological and anthropological research, interaction, and interpretation of past and present non-Western societies. No credit for students who have earned credit for 3262. [3]

**ANTH6270 - Underwater and Maritime Archaeology****Title**

Underwater and Maritime Archaeology

**Catalog Description**

History, theory, and methodology in underwater, marine, and nautical archaeology. Technologies for survey, excavation, and analysis. Cultures past and present, impacts of climate change, and connections to marine resources in the present. [3]

**ANTH6343 - Biology and Culture of Race****Title**

Biology and Culture of Race

**Catalog Description**

(Also listed as ANTH 3343) Biological and cultural perspectives on race in the United States and internationally. Patterns of human genetic variation. Biomedical use of racial categories. Social and cultural construction of race. Racism and racial discrimination. Racial disparities in health. No credit for students who have earned credit for 3343. [3]

**ANTH6344 - Genetic Anthropology Lab Techniques****Title**

Genetic Anthropology Lab Techniques

**Catalog Description**

(Also listed as ANTH 3344) Applications of molecular anthropology techniques. DNA data analysis. Genetic methods and findings. DNA comparisons between world populations. Studies of ancient DNA. No credit for students who have earned credit for 3344. [3]

**ANTH6345 - Human Evolutionary Genetics****Title**

Human Evolutionary Genetics

**Catalog Description**

(Also listed as ANTH 4345) Core issues in human evolution and population genetics. Molecular evidence for the origin of modern humans, reconstruction of human migrations, race, and detection of admixture between populations. Implications for human disease. Offered on a graded basis only. No credit for students who earned credit for 294 section 1 in fall 2012. Prerequisite or corequisite: BSCI 1100, BSCI 1105, or BSCI 1510. [3]

**ANTH6347 - Bioethics in Anthropology****Title**

Bioethics in Anthropology

**Catalog Description**

Humans as study subjects in research. Human complexities and experimentation; eugenics; and ethical, legal, and social issues of research. [3]

## **ANTH6371 - Social and Health Consequences of Pandemics**

### **Title**

Social and Health Consequences of Pandemics

### **Catalog Description**

(Also listed as ANTH 3371) Origins, spread, mortality, and the biological and social consequences. The epidemic of bubonic plague in the 1300s, known as the European Black Death. The devastation of indigenous New World populations by European diseases after 1492. Social and medical responses. Implications for modern societies. No credit for students who have earned credit for 3371. [3]

## **ANTH6372 - Human Osteology**

### **Title**

Human Osteology

### **Catalog Description**

(Also listed as ANTH 3372) Anatomy of the human skeleton. Determination of age, sex, stature, and biological affinity from bones and dentition. Analysis of archaeological skeletal remains for diagnosis of disease and identification of cultural practices. Use of human remains in criminal investigation. No credit for students who have earned credit for 3372. [3]

## **ANTH6373 - Hlth/Disease Anc Popltns**

### **Title**

Hlth/Disease Anc Popltns

### **Catalog Description**

(Also listed as ANTH 4373) Paleopathology of mummies and skeletons. Skeletal evidence for violence and warfare. Gender and social status differences in diet, disease, and activity patterns to reconstruct ancient social organization. Biological relationships among ancient and modern populations. Ethics and federal law in the study of human remains. Laboratory analysis of skeletons. No credit for students who have earned credit for 4373. [3]

## **ANTH6614 - Advanced K'iche' Maya**

### **Title**

Advanced K'iche' Maya

### **Catalog Description**

(Also listed as ANTH 3614) Vocabulary, listening, and speaking skills. Modern and colonial texts. Cultural context of linguistic practices in K'iche' communities. No credit for students who have earned credit for 3614. [3]

## **ANTH6615 - Readings in K'iche' Mayan**

### **Title**

Readings in K'iche' Mayan

### **Catalog Description**

(Also listed as ANTH 3615) Taught in K'iche'. Advanced vocabulary, grammar, syntax, reading, and writing. Colonial and modern texts. No credit for students who have earned credit for 3615. [3]

**ANTH6620 - Maya Language and Literature****Title**

Maya Language and Literature

**Catalog Description**

(Also listed as ANTH 3620) Introduction to a contemporary Maya language. Linguistic analysis and cultural concepts. By permission of instructor. May be repeated for the study of different Maya languages for a total of 6 credits. No credit for students who have earned credit for 3620. [1-6; maximum of 6 credits total for all semesters of ANTH 6620]

**ANTH6622 - Classic Maya Language and Hieroglyphs****Title**

Classic Maya Language and Hieroglyphs

**Catalog Description**

(Also listed as ANTH 3622) Linguistic analysis of Classic Maya Hieroglyphs from A.D. 100-1000. Methods of decipherment, reading, and interpreting an ancient script. Role of socio-economic status in literacy. No credit for students who have earned credit for 3622. [3]

**ANTH6850 - Independent Research****Title**

Independent Research

**Catalog Description**

(Also listed as ANTH 3850) Readings on selected topics (of the student's choice) and the preparation of reports. No credit for students who have earned credit for 3850. [1-3]

**ANTH6851 - Independent Research****Title**

Independent Research

**Catalog Description**

(Also listed as ANTH 3851) Readings on selected topics (of the student's choice) and the preparation of reports. No credit for students who have earned credit for 3851. [1-3]

**ANTH6852 - Independent Research****Title**

Independent Research

**Catalog Description**

Readings on selected topics (of the student's choice) and the preparation of reports. Prerequisite: ANTH 6850, 6851. [1-3]

**ANTH6853 - Independent Research****Title**

Independent Research

**Catalog Description**

Readings on selected topics (of the student's choice) and the preparation of reports. Prerequisite: 6852. [1-3]



**ANTH6865 - Field Research****Title**

Field Research

**Catalog Description**

(Also listed as ANTH 3865) Directed field research on topics of the student's choice. May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 6 credits per semester of enrollment. No credit for students who have earned credit for 3865. [1-6]

**ANTH6880 - Internship Readings and Research****Title**

Internship Readings and Research

**Catalog Description**

(Also listed as ANTH 3880) Readings and research conducted under the supervision of a member of the Anthropology department and a substantial research paper are required. Students from any discipline can gain experience working with a local, national, or international organization in developing a project to broaden their understanding of anthropological issues. Hours for background readings and research will be completed in ANTH 6880 concurrently with and regardless of the numbers of hours taken in internship training in 6881. Normally a 2.90 grade point average, 6 hours of prior work in ANTH, and prior approval of the student's plan by the director of undergraduate studies in Anthropology are required. A research paper and report must be submitted at the end of the semester during which the internship training is completed. No credit for students who have earned credit for 3880. [Variable credit: 1-6]

**ANTH6881 - Internship Training****Title**

Internship Training

**Catalog Description**

(Also listed as ANTH 3881) Offered on a Pass/Fail basis only and must be taken concurrently with 6880. Hours of 6881 will not count toward the Anthropology major or minor. Students from any discipline can gain experience working with a local, national, or international organization in developing a project to broaden their understanding of anthropological issues. Hours for background readings and research will be completed in ANTH 6880 concurrently with and regardless of the numbers of hours taken in internship training in 6881. Normally a 2.90 grade point average, 6 hours of prior work in ANTH, and prior approval of the student's plan by the director of undergraduate studies in Anthropology are required. A research paper and report must be submitted at the end of the semester during which the internship training is completed. No credit for students who have earned credit for 3881. [Variable credit: 1-9]

**ANTH6890 - Special Topics****Title**

Special Topics

**Catalog Description**

(Also listed as ANTH 3890) Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3890. [3]

**ANTH7150 - Urban Ecology****Title**

Urban Ecology

**Catalog Description**

Environmental contexts and consequences of human and non-human life processes in cities through history. Transformations of landscapes, food systems, and built environments. Origins of cities, urbanization, industrial archaeology, urban planning, and environmental racism. Long-term perspectives on climate change, political ecology, environmental history, green politics, and prospects for sustainability. [3]

**ANTH7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-12]

**ANTH8000 - History of Anthropological Theory I****Title**

History of Anthropological Theory I

**Catalog Description**

An advanced consideration of the history of anthropological theory from its origins to the mid-twentieth century. [3]

**ANTH8001 - History of Anthropological Theory II****Title**

History of Anthropological Theory II

**Catalog Description**

An advanced consideration of the history of anthropological theory from the mid-twentieth century to the present. [3]

**ANTH8010 - Special Topics****Title**

Special Topics

**Catalog Description**

Problems, themes, or issues in anthropological theory and methods. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**ANTH8100 - Political Violence****Title**

Political Violence

**Catalog Description**

Comparative and ethnographic analysis of state violence, guerrilla insurgencies, paramilitarism and vigilantism; consequences of repression, impunity, and social fragmentation on historical memory and democratic processes. [3]

**ANTH8104 - Seminar on Political Economy and Anthropology****Title**

Seminar on Political Economy and Anthropology

**Catalog Description**

Anthropological approaches to political economy and globalization. Fundamental works in political economy and economic anthropology. [3]

**ANTH8106 - Ethics in Anthropology****Title**

Ethics in Anthropology

**Catalog Description**

Ethical obligations of anthropologists in dealing with human subjects on the interpretation, interaction, and action with non-western societies. Ethics from Socrates to radical postmodernism. Debate of specific issues presented by non-Western practices, cultural property rights, sites versus sacred places, repatriation, cultural relativism, and anthropological activism. [3]

**ANTH8107 - Race as a Cultural and Legal Construct****Title**

Race as a Cultural and Legal Construct

**Catalog Description**

Historical and contemporary roles of race and racism in settler colonialism, slavery, the nation-state, and empire. Theoretical perspectives from social constructionism, anti-colonial literature, critical race theory, and standpoint theory. [3]

**ANTH8108 - Ethnographies of Race, Space, and Place****Title**

Ethnographies of Race, Space, and Place

**Catalog Description**

Complex dynamics of race and how they have shaped geographic transformations and temporalities. Ethnical ways of conducting place-based research. [3]

**ANTH8110 - Seminar in Maya Ethnography****Title**

Seminar in Maya Ethnography

**Catalog Description**

Ethnographic survey of the Maya of Mexico and Guatemala; historical and current data, methods, theories. [3]

**ANTH8200 - Archaeological Method and Theory****Title**

Archaeological Method and Theory

**Catalog Description**

Development of archaeology as a discipline; relationships with anthropology and history; intellectual trends. Prerequisite: consent of instructor. [3]

**ANTH8201 - Advanced Spatial Analysis****Title**

Advanced Spatial Analysis

**Catalog Description**

Theoretical and methodological training for advanced GIS applications in social science research. Implementing GIS in research design, field spatial data acquisition methods, data processing, management, visualization, and analysis. [3]

**ANTH8210 - Preindustrial Political Systems****Title**

Preindustrial Political Systems

**Catalog Description**

History, structure, and change of pre-modern political systems around the world. [3]

**ANTH8211 - Space, Place, and Landscape****Title**

Space, Place, and Landscape

**Catalog Description**

Cross-disciplinary approaches to the significance of space and landscape for human societies in the past and present. [3]

**ANTH8212 - Historical Archaeology****Title**

Historical Archaeology

**Catalog Description**

Development, practice, methods, and theoretical perspectives in historical archaeology; relationships between archaeology and history. [3]

**ANTH8213 - Historical Anthropology****Title**

Historical Anthropology

**Catalog Description**

How culture is ordered by history and vice versa. Cultural transformation and reproduction through time. Structures-in-history. How historical consciousness affects historical and cultural processes. Narrative versus systemic/analytical approaches to history and culture. Postmodern critiques of history and culture. Indigenous histories, ethnohistory, historical ecology, macro- and micro-histories. [3]

**ANTH8220 - The Historical Archaeology of Latin America****Title**

The Historical Archaeology of Latin America

**Catalog Description**

The study of archaeological, historic, and ethnohistorical materials in examining the conquest, colonization, and process of culture change in Latin America. [3]

**ANTH8230 - The Collapse of Civilizations: General Theories and the Maya Collapse**  
**Title**

The Collapse of Civilizations: General Theories and the Maya Collapse

**Catalog Description**

An advanced consideration of the causes and processes involved in the decline of complex societies. General theory is then illustrated by detailed interactive study of the evidence and interpretations of the collapse of the civilization of the Classic Maya, arguably the New World's most advanced society. A seminar allowing each student to develop and define their own perspective on this major problem in archaeology and social theory. [3]

**ANTH8232 - Seminar in Mesoamerican Archaeology**  
**Title**

Seminar in Mesoamerican Archaeology

**Catalog Description**

Important themes in the prehistory of pre-Columbian civilizations of Mexico and Central America. May be repeated for credit if there is no duplication in topic. [3]

**ANTH8240 - Seminar in South American Archaeology and Ethnohistory**  
**Title**

Seminar in South American Archaeology and Ethnohistory

**Catalog Description**

The prehistory of pre-Columbian civilizations of the Andean and lowland regions of South America. [3]

**ANTH8300 - Human Variation and Osteology**  
**Title**

Human Variation and Osteology

**Catalog Description**

Survey of physical and genetic variation in modern human populations. Laboratory techniques in osteological analysis. [3]

**ANTH8301 - Bioarchaeology Theory and Methods**  
**Title**

Bioarchaeology Theory and Methods

**Catalog Description**

The body as a form of material culture. Traumatic violence, structural violence, and community health profiles. Sex and gender in the bioarchaeological record. Skeletal analysis; paleopathology; stable isotope analysis; ancient DNA; radiocarbon dating. Knowledge of skeletal anatomy is encouraged. No credit for students who have earned credit for 8010 section 02 in fall 2015. [3]

**ANTH8310 - The Anthropology of Death: Body, Place, and Memory****Title**

The Anthropology of Death: Body, Place, and Memory

**Catalog Description**

Cultural responses to death in Western and non-Western societies. Emphasis on issues of how social relations, emotion, and memory are shaped in relation to ideas and practices focused on the body and the significance of places as sites of identity. Theory and perspectives from anthropology, religion, and philosophy. [3]

**ANTH8311 - Violence and Its Embodiments in the Past and Present****Title**

Violence and Its Embodiments in the Past and Present

**Catalog Description**

Anthropology and bioarchaeology of violence in ancient and modern communities. Bioarchaeological theory and method to identify trauma and violence against the body. Study of war and other forms of violence, including domestic abuse, ritual battles, corporeal punishment. [3]

**ANTH8400 - Seminar in Statistical Methods****Title**

Seminar in Statistical Methods

**Catalog Description**

Conceptual overview of statistical methods for graduate students in the social sciences. Topics include descriptive statistics, dimensionality reduction, regression analysis, Bayesian inference, causal inference, and machine learning. Discussion of data structure and requirements, exploratory/confirmatory framing, hypothesis testing, assumptions, measures of uncertainty, and evaluation metrics. [3]

**ANTH8500 - Teaching Anthropology****Title**

Teaching Anthropology

**Catalog Description**

Preparation for teaching anthropology courses at the university level. Pedagogical practice and theory. Observations of master teachers; teaching practice and evaluation. Design of syllabi, readings, and assignments. Approaches to teaching challenging topics. [3]

**ANTH8999 - Non-candidate Research****Title**

Non-candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**ANTH9000 - Seminar in Research Design****Title**

Seminar in Research Design

**Catalog Description**

Objectives and strategies of contemporary research problems in anthropology; formulation, writing, and construction of grant proposals; interplay between data, method, and theory; develop skill in critiquing research ideas, techniques, and designs. [3]

**ANTH9001 - Research Design in Anthropology****Title**

Research Design in Anthropology

**Catalog Description**

Research design, formulating research questions, and definition of appropriate data and methods. [3]

**ANTH9002 - Publishing in Anthropology****Title**

Publishing in Anthropology

**Catalog Description**

Preparation to publish in peer-reviewed journals in anthropology and related fields. Peer-review process and editorial decisions. Issues in publishing patterns by sub-discipline, professional rank, and gender. Review of manuscripts in preparation. Familiarity with research design is expected. [3]

**ANTH9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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**Arabic****ARA5101 - Elementary Arabic****Title**

Elementary Arabic

**Catalog Description**

(Also listed as ARA 1101) Development of reading, listening, speaking, and writing skills. No credit for students who have earned credit for a more advanced Arabic language course. No credit for students who have earned credit for 1101. [5]

**ARA5102 - Elementary Arabic****Title**

Elementary Arabic

**Catalog Description**

(Also listed as ARA 1102) Continuation of 5101. Development of reading, listening, speaking, and writing skills. No credit for students who have earned credit for a more advanced Arabic language course. No credit for students who have earned credit for 1102. [5]

**ARA5201 - Intermediate Arabic****Title**

Intermediate Arabic

**Catalog Description**

(Also listed as ARA 2201) Practice and development of all language skills at the intermediate-advanced level. Intensive work in spoken Arabic with emphasis on vocabulary acquisition, reading comprehension, and writing skills. Advanced grammar, modern Arabic word formation, verb aspect usage, and structure of complex sentences. Three hours of class work per week with an additional two hours per week of individual work in the language laboratory. No credit for students who have earned credit for a more advanced Arabic language course. No credit for students who have earned credit for 2201. [4]

**ARA5202 - Intermediate Arabic****Title**

Intermediate Arabic

**Catalog Description**

(Also listed as ARA 2202) Continuation of 5201. Practice and development of all language skills at the intermediate-advanced level. Intensive work in spoken Arabic with emphasis on vocabulary acquisition, reading comprehension, and writing skills. Advanced grammar, modern Arabic word formation, verb aspect usage, and structure of complex sentences. Three hours of class work per week with an additional two hours per week of individual work in the language laboratory. No credit for students who have earned credit for a more advanced Arabic language course. No credit for students who have earned credit for 2202. [4]

**ARA5301 - Advanced Arabic****Title**

Advanced Arabic

**Catalog Description**

(Also listed as ARA 3301) Further development of listening, reading, speaking, and writing skills in the Arabic language. Emphasis on grammar and literary techniques. Offered on a graded basis only. No credit for students who have earned credit for a more advanced Arabic language course. No credit for students who have earned credit for 3301. [3]

**ARA5302 - Advanced Arabic****Title**

Advanced Arabic

**Catalog Description**

(Also listed as ARA 3102) Continuation of 5301. Further development of listening, reading, speaking, and writing skills in the Arabic language. Emphasis on grammar and literary techniques. Offered on a graded basis only. No credit for students who have earned credit for a more advanced Arabic language course. No credit for students who have completed 3102. [3]



**ARA5401 - Media Arabic****Title**

Media Arabic

**Catalog Description**

(Also listed as ARA 3201) Listening to, discussing, simulating, and analyzing Arabic media materials. Coverage of current and historical events, such as TV broadcasts, headline news, documentaries, and public discussions on political, religious, and cultural issues. Offered on a graded basis only. No credit for students who have earned credit for 3201. [3]

**ARA5510 - Arabic of the Qur'an and Other Classical Texts****Title**

Arabic of the Qur'an and Other Classical Texts

**Catalog Description**

Syntactical and morphological features of Classical Arabic. Differences and similarities with Modern Standard Arabic in vocabulary usage, semantic extensions, and context; vocabulary borrowing. Texts drawn from the Qur'an, Hadith, and Sira (biographical) literature. Serves as repeat credit for ARA 3310. [3]

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## Asian Studies

**ASIA5151 - The Third World and Literature****Title**

The Third World and Literature

**Catalog Description**

(Also listed as ASIA 3151) The history of cultural and political concepts of the Third World from 1955 to the present. Contemporary literary and cultural debates regarding models of transnationalism and processes of globalization. National literatures and cultures foundational to the Third World model. The relationship between the genre of the novel and the formation of national communities. No credit for students who have earned credit for 3151. [3]

**ASIA5210 - Hollywood Hanoi****Title**

Hollywood Hanoi

**Catalog Description**

(Also listed as ASIA 2210W) Cultural narratives of the Vietnam War, including novels and films. War and representation. International, minority, and antiwar perspectives on the violence and aftermath. Muhammad Ali, Werner Herzog, Jean Genet, Graham Greene, and Dinh Linh. All texts in English translation. No credit for students who have earned credit for 2210W. [3]

**ASIA5511 - Popular Culture in Modern Japan****Title**

Popular Culture in Modern Japan

**Catalog Description**

(Also listed as ASIA 2511) Popular culture in Japan from 1900 to the present. The rise of mass culture and media, song, sports, food, fashion, and popular film genres. No credit for students who have earned credit for 2511. [3]

**ASIA5512 - Explorations of Japanese Animation**

**Title**

Explorations of Japanese Animation

**Catalog Description**

Historical contexts, production techniques, visual style, narrative forms, and interpretive analyses of feature-length Japanese animated films by auteur directors from the 1980s to the present, featuring Hayao Miyazaki and three others on a rotating basis from among Satoshi Kon, Mamoru Oshii, Mamoru Hosoda, Makoto Shinkai, Hideaki Anno, and Isao Takahata. [3] (INT)

**ASIA5605 - Romancing the Nation in Modern Chinese Literature**

**Title**

Romancing the Nation in Modern Chinese Literature

**Catalog Description**

[Also listed as 2605] From the fourteenth century to the present. Fiction, drama, and poetry. Family relations and nation-state in romantic writings. Knowledge of Chinese is not required. [3]

**ASIA5606 - The Martial Tradition in Chinese Literature**

**Title**

The Martial Tradition in Chinese Literature

**Catalog Description**

[Also listed as 2606] From eleventh century BCE to modern period. War, banditry, revenge, cannibalism, female knight-errant. All genres of literature, supplemented by visual material, theater, and film. Knowledge of Chinese is not required. [3]

**ASIA5607 - Self and Society in Pre-modern Chinese Literature**

**Title**

Self and Society in Pre-modern Chinese Literature

**Catalog Description**

From the seventeenth-century BCE to the seventeenth-century CE. Poetry, prose, fiction, and drama. Self, society, religion, gender, and print culture. No credit for students who have earned credit for 3891 section 01 offered fall 2015. Knowledge of Chinese is not required. [3]

**ASIA5608 - Chinese Drama: 13th-20th Centuries**

**Title**

Chinese Drama: 13th-20th Centuries

**Catalog Description**

Traditional and modern Chinese drama. Text, image, and performance. Gender, religious thinking, commerce, and censorship. Knowledge of Chinese is not required. [3]

**ASIA5609 - Writing and Gender in Traditional China****Title**

Writing and Gender in Traditional China

**Catalog Description**

Pre-modern China: 1st century CE to 20th century CE. Women writers, women in family and society, gender relations, cross-dressing, and foot-binding. Poetry, prose, drama, fiction, and visual materials. Knowledge of Chinese is not required. [3]

**ASIA5633 - Self-Cultivation in Ancient China****Title**

Self-Cultivation in Ancient China

**Catalog Description**

(Also listed as ASIA 3633) 300 BCE to 500 CE. Methods, goals, and contexts of self-cultivation in antiquity. Breathing exercises, meditation, visualization, sexual arts, sacrifice, alchemy, and other practices in their religious, cultural, and social contexts. No credit for students who have earned credit for 3633. [3]

**ASIA5650 - Translating Sunzi (Sun Tzu) The Art of War****Title**

Translating Sunzi (Sun Tzu) The Art of War

**Catalog Description**

Commentaries on Sunzi and related Chinese military texts from Classical and Literary Chinese into English. Advanced study of Classical and Literary Chinese. Advanced study of military thought. Prerequisite: CHIN 5405. [3]

**ASIA5680 - Inside China****Title**

Inside China

**Catalog Description**

(Also listed as ASIA 1680) First-hand experience of China's dynamic society and expanding economy. Guided exploration of famous historical sites and contemporary institutions such as hospitals, businesses, factories, and art galleries in Beijing and Shanghai. Interviews with individuals from many different walks of life, including physicians, entrepreneurs, migrant workers, and college students. No knowledge of Chinese is required. Offered on a graded basis only. [3]

**ASIA5851 - Independent Study****Title**

Independent Study

**Catalog Description**

(Also listed as ASIA 3851) Designed primarily for majors who want to study Asian topics not regularly offered in the curriculum. Must have consent of instructor. May be repeated for credit more than once, but students may earn only up to 3 credits per semester of enrollment. No credit for students who have earned credit for 3851. [1-3]

**ASIA5852 - Independent Study****Title**

Independent Study

**Catalog Description**

(Also listed as ASIA 3852) Designed primarily for majors who want to study Asian topics not regularly offered in the curriculum. Must have consent of instructor. May be repeated for credit more than once, but students may earn only up to 3 credits per semester of enrollment. No credit for students who have earned credit for 3852. [1-3]

**ASIA5891 - Special Topics****Title**

Special Topics

**Catalog Description**

(Also listed as ASIA 3891) Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3891. [1-3]

**ASIA5892 - Special Topics****Title**

Special Topics

**Catalog Description**

(Also listed as ASIA 3892) Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3892. [1-3]

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## Astronomy

**ASTR7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-13]

**ASTR8001 - Order of Magnitude Astrophysics****Title**

Order of Magnitude Astrophysics

**Catalog Description**

Order-of-magnitude estimates on astrophysical problems. May be repeated for credit more than once. Students may enroll in more than one section of this course each semester. [1]

**ASTR8002 - Teaching Practicum****Title**

Teaching Practicum

**Catalog Description**

Discussion of best teaching practices in weekly meeting with instructor. Application of teaching strategies via teaching undergraduate lab or leading homework help-desk sessions. Offered on satisfactory/unsatisfactory basis. [0-1]

**ASTR8003 - Astrophysics Seminars****Title**

Astrophysics Seminars

**Catalog Description**

Weekly attendance at Astrophysics program events: colloquium, journal club, and seminars. [0]

**ASTR8010 - Radiative Processes****Title**

Radiative Processes

**Catalog Description**

Electromagnetic radiation from astrophysical sources. Radiative transfer; blackbody radiation; atomic and molecular absorption and emission; radiation from moving charges. [3]

**ASTR8020 - Special Topics in Astrophysics****Title**

Special Topics in Astrophysics

**Catalog Description**

Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**ASTR8030 - Stellar Astrophysics****Title**

Stellar Astrophysics

**Catalog Description**

Physics of stellar structure and evolution, including nuclear energy generation, equations of state, and heat transfer by radiation, conduction, and convection. Numerical stellar models. Observational aspects of stellar astrophysics. [3]

## **ASTR8040 - The Structure and Dynamics of Galaxies**

### **Title**

The Structure and Dynamics of Galaxies

### **Catalog Description**

The stellar, gaseous, and dark matter content of galaxies; their internal bulk properties, structure, kinematics, and dynamics. Equilibrium and stability of stellar systems. Orbit theory, the gravitational N-body problem, relaxation, dynamical friction, and the Fokker-Planck equation. Galaxy evolution from the standpoint of stellar populations, the initial mass function, chemical evolution, and galaxy interactions. Serves as repeat credit for ASTR 3700. [3]

## **ASTR8050 - Structure Formation in the Universe**

### **Title**

Structure Formation in the Universe

### **Catalog Description**

Dark matter and dark energy. Growth of linear and non-linear density fluctuations. Density and velocity fields, perturbation theory, and non-linear collapse models. Cosmological N-body simulations and the formation of dark matter halos. Galaxy clustering measurements and galaxy formation physics. Experimental cosmological probes of dark matter and dark energy. [3]

## **ASTR8060 - Observational Methods in Astronomy**

### **Title**

Observational Methods in Astronomy

### **Catalog Description**

Observational tools of the professional astronomer. Observation planning including: telescope and instrument selection, conducting observations, calculation of expected signal-to-noise ratio, data reduction, and extraction of photometric and spectroscopic measurements. [3]

## **ASTR8070 - Astrostatistics**

### **Title**

Astrostatistics

### **Catalog Description**

Statistical and computational techniques for data-mining and inference in an astronomical context. Probability theory, comparison of frequentist and Bayesian inference. Strategies for data exploration and visualization. Approaches to regression, parameter estimation, and model selection (e.g. Markov chain Monte Carlo). Overview of time-series analysis and deep-learning techniques. [3]

## **ASTR8080 - Big Data in Astronomical Surveys**

### **Title**

Big Data in Astronomical Surveys

### **Catalog Description**

The manipulation and analysis of catalog-level data from large astronomical surveys. Survey observations, cross-matching catalogs, statistical analysis, version control. Emphasis on development of code and best practices. Not open to students who have completed 3890 section 01 offered fall 2019 or 8020 section 01 offered fall 2019. [3]

**ASTR8090 - Relativistic Astrophysics****Title**

Relativistic Astrophysics

**Catalog Description**

Studying the Universe through the extreme relativistic environments of neutron stars and black holes, along with the gravitational waves they produce. Differential geometry, spacetime curvature, the Einstein Field Equations, the Schwarzschild Metric for black holes, production and detection of Gravitational Waves, and the Friedmann-Robertson-Walker metric for cosmology. [3]

**ASTR8100 - Multi-Messenger Black Hole Astrophysics****Title**

Multi-Messenger Black Hole Astrophysics

**Catalog Description**

Multi-messenger astrophysics with black holes. Gravitational-wave observations, electromagnetic radiation, elementary particles, and other cosmic messengers. Landmark scientific papers in the field and hands-on training with data from the Laser Interferometer Gravitational-Wave Observatory. Serves as repeat credit for students who earned credit for 8020 section 01 offered Fall 2022. Prerequisite: 8001. [3]

**ASTR8900 - Independent Study****Title**

Independent Study

**Catalog Description**

May be repeated for credit more than once, but students may earn only up to 3 credits per semester of enrollment. [1-3]

**ASTR8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-13]

**ASTR9995 - Half-time Ph.D. Dissertation Research****Title**

Half-time Ph.D. Dissertation Research

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

**ASTR9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-13]

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## Biochemistry (GS)

### **BCHM-GS7999 - Master's Thesis Research**

#### **Title**

Master's Thesis Research

#### **Catalog Description**

[0-12]

### **BCHM-GS8300 - Introduction To Structural Biology**

#### **Title**

Introduction To Structural Biology

#### **Catalog Description**

Introduction to methods to determine the three-dimensional structures of biological macromolecules and macromolecular complexes at or near atomic resolution. Techniques covered include X-ray crystallography, NMR, EPR, and fluorescence spectroscopies, cryo-electron microscopy, and computational modeling. Emphasis is placed on practical aspects of each technique and the range of applications for which each technique is applicable. The course is given during the first third of the semester, just preceding Biochemistry 8303. SPRING. [1] Chazin, Egli, Lacy, Lang, Mchaourab, Sheehan.

### **BCHM-GS8301 - Enzyme Mechanisms and Kinetics of Catalysis**

#### **Title**

Enzyme Mechanisms and Kinetics of Catalysis

#### **Catalog Description**

This course is focused on the chemical mechanisms by which enzymes catalyze reactions. Chemical principles are applied to biochemical problems. Major topics include principles of catalysis, enzyme kinetics (both steady-state and pre-equilibrium), roles of cofactors and prosthetic groups in catalysis, and interpretation of kinetic results. Prerequisites: Organic chemistry, biochemistry. SPRING [1] Guengerich

### **BCHM-GS8302 - Advanced Biochemistry, Cell Biology, And Genetics**

#### **Title**

Advanced Biochemistry, Cell Biology, And Genetics

#### **Catalog Description**

Advanced concepts in genetics, biochemistry, and cell biology will be reviewed using a combination of lectures and discussion sections based on published manuscripts. Prerequisite: IGP core course or consent of instructor. FALL. [3] Course Co-Directors: Ascano, Hodges. Co-Instructors: Heibert, Merrikh, Ren, Schey

### **BCHM-GS8303 - Biomolecular X-Ray Crystallography**

#### **Title**

Biomolecular X-Ray Crystallography

#### **Catalog Description**

Introduction to the theory and practice of X-ray crystallography for the determination of the three-dimensional structure of biological macromolecules at atomic resolution. Topics to be covered include X-ray diffraction, symmetry and space groups, crystallization, data collection, phasing, model building, refinement and validation. SPRING. [2] Egli, Harp.



### **BCHM-GS8304 - Cryo-Electron Microscopy**

#### **Title**

Cryo-Electron Microscopy

#### **Catalog Description**

No prerequisites. SPRING [4] Binshtein, Chambers, Collier, Karakas, Kendall, Kroh, Mullins, Nakagawa, Smith, Wan, Zhou

### **BCHM-GS8323 - Special Problems And Experimental Techniques**

#### **Title**

Special Problems And Experimental Techniques

#### **Catalog Description**

Opportunity to master advanced laboratory techniques while pursuing special problems under direction of individual members of the faculty in areas of their specialized interests. Admission to course, hours, and credit by arrangement. FALL, SPRING, SUMMER. [Variable credit: 1-6] Cortez and Staff.

### **BCHM-GS8327 - Scientific Communication**

#### **Title**

Scientific Communication

#### **Catalog Description**

This course will develop skills required for effective oral and written scientific communication. Students will present research from the current literature and will be required to write an NIH formatted grant proposal to be critiqued by faculty assigned by the course director. Students not working for a degree in biochemistry must have the consent of the instructor to enroll. FALL. [2] Schey, Wagner.

### **BCHM-GS8336 - Biochemical and Molecular Toxicology**

#### **Title**

Biochemical and Molecular Toxicology

#### **Catalog Description**

Chemical and biological aspects of toxicology and carcinogenesis, including basic principles and mechanisms, metabolism and enzymology, cellular biology, chemistry of reactive intermediates, tissue-specific toxicity, and a survey of several classes of environmentally important compounds and drugs. Prerequisite: organic chemistry and general biochemistry. Three lectures per week. FALL. [3] Guengerich

### **BCHM-GS8337 - Molecular Aspects Of Cancer Research**

#### **Title**

Molecular Aspects Of Cancer Research

#### **Catalog Description**

(Also listed as Cell and Developmental Biology 8337) A focused series of seminars and discussions to explore the molecular basis of cancer. Seminars rely heavily on extramural speakers with recognized expertise in selected research areas. Discussion sections led by a faculty member following each series of three to four seminars. SPRING. [1] Hiebert and Staff.

### **BCHM-GS8343 - Biomolecular NMR Spectroscopy**

#### **Title**

Biomolecular NMR Spectroscopy

#### **Catalog Description**

Introduction to the theory and practice of nuclear magnetic resonance (NMR) spectroscopy for the study of the structure, dynamics, and biochemistry of biological macromolecules. After introducing the basic concepts of NMR and formalisms for predicting the outcome of experiments, topics to be covered will include multidimensional NMR, scalar and dipolar couplings, chemical exchange, relaxation, resonance assignment strategies, and determination of 3D structures. Prerequisite: Biochemistry 8300. FALL. [3] Chazin, Sanders, Voehler.

### **BCHM-GS8349 - Graduate Seminar In Molecular Biophysics**

#### **Title**

Graduate Seminar In Molecular Biophysics

#### **Catalog Description**

This course is devoted to the study of the 14 top papers of the past 12 months where the tools of molecular biophysics have been used to greatly advance medicine or biology. A group learning format will be used, wherein students work together in groups. Each class will be driven primarily by the students- the faculty mentor(s) serve to facilitate the discussion, answer questions, and provide broader insights. The class will be split up into small working/presentation groups. May be repeated for credit. SPRING. [1] Chazin.

### **BCHM-GS8352 - Analytical Proteomics**

#### **Title**

Analytical Proteomics

#### **Catalog Description**

Introduces analytical proteomics methods and approaches through lectures, directed readings, and group and individual data analysis exercises. Topics include (a) mass spectrometry instrumentation, (b) mass spectrometry approaches to protein and peptide analysis, (c) protein and peptide preparation and separation methods, (d) bioinformatics tools for identification of proteins from mass spectrometry data, (e) quantitative proteomics methods, (f) applications of proteomics in common experimental designs in biochemistry and cell biology, (g) applications to clinical studies. SPRING. [2]. Schey

### **BCHM-GS8381 - Molecular Foundations Of Medicine**

#### **Title**

Molecular Foundations Of Medicine

#### **Catalog Description**

Molecular Foundations of Medicine is designed to familiarize students with the cellular structures, biomolecules, and processes that constitute life, human health, and disease at the molecular level. The course employs an integrated approach to teach underlying principles of biochemistry, cell and tissue biology, and genetics with an emphasis on human systems and medical conditions. The inclusion of clinical correlation sessions, small groups, and laboratory sessions will further integrate and broaden course material and relate molecular processes to the study of human disease. Prerequisite: MSTP students only. FALL. [Variable credit: 1-6] Osheroff, George, Pettepher.

### **BCHM-GS8999 - Non-Candidate Research**

#### **Title**

Non-Candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

### **BCHM-GS9999 - Ph.D. Dissertation Research**

#### **Title**

Ph.D. Dissertation Research

#### **Catalog Description**

[Variable credit: 0-12]

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## **Biological Sciences**

### **BSCI5101 - Human Anatomy and Physiology I**

#### **Title**

Human Anatomy and Physiology I

#### **Catalog Description**

Structure and function of the human organism. Integration of the gross anatomical structures and organ systems with microscopic structure, physiological function, and homeostatic mechanisms. Clinical relevance of selected topics. Not open to students who have completed NURS 3101 or MHS 3101. Prerequisite: 1510; Prerequisite or corequisite: 1511. [4]

### **BSCI5102 - Human Anatomy & Physiology II**

#### **Title**

Human Anatomy & Physiology II

#### **Catalog Description**

(Also listed as BSCI 3102) Continuation of 2101. Structure and function of the human organism. Integration of the gross anatomical structures and organ systems with microscopic structure, physiological function, and homeostatic mechanisms. Clinical relevance of selected topics. No credit for students who have earned credit for NURS 3102; MHS 3102. [4]

### **BSCI5150 - General Microbiology**

#### **Title**

General Microbiology

#### **Catalog Description**

Genetics, cell biology, physiology, and diversity of microorganisms; their role in research and impact on human health and the environment. [3]

## **BSCI5201 - Introduction to Cell Biology**

### **Title**

Introduction to Cell Biology

### **Catalog Description**

Structure and function of cells, subcellular organelles, and macromolecules. Fundamentals of organelle function, membrane transport, energy production and utilization, cell motility, cell division, intracellular transport and mechanisms of signal transduction. [3]

## **BSCI5205 - Evolution**

### **Title**

Evolution

### **Catalog Description**

Evolutionary theory, with emphasis on evolutionary mechanisms. Microevolutionary processes of adaptation and speciation and macro-evolutionary patterns. Evidence from genetics, ecology, molecular biology, and paleontology in the historical context of the neo-Darwinian synthesis. [3]

## **BSCI5210 - Principles of Genetics**

### **Title**

Principles of Genetics

### **Catalog Description**

Basic principles and mechanisms of inheritance discussed and related to other biological phenomena and problems. [3]

## **BSCI5226 - Immunology**

### **Title**

Immunology

### **Catalog Description**

(Also listed as BSCI 3226) The molecular and cellular basis of immunity. Emphasis on molecular structure, the genetic origin of diversity in B-cell and T-cell receptors, antigen presentation, and the cellular interactions leading to the immune response. Tolerance, tumor and transplantation immunity, autoimmune and immunodeficiency diseases, and allergy. Prerequisite: 2201 or 2210. [3]

## **BSCI5230 - Biological Clocks**

### **Title**

Biological Clocks

### **Catalog Description**

(Also listed as BSCI 3230) Study of innate mechanisms for measurement of time in living organisms. Emphasis on the functional significance and physiological basis of biological clocks in animals and humans. Topics include circadian rhythms, time-compensated celestial navigation, photoperiodism, and the role of biological clocks in human behavior. No credit for students who have earned credit for 3230. [3]

### **BSCI5231 - Paleobiology**

#### **Title**

Paleobiology

#### **Catalog Description**

Macroevolutionary processes as observed through the fossil record. Inference of evolutionary relationships, physiology, reproduction, behavior, and ecology. Fundamentals of paleobiology, paleoecology, paleoclimates, macroecology, biogeography, geology, geochemistry, anthropology, and conservation paleobiology. Effects of climate change and human impacts, in deep-time. [3]

### **BSCI5232 - Biodiversity, Climate Change and Our Health**

#### **Title**

Biodiversity, Climate Change and Our Health

#### **Catalog Description**

Impacts of climate change on biological and ecological systems from the Paleozoic era to today. Inter-play of earth's systems, climate, and biological innovations. Effects on our natural resources, and consequences for our health. [3]

### **BSCI5233 - Conservation Biology**

#### **Title**

Conservation Biology

#### **Catalog Description**

Ecological, evolutionary, social, and economic aspects of biodiversity loss and ecosystem disruption due to human activities. Climate change, habitat fragmentation, species overexploitation, and invasive species. Sustainable development, habitat restoration, and species reintroduction. [3]

### **BSCI5234 - Microbiology**

#### **Title**

Microbiology

#### **Catalog Description**

Microorganisms, including bacteria, archaea, eukaryotes, viruses, and their mobile genetic elements. Origins, universality, and diversity of microbial life. Modes of genome evolution, symbioses between microbes and hosts, biotechnology, applications, and human microbiome. Not open to students who have earned credit for 3234. [3]

### **BSCI5236 - Parasitology**

#### **Title**

Parasitology

#### **Catalog Description**

(Also listed as BSCI 3236) Biology and epidemiology of eukaryotic parasites of medical and veterinary significance. Diagnosis, treatment, and control of parasitic protists, platyhelminthes, nematodes, and arthropods. Impact on global health. No credit for students who have earned credit for 3236. [3]

**BSCI5238 - Ecology****Title**

Ecology

**Catalog Description**

(Also listed as BSCI 2238) Population biology, evolutionary ecology, community structure, with emphasis on species interactions, including competition, predation, and symbiosis. No credit for students who have earned credit for 2238. [3]

**BSCI5238L - Ecology Lab****Title**

Ecology Lab

**Catalog Description**

(Also listed as BSCI 2238L) One three-hour laboratory and discussion period or field trip per week. Prerequisite or corequisite: 5238. No credit for students who have earned credit for 2238L. [1]

**BSCI5239 - Evolution of Behavior****Title**

Evolution of Behavior

**Catalog Description**

(Also listed as BSCI 3239) Theoretical and empirical research on the evolution of behavior. Evolutionary approaches to the study of animal behavior, including the role of behavior in foraging, competition, predator-prey interactions, and sociality. Behavioral adaptations and their roles in sexual selection, mating systems, and animal communication. No credit for students who have earned credit for 3239. [3]

**BSCI5240 - Molecular Evolution and Disease****Title**

Molecular Evolution and Disease

**Catalog Description**

Molecular evolution of adaptation and disease. Molecular mechanisms of human disease approached through analysis of evolutionary adaptation in extremophile animals. Comparative analysis of multiple protein systems that facilitate adaptation in some species but are implicated in human conditions such as cancer, visual impairment, and aging. Not open to students who completed BSCI 3890/5890 section 02 offered spring 2024. [3]

**BSCI5243 - Principles of Human Disease****Title**

Principles of Human Disease

**Catalog Description**

(Also listed as BSCI 3243) Application of genetics, cell biology, and molecular biology to the study of human diseases. Genomics, gene mapping, and molecular techniques. Animal models of disease. Chromosomal abnormalities, single-gene and multifactorial diseases, and epigenetics. No credit for students who earn credit for 3243. [3]

**BSCI5245 - Biology of Cancer****Title**

Biology of Cancer

**Catalog Description**

(Also listed as BSCI 3245) Application of cell biology, molecular biology, and genetics to the study of cancer. Tumorigenesis; cellular oncogenes; growth factor signaling; tumor suppressor genes; apoptosis; metastasis and invasion. No credit for students who have earned credit for 3245. [3]

**BSCI5247 - Molecular Evolution****Title**

Molecular Evolution

**Catalog Description**

(Also listed as BSCI 3247) The theory of evolution at the molecular level. The evolution of DNA and RNA sequences, proteins, and genome structures will be studied using models from population genetics and comparative approaches. Molecular clocks, the evolution of gene regulation and globin genes, molecular phylogeny, and human evolution. No credit for students who have earned credit for 3247. [3]

**BSCI5252 - Cellular Neurobiology****Title**

Cellular Neurobiology

**Catalog Description**

(Also listed as BSCI 3252) Structure and function of nerve cells. Emphasis on electrical excitability, synaptic transmission, and sensory transduction. Cellular mechanisms underlying simple behaviors, sensory information processing, and learning and memory. No credit for students who have earned credit for 3252. [3]

**BSCI5254 - Neurobiology of Behavior****Title**

Neurobiology of Behavior

**Catalog Description**

(Also listed as BSCI 3254) Nerve cell interactions in neuronal networks of the central nervous system of animals and their impact for regulating behavior. Sensory systems, sensory-motor integration, central processing of information, neuronal-hormonal interactions; and brain anatomy and organization in invertebrates and vertebrates. No credit for students who have earned credit for 3254. [3]

**BSCI5256 - Molecules of the Brain****Title**

Molecules of the Brain

**Catalog Description**

(Also listed as BSCI 3256) Molecules of neural wiring, involving cell identity, pathfinding, synaptogenesis. Molecules of nerve cell communication, with relationship to drugs of addiction and abuse. Molecules of nervous system plasticity, and the mechanistic bases of learning and memory. Relation of these mechanisms to causes of human neurological diseases. No credit for students who have earned credit for 3256. [3]

## **BSCI5265 - Biochemistry II**

### **Title**

Biochemistry II

### **Catalog Description**

(Also listed as BSCI 4265) Biochemistry of the expression, transmission, and maintenance of genetic information. DNA transcription, replication, recombination, and repair. Structural mechanisms and biological functions of DNA processing proteins. Offered on a graded basis only. No credit for students who have earned credit for 4265. [3]

## **BSCI5266 - Advanced Molecular Genetics**

### **Title**

Advanced Molecular Genetics

### **Catalog Description**

(Also listed as BSCI 4266) Principles of classical and molecular genetic analysis: mutation and recombination, mapping, and the application of genetic methodology to the study of complex systems. Special emphasis on modern genomic approaches. No credit for students who have earned credit for 4266. [3]

## **BSCI5267 - Molecular Virology**

### **Title**

Molecular Virology

### **Catalog Description**

(Also listed as BSCI 4267) Application of genetics, biochemistry, molecular and cell biology to the study of viruses. Virus structure and classification, viral strategies of gene expression, genome replication, particle assembly. Host defenses against viruses. Comparisons with other infectious agents. Discussion of real-world outbreaks. No credit for students who have earned credit for 4267. [3]

## **BSCI5268 - Ecology and Evolution of Infectious Diseases**

### **Title**

Ecology and Evolution of Infectious Diseases

### **Catalog Description**

Principles of infectious disease ecology, epidemiology, and evolution. Host-parasite coevolution, parasite ecology, and the evolution of resistance, tolerance, and pathogen virulence in humans, other animals, and plants. Experimental and mathematical approaches. Serves as repeat credit for students who have earned credit for BSCI 5890-04 offered fall 2023 or fall 2022. [3]

## **BSCI5270 - Statistical Methods in Biology**

### **Title**

Statistical Methods in Biology

### **Catalog Description**

(Also listed as BSCI 3270) An introduction to statistical methods used in the analysis of biological experiments, including the application of computer software packages. Emphasis on testing of hypotheses and experimental design. Topics include descriptive statistics, analysis of variance, regression, correlation, contingency analysis, and the testing of methods for sampling natural populations. No credit for students who have earned credit for 3270. [3]



## **BSCI5271 - Programming for Biologists**

### **Title**

Programming for Biologists

### **Catalog Description**

Hands-on analysis of rich biological datasets using MATLAB. Development of programming skills applied to diverse research and analysis contexts within biology. Appropriate for beginner and advanced programmers. Serves as repeat credit for students who earned credit for BSCI 5890 section 03 offered Fall 2023 or BSCI 5890 section 04 offered Spring 2024. [3]

## **BSCI5272 - Genome Science**

### **Title**

Genome Science

### **Catalog Description**

(Also listed as BSCI 3272) Aims and importance of the science. Retrieval of genome data from public databases; experimental and computational methods used in analysis of genome data and their annotation. Functional aspects of genomics, transcriptomics, and proteomics; use of phylogenetics and population genomics to infer evolutionary relationships and mechanisms of genome evolution. No credit for students who have earned credit for 3272. [3]

## **BSCI5275 - Molecular Biology**

### **Title**

Molecular Biology

### **Catalog Description**

Mechanisms underlying the maintenance and expression of our genomes. DNA replication, DNA repair, transcription, and RNA metabolism. [3]

## **BSCI5285 - Membrane Biochemistry**

### **Title**

Membrane Biochemistry

### **Catalog Description**

Molecular mechanisms and interactions of biological molecules in membrane biochemistry and maintenance of cellular homeostasis. Membrane transport and trafficking; lipids; signaling; protein translocation and quality control. [3] (MNS)

## **BSCI5520 - Biochemistry**

### **Title**

Biochemistry

### **Catalog Description**

Structures and mechanisms of action of biological molecules, proteins, nucleic acids, lipids, and polysaccharides. Enzymology. Carbohydrate metabolism. [3]

### **BSCI5820 - Paleoeological Methods**

#### **Title**

Paleoeological Methods

#### **Catalog Description**

Tools used to interpret past environments and climates, including plant microfossils, pollen and phytoliths, vertebrate morphology, and dental microwear and mesowear. Geochemical tools such as stable isotopes and rare earth elements. Integrating methods for paleontological and anthropological studies, including the use of databases and meta-analyses. Readings from primary sources. [3]

### **BSCI5890 - Special Topics in Biological Sciences**

#### **Title**

Special Topics in Biological Sciences

#### **Catalog Description**

(Also listed as BSCI 3890) Topics vary. May be repeated for credit more than once by permission of the director of undergraduate studies. Students may enroll in more than one section of this course each semester. Prerequisite: 1511. [3]

### **BSCI6210 - On the Origin of Ideas in Biology**

#### **Title**

On the Origin of Ideas in Biology

#### **Catalog Description**

Literature-guided study of pioneering research in biological sciences. Principles of evolution, ecology and organismal biology, genome architecture and information flow, cell organization, protein structure and function, and neurobiology and behavior. [4]

### **BSCI6320 - Graduate Seminar in Biological Sciences**

#### **Title**

Graduate Seminar in Biological Sciences

#### **Catalog Description**

May be repeated for credit more than once. Students may enroll in more than one section of this course each semester. [1]

### **BSCI6330 - Pedagogical Principles in Biological Sciences**

#### **Title**

Pedagogical Principles in Biological Sciences

#### **Catalog Description**

Theory and practice of inclusive science teaching, drawing from primary and secondary literature. Evidence-based practices that promote learning, strategies to adapt practice to pedagogical context and to the needs of different learners. Pedagogical practices that foster inclusion and equity. [1]

### **BSCI6332 - Seminar in Biological Rhythms**

#### **Title**

Seminar in Biological Rhythms

#### **Catalog Description**

May be repeated for credit more than once. Students may enroll in more than one section of this course each semester. [1-2]

### **BSCI6336 - Seminar in Ecology and Evolutionary Biology**

#### **Title**

Seminar in Ecology and Evolutionary Biology

#### **Catalog Description**

May be repeated for credit more than once. Students may enroll in more than one section of this course each semester. [1-2]

### **BSCI6341 - Focal Topics in Molecular Biology**

#### **Title**

Focal Topics in Molecular Biology

#### **Catalog Description**

In-depth analysis of three to four research areas in molecular and cell biology taught by experts in each subdiscipline through lectures and discussions of papers from the current literature. Prerequisite: IGP 8001 or permission of instructor. [3]

### **BSCI6384 - The Brain and Behavior**

#### **Title**

The Brain and Behavior

#### **Catalog Description**

Brain and Behavior provides a basic understanding of the human central nervous system and human behavior. The format includes lectures, lab exercises, small-group discussions, and patient case presentations. Brain and Behavior integrates three areas of medical science: (1) neuroanatomy, physiology, and biochemistry; (2) psychopathology and systems neuroscience; and (3) pathology, pharmacology, and radiology. Prerequisites: MSTP students only. [1]

### **BSCI6385 - Advanced Reading in Biological Sciences**

#### **Title**

Advanced Reading in Biological Sciences

#### **Catalog Description**

Specialized topics under the guidance of a member of the department's faculty. Open to qualified graduate students only. Admission to course by arrangement. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

### **BSCI7390 - Special Topics and Advanced Techniques in Biological Sciences**

#### **Title**

Special Topics and Advanced Techniques in Biological Sciences

#### **Catalog Description**

Specialized laboratory experiments, open to a limited number of properly qualified students. Admission to course, hours, and credit by arrangement. May be repeated for credit more than once. Students may enroll in more than one section of this course each semester. [1-4]

### **BSCI7999 - Master's Thesis Research**

#### **Title**

Master's Thesis Research

#### **Catalog Description**

[0-12]

### **BSCI8999 - Non-candidate Research**

#### **Title**

Non-candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

### **BSCI9999 - Ph.D. Dissertation Research**

#### **Title**

Ph.D. Dissertation Research

#### **Catalog Description**

[0-12]

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## **Biomedical Engineering**

### **BME5100 - Lasers in Surgery and Medicine**

#### **Title**

Lasers in Surgery and Medicine

#### **Catalog Description**

(Also listed as BME 4100) Fundamentals of lasers, light-tissue interaction, problem-based design of optical instrumentation. Applications in laser surgery, disease detection, and surgical guidance. Includes hands-on experiences. No credit for students who have earned credit for 4100. FALL. [3]

**BME5130 - Systems Physiology****Title**

Systems Physiology

**Catalog Description**

(Also listed as BME 3100) Quantitative physiology from the engineering point of view. Descriptive physiology of several organ systems (nervous, musculoskeletal, cardiovascular, gastrointestinal). Mathematical modeling and computer simulation of organ systems and physiologic control mechanisms. No credit for students who have earned credit for 3100. FALL. [3]

**BME5131 - Systems Physiology****Title**

Systems Physiology

**Catalog Description**

(Also listed as BME 2302) Quantitative physiology from the engineering point of view. Descriptive physiology of several organ systems (blood, immune, endocrine, respiratory, renal, reproductive). Mathematical modeling and computer simulation of organ systems and physiologic control mechanisms. No credit for students who have earned credit for 2002, 2302, or 3101. SPRING. [3]

**BME5200 - Principles and Applications of BioMicroElectroMechanical Systems (BioMEMS)****Title**

Principles and Applications of BioMicroElectroMechanical Systems (BioMEMS)

**Catalog Description**

(Also listed as BME 4200) The principles, design, fabrication and application of micro- and nano-devices to instrument and control biological molecules, living cells, and small organisms, with a strong emphasis on development of microfabricated systems and micro- and nano-biosensors. Students will lead discussions from the research literature. Graduate students will prepare a research proposal or fabricate a functioning BioMEMS device. No credit for students who have earned credit for 4200. FALL. [3]

**BME5400 - Foundations of Medical Imaging****Title**

Foundations of Medical Imaging

**Catalog Description**

(Also listed as BME 4400) Physics and engineering of image formation by different modalities used for medical applications. Concepts common to different imaging modalities and limits of physical phenomena. Mathematical concepts of image formation and analysis; techniques for recording images using ionizing radiation (including CT), ultrasound, magnetic resonance, and nuclear (including SPECT and PET). Methods of evaluating image quality. No credit for students who have earned credit for 4400. SPRING. [3]

**BME5500 - Nanobiotechnology****Title**

Nanobiotechnology

**Catalog Description**

(Also listed as BME 4500) Synthesis and characterization of nanostructured materials for use in living systems. Clinical applications of nanoscale biosensors. Methods for single molecule detection in biological specimens. Quantitative structure/function assessment of nanostructures in living systems. No credit for students who have earned credit for 4500. SPRING. [3]

**BME5884 - Internship****Title**

Internship

**Catalog Description**

Internship working in a professional setting. Departmental approval required. FALL, SPRING, SUMMER. [0]

**BME5950 - Design of Biomedical Engineering Devices and Systems I****Title**

Design of Biomedical Engineering Devices and Systems I

**Catalog Description**

(Also listed as BME 4950) Integration of the engineering and life science backgrounds of senior biomedical engineering students through the presentation of design principles for medical devices and systems. Design principles and case examples for biomedical electronics, mechanical, chemical, and computing systems are presented. A full-semester design project is required. Evaluation is conducted through periodic oral and written presentations, and through a final written and poster report. No credit for students who have earned credit for 4950. [2]

**BME5951 - Design of Biomedical Engineering Devices and Systems II****Title**

Design of Biomedical Engineering Devices and Systems II

**Catalog Description**

(Also listed as BME 4951) Integration of the engineering and life science backgrounds of senior biomedical engineering students through the presentation of design principles for medical devices and systems. Design principles and case examples for biomedical electronics, mechanical, chemical, and computing systems are presented. A full-semester design project is required. Evaluation is conducted through periodic oral and written presentations, and through a final written and poster report. No credit for students who have earned credit for 4951. [3]

**BME6110 - Research and Professional Development in Biomedical Engineering****Title**

Research and Professional Development in Biomedical Engineering

**Catalog Description**

Database search strategies, interpreting engineering and scientific literature, communication skills, engineering design, proposal writing, preparation of engineering publications, technology transfer/intellectual property, engineering laboratory documentation, regulatory oversight, ethics, funding. FALL. [3].

**BME6301 - Engineering in Surgery and Intervention: Provocative Questions****Title**

Engineering in Surgery and Intervention: Provocative Questions

**Catalog Description**

Explores engineering and clinical aspects of treating disease or disorders by clinically-driven provocative questions. Surgical/Interventional mechanics, locoregional therapies such as convection-enhanced delivery, neuromodulation, and ablation. Image-guided therapies, and role of discovery and design in context of treatment. SPRING. [3].

## **BME6302 - Engineering in Surgery and Intervention: Clinical Interactions**

### **Title**

Engineering in Surgery and Intervention: Clinical Interactions

### **Catalog Description**

Literature review coupled with clinical immersion experience. Literature review centers on clinical translation of engineering research in surgical/interventional applications. Clinical immersion involves observing surgical/interventional procedures and attending clinical conferences. Prerequisite: Permission of Instructor. FALL. [3].

## **BME7110 - Laser-Tissue Interaction and Therapeutic Use of Lasers**

### **Title**

Laser-Tissue Interaction and Therapeutic Use of Lasers

### **Catalog Description**

Optical and thermal aspects and models of the interaction between laser/light and biological tissue as it is used for therapeutic applications in medicine and biology. Issues and objectives in therapeutic and surgical applications of lasers, overview of state-of-the-art topics and current research. FALL. [3]

## **BME7120 - Optical Diagnosis: Principles and Applications**

### **Title**

Optical Diagnosis: Principles and Applications

### **Catalog Description**

Applications of light and tissue optical properties for the diagnosis of tissue pathology. Basic scientific and engineering principles for developing techniques and devices that use light to probe cells and tissues. Recent applications of different optical diagnostic techniques. SPRING. [3]

## **BME7140 - Fundamentals of Optics**

### **Title**

Fundamentals of Optics

### **Catalog Description**

Principles of optics. Ray, wave, and Fourier propagation analysis of optical elements and systems. Gaussian beams, interference, diffraction, polarization, and coherence. Overview of state-of-the-art imaging technologies including holography, OCT, microscopy and super-resolution. Imaging and aberration theory with ray-tracing simulation software. [3]

## **BME7310 - Advanced Computational Modeling and Analysis in Biomedical Engineering**

### **Title**

Advanced Computational Modeling and Analysis in Biomedical Engineering

### **Catalog Description**

Survey of current topics within biomedical modeling: biotransport, biomechanics, tumor and virus growth dynamics, model-based medical imaging techniques, etc. Mathematical development and analysis of biomedical simulations using advanced numerical techniques for the solution of ordinary and partial differential equations. Emphasis will be on graduate research related topics. SPRING. [3]

## **BME7410 - Quantitative Methods in Biomedical Engineering**

### **Title**

Quantitative Methods in Biomedical Engineering

### **Catalog Description**

Mathematics, quantitative analysis, and computational methods for biomedical engineering applications. Topics include applied probability and statistics, signal analysis and experiment design, linear systems, Fourier transforms, and numerical modeling and analysis. FALL. [3]

## **BME7413 - Advanced Biomechanics**

### **Title**

Advanced Biomechanics

### **Catalog Description**

Application of advanced concepts in statics, dynamics, continuum mechanics, and strength of materials to biological systems. Topics include measurement of mechanical properties of biological materials; rheological properties of blood; mechanics of cells, bone, skeletal muscle, and soft tissue; normal and abnormal dynamics of human movement; mechanics of articular joint movement; pulmonary mechanics; cardiac mechanics; arterial mechanics; mechanics of veins and collapsible vessels; and mechanics of flow in the microcirculation. Prerequisite: BME 2100, BME 3000 or equivalent. [3]

## **BME7419 - Engineering Models of Cellular Phenomena**

### **Title**

Engineering Models of Cellular Phenomena

### **Catalog Description**

Application of engineering methods to model and quantify aspects of cell physiology. Topics include receptor mediated cell processes, cell-cell signaling, cooperative barrier behavior, cell structural components, and cell motility. SPRING. [3] (Offered alternate years)

## **BME7420 - Magnetic Resonance Imaging Methods**

### **Title**

Magnetic Resonance Imaging Methods

### **Catalog Description**

MR techniques to image tissue for clinical evaluation and research. RF pulses, k-space trajectories, chemical shift, motion, flow, and relaxation. Derivation of signal equations for pulse sequence design and analysis. Course includes hands-on experimental studies. SPRING. [3]

## **BME7425 - Physical Measurements on Biological Systems**

### **Title**

Physical Measurements on Biological Systems

### **Catalog Description**

A survey of the state-of-the-art in quantitative physical measurement techniques applied to cellular or molecular physiology. Topics include the basis for generation, measurement, and control of the transmembrane potential; electrochemical instrumentation; optical spectroscopy and imaging; x-ray diffraction for determination of macromolecular structure; magnetic resonance spectroscopy and imaging. Prerequisite: PHYS 2250. SPRING. [3]



### **BME7430 - Cancer Imaging**

#### **Title**

Cancer Imaging

#### **Catalog Description**

Applications of noninvasive, in vivo imaging (i.e., MRI, optical, CT, SPECT, PET, and ultrasound) to cancer biology. Emphasis on assessing the response of tumors to treatment using emerging and quantitative imaging techniques. Prerequisites: BME 4400 or PHYS 2805. SPRING. (Offered alternate years) [3]

### **BME7440 - Neuroimaging**

#### **Title**

Neuroimaging

#### **Catalog Description**

Applications of noninvasive imaging techniques including MRI, fMRI, optical, EEG, and PET to the study of neural systems. Emphasis on the human brain, with a focus on current scientific literature. Prerequisites: BME 4400 or PHYS 2805. FALL. (Offered alternate years) [3]

### **BME7450 - Advanced Quantitative and Functional Imaging**

#### **Title**

Advanced Quantitative and Functional Imaging

#### **Catalog Description**

Analysis of non-invasive imaging techniques to assess the structure and function of tissues in the body. Applications of computed tomography, positron emission tomography, ultrasound, and magnetic resonance imaging to tissue characterization, including measurement of tissue volume, microstructure, organ perfusion, blood flow, brain function, and receptor density. Prerequisite: working knowledge of MATLAB. FALL. [3]

### **BME7473 - Design of Medical Products, Processes, and Services**

#### **Title**

Design of Medical Products, Processes, and Services

#### **Catalog Description**

Medical design projects involving teams of graduate level engineering and management students. Projects are solicited from industry or universities and are undertaken from the initial phase of a design request to the end product, prototype, plan, or feasibility analysis. Prerequisite: BME 4950 or equivalent. SPRING. [3]

### **BME7500 - Independent Study in Biomedical Engineering**

#### **Title**

Independent Study in Biomedical Engineering

#### **Catalog Description**

Study of advanced biomedical engineering topics not regularly offered in the curriculum. Consent of instructor is required. FALL, SPRING. [3]

**BME7530 - Advanced Synthetic Biology and Cell Design**

**Title**

Advanced Synthetic Biology and Cell Design

**Catalog Description**

Advanced principles used to interrogate and encode cell behaviors. Exploration of modules from diverse domains of life that can be assembled for bioengineering applications, including adoptive cell therapy and regenerative medicine. SPRING. [3]

**BME7899 - Master of Engineering Project**

**Title**

Master of Engineering Project

**Catalog Description**

Master of Engineering Project [0-6]

**BME7999 - Master's Thesis Research**

**Title**

Master's Thesis Research

**Catalog Description**

Master's Thesis Research

**BME8900 - Special Topics**

**Title**

Special Topics

**Catalog Description**

[1-3]

**BME8901 - Special Topics**

**Title**

Special Topics

**Catalog Description**

[1-3]

**BME8902 - Special Topics**

**Title**

Special Topics

**Catalog Description**

[1-3]

**BME8903 - Special Topics**

**Title**

Special Topics

**Catalog Description**

[1-3]

**BME8991 - Biomedical Research Seminar**

**Title**

Biomedical Research Seminar

**Catalog Description**

[1]

**BME8992 - Biomedical Research Seminar**

**Title**

Biomedical Research Seminar

**Catalog Description**

[1]

**BME8993 - Biomedical Research Seminar**

**Title**

Biomedical Research Seminar

**Catalog Description**

[1]

**BME8994 - Biomedical Research Seminar**

**Title**

Biomedical Research Seminar

**Catalog Description**

[1]

**BME8999 - Non-Candidate Research**

**Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

## **BME9999 - Ph.D. Dissertation Research**

### **Title**

Ph.D. Dissertation Research

### **Catalog Description**

[0-12]

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## **Biomedical Informatics (GS)**

### **BMIF6101 - Biomedical Informatics Foundations and Methods I**

#### **Title**

Biomedical Informatics Foundations and Methods I

#### **Catalog Description**

This two-semester introductory course examines the unique characteristics of clinical and biomedical data, the context of their production and use, and the methods for representation and transformation of health data, information, and knowledge to improve health care. Students will be introduced to concepts, theories, and methods underlying contemporary and emerging biomedical informatics applications, including knowledge discovery, information retrieval, medical decision making, evaluation of evidence, knowledge representation, human factors, and qualitative methods. Students will also get exposure to the history of biomedical informatics and principles of ethical and equitable computing, as well as develop foundational concepts of analytical thinking and computation that are instrumental in solving challenging problems in biomedical informatics. PREREQ: Enrollment in the biomedical informatics graduate program or permission of the instructor; FALL; Anker

### **BMIF6102 - Biomedical Informatics Foundations and Methods II**

#### **Title**

Biomedical Informatics Foundations and Methods II

#### **Catalog Description**

This two-semester introductory course examines the unique characteristics of clinical and biomedical data, the context of their production and use, and the methods for representation and transformation of health data, information, and knowledge to improve health care. Students will be introduced to concepts, theories, and methods underlying contemporary and emerging biomedical informatics applications, including knowledge discovery, information retrieval, medical decision making, evaluation of evidence, knowledge representation, human factors, and qualitative methods. Students will also get exposure to the history of biomedical informatics and principles of ethical and equitable computing, as well as develop foundational concepts of analytical thinking and computation that are instrumental in solving challenging problems in biomedical informatics. PREREQ: Enrollment in the biomedical informatics graduate program or permission of the instructor; FALL; Instructor: TBD

### **BMIF6200 - RCR for Biomedical Informatics**

#### **Title**

RCR for Biomedical Informatics

#### **Catalog Description**

Part one of the two-part RCR Course. The course will address key topics related to Responsible Conduct of Research (RCR) in biomedical informatics research such as human subjects research, responsible and ethical data use, and ethical issues in biomedical informatics research. Sessions will be held throughout the year as part of the Research Colloquium Series. FALL [0] Unertl

**BMIF6201 - RCR for Biomedical Informatics****Title**

RCR for Biomedical Informatics

**Catalog Description**

Part two of the required Responsible Conduct in Research (RCR) series. The course will address key topics related to Responsible Conduct of Research (RCR) in biomedical informatics research such as human subjects research, responsible and ethical data use, and ethical issues in biomedical informatics research. Sessions will be held throughout the year as part of the Research Colloquium Series. SPRING [0] Unertl

**BMIF6310 - Foundations Of Bioinformatics****Title**

Foundations Of Bioinformatics

**Catalog Description**

This survey course introduces students to the experimental context and implementation of key algorithms in bioinformatics. The class begins with a review of basic biochemistry and molecular biology. The group will then focus on algorithms for matching and aligning biological sequences, given the context of molecular evolution. The emphasis will move from comparing sequences to the systems developed to enable high-throughput DNA sequencing, genome assembly, and gene annotation. Gene products will be the next focus as students consider the algorithms supporting proteomic mass spectrometry and protein structure inference and prediction. The informatics associated with transcriptional microarrays for genome-wide association studies will follow. Finally, the class will examine biological networks, including genetic regulatory networks, gene ontologies, and data integration. Formal training in software development is helpful but not required. Students will write and present individual projects. Undergraduates need the permission of the instructor to enroll. FALL. [3] Guo.

**BMIF6321 - Scientific Communication****Title**

Scientific Communication

**Catalog Description**

The course will enhance students' skills in written and oral scientific communication. An introductory segment covers categories of scientific writing, the peer review process, and ethical issues in research communication. Through a two-semester sequence, it provides direct, hands-on experience in writing papers, abstracts, and grant proposals; critiquing and copy editing; and preparing and giving presentations for scientific meetings. FALL [1] Rosenbloom, Davis.

**BMIF6322 - Scientific Communication****Title**

Scientific Communication

**Catalog Description**

The course will enhance students' skills in written and oral scientific communication. An introductory segment covers categories of scientific writing, the peer review process, and ethical issues in research communication. Through a two-semester sequence, it provides direct, hands-on experience in writing papers, abstracts, and grant proposals; critiquing and copy editing; and preparing and giving presentations for scientific meetings. SPRING. [1] Rosenbloom, Davis.

**BMIF6331 - Journal Club and Research in Progress**

**Title**

Journal Club and Research in Progress

**Catalog Description**

The class meets weekly and is a seminar course that involves two revolving formats: journal club presentations and student research in progress presentations. For Biomedical Informatics graduate students only, usually taken in the second year of the program. FALL [1] Reese

**BMIF6332 - Journal Club and Research in Progress**

**Title**

Journal Club and Research in Progress

**Catalog Description**

The class meets weekly and is a seminar course that involves two revolving formats: journal club presentations and student research in progress presentations. For Biomedical Informatics graduate students only, usually taken in the second year of the program. SPRING [1] Reese

**BMIF6341 - Research Rotation In Biomedical Informatics**

**Title**

Research Rotation In Biomedical Informatics

**Catalog Description**

Students will perform research under the direction of a faculty adviser. FALL. [1] Staff.

**BMIF6342 - Research Rotation In Biomedical Informatics**

**Title**

Research Rotation In Biomedical Informatics

**Catalog Description**

Students will perform research under the direction of a faculty adviser. SPRING. [1] Staff.

**BMIF6390 - Special Topics**

**Title**

Special Topics

**Catalog Description**

Selected topics in Biomedical Informatics. [3]

## **BMIF7310 - Clinical and Transitional Research Informatics**

### **Title**

Clinical and Transitional Research Informatics

### **Catalog Description**

Informatics underpins every aspect of modern clinical and translational science. Good clinical and translational data management can have as much of an effect on the successful conduct of research as a sound statistical analysis plan or a well written clinical protocol. Additionally, recent advances in data sharing and cloud computing resources have increased the availability of large data for discovery, hypothesis generation, and generalization of research results. In this survey course, students will learn about the design principles and applications of informatics tools for every step for clinical research process, including regulatory submission, recruitment, consent, data collection, privacy protection, data cleaning, and data sharing. They will gain hands-on experience in using these tools and the All-of-us Researcher Workbench with class assignments and projects. Students must have basic proficiency in R or Python. FALL [2] Cheng

## **BMIF7320 - Healthcare System and Informatics**

### **Title**

Healthcare System and Informatics

### **Catalog Description**

The purpose of this course is for students to understand the organizational world in which they will spend most of their professional lives. A better understanding will lead to strategies to build partnerships with physicians, researchers, hospitals, and academic organizations. In turn, better understanding will lead to working more closely as a team in planning future directions and implementing technological programs and changes. This course provides an overview of theoretical concepts as well as the practical tools for the student to understand and work effectively with two major topic areas: (1) understanding the health care environment; and (2) understanding organizational informatics, including the implementation of informatics systems and the concepts of behavioral change management. Prerequisite: BMIF 6101 is a required prerequisite to this course. SPRING. [3] TBD.

## **BMIF7335 - Clinical Observations**

### **Title**

Clinical Observations

### **Catalog Description**

This course is designed to give graduate students with non-clinical experience exposure to the clinical environment and to understand more about the sources of the data they are analyzing. Only open to students in the Biomedical Informatics graduate program. FALL [3] Unertl

## **BMIF7340 - Clinical Informatics**

### **Title**

Clinical Informatics

### **Catalog Description**

Clinical informatics is the subdiscipline of biomedical informatics focused on clinical applications, particularly clinical information systems such as electronic health records. Topics covered include inpatient, outpatient and departmental information systems; clinical decision support; terminology and data standards; quality and safety; patient computing; population health; and innovation, governance, and leadership. The course broadly explores how information systems and informatics principles are applied in clinical settings and is intended to be useful to students interested in these application areas, including students with a clinical background or those new to the clinical environment. Prerequisite: BMIF 6101 or permission of instructors. SPRING. [3] Wright, McCoy

## **BMIF7350 - Technology and Society**

### **Title**

Technology and Society

### **Catalog Description**

This course engages students in discovering relationships among individuals, institutions, and technologies, and how those relationships evolved in specific cultural contexts. Students and instructors will explore this topic in four modules: 1) understanding health care actors and technologies; 2) institutions and other infrastructures, including scientific disciplines, government, and information infrastructures; 3) principles of ethics and their application in biomedical informatics research and practice; and 4) integration of the concepts. The course will be conducted as a seminar, in which students and instructors will discuss assigned readings and films. Each student will present a final case to the group. FALL [3] Novak

## **BMIF7370 - Evaluation Methods In Biomedical Informatics**

### **Title**

Evaluation Methods In Biomedical Informatics

### **Catalog Description**

Students are introduced to health information technology evaluation, with exposure to study design, including sampling, appropriate use of controls; data collection, including human subjects research considerations; analysis, including testing for statistical significance, definitions of sensitivity and specificity, ROC plots; and reporting of results. Quantitative and qualitative methods will be covered, as well as methods and issues specific to health care settings. Prerequisite: BMIF 6101 or instructor permission is a required prerequisite to this course. FALL. [3] Peterson, Unertl.

## **BMIF7380 - Data Privacy In Biomedicine**

### **Title**

Data Privacy In Biomedicine

### **Catalog Description**

This course introduces students to concepts for evaluating and constructing technologies that protect personal privacy in data collected for primary care and biomedical research. Material in this course touches on topics in biomedical knowledge modeling, data mining, policy design, and law. Prerequisite: students are expected to be proficient in writing basic software programs, although no specific programming language is required. SPRING. [3] Malin.

## **BMIF7390 - Special Topics: Error and Safety Critical Systems**

### **Title**

Special Topics: Error and Safety Critical Systems

### **Catalog Description**

This case study based course will look at errors in safety critical systems, including healthcare and aviation. It will explore errors from multiple perspectives, specifically computer science and systems engineering. SPRING [3] Anders.

## **BMIF7391 - Special Topics Seminar In Biomedical Informatics**

### **Title**

Special Topics Seminar In Biomedical Informatics

### **Catalog Description**

This course is designed for faculty to offer small groups of students a study course on a topic of mutual interest and concern in the faculty member's area of expertise.



**BMIF7395 - Directed Research/Independent Study**

**Title**

Directed Research/Independent Study

**Catalog Description**

Students will work under close supervision of a specific faculty member on an ongoing research problem. Depending on the specific project, students will learn aspects of study design, research methods, data collection and analysis, research manuscript writing, and human factors engineering. Completion of Course Plan and approval of the Director of Graduate Studies is required. SPRING/FALL. [1-3] Staff.

**BMIF7400 - Teaching Practicum**

**Title**

Teaching Practicum

**Catalog Description**

Students will complete 30 hours of teaching practicum experience for a Pass/Fail grade. FALL [0] Unertl

**BMIF7401 - Teaching Practicum**

**Title**

Teaching Practicum

**Catalog Description**

Students will complete 30 hours of teaching practicum experience for a Pass/Fail grade. SPRING [0] Unertl

**BMIF7999 - Master's Thesis Research**

**Title**

Master's Thesis Research

**Catalog Description**

Master's Thesis Research

**BMIF8999 - Non-Candidate Research**

**Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

**BMIF9999 - Ph.D. Dissertation Research**

**Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

### **BMS7001 - Scientific Communication in the Biomedical Sciences**

#### **Title**

Scientific Communication in the Biomedical Sciences

#### **Catalog Description**

Weekly reading assignments will be accompanied by writing assignments in which students will communicate their own life lessons in the context of assigned readings. A goal will be for each student to define personal motivation to pursue careers in the biomedical sciences. [1]

### **BMS7002 - Critical Thinking in the Biomedical Sciences**

#### **Title**

Critical Thinking in the Biomedical Sciences

#### **Catalog Description**

Reading and critical analysis of topics that comprise the MCAT exam. [3]

### **BMS7006 - BMS Responsible Conduct in Research**

#### **Title**

BMS Responsible Conduct in Research

#### **Catalog Description**

[0]

### **BMS8002 - Narrative-based Healthcare**

#### **Title**

Narrative-based Healthcare

#### **Catalog Description**

Full realization of narrative medicine crosses the disciplines of medicine and the humanities to include issues of bioethics, cultural competency, and social determinants of health. To better understand patient relationships, students will engage in readings and discussion focusing on provider-patient communications. [3]

### **BMS8003 - Service Learning in the Biomedical Sciences**

#### **Title**

Service Learning in the Biomedical Sciences

#### **Catalog Description**

This course structures opportunities for students in the MS Program in the Biomedical Sciences to participate in service/learning experiences in the Nashville area. Students will arrange activities that complement medical school applications. The course will be one credit hour, offered every semester. At the end of each semester, students will write a paper describing their experiences. [1]

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## **Biostatistics**

## **BIOS6301 - Introduction To Statistical Computing**

### **Title**

Introduction To Statistical Computing

### **Catalog Description**

This course is designed for students who seek to develop skills in statistical computing. Students learn how to use R software for data management, data tabulation and summarization, data presentation, and report . Topics include organization and documentation of data, input and export of data sets, methods of cleaning data, tabulation and graphing of data, programming capabilities, and an introduction to data simulations and bootstrapping. Students are also introduced to markdown, knitr, and Quarto for report writing. Prerequisites: None. FALL. [2] Beck.

## **BIOS6306 - Introduction to Study Design**

### **Title**

Introduction to Study Design

### **Catalog Description**

This course introduces principles of study design in biomedical and health sciences. The designs considered include case series, ecologic studies, matched and unmatched case-control studies, observational cohort studies, historically controlled clinical trials, screening trials, and randomized clinical trials. The goal is to introduce critical design challenges that ultimately impact the ability to generate statistical inferences from observed samples to the target populations. Concepts such as internal and external validity, bias identification and control, confounding, and effect modification are discussed and illustrated with examples from the medical literature. The dependence of traditional univariate measures of statistical association (absolute risk, relative risk, odds ratios) on critical design elements is highlighted. Statistical evaluation of diagnostic tests is also introduced along with a brief introduction to causal inference. Prerequisites: None.FALL [3] Dupont.

## **BIOS6311 - Principles Of Modern Biostatistics**

### **Title**

Principles Of Modern Biostatistics

### **Catalog Description**

This course is the first in a two-course series on modern biostatistical reasoning and evaluation of data analysis methods. Students learn the statistical principles that govern the analysis of data in the health sciences and biomedical research. Traditional probabilistic concepts and modern computational techniques are integrated with applied examples from biomedical and health sciences. Topics include axioms of probability, probability distributions and their moments, properties of estimators, law of large numbers, central limit theorem, theory of confidence intervals and hypothesis testing (for one-sample and two-sample problems), paradigms of statistical inference (frequentist, Bayesian, likelihood), introduction to non-parametric techniques, bootstrapping and simulation, sample size projections, and basic study design issues. Prerequisites: Familiarity with calculus and probability concepts such as double integrals, partial derivatives, expectations, variances, cumulative density functions, and quantile functions is expected. Fall [3]. Vandekar.

## **BIOS6311L - Principles Of Modern Biostatistics Lab**

### **Title**

Principles Of Modern Biostatistics Lab

### **Catalog Description**

This is a laboratory and discussion session for BIOS 6311 (Principles of Modern Biostatistics). Students review relevant theory and work on applications as a group. Computing solutions and extensions using R software are emphasized. Students are required to take BIOS 6311 [3] concurrently. Fall [1]. Vandekar.

## **BIOS6312 - Modern Regression Analysis**

### **Title**

Modern Regression Analysis

### **Catalog Description**

This course is the second in a two-course series on modern biostatistical reasoning and evaluation of data analysis methods. Students learn modern regression analysis and model-building techniques from an applied perspective. Theoretical principles are demonstrated with applied examples from biomedical and health sciences. Topics include regression modeling for continuous outcomes, including simple linear regression, multiple linear regression, and analysis of variance with one-way, two-way, three-way, and analysis of covariance models. There is a brief introduction to regression models for binary outcomes (logistic regression), ordinal outcomes (proportional odds models), count outcomes (Poisson and negative binomial models), and time-to-event outcomes (Kaplan-Meier curves, Cox proportional hazards models). Incorporated into the presentation of these models are topics such as regression diagnostics, non-parametric regression, splines, data-reduction techniques, model validation, parametric bootstrapping, and a brief introduction to methods for handling missing data. Prerequisites: BIOS 6311. Spring [3]. Slaughter.

## **BIOS6312L - Modern Regression Analysis Lab**

### **Title**

Modern Regression Analysis Lab

### **Catalog Description**

This is a laboratory and discussion session for BIOS 6312 (Modern Regression Analysis). Students review relevant theory and work on applications as a group. Computing solutions and extensions using R software are emphasized. Students are required to take BIOS 6312 [3] concurrently. Spring [1]. Slaughter.

## **BIOS6321 - Clinical Trials and Experimental Design**

### **Title**

Clinical Trials and Experimental Design

### **Catalog Description**

This course is an introduction to statistical aspects of the design, monitoring, and analysis of experiments. Emphasis is on studies of human subjects (i.e., clinical trials). Topics include study designs, randomization and balance, selection of estimands and endpoints, sample size projections, data collection and quality control, data monitoring and interim analysis, principles of and issues in the analysis of trial data, and interpretation and reporting of results. Prerequisites: BIOS 6301 or equivalent, BIOS 6311 or equivalent. Spring [3]. Samuels.

## **BIOS6341 - Fundamentals of Probability**

### **Title**

Fundamentals of Probability

### **Catalog Description**

This course is the first in a two-course series on probability and statistical inference that introduces and explores the probabilistic framework underlying statistical theory. Students learn probability theory—the formal language of uncertainty—and its application to everyday statistical concepts and analysis methods. Topics include probability axioms, probability and sample space, events and random variables, transformation of random variables, probability inequalities, independence, discrete and continuous distributions, expectations and variances, conditional expectation, moment generating functions, random vectors, convergence concepts (in probability, in distribution, and almost surely), weak and strong law of large numbers, central limit theorem, delta method, order statistics, and exponential family. Prerequisites: Familiarity with infinite series, double integrals, integration by parts, and partial derivatives is expected. Fall [3]. Hackstadt.

### **BIOS6341L - Fundamentals of Probability Lab**

#### **Title**

Fundamentals of Probability Lab

#### **Catalog Description**

This is a laboratory and discussion session for BIOS 6341 (Fundamentals of Probability). Students review relevant theory and work on applications as a group. Collaborative work and problem solving as a group are emphasized. Students validate analytical solutions and explore limit theorems using R software. Students are required to take BIOS 6341 [3] concurrently. Fall [1]. Hackstadt.

### **BIOS6342 - Contemporary Statistical Inference**

#### **Title**

Contemporary Statistical Inference

#### **Catalog Description**

This course is the second in a two-course series on probability and statistical inference that introduces and explores the fundamental inferential framework for parameter estimation, testing hypotheses, and interval estimation. Students learn classical methods of inference (hypothesis testing), and paradigms of statistical inference (frequentist, Bayesian, likelihood) and their surrounding controversies. Topics include sufficiency, minimal sufficiency, exponential family, ancillarity, completeness, conditionality principle, Fisher's information, Cramer-Rao inequality, hypothesis testing (likelihood ratio test, most powerful test, optimality, Neyman-Pearson lemma, inversion of test statistics), likelihood principle, law of likelihood, Bayesian posterior estimation, interval estimation (confidence intervals, support intervals, credible intervals), basic asymptotic and large sample theory, and maximum likelihood estimation. Prerequisites: BIOS 6341. Spring [3]. Johnson.

### **BIOS6342L - Contemporary Statistical Inference Lab**

#### **Title**

Contemporary Statistical Inference Lab

#### **Catalog Description**

This is a laboratory and discussion session for BIOS 6342 (Contemporary Statistical Inference). Students review relevant theory and work on applications as a group. Computing solutions and extensions using R software are emphasized. Students are required to take BIOS 6342 [3] concurrently. Spring [1]. Johnson.

### **BIOS7323 - Applied Survival Analysis**

#### **Title**

Applied Survival Analysis

#### **Catalog Description**

This course provides an applied introduction to methods for time-to-event data with censoring mechanisms. Topics include life tables, non-parametric approaches (Kaplan-Meier curves, log-rank test), semi-parametric approaches (Cox proportional hazards model), parametric approaches (Weibull, gamma), competing risks, and time-dependent covariates. Focus is on fitting the models and the relevance of those models for the biomedical application. Prerequisites: BIOS 6312 or equivalent. Fall [3]. Tao.

### **BIOS7323L - Applied Survival Analysis Lab**

#### **Title**

Applied Survival Analysis Lab

#### **Catalog Description**

This is a laboratory and discussion session for BIOS 7323 (Applied Survival Analysis). Students review relevant theory and work on applications as a group. Computing solutions and extensions using R software are emphasized. Students are required to take BIOS 7323 [3] concurrently. Fall [1]. Tao.

## **BIOS7330 - Regression Modeling Strategies**

### **Title**

Regression Modeling Strategies

### **Catalog Description**

This course presents strategies for, and a survey of current thinking on, building multivariable regression models primarily for the purpose of prediction, but also for estimation and inference. Topics include using regression splines to relax linearity assumptions, the perils of variable selection and over-fitting, where to spend degrees of freedom, shrinkage, imputation of missing data, data reduction, and interaction surfaces. There is also an emphasis placed on describing approaches for graphically understanding models and using resampling to estimate a model's likely performance on new data. Statistical methods related to binary logistic models, ordinal logistic models, and survival models are covered. Students will develop, validate, and graphically describe multivariable regression models. Prerequisites: BIOS 6312 or equivalent. Spring [3]. Schildcrout.

## **BIOS7345 - Advanced Regression Analysis I (Linear and General Linear Models)**

### **Title**

Advanced Regression Analysis I (Linear and General Linear Models)

### **Catalog Description**

This course is the first in a two-course series on advanced regression analysis that covers the underlying mechanics of linear and generalized linear models for independent data. Following a brief review of salient topics in linear algebra and multivariate normal theory, the first half of the course covers ordinary least squares in the cases of full rank and non-full rank design matrices, weighted least squares, optimality (the Gauss-Markov theorem), analysis of variance (ANOVA), hypothesis testing, confidence and prediction regions, model misspecification, diagnostics, and regularization. The second half of the course covers generalized linear models (e.g., binomial, Poisson, and gamma regression) from the likelihood and Z-estimation frameworks, overdispersion and quasi-likelihood, hypothesis testing, diagnostics, and negative binomial regression. As time permits, advanced topics will be covered such as matched pair designs, regression of nominal and ordinal outcomes, cumulative probability models, and receiver operating characteristic regression. Prerequisites: BIOS 6312 or equivalent, BIOS 6342 or equivalent. Fall [3]. Spieker.

## **BIOS7345L - Adv Regression Analysis I Lab**

### **Title**

Adv Regression Analysis I Lab

### **Catalog Description**

This is a laboratory and discussion section for BIOS 7345 (Advanced Regression Analysis I). Students review relevant theory and work on applications as a group. Computing solutions and extension using R software are emphasized. Students are required to take BIOS 7345 [3] concurrently. Fall [1]. Spieker.

## **BIOS7346 - Advanced Regression Analysis II (General Linear & Longitudinal Models)**

### **Title**

Advanced Regression Analysis II (General Linear & Longitudinal Models)

### **Catalog Description**

This course is the second in a two-course series on advanced regression analysis that extends linear and generalized linear models to the analysis of dependent (specifically, longitudinal) data. Parametric (generalized least squares, likelihood-based mixed-effects models) and semi-parametric (generalized estimating equations) regression-based methods are central to the course. Advanced topics include transition models, marginalized models, missing data, and joint models for longitudinal and survival data. Emphasis is placed on the theoretical framework for longitudinal data analysis, the statistical properties of longitudinal data analysis methods, and their development and application to modern biomedical research. Prerequisites: BIOS 7345. Spring [3]. French.

## **BIOS7346L - Advanced Regression Analysis II Lab**

### **Title**

Advanced Regression Analysis II Lab

### **Catalog Description**

This is a laboratory and discussion session for BIOS 7346 (Advanced Regression Analysis II), focusing on the illustrative application of longitudinal data analysis methods to biomedical research data using R software. Students are required to take BIOS 7346 [3] concurrently. Spring [1]. French.

## **BIOS7351 - Statistical Collaboration in Health Sciences I**

### **Title**

Statistical Collaboration in Health Sciences I

### **Catalog Description**

This course is the first in a two-course series on collaboration in statistical science. Students are exposed to a variety of challenges that arise in collaborative arrangements. The course's goal is to develop the knowledge, skills, attitude, and behavior necessary to interact with research and statistical collaborators in routine health science applications. The importance of understanding and learning the science underlying collaborations is emphasized. Students experience various biostatistics roles while collaborating with real investigators and projects. Students gain experience that builds interpersonal, communication, professionalism, leadership, teaching, and presentation and interviewing skills. Real-world issues and challenges are discussed. There will be special guest lectures on grants, career choices, and collaboration satisfaction. Course content also makes use of departmental clinics that are run concurrently. Prerequisites: None. Fall [3]. Davidson.

## **BIOS7352 - Statistical Collaboration in Health Sciences II**

### **Title**

Statistical Collaboration in Health Sciences II

### **Catalog Description**

This course is the second in a two-course series on collaboration in statistical science. Students are exposed to a variety of challenges that arise in collaborative arrangements. The course's goal is to sharpen students' collaborative skills while exposing them to the application of advanced statistical techniques in routine health science applications. The importance of understanding and learning the science underlying collaborations are emphasized. Students are exposed to real collaborative projects, and face real-life challenges such as opaque scientific direction, poor scientific formulation, lack of time, and ill-formulated messy data. Students engage in several projects that involve the use of a wide range of biostatistics methods from design to analysis. Course content may also make use of departmental clinics. Prerequisites: BIOS 7351. Spring [3]. Raman.

## **BIOS7361 - Advanced Concepts in Probability and Real Analysis for Biostatisticians**

### **Title**

Advanced Concepts in Probability and Real Analysis for Biostatisticians

### **Catalog Description**

This course is the first in a two-course series on advanced probability and statistical inference. Topics include characteristic functions, modes of convergence, uniform integrability, Brownian motion, classical limit theorems,  $L_p$  spaces, projections, sigma-algebras and RVs, martingales, random walks, Markov chains, and probabilistic asymptotics. Emphasis on measure theory is minimal. Concepts are illustrated in biomedical applications whenever possible. Prerequisites: BIOS 6342 or equivalent. Fall [3]. Johnson.

## **BIOS7362 - Advanced Statistical Learning and Inference**

### **Title**

Advanced Statistical Learning and Inference

### **Catalog Description**

This course is the second in a two-course series on advanced probability and statistical inference. Through a combination of lectures, readings, hands-on exercises, and student-led discussions, the course offers an intricate blend of both theoretical and applied insights into probabilistic machine learning algorithms, excluding deep learning. Initial sessions provide a concise yet comprehensive review of linear models, which is then followed by an in-depth exploration of non-parametric methods such as KNN, kernel density estimation, and kernel methods. The latter part of the course introduces advanced topics such as learning with fewer labeled examples, including transfer and active learning, and concludes with a focus on dimensionality reduction, clustering, and recommender systems. Student participation in discussions is a significant part of the learning process. The course employs a variety of biomedical case studies to offer a nuanced understanding of how statistical learning algorithms are deployed in real-world scenarios. Prerequisites: BIOS 7361. Spring [3]. Asiaee.

## **BIOS7362L - Advanced Statistical Learning and Inference**

### **Title**

Advanced Statistical Learning and Inference

### **Catalog Description**

This is a discussion section/lab for Advanced Statistical Inference. Students will review relevant theory and work on applications as a group. Students are required to take 7362 concurrently. [1] Spring. Shotwell.

## **BIOS7393 - Independent Study in Biostatistics**

### **Title**

Independent Study in Biostatistics

### **Catalog Description**

Designed to allow the student to explore and/or master advanced or specialized topics in Biostatistics under the guidance of faculty with relevant expertise. May be repeated. [1-3]

## **BIOS7999 - Master's Thesis Research**

### **Title**

Master's Thesis Research

### **Catalog Description**

Master's Thesis Research [0-12]

## **BIOS8004 - Ethical Principles and Practices for Biostatisticians**

### **Title**

Ethical Principles and Practices for Biostatisticians

### **Catalog Description**

This reading and discussion-based course is based on the American Statistical Association's Ethical Guidelines for Statistical Practice. Topics include professional integrity and accountability, integrity of data and methods, responsibilities to science/public/funder/client, responsibilities to research subjects, responsibilities to research team colleagues, responsibilities to other statisticians or statistics practitioners, responsibilities regarding allegations of misconduct, and responsibilities of employers, including organizations, individuals, attorneys, or other clients employing statistical practitioners. Prerequisites: None. Fall [0]. Greevy.



## **BIOS8366 - Advanced Statistical Computing**

### **Title**

Advanced Statistical Computing

### **Catalog Description**

This course introduces advanced computing and analytical skills and concepts in biomedical data sciences. The course covers real-world data platforms, diverse analytics environments, statistical data analysis in Python, numerical methods, bioinformatics computing, cloud computing, and data visualization. The objective of the course is to enable students to adapt to the computational challenges required by today's biomedical data sciences and big data computing, and to equip them with the knowledge and skills to solve real-world problems. Students are expected to analyze big complex data in cloud-based computing and data analysis environments. The course involves substantial programming in R, Python, SQL, and Shell scripts. Prerequisites: BIOS 6301 or equivalent, BIOS 6342 or equivalent. Offered biennially [3]. Xu.

## **BIOS8370 - Foundations of Statistical Inference**

### **Title**

Foundations of Statistical Inference

### **Catalog Description**

Examines the foundations of statistical inference as viewed from Frequentist, Bayesian, and Likelihood approaches. Famous papers and controversies are discussed along with statistical theories of evidence and decision theory, and their historic significance. [3]

## **BIOS8372 - Bayesian Methods**

### **Title**

Bayesian Methods

### **Catalog Description**

This advanced course introduces the methodology and rationale for Bayesian methods and their applications. Topics include the historical development of Bayesian methods such as hierarchical models, Markov chain Monte Carlo (MCMC) and related sampling methods, specification of priors, sensitivity analysis, and model checking and comparison. This course features applications of Bayesian methods to biomedical research. Prerequisites: BIOS 6301 or equivalent, BIOS 7345 or equivalent. Offered biennially [3]. Choi.

## **BIOS8375 - Causal Inference**

### **Title**

Causal Inference

### **Catalog Description**

This advanced course introduces causal inference methods for observational data and randomized studies. Topics include the Rubin causal model, directed acyclic graphs, propensity scores, inverse probability weighting, instrumental variables, causal mediation analysis, marginal structural models, g-computation, and sensitivity analyses to examine robustness to untestable assumptions. Students learn the basic theory behind the methods and their application to biomedical data examples. Prerequisites: BIOS 7323 or equivalent, BIOS 7346 or equivalent. Offered biennially [3]. Shepherd.

## **BIOS8999 - Non-Candidate Research**

### **Title**

Non-Candidate Research

### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

**BIOS9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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**Business-Arts&Science****BUSA5700 - Investment Analysis****Title**

Investment Analysis

**Catalog Description**

(Previously FNEC 5700) Investment principles and practices. Security analysis and valuation. Portfolio theory. Current issues in the financial sector. Stock market simulation. No credit for students who have earned credit for 3700. [3]

**BUSA5705 - Financial Management****Title**

Financial Management

**Catalog Description**

(Previously FNEC 5705) Analysis of cases representing capital budgeting, forecasting cash flow, risk assessment, capital structure, mergers and acquisitions. Seminar. No credit for students who have earned credit for 3705. [3]

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**Cancer Biology (GS)****CANB7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

Master's Thesis Research

**CANB8326 - Cancer Biology Grant Writing****Title**

Cancer Biology Grant Writing

**Catalog Description**

This self-guided course provides applied training in grant writing for students in their first year in the Cancer Biology program and second overall year in graduate school. Students will write an NRSA proposal and are assigned two faculty reviewers who will provide feedback in at least three meetings. Input from the mentor is essential but needs to be limited to verbal discussions with the student. The proposal will be written and submitted to the reviewers in stages, with three required face-to-face meetings. Passing of the course depends on the final quality of the proposal, the ability of the student to incorporate suggestions and to respond to criticism, and the adherence to deadlines laid out by the course director at the beginning of the course. Course Director: Rachelle Johnson, Ph.D. SUMMER [1]

**CANB8340 - Introduction To Cancer Biology****Title**

Introduction To Cancer Biology

**Catalog Description**

This is a didactic lecture series in which general concepts in cancer biology will be reviewed. Topics range from molecular biology of cancer (oncogene and tumor suppressors) to novel concepts such as cancer stem cells and therapeutic approaches. Prerequisite: IGP core course or consent of instructor. FALL [2] Yull.

**CANB8342 - Advanced Concepts In Cancer Biology****Title**

Advanced Concepts In Cancer Biology

**Catalog Description**

Advanced concepts in cancer biology will be reviewed in depth using a combination of lectures and student-led discussion sessions based on current literature. This course is offered only in tandem with the Introduction to Cancer Biology course to be taken concurrently. Prerequisite: must be a Cancer Biology graduate student or have consent of instructor. FALL. [4] Fingleton.

**CANB8344 - Cancer Immunotherapy****Title**

Cancer Immunotherapy

**Catalog Description**

(Also listed as a module in IGP). The extraordinary rise of Cancer Immunotherapy is used as a platform to examine the past, current and future implications of this rapidly growing discipline. The team taught course combines didactic lecture with key literature assignments aimed at providing not only an understanding of the current immunotherapy landscape, but also an important sense of perspective. The first half of the course covers basic concepts in adaptive and innate immunology, and cancer, needed to read and understand the literature. The second half is based on recent landmark literature in "Cancer Immunotherapy". Instructor presentations aimed at addressing overarching concepts will be coordinated with student-presentations of key papers. [2] Joyce

**CANB8347 - Cancer Systems Biology****Title**

Cancer Systems Biology

**Catalog Description**

This course introduces students to the field of Cancer Systems Biology, which aims to frame cancer as a complex biological system through multidisciplinary approaches linking biology, engineering, and computer science. It is designed to teach students how to apply "systems thinking" to the analysis and modeling of fundamental questions in cancer research. The course will provide an overview of basic concepts in systems biology, including complexity, systems dynamics, networks, evolution and game theory. A survey of mathematical, statistical and computational tools will empower students to apply these concepts to concrete cancer biology projects. Examples of class activities include: construction of gene or signaling networks using literature-based knowledge and existing databases; visualization of multidimensional data; and, basic programming workshops. There will be strong emphasis on designing "systems" experiments and interpreting results in a modern cancer research laboratory. [3] Tyson

## **CANB8351 - Teaching Assistantship in Cancer Biology Curriculum**

### **Title**

Teaching Assistantship in Cancer Biology Curriculum

### **Catalog Description**

Enrollees in the course will act as teaching assistants for one of the Cancer Biology courses (8340 or 8342 in Fall; 8347 or 8384 in spring) with a maximum of 16 hours class contact time. All enrollees will be also required to participate in a monthly journal club for that semester devoted to teaching methods in STEM subjects; and to work with course directors on evaluations. Prerequisites: CANB 8340 and CANB 8342, Ph.D. candidacy. [1] Fingleton.

## **CANB8384 - Precision Cancer Medicine**

### **Title**

Precision Cancer Medicine

### **Catalog Description**

Precision medicine is the tailoring of patient therapy based on pharmacogenetic biomarkers that predict the likelihood of drug response or risk of adverse events, and highlights the importance of foundational science translation in improving patient outcomes. Although precision medicine can be applied to a number of diseases, oncology, arguably, sits at the forefront. Over the last decade, there has been an increase in the understanding of cancer molecular drivers and based on this information, gene mutation-specific inhibitors have been successfully used in the clinic that target only sub-populations of patients with particular tumor genotypes. As a result, there is a need for oncologists to have an appreciation of the fundamental molecular biology underlying the patient's tumor to effectively translate tumor genotype to precision patient care. This course will provide a unique experience in oncology where medical and graduate students work together to explore the molecular drivers of cancer and how that information is translated into targeted cancer therapies. Foundational science topics will include anatomy, physiology, histology, biochemistry, cell biology, genetics, molecular biology, immunology, pathology, radiobiology, and toxicology. Students will explore the concepts of oncogene addiction, acquired resistance to targeted therapy, immunotherapy, tumor heterogeneity, drug discovery, genetic screening and counseling, molecular diagnostics, and cancer clinical trials through online modules, seminars, team-based learning, and case-based learning activities. The information learned will be used as a platform to describe how molecular changes are detected in the laboratory and leveraged in the clinic for personalized patient care. Students will examine the multidisciplinary teams necessary in the care of cancer patients and the benefits of and challenges that precision medicine offers to oncologists through participation in individualized clinical experiences and tumor boards. Students will also have the ability to pursue their own interests in oncology through student-led presentations on a topic of their choice. [2] Dahlman

## **CANB8386 - CQS Summer Institute- Introduction to the All of Us Research Program**

### **Title**

CQS Summer Institute- Introduction to the All of Us Research Program

### **Catalog Description**

The large-scale All of Us initiative collects data from over one million participants in the United States. This program gathers diverse data types, such as survey data, electronic health records, physical measurements, mobile health data (Fitbit), whole genome sequences, and array data. As a freely accessible resource, it plays a crucial role in improving health and advancing precision medicine. Researchers can access and analyze All of Us data via the Researcher Workbench, a secure Google cloud-based platform. This short course will (1) provide an overview of the Researcher Workbench and its built-in tools, (2) cover the process of identifying and extracting variables, and (3) feature case studies that illustrate using the Workbench to analyze various data types.

**CANB8388 - CQS Summer Institute- Big Data in Biomedical Research**  
**Title**

CQS Summer Institute- Big Data in Biomedical Research

**Catalog Description**

This course will explore statistical, bioinformatic, and computational methods and tools for analyzing big omics data in biomedical research, including experimental design for omics research, RNA-sequencing, single-cell RNA-sequencing, and statistical and bioinformatic methods in high-dimensional data. Students will gain practical experience with RNA-seq and single-cell RNA-seq analysis, including read mapping, quantification, differential expression, cell clustering, and marker gene identification, as well as performing functional interpretation of results.

**CANB8390 - CQS Summer Institute- Regression and Modeling in R**  
**Title**

CQS Summer Institute- Regression and Modeling in R

**Catalog Description**

This course will cover advanced statistical topics frequently used in biological and medical research. Emphasis will be placed on practical applications of statistical methods and interpretation of the results. During this week, you will expand your understanding of the advantages and limitations of various methods, choose appropriate analytic approaches based on type of outcome variable and data structure, develop advanced statistical models in R, perform model diagnostic analyses, and interpret R output and analysis results.

**CANB8392 - CQS Summer Institute- Introduction to Causal Inference**  
**Title**

CQS Summer Institute- Introduction to Causal Inference

**Catalog Description**

Many are familiar with the phrase “correlation does not imply causation,” but that then begs the question: what exactly is causation in the first place? In this five-day short course, we will introduce fundamentals of causal inference approaches. The first three days will provide an overview of commonly implemented causal inference methods, including standardization, matching, inverse-weighting, and instrumental variables. The fourth day will focus on methods for longitudinal data, and the fifth day will address miscellaneous topics, including sensitivity analyses and causal inference with survival outcomes. Throughout the course, emphasis will be placed on graphical representation of variables through “directed acyclic graphs” (i.e., DAGs) and software implementation.

**CANB8999 - Non-Candidate Research**  
**Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

**CANB9999 - Ph.D. Dissertation Research**  
**Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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# Cell Biology

## **CBIO-GS8310 - Effective Scientific Communication**

### **Title**

Effective Scientific Communication

### **Catalog Description**

This is a graduate-level course with two major goals pivotal for success as a scientist: (1) To learn effective scientific written and oral communication (2) To learn effective grant writing and reviewing. The class features lectures and workshops with faculty from the Department of Cell and Developmental Biology and other departments. The course is divided into three sections: (1) Instruction on scientific writing, rigor and reproducibility, experimental design, manuscript preparation, and practical statistics (2) Grant Writing and Reviewing. Proposals written by the students on a topic related to their research interests will be discussed by the class in writing workshops and feedback sessions and reviewed by their fellow students at a mock study section (3) Student Presentations. Students will prepare and present lectures related to their research interests. Prerequisite: Bioregulation classes. [3] Weaver and Burkewitz.

## **CBIO-GS8312 - Introduction to Developmental Biology**

### **Title**

Introduction to Developmental Biology

### **Catalog Description**

This combined lecture and laboratory course, informally called "Boot Camp," will present students with the basics in the analysis of standard animal models used in modern developmental biology. Central concepts in development will be presented in lecture while the student will gain "hands on" training in the growth and care of embryos and analysis of embryonic development in model organisms. Standard methods of analysis (e.g. basic microscopy/morphological analysis, immunolabeling, time-lapse imaging, embryo microinjection) will be presented. Prerequisite: IGP Curriculum. Summer Session. [3] Ihrie.

## **CBIO-GS8313 - Introduction to Modern Biological Microscopy**

### **Title**

Introduction to Modern Biological Microscopy

### **Catalog Description**

This lecture course will provide students an introduction to modern microscopy and its biological applications. Topics will include diverse methods of light and electron microscopy, the basic principles of each method, details of specific instrumentation, historical background, advantages and restrictions, as well as applicability to various model systems and organisms. Sample preparation, technical hurdles, tricks of live imaging, micro- and nanomanipulation, quantitative image analysis and other issues will be addressed. The course will also include a tour of microscopy facilities available at Vanderbilt. SPRING. [1] Burnette

## **CBIO-GS8315 - Teaching Cell Biology**

### **Title**

Teaching Cell Biology

### **Catalog Description**

Students will gain mastery of basic cell biology principles through teaching the material to classmates. The format will consist of student-taught lectures with accompanying reading assignments. This class has several goals: to serve as a refresher (or foundational) course in cell biology; to help students prepare for their qualifying examinations; to give students experience in teaching to prepare for future career opportunities; to improve scientific presentation skills. Priority will be given to graduate students in the CDB program. SPRING [2] Page-McCaw.

**CBIO-GS8320 - Cancer And Development****Title**

Cancer And Development

**Catalog Description**

(Also listed as CANB 8320) Graduate-level course that will examine relationships between cellular responses in normal tissue development and cancer. The goal of the course is to familiarize the students with major cellular pathways and responses that are regulated in normal embryonic and post-natal tissue development and how abnormal re-activation of these responses gives rise to malignant disease. Offered every other year. SPRING. [3] (not currently offered)

**CBIO-GS8324 - Epithelial Pathobiology****Title**

Epithelial Pathobiology

**Catalog Description**

To introduce students to issues of polarized epithelial cell function in the context of normal physiology as well as alterations associated with disease. Two one-and-one-a-half-hour sessions per week, one-semester course; paper presentation and discussion on Wednesday, lecture on Friday by visiting scientists from outside Vanderbilt will present special topics changing each year. Prerequisite: Open to all graduate students. Offered every other year. [3] Coffey and Goldenring.

**CBIO-GS8330 - Seminar In Cell and Developmental Biology****Title**

Seminar In Cell and Developmental Biology

**Catalog Description**

The goal of the course is for graduate students to learn about two cutting-edge areas of research in cell and developmental biology. Each area will be presented by four outside speakers (eight dates total). The week before each seminar, the student will read and discuss, facilitated by a faculty member, a paper authored by the next week's speaker and prepare written critiques. The students will attend the seminar followed by a discussion section with the speaker. FALL, SPRING. [1] (not currently offered)

**CBIO-GS8331 - Current Topics in Stem Cell and Developmental Biology****Title**

Current Topics in Stem Cell and Developmental Biology

**Catalog Description**

This course in both fall and spring semesters meets once per week to hear a graduate student, postdoctoral fellow, or faculty member discuss a research paper from outside his or her own field of research, with substantial audience Q&A and discussion, during a weekly journal club. Students taking the course for credit must attend most of the semester's presentations. After pairing with a faculty mentor, they together choose and prepare a topical paper that the trainee presents towards the end of the semester. Students planning to register must contact and discuss plans with the director (chris.wright@vanderbilt.edu) in the preceding semester. FALL, SPRING. [1] Wright.

**CBIO-GS8332 - Training in Scientific Outreach****Title**

Training in Scientific Outreach

**Catalog Description**

The main objective of this course will be to provide training in outreach communication through instruction and community outreach activities. Trainees in this course will learn about and practice different kinds of scientific outreach and work with middle school teachers to develop classroom activities that promote STEM in the local community. SPRING [1] MacGurn and Zanic.

**CBIO-GS8333 - Classic Papers****Title**

Classic Papers

**Catalog Description**

The goal of this one-credit course is to expose graduate students to landmark experiments in cell and developmental biology and to show how these studies have shaped contemporary research. Each week, a student, with help of a faculty member from the Department of Cell and Developmental Biology, will lead the discussion of a landmark paper on related topics. Other students will participate by engaging active discussion and writing a one-page essay to summarize how the original studies had addressed a key gap in a field and offer his/her perspective on how that had altered research trajectories. The course aims at helping students to learn how to identify key gaps in research and how to design experiments to address the gaps. The course also aims to encourage/teach students to use innovative thinking in project designing and planning in their thesis research. FALL. [1] Gu.

**CBIO-GS8336 - Special Topics in Cell Biology****Title**

Special Topics in Cell Biology

**Catalog Description**

CBIO-GS 8336. Special Topics Cell Biology. Topics vary at the discretion of the departmental teaching staff. May be repeated for credit if the topic changes. [Variable credit: 1-4]. CDB Department.

**CBIO-GS8337 - Molecular Aspects of Cancer Research****Title**

Molecular Aspects of Cancer Research

**Catalog Description**

(Also listed as Biochemistry 8337) A focused series of seminars and discussions to explore the molecular basis of cancer. Seminars rely heavily on extramural speakers with recognized expertise in selected research areas. Students meet with the speaker immediately following each seminar. Discussion sections led by a faculty member follow each series of three to four seminars. SPRING. [1] Hiebert (Biochemistry).



### **CBIO-GS8338 - Nobel Laureates in the Life Sciences**

#### **Title**

Nobel Laureates in the Life Sciences

#### **Catalog Description**

This course is intended to give students a personal perspective on the careers of exceptional cell and developmental biology researchers. Each session will focus on Nobel Prize or Lasker Award winners in Physiology or Medicine that have impacted cell and developmental biology fields. A faculty member with training or interest ties to the researcher will present and lead a discussion on the research topic and the history of the researcher's career. In preparation for each session, the students will research the information at or linked to the award Web sites. For each session, the students will be given a key paper(s) of the winner (or the winner's acceptance speech, or biographical articles, etc. at the discretion of the faculty member). During the class-time interactions with the faculty member, the students will incorporate their perspectives on what they found interesting about the winner's history. In addition, before the joint student/faculty presentation, the designated students will give a journal club on one-two seminal papers by the Nobel winner. The rest of the class will turn in a one-page summary detailing one of the papers' importance and findings. Open to 1st year and 2nd year students. SPRING. [1] Chang.

### **CBIO-GS8339 - Research Seminar in Cell Biology**

#### **Title**

Research Seminar in Cell Biology

#### **Catalog Description**

Students enrolled in the class, also known as Research Exchange (REx), will attend research presentations and engage in dialogue and constructive feedback with the presenters, who are advanced graduate students and postdocs. FALL, SPRING [1] Irish and Kaverina.

### **CBIO-GS8340 - Special Problems and Experimental Techniques**

#### **Title**

Special Problems and Experimental Techniques

#### **Catalog Description**

Designed to allow the student an opportunity to master advanced techniques in cell biology while pursuing special projects under individual members of the faculty in their areas of expertise. Admission to course, hours, and credit by arrangement. Variable credit. [1-6]

### **CBIO-GS8341 - Stem/Progenitor Cell and Regenerative Biology**

#### **Title**

Stem/Progenitor Cell and Regenerative Biology

#### **Catalog Description**

The course covers at an advanced level the history, current and future research and potential translational applications of stem/progenitor-cell and regenerative biology. The course particularly covers how newly emerging concepts are revolutionizing our understanding of cell and developmental biology, and influencing, for example, prospective interventions relevant to human health and disease. Lectures and discussion topics will cover several seminal as well as controversial publications. Ethical concerns and consequences raised by basic and translational research and discovery will be paramount during lectures and discussions. Attendance is limited to trainees who have progressed beyond the first year of the Ph.D. (IGP, or an equivalent program). Two credit hours, with one two-hour session per week. Credit and grading are by recorded attendance, and the scoring of functional participation - to be audited by directors and co-directors - in discussion-based learning activities. Extramural lecturers/speakers will be featured, with opportunities for small-group interactions with trainees. The course is also available for audit by post-doctoral fellows or other personnel, but only after prior consultation with the course director (Prof. Chris Wright). Runs mid-January to mid-April. Magnuson (MPB). SPRING [2] Wright and Manguson.

## **CBIO-GS8345 - Cellular and Molecular Neuroscience**

### **Title**

Cellular and Molecular Neuroscience

### **Catalog Description**

(Also listed as Molecular Physiology and Biophysics 8345, Neuroscience 8345, Pharmacology 8345) This course is a required entry-level course for students in the Cell and Molecular Track of the Neuroscience Graduate Program at Vanderbilt that should be taken in the first graduate school year. It also serves as an elective for medical students and graduate students in a number of other programs. Its goal is to expose students to fundamental concepts and techniques in molecular and cellular neuroscience and provide a theoretical context for experimental analysis of brain function and disease. The course is divided into three modules. Module I: Neural Anatomy and Development provides an overview of the anatomy of the nervous system and neurotransmitters and examines concepts in neural pattern formation, neuronal migration, axon guidance, and synapse formation. Module II. Signaling, Plasticity, and Modulation reviews biophysical and molecular concepts relating to neuronal membrane excitability, secretion, and plasticity. Module III: Neural Diseases and Disease Models focuses on specific brain disorders such as epilepsy, pain disorders, Alzheimer's disease, depression, and schizophrenia and current models used to investigate their origin and/or treatment. This course combines faculty lecture with discussion of original articles, with an emphasis on fundamental concepts and the elucidation of important research paradigms in the discipline. Faculty and assistants guide students through important research paradigms with a critical analysis of the primary literature in the topic area. Prerequisite: Bioregulation I (IGP 8001) or consent of instructor. Course directors may consider undergraduate course work in cell biology or biochemistry to meet this requirement. SPRING. [4] Currie, Carter, and Staff

## **CBIO-GS8349 - Genetics Of Model Organisms**

### **Title**

Genetics Of Model Organisms

### **Catalog Description**

Basic genetic principles across a broad range of organisms (yeast, *C. elegans*, *Drosophila melanogaster*, plants, mouse, zebrafish) that are used in genetic analyses to investigate molecular pathways of interest for human disease will be presented. This course will provide students with in-depth terminology and understanding of the advantages, applications, and approaches specific to each organism. Genomic and bioinformatics tools that facilitate genetic analysis in each species will be emphasized. Specific examples of how each model organism has successfully contributed to elucidation of a human disease gene, pathway, or genetic principle will be presented. Course combines faculty lectures with student presentation and discussion of original articles to emphasize the uniqueness of each model system. Prerequisite: one statistics course at the upper undergraduate level or higher and Fundamentals of Genetic Analysis (MPB 8385), or permission of instructor SPRING. [3] (not currently offered)

## **CBIO-GS8999 - Non-Candidate Research**

### **Title**

Non-Candidate Research

### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

## **CBIO-GS9999 - Ph.D. Dissertation Research**

### **Title**

Ph.D. Dissertation Research

### **Catalog Description**

[0-12]

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## Chemical and Biomolecular Engineering

### **CHBE5200 - Phase Equilibria and Stage-Based Separations**

#### **Title**

Phase Equilibria and Stage-Based Separations

#### **Catalog Description**

(Also listed as CHBE 3200) Thermodynamic principles and calculations of mixture phase equilibrium. Development of correlations to design chemical separation processes. Applications to separation processes involving gases, liquids, and solids such as distillation, adsorption, and extraction. Simulation of separation processes. No credit for students who have earned credit for 3200. FALL. [3]

### **CHBE5250 - Chemical Reaction Engineering**

#### **Title**

Chemical Reaction Engineering

#### **Catalog Description**

(Also listed as CHBE 3250) Thermodynamic basis of chemical equilibrium. Analysis of chemical kinetic data and application to the design of chemical reactors. Batch, semibatch, and flow reactors are considered in both steady-state and transient operation. Brief treatments of catalysis and physical and chemical adsorption. No credit for students who have earned credit for 3250. SPRING. [3]

### **CHBE5300 - Fluid Mechanics and Heat Transfer**

#### **Title**

Fluid Mechanics and Heat Transfer

#### **Catalog Description**

(Also listed as CHBE 3300) Principles of momentum and energy transport and their application to the analysis and design of chemical and biological engineering systems. No credit for students who have earned credit for 3300. FALL. [3]

### **CHBE5350 - Mass Transfer and Rate-Based Separations**

#### **Title**

Mass Transfer and Rate-Based Separations

#### **Catalog Description**

(Also listed as CHBE 3350) Principles of mass transfer and their application to the analysis of chemical and biological engineering systems. Design of rate-based separation operations. No credit for students who have earned credit for 3350. SPRING. [3]

### **CHBE5500 - Bioprocess Engineering**

#### **Title**

Bioprocess Engineering

#### **Catalog Description**

(Also listed as CHBE 4500) Application of cellular and molecular biology to process engineering to describe the manufacture of products derived from cell cultures. Design and scale-up of bioreactors and separation equipment. Metabolic and protein engineering utilizing genetically engineered organisms. No credit for students who have earned credit for 4500. [3]

### **CHBE5600 - Chemical Process Control**

#### **Title**

Chemical Process Control

#### **Catalog Description**

(Also listed as CHBE 3600) Design of control systems for chemical processes. Principles of process dynamics and control of single and multivariable systems. Frequency and stability analyses and their effect on controller design. No credit for students who have earned credit for 3600. [3]

### **CHBE5800 - The Molecular and Cellular Mechanome**

#### **Title**

The Molecular and Cellular Mechanome

#### **Catalog Description**

(Also listed as CHBE 4800) Applications of molecular and cellular biophysics and mechanics over various lengths, energy and timescales to describe biological phenomena through an 'omics' systems level perspective to molecular motors, cell machinery, mechanotransduction, cell migration, cell division, and nonequilibrium receptor ligand interactions. Physical and engineering based descriptions of molecular and cellular machinery incorporating biophysics and statistical and continuum mechanics perspectives. Modern and historical results, instrumentation, and measurement techniques. No credit for students who have earned credit for 4800. FALL. [3]

### **CHBE5805 - Biomolecular Engineering and Design**

#### **Title**

Biomolecular Engineering and Design

#### **Catalog Description**

Approaches for interrogating and controlling biological function on a molecular and cellular level. Applications to biotechnology fields such as diagnostics, therapeutics, and regenerative medicine. Focus areas include concepts of molecular recognition, extracellular and intracellular signal transduction, protein engineering, genome engineering, cellular engineering, and tissue engineering. [3]

### **CHBE5810 - Metabolic Engineering**

#### **Title**

Metabolic Engineering

#### **Catalog Description**

(Also listed as CHBE 4810) Analysis and synthesis of metabolic networks using principles of thermodynamics, kinetics, and transport phenomena. Computational approaches for predicting metabolic phenotypes. Experimental techniques to measure and manipulate key metabolic variables including pathway fluxes, protein/gene expression, enzyme regulation, and intracellular metabolite concentrations. No credit for students who have earned credit for 4810. [3]

### **CHBE5820 - Immunoengineering**

#### **Title**

Immunoengineering

#### **Catalog Description**

CHBE 5820. Immunoengineering. (Also listed as CHBE 4820) Approaches and technologies for manipulating and studying the immune system. Topics include fundamentals of immunology, immunology tools and methods, vaccines and immunotherapies, drug delivery principles, and materials engineering for immunomodulation. No credit for students who have earned credit for 4820. [3]

## **CHBE5825 - Biomaterials for Drug Delivery**

### **Title**

Biomaterials for Drug Delivery

### **Catalog Description**

(Also listed as CHBE 4825) Overview, design, and characterization of biomaterials used in biological systems for drug delivery. Molecular principles, polymer synthesis, controlled release, stimuli-responsive materials, biomimetic materials, biological considerations, and delivery strategies. Emphasis on rational design, transport, and applications. Serves as repeat credit for CHBE 4825 or BME 8901 with the topic of Advanced Drug Delivery. [3]

## **CHBE5830 - Molecular Simulation**

### **Title**

Molecular Simulation

### **Catalog Description**

(Also listed as CHBE 4830) Modern tools of statistical mechanics, such as Monte Carlo and molecular dynamics simulation, and variations. Methods, capabilities, and limitations of molecular simulation and applications to simple and complex fluids relevant to the chemical and related processing industries. No credit for students who have earned credit for 4830. [3]

## **CHBE5840 - Synthesis and Applications of 2D Nanomaterials**

### **Title**

Synthesis and Applications of 2D Nanomaterials

### **Catalog Description**

(Also listed as CHBE 4840) Structure-property relationships and applications of atomically thin, two-dimensional materials and 2D/layered systems. Preparation by mechanical exfoliation, solution processing, and bottom-up synthesis. Nucleation/growth of 2D materials via gas/solid, liquid/solid, and catalytic/phase transformation reactions. Kinetic vs. thermodynamic processing, stabilizing meta-stable intermediates, interface engineering, and scale-up. No credit for students who have earned credit for 4840. [3]

## **CHBE5850 - Semiconductor Materials Processing**

### **Title**

Semiconductor Materials Processing

### **Catalog Description**

(Also listed as CHBE 4850) Materials processing unit operations of silicon device manufacturing. Basic semiconductor physics and device theory, production of substrates, dopant diffusion, ion implantation, thermal oxidation and deposition processes, plasma deposition processes, photolithography, wet chemical and plasma etching, and analytical techniques. Lectures alternate with one two-hour laboratory on a weekly basis. No credit for students who have earned credit for 4850. FALL. [3]

## **CHBE5860 - Molecular Aspects of Chemical Engineering**

### **Title**

Molecular Aspects of Chemical Engineering

### **Catalog Description**

(Also listed as CHBE 4860) Integration of molecular chemistry, property-based thermodynamic descriptions, and a focus on intermolecular energetics for process analysis and product design. Case studies involve molecular, macromolecular, supramolecular, and biomolecular systems. No credit for students who have earned credit for 4860. [3]

**CHBE5870 - Polymer Science and Engineering****Title**

Polymer Science and Engineering

**Catalog Description**

(Also listed as CHBE 4870) Macromolecular systems with emphasis on the interrelationship of chemical, physical, and engineering properties. Further relation of these properties to synthesis. Physicochemical and biological applications. No credit for students who have earned credit for 4870. [3]

**CHBE5875 - Colloid Science and Engineering****Title**

Colloid Science and Engineering

**Catalog Description**

(Also listed as CHBE 4875) Fundamental concepts (surface forces, self-assembly, electrokinetics) and experimental techniques (microscopy, scattering, measurement of charge) in colloid science. Applications to personal care products, energy devices, and drug delivery. No credit for students who have earned credit for 4875. [3]

**CHBE5880 - Corrosion Science and Engineering****Title**

Corrosion Science and Engineering

**Catalog Description**

(Also listed as CHBE 4880) Aqueous-phase metal and alloy corrosion phenomena. Fundamental chemistry and electrochemistry theories, as applied to corroding systems. Specific forms of corrosion including pitting, crevice corrosion, and galvanic corrosion. Methods for corrosion control based on electrochemical fundamentals. No credit for students who have earned credit for 4880. SPRING [3]

**CHBE5884 - Internship****Title**

Internship

**Catalog Description**

Internship working in a professional setting. Departmental approval required. FALL, SPRING, SUMMER. [0]

**CHBE5890 - Special Topics****Title**

Special Topics

**Catalog Description**

(Also listed as CHBE 3890) No credit for students who have earned credit for 3890. [Variable credit: 1-3 each semester]

**CHBE6100 - Applied Mathematics in Chemical Engineering****Title**

Applied Mathematics in Chemical Engineering

**Catalog Description**

Chemical engineering applications of advanced mathematical methods. Analytical and numerical methods for ordinary and partial differential equations. Emphasis on recognizing the form of a mathematical model and possible solution methods. Applications in heat and mass transfer, chemical kinetics. FALL. [3]

**CHBE6110 - Advanced Chemical Engineering Thermodynamics****Title**

Advanced Chemical Engineering Thermodynamics

**Catalog Description**

Application of the thermodynamics method to chemical engineering problems. Development of the first, second, and third laws of thermodynamics; estimation and correlation of thermodynamic properties; chemical and phase equilibria; irreversible thermodynamics. FALL. [3]

**CHBE6120 - Applied Chemical Kinetics****Title**

Applied Chemical Kinetics

**Catalog Description**

Experimental methods in kinetics. Kinetics of industrial reactions and reactor design. Absorption and catalytic systems are considered. FALL. [3]

**CHBE6200 - Transport Phenomena****Title**

Transport Phenomena

**Catalog Description**

The theory of non-equilibrium processes. Development of the analogy between momentum, energy, and mass transport with applications to common engineering problems. SPRING. [3]

**CHBE6250 - Professional Communication Skills for Engineers****Title**

Professional Communication Skills for Engineers

**Catalog Description**

Written and oral communication skills for engineers to produce peer-reviewed journal publications, research proposals, and research presentations. SPRING. [1]

**CHBE7899 - Master of Engineering Project****Title**

Master of Engineering Project

**Catalog Description**

[0-6]

**CHBE7999 - Master's Thesis Research**  
**Title**

Master's Thesis Research

**Catalog Description**

[0-6]

**CHBE8900 - Special Topics**  
**Title**

Special Topics

**Catalog Description**

[Variable credit: 1-3 each semester]

**CHBE8991 - Seminar**  
**Title**

Seminar

**Catalog Description**

[0]

**CHBE8999 - Non-Candidate Research**  
**Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

**CHBE9999 - Ph.D. Dissertation Research**  
**Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## **Chemical and Physical Biology**



## **CPBP8306 - Introduction to Chemical, Physical, and Systems Biology**

### **Title**

Introduction to Chemical, Physical, and Systems Biology

### **Catalog Description**

An introduction to living systems, with strong emphasis on the logic of component interactions, in scales ranging from molecules to organisms. Basic properties of complex biological systems are covered, including robustness, adaptability and self-organization. Cell component parts surveyed include: Nucleic Acids, Proteins, Carbohydrates, Lipids, Cytoskeleton, Secreted Factors, Transcription Factor Networks, Channels and Receptors. The Cell is presented as the principal context and actor for biology to happen, covering: Cell Identity, Epigenetics, Metabolism, Cell Growth Pathways, Stress Response Pathways, Tissue architecture, Organs, Immune System. State-of-the-art methods for computational and experimental analyses are addressed both throughout the lectures, and in specific topics including Drug Discovery, Imaging, Working with Big Data [1-8]

## **CPBP8307 - Ion Channel Structure and Function**

### **Title**

Ion Channel Structure and Function

### **Catalog Description**

Membrane Protein Structure and Function or Structural Biology [1]

## **CPBP8308 - Protein-Protein Interactions**

### **Title**

Protein-Protein Interactions

### **Catalog Description**

Essentially all cellular functions depend on appropriately specific and dynamically modulated interactions of multiple proteins. This course is intended to provide students with a cohesive and comprehensive overview of current qualitative and quantitative methodology used in this field, and the application of these techniques to provide novel insights into disparate cellular functions/systems. [1]

## **CPBP8310 - Graduate Seminar In Chemical Biology**

### **Title**

Graduate Seminar In Chemical Biology

### **Catalog Description**

This course aims to introduce fundamental concepts of contemporary science at the interface of chemical biology. A series of overviews and in-depth case studies will demonstrate the breadth of chemical biology and the importance of this emerging field in advancing biological sciences. [1]

## **CPBP8312 - Cur Top In Imaging Sci.**

### **Title**

Cur Top In Imaging Sci.

### **Catalog Description**

Cur Top in Imaging Sci.

### **CPBP8320 - Foundations In Chemical Biology**

#### **Title**

Foundations In Chemical Biology

#### **Catalog Description**

A series of overviews and in-depth case studies will demonstrate the breadth of chemical biology and the importance of this emerging field in advancing biological sciences. [3]

### **CPBP8324 - Scientific Communication in Chemical and Physical Biology**

#### **Title**

Scientific Communication in Chemical and Physical Biology

#### **Catalog Description**

Principles of effective oral and written communication in the sciences. Each student will write, present, and defend a short research proposal based on their research area. [1]

### **CPBP8327 - Data Analysis for the Biomedical Sciences**

#### **Title**

Data Analysis for the Biomedical Sciences

#### **Catalog Description**

This module will focus on the variety of analytical approaches for determination of quantitative physical and biological parameters from noisy data with an emphasis on programming. [1]

### **CPBP8328 - Systems Thinking in Biomedicine**

#### **Title**

Systems Thinking in Biomedicine

#### **Catalog Description**

This course acts as an introduction to the field of Systems Biology. It is designed to help students consider the interaction among the component parts of various systems and learn approaches to defining these interactions mathematically and simulate them computationally in order to apply these concepts to human health. It will consist of one-hour lectures from invited speakers approximately every other week followed by an hour of discussion. This class fulfills the CPBP and QCB one credit hour seminar requirement. Fridays from 3-5 pm are also available (not mandatory) for more informal gatherings and open discussions about Systems Biology.

### **CPBP8330 - Special Topics in Protein Biochemistry**

#### **Title**

Special Topics in Protein Biochemistry

#### **Catalog Description**

Structural, chemical, biochemical, and biophysical studies of ligand-protein recognition including the activation of G protein-coupled receptors (GPCRs). May be repeated. [1]. Meiler.

**CPBP8349 - Graduate Seminar In Molecular Biophysics****Title**

Graduate Seminar In Molecular Biophysics

**Catalog Description**

Students are directed to in-depth reading and discussion of the top publications of the past year in which the tools of molecular biophysics have been used to greatly advance medicine and biology. A group learning format is used wherein all students work together each week in one of two teams. Each class is lead by the students, with the faculty mentor(s) serving to facilitate the discussion, answer questions, and provide broader insights. [1]

**CPBP8350 - Independent Study****Title**

Independent Study

**Catalog Description**

FALL, SPRING, SUMMER. [1-6]

**CPBP8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. FALL, SPRING, SUMMER. [0-12]

**CPBP9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Chemistry

**CHEM5010 - Inorganic Chemistry****Title**

Inorganic Chemistry

**Catalog Description**

A survey of modern inorganic chemistry including coordination compounds and the compounds of the main-group elements. Representative reactions and current theories are treated. No credit for students who have earned credit for 3010. [3]

**CHEM5020 - Introduction to Bioinorganic Chemistry****Title**

Introduction to Bioinorganic Chemistry

**Catalog Description**

(Also listed as CHEM 3020) Functions of inorganic elements in living cells. The manner in which coordination can modify the properties of metallic ions in living systems. No credit for students who have earned credit for 3020. [3]

**CHEM5030 - Physical Methods in Inorganic Chemistry****Title**

Physical Methods in Inorganic Chemistry

**Catalog Description**

Application of spectroscopic methods to inorganic chemistry. Discussion of symmetry and group theory as required for the use of spectroscopic methods is also included. [3]

**CHEM5040 - Nanoparticles****Title**

Nanoparticles

**Catalog Description**

Bottom-up synthetic schemes for nanoparticle construction; characterization techniques; consequences of quantum confinement, and surface area enhancement; design for specific applications. Prerequisite or corequisite: 3010. [3]

**CHEM5050 - Introduction to Organometallic Chemistry****Title**

Introduction to Organometallic Chemistry

**Catalog Description**

(Also listed as CHEM 4050) A general description of the preparation, reaction chemistry, molecular structure, bonding, and spectroscopic identification of organometallic compounds of the transition metals. No credit for students who have earned credit for 4050. [3]

**CHEM5120 - Instrumental Analytical Chemistry****Title**

Instrumental Analytical Chemistry

**Catalog Description**

(Also listed as CHEM 3120) Chemical and physical principles of modern analytical chemistry instrumentation. No credit for students who have earned credit for 3120. [3]

**CHEM5130 - Advanced Analytical Chemistry****Title**

Advanced Analytical Chemistry

**Catalog Description**

Design and analysis of experimental data, instrumental design, and analytical surface science. [1-3]

**CHEM5140 - Analytical Mass Spectrometry****Title**

Analytical Mass Spectrometry

**Catalog Description**

Theory, design, and interpretation of mass spectrometry instrumentation and experiments. [3]

**CHEM5150 - Electrochemistry: Theory and Analysis****Title**

Electrochemistry: Theory and Analysis

**Catalog Description**

[3]

**CHEM5160 - Separation Methods: A Practical Approach****Title**

Separation Methods: A Practical Approach

**Catalog Description**

Theories of separation science; distillation, capillary electrophoresis, membrane separation, and supercritical fluid extraction; emphasis on chromatography. [3]

**CHEM5170 - Analytical Optical Methods****Title**

Analytical Optical Methods

**Catalog Description**

Analytical spectroscopy and biomedical imaging. [3]

**CHEM5209 - Organic Chemistry Structure and Mechanism****Title**

Organic Chemistry Structure and Mechanism

**Catalog Description**

The first half of 5210. Theory, models, and description of chemical bonding. Stereochemistry, and conformational analysis. Reaction thermodynamics, kinetics, and mechanism. Not open to students who have earned credit for CHEM 4210 or 5210 without permission. Total credit earned for this course and CHEM 4210 or 5210 will not exceed 4 hours. Credit reduced from most recent course taken (or from test or transfer credit) as appropriate. Prerequisite: One year of organic chemistry. [2]

### **CHEM5210 - Organic Structure, Mechanism, and Reactions**

#### **Title**

Organic Structure, Mechanism, and Reactions

#### **Catalog Description**

Theory, models, and description of chemical bonding. Stereochemistry, and conformational analysis. Reaction thermodynamics, kinetics, and mechanism. Synthetic transformations employed in small molecule synthesis. Serves as repeat credit for CHEM 4210. Not open to students who have earned credit for CHEM 5209 without permission. Total credit earned for this course and CHEM 5209 will not exceed 4 hours. Credit reduced from most recent course taken (or from test or transfer credit) as appropriate. Prerequisite: One year of organic chemistry. [4]

### **CHEM5220 - Spectroscopic Identification of Organic Compounds**

#### **Title**

Spectroscopic Identification of Organic Compounds

#### **Catalog Description**

(Also listed as CHEM 3220) Theoretical and practical aspects of spectroscopic methods, with an emphasis on NMR spectroscopy, for structural characterization of organic compounds. No credit for students who have earned credit for 3220. [3]

### **CHEM5230 - Physical Organic Chemistry**

#### **Title**

Physical Organic Chemistry

#### **Catalog Description**

(Also listed as CHEM 4230) Structure and bonding in organic molecules. Reactive intermediates and organic reaction mechanisms. No credit for students who have earned credit for 4230. [3]

### **CHEM5240 - Advanced Organic Reactions**

#### **Title**

Advanced Organic Reactions

#### **Catalog Description**

(Also listed as CHEM 4240) A comprehensive study of organic reactions and their application to the preparation of small molecules. Three lectures per week. No credit for students who have earned credit for 4240. [3]

### **CHEM5310 - Physical Chemistry: Chemical Thermodynamics and Equilibrium**

#### **Title**

Physical Chemistry: Chemical Thermodynamics and Equilibrium

#### **Catalog Description**

(Also listed as CHEM 3310) Chemical thermodynamics and equilibrium, their statistical foundation, and applications to chemical phenomena. [3]

**CHEM5320 - Quantum Chemistry****Title**

Quantum Chemistry

**Catalog Description**

Limits of classical mechanics at the atomic and molecular level; postulates of quantum mechanics applied to problems in one, two, and three dimensions; perturbation and other methods. Prerequisite: 3300 or equivalent. [3]

**CHEM5330 - Spectroscopy****Title**

Spectroscopy

**Catalog Description**

Experimental and theoretical aspects of spectroscopy. Energy levels, selection rules, and spectral transitions related to atomic and molecular structure. Design of contemporary magnetic resonance and optical spectroscopy measurements. Prerequisite: 3310. [3]

**CHEM5340 - Applications of Group Theory****Title**

Applications of Group Theory

**Catalog Description**

Molecular symmetry, point groups, and character tables. Application to molecular orbitals, vibrational spectra, organic and inorganic systems. [3]

**CHEM5350 - Statistical Thermodynamics****Title**

Statistical Thermodynamics

**Catalog Description**

Statistical mechanics and chemical equilibrium; distribution laws, partition functions, and thermodynamic properties of atoms and molecules; applications to gases, liquids, and solids. Prerequisite: 232. [3]

**CHEM5360 - Advanced Quantum Chemistry****Title**

Advanced Quantum Chemistry

**Catalog Description**

Advanced topics in the application of quantum mechanics to chemical bonding and spectroscopy. Prerequisite: 5320. [3]

## **CHEM5410 - Molecular Modeling Methods**

### **Title**

Molecular Modeling Methods

### **Catalog Description**

Computer simulation studies of molecules with emphasis on applications to biological molecules and complexes. Background theory, implementation details, capabilities and practical limitations. Prerequisite: 3300 and 3310. Includes one threehour laboratory per week. Serves as repeat credit for students who completed 233 prior to fall 2010. [4]

## **CHEM5420 - Computational Structural Biochemistry**

### **Title**

Computational Structural Biochemistry

### **Catalog Description**

Theoretical and practical aspects of protein sequence alignments, secondary structure prediction, comparative modeling, protein-protein and protein-ligand docking. Structure-based drug design, virtual screening, quantitative structure activity relations, cheminformatics, and pharmacophore mapping in therapeutic development. Prerequisite: 3310. Serves as repeat credit for students who completed 238 prior to fall 2010. [4]

## **CHEM5600 - Chemical Literature**

### **Title**

Chemical Literature

### **Catalog Description**

(Also listed as CHEM 3600) Assigned readings and problems in the nature and use of the chemical literature. No credit for students who have earned credit for 3600. [1]

## **CHEM5610 - Chemistry of Inorganic Materials**

### **Title**

Chemistry of Inorganic Materials

### **Catalog Description**

Chemical synthesis, processing, characterization, and applications of inorganic materials. Molecular precursor routes to inorganic solids. Structure and bonding properties of materials at the atomic, molecular, or extended molecular level and their relationship to desired properties. Carbon-based materials (graphene, fullerenes, diamond), ceramics and zeolites, semiconductors, electronic, magnetic, and optical materials, and nanomaterials. Prerequisite: General chemistry. Serves as repeat credit for students who completed 350 in fall 2011, fall 2009, or fall 2007. [3]

## **CHEM5620 - Chemistry of Biological Materials**

### **Title**

Chemistry of Biological Materials

### **Catalog Description**

The synthesis, directed self-assembly, and hierarchical organization of naturally occurring materials. Engineering of new bioinspired artificial materials for diverse applications. Materials and devices from DNA, genetic reprogramming of the design of new materials. Peptide-, protein-, and carbohydrate-based materials. Biomineralization, biomimetic systems, and complexity in self-assembly. [3]



## **CHEM5630 - Macromolecular Chemistry: Polymers, Dendrimers, and Surface Modifications**

### **Title**

Macromolecular Chemistry: Polymers, Dendrimers, and Surface Modifications

### **Catalog Description**

(Also listed as CHEM 3630) Synthesis and characterization of macromolecular materials including linear, branched, dendrimetric, and star polymers. Mechanical and physiochemical properties of polymeric types. Kinetics of living polymerization. Applications to nanostructures, templates, and advanced devices. No credit for students who have earned credit for 3630. [3]

## **CHEM5710 - Bioorganic Chemistry**

### **Title**

Bioorganic Chemistry

### **Catalog Description**

(Also listed as CHEM 3710) Essential metabolites including vitamins, steroids, peptides, and nucleotides. Consideration of phosphate esters and the synthesis of oligodeoxynucleotides. Three lectures per week. No credit for students who have earned credit for 5710. [3]

## **CHEM5720 - Drug Design and Development**

### **Title**

Drug Design and Development

### **Catalog Description**

(Also listed as CHEM 4720) Concepts of drug design; physical chemistry of drug interactions with receptors, enzymes, and DNA; drug absorption and distribution. Organic chemistry of drug metabolism; mechanism of action for selected therapeutic classes. No credit for students who have earned credit for 4720. [3]

## **CHEM5902 - Pedagogy Chem Education**

### **Title**

Pedagogy Chem Education

### **Catalog Description**

Pedagogical techniques for the chemistry classroom. Knowledge application in discussion sections and development of teaching materials. Consent of Instructor required for registration. Offered on a graded basis only. May be repeated once for credit. Prerequisite: 2212 or 2222. [1]

## **CHEM6050 - Special Topics in Inorganic Chemistry**

### **Title**

Special Topics in Inorganic Chemistry

### **Catalog Description**

[3]

## **CHEM6150 - Special Topics in Analytical Chemistry**

### **Title**

Special Topics in Analytical Chemistry

### **Catalog Description**

[3]

**CHEM6250 - Special Topics in Organic Chemistry**

**Title**

Special Topics in Organic Chemistry

**Catalog Description**

[3]

**CHEM6340 - Special Topics in Chemical Physics**

**Title**

Special Topics in Chemical Physics

**Catalog Description**

[3]

**CHEM6350 - Special Topics in Physical Chemistry**

**Title**

Special Topics in Physical Chemistry

**Catalog Description**

[3]

**CHEM6900 - Professional Development**

**Title**

Professional Development

**Catalog Description**

Grant writing, from specific aims and development of hypotheses to broader impact statements. The curriculum vitae, the "three-minute thesis" pitch, scientific presentations, and responsible conduct in research. Open only to chemistry graduate students. May be repeated for credit once for a total of two credit hours. [1]

**CHEM6901 - Introduction to Research**

**Title**

Introduction to Research

**Catalog Description**

Introduction to chemical research under the guidance of individual faculty members. Students participate in three rotations among faculty research groups and provide graded work. For chemistry graduate students only. [1-2]

**CHEM6902 - Practicum in Chemistry Instruction**

**Title**

Practicum in Chemistry Instruction

**Catalog Description**

Preparation for and the teaching of chemistry to undergraduate students. [0-1]

**CHEM6903 - Advanced Reading in Chemistry****Title**

Advanced Reading in Chemistry

**Catalog Description**

Specialized topics under the guidance of a departmental faculty member. Open to qualified graduate students only. [1-3]

**CHEM7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-12]

**CHEM8999 - Non-candidate Research****Title**

Non-candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**CHEM9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Chinese

**CHIN5101 - Elementary Chinese I****Title**

Elementary Chinese I

**Catalog Description**

(Also listed as CHIN 1101) Introduction to Modern Chinese pronunciation, grammar, conversation, reading, and writing. No credit for students who have earned credit for a more advanced Chinese language course. No credit for students who have earned credit for 1101. [4]

**CHIN5102 - Elementary Chinese II****Title**

Elementary Chinese II

**Catalog Description**

(Also listed CHIN 1102) Continuation of 5101. Introduction to Modern Chinese pronunciation, grammar, conversation, reading, and writing. No credit for students who have earned credit for a more advanced Chinese language course. No credit for students who have earned credit for 1102. [4]

**CHIN5110 - Calligraphy****Title**

Calligraphy

**Catalog Description**

(Also listed as CHIN 1110) Basic skills of writing standard script kaishu. Basic aesthetic of Chinese calligraphy. No Chinese language background necessary. No credit for students who have earned credit for 1231. [1]

**CHIN5201 - Intermediate Chinese I****Title**

Intermediate Chinese I

**Catalog Description**

(Also listed as CHIN 2201) Oral and written language training. No credit for students who have earned credit for a more advanced Chinese language course. Prerequisite: 1102. 4] (INT)

**CHIN5202 - Intermediate Chinese II****Title**

Intermediate Chinese II

**Catalog Description**

(Also listed as CHIN 2202) Continuation of 2201. Language training in oral and written Chinese. No credit for students who have earned credit for a more advanced Chinese language course. Prerequisite: 2201. [4] (INT)

**CHIN5301 - Advanced Chinese I****Title**

Advanced Chinese I

**Catalog Description**

(Also listed as CHIN 3301) Readings in Chinese culture to enhance proficiency in oral and written Chinese. No credit for students who have earned credit for a more advanced Chinese language course. No credit for students who have earned credit for 3301. [3]

**CHIN5302 - Advanced Chinese II****Title**

Advanced Chinese II

**Catalog Description**

(Also listed as CHIN 3302) Readings in Chinese culture to enhance proficiency in oral and written Chinese. No credit for students who have earned credit for a more advanced Chinese language course. No credit for students who have earned credit for 3302 or 3302W. [3]

**CHIN5401 - Business Chinese I****Title**

Business Chinese I

**Catalog Description**

(Also listed as CHIN 4401) Language skills for listening, speaking, reading, and writing in business environments. Modern China from economic and business perspectives. No credit for students who have earned credit for a more advanced Chinese language course. No credit for students who have earned credit for 4401. [3]

**CHIN5402 - Business Chinese II****Title**

Business Chinese II

**Catalog Description**

(Also listed as CHIN 4402) Continuation of 5402. Language skills for listening, speaking, reading, and writing in business environments. Modern China from economic and business perspectives. No credit for students who have earned credit for 4402. [3]

**CHIN5403 - Readings in Modern Chinese Media****Title**

Readings in Modern Chinese Media

**Catalog Description**

(Also listed as CHIN 4403) Books, newspapers, Internet, and television documents and productions pertaining to political, social, and economic issues in China, including foreign trade-related issues. No credit for students who have earned credit for 4403. [3]

**CHIN5404 - Readings in Modern Chinese Media****Title**

Readings in Modern Chinese Media

**Catalog Description**

(Also listed as CHIN 4404) Books, newspapers, and Internet sources pertaining to political, social, and cultural issues. No credit for students who have earned 4404. [3]

**CHIN5405 - Classical Chinese Literature and Philosophy****Title**

Classical Chinese Literature and Philosophy

**Catalog Description**

(Also listed as CHIN 4405) Classical writings by Confucius, Sunzi, and Zhuangzi. Poems by Li Bai and Du Fu. Excerpts from The Dream of the Red Chamber. Linguistic comparisons between classical and modern Chinese. No credit for students who have earned credit for 4405. [3]

### **CHIN5406 - Readings in Modern Literary Chinese**

#### **Title**

Readings in Modern Literary Chinese

#### **Catalog Description**

(Also listed as CHIN 4406) 1910 to the present. Chinese literature and poetry. Linguistic transformations that produced modern literary Chinese. No credit for students who have earned credit for 4406. [3]

### **CHIN5851 - Independent Study**

#### **Title**

Independent Study

#### **Catalog Description**

(Also listed as CHIN 3851) Designed primarily for majors who want to study Chinese not regularly offered in the curriculum. Must have consent of instructor. May be repeated for a total of 12 credits in 5851 and 5852 combined if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3; maximum 12 credits total for all semesters of CHIN 5851 and 5852.] No credit for students who have earned credit for 3851. (No AXLE credit)

### **CHIN5852 - Independent Study**

#### **Title**

Independent Study

#### **Catalog Description**

(Also listed as CHIN 3852) Designed primarily for majors who want to study Chinese not regularly offered in the curriculum. Must have consent of instructor. May be repeated for a total of 12 credits in 5851 and 5852 combined if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3; maximum 12 credits total for all semesters of CHIN 5851 and 5852.] (No AXLE credit)

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## **Civil Engineering**

### **CE5100 - Geographic Information Systems (GIS)**

#### **Title**

Geographic Information Systems (GIS)

#### **Catalog Description**

(Also listed as CE 4100) Principles of computerized geographic information systems (GIS) and analytical use of spatial information. Integration with global positioning systems (GPS) and internet delivery. Includes GIS software utilization and individual projects. No credit for students who have earned credit for 4100. SPRING. [3]

### **CE5150 - Energy Systems Engineering**

#### **Title**

Energy Systems Engineering

#### **Catalog Description**

(Also listed as CE 4150) Physical principles of energy conversion. Energy sources and usage. Sustainability and carrying capacity. Systems tools and economics for energy systems. Energy distribution and storage. Future energy system design. SPRING. [3]

## **CE5200 - Advanced Structural Steel Design**

### **Title**

Advanced Structural Steel Design

### **Catalog Description**

(Also listed as CE 4200) Advanced topics in column and beam design including local buckling, composite beams, plate girders, and torsion design. Behavior and design of bolted and welded connections. Structural planning and design of structural systems such as multistory buildings including computer applications. No credit for students who have earned credit for 4200. FALL. [3]

## **CE5210 - Advanced Reinforced Concrete Design**

### **Title**

Advanced Reinforced Concrete Design

### **Catalog Description**

(Also listed as CE 4210) Design and behavior of two-way slab systems. Yield line theory. Shear and torsion analysis and design. Serviceability requirements and control of deflections of reinforced concrete systems. Prestressed concrete. No credit for students who have earned credit for 4210. SPRING. [3]

## **CE5240 - Infrastructure Systems Engineering**

### **Title**

Infrastructure Systems Engineering

### **Catalog Description**

(Also listed as CE 4240) Systems-level approach to the infrastructure of the built environment. Elements of systems engineering. Case studies of infrastructure under duress. Smart infrastructure. Transportation, building, and water and wastewater supply and distribution systems. Infrastructure interdependencies and concepts of smart cities. Applications to infrastructure system design. FALL. [3]

## **CE5250 - Foundation Analysis and Design**

### **Title**

Foundation Analysis and Design

### **Catalog Description**

(Also listed as CE 4250) Study of shallow and deep foundation elements and systems for civil engineering structures. Soil exploration and site investigation. No credit for students who have earned credit for 4250. SPRING. [3]

## **CE5300 - Reliability and Risk Case Stud**

### **Title**

Reliability and Risk Case Stud

### **Catalog Description**

(Also listed as CE 4300) Review of historical events involving successes and failures in managing system reliability and risk from a wide range of perspectives, including design, production, operations, organizational culture, human factors and exogenous events. Analysis of risk factors leading to event occurrence, as well as event consequences in terms of impacts to public health, safety, security and environmental protection. Evaluation of risk mitigation strategies based on achievable goals, technical and political feasibility, and economic impact. Cases drawn from natural disasters, industrial accidents, and intentional acts. No credit for students who have earned credit for CE 4300. FALL. [3]

## **CE5320 - Data Analytics for Engineers**

### **Title**

Data Analytics for Engineers

### **Catalog Description**

(Also listed as CE 4320) Programming, analysis, and visualization of real data for the purposes of informing decision making in engineering problems. Statistical modeling in a practical and applied perspective; application of data analytics to bridge the gap between data and decisions; fundamentals of design of experiments. No credit for students who have earned credit for CE 4320. FALL. [3]

## **CE5340 - Risk and Decision Analysis**

### **Title**

Risk and Decision Analysis

### **Catalog Description**

(Also listed as CE 4340) Risk quantification, risk perception, decision-making under uncertainty, risk communication. Model risk and decisions using analytical and simulation approaches. Focus on theory and methodology, applications in engineering, environmental systems, business, and healthcare. No credit for students who have earned credit for CE 4340. FALL. [3]

## **CE5400 - Construction Project Management**

### **Title**

Construction Project Management

### **Catalog Description**

(Also listed as CE 4400) Theory and application of the fundamentals of construction project management. The construction process and the roles of professionals in the process. Overview of the construction project from conception through completion. Application of management practices including planning, directing, cost minimizing, resource allocation, and control of all aspects of construction operations and resources. No credit for students who have earned credit for 4400. FALL. [3]

## **CE5401 - Advanced Construction Project Management**

### **Title**

Advanced Construction Project Management

### **Catalog Description**

(Also listed as CE 4401) Current and critical issues in the construction industry, including best practices developed at the Construction Industry Institute (CII). Guest lecturers include representatives of the CII and visiting industry leaders. No credit for students who have earned credit for 4401. FALL. [3]

## **CE5405 - Construction Estimating**

### **Title**

Construction Estimating

### **Catalog Description**

(Also listed as CE 4405) Estimation of material, labor, and equipment quantities, including costing and pricing of construction projects. Application of estimating practices using real-world examples and project estimating software. Corequisite: CE 5400. No credit for students who have earned credit for 4405. FALL. [3]



## **CE5410 - Construction Planning and Scheduling**

### **Title**

Construction Planning and Scheduling

### **Catalog Description**

(Also listed as CE 4410) Fundamentals of construction planning and scheduling. Application of management practices including: process planning; directing, costing; resource allocation; and controlling all aspects of construction operations and resources, from pre-construction through operation and maintenance. Use of real-world examples and project scheduling software. No credit for students who have earned credit for 4410. SPRING. [3]

## **CE5415 - Construction Materials and Methods**

### **Title**

Construction Materials and Methods

### **Catalog Description**

(Also listed as CE 4415) Implications of design realities, material specifications, code limitations, and regulations on the construction process. Natural and man-made materials, construction techniques, and other issues that impact quality, constructability, and life-cycle assessment. No credit for students who have earned credit for 4415. SUMMER. [3]

## **CE5420 - Construction Law and Contracts**

### **Title**

Construction Law and Contracts

### **Catalog Description**

(Also listed as CE 4420) Review of case studies involving successes and failures in legal principles and landmark cases relevant to civil engineering and construction. Contracts, torts, agency and professional liability, labor laws, insurance, expert testimony, arbitration, patents and copyrights, sureties, and ethics. No credit for students who have earned credit for 4420. SPRING. [3]

## **CE5425 - Building Information Modeling**

### **Title**

Building Information Modeling

### **Catalog Description**

(Also listed as CE 4425) Generation and management of building data during its life cycle. Three-dimensional, real-time, dynamic modeling to increase productivity in building design and construction. Considerations of building geometry, spatial relationships, geographic information, and building components. No credit for students who have completed 4425. FALL. [3]

## **CE5430 - High Performance and Green Buildings**

### **Title**

High Performance and Green Buildings

### **Catalog Description**

(Also listed as CE 4430) Design and construction of high performance buildings and related systems in buildings. Leadership in Energy and Environmental Design (LEED) green Building Rating System (TM) building approach to sustainability No credit for students who have earned credit for 4430. SPRING. [3]

**CE5500 - Transportation System Design****Title**

Transportation System Design

**Catalog Description**

(Also listed as CE 4500) Geometric analysis of transportation ways with particular emphasis on horizontal and vertical curve alignment. Design of highways, interchanges, intersections, and facilities for air, rail, and public transportation. No credit for students who have earned credit for 4500. SPRING. [3]

**CE5505 - Urban Transportation Planning****Title**

Urban Transportation Planning

**Catalog Description**

(Also listed as CE 4505) Analytical methods and the decision-making process. Transportation studies, travel characteristic analysis, and land-use implications are applied to surface transportation systems. Emphasis is on trip generation, trip distribution, modal split, and traffic assignment. Computerized planning programs are used. No credit for students who have earned credit for 4505. SPRING. [3]

**CE5510 - Traffic Engineering****Title**

Traffic Engineering

**Catalog Description**

(Also listed as CE 4510) Analysis of the characteristics of traffic, including the driver, vehicle, volumes, speeds, capacities, roadway conditions, and accidents. Traffic regulation, control, signing, signalization, and safety programs are also discussed. No credit for students who have earned credit for 4510. FALL. [3]

**CE5884 - Internship****Title**

Internship

**Catalog Description**

Internship working in a professional setting. Departmental approval required. Corequisite: CE 5400. [0]

**CE5999 - Special Topics****Title**

Special Topics

**Catalog Description**

(Also listed as CE 3890) No credit for students who have earned credit for 3890. [3]

## **CE6200 - Continuum Mechanics**

### **Title**

Continuum Mechanics

### **Catalog Description**

Mathematical preliminaries: tensor algebra, tensor calculus, coordinate transformation, principal values and directions. Kinematics of continuum: motion and deformation, infinitesimal and finite strain theory, balance of mass. Stress and integral formulations: traction on planes, stress invariants and failure theories, Piola-Kirchhoff stress tensors, balance of momentum, stress power. Elastic solid: linear isotropic and anisotropic elasticity, engineering material constants, plane elastic waves, non-linear isotropic elasticity. FALL. [3].

## **CE6205 - Theory of Inelasticity**

### **Title**

Theory of Inelasticity

### **Catalog Description**

Physical mechanisms of deformation and failure. Modern theories of plasticity, viscoplasticity and continuum damage mechanics. Thermodynamics of plasticity and damage processes. Numerical and computational aspects of inelastic deformation mechanisms in solids and structures. SPRING. [3]

## **CE6210 - Finite Element Analysis**

### **Title**

Finite Element Analysis

### **Catalog Description**

Discrete modeling of problems of the continua. Mathematical basis of finite element method-weighted residual and variational concepts. Finite element formulations; displacement, force, and mixed methods. 1-D problems of the continua and finite element solution-C0 and C1 elements, eigenvalue and transient problems. Error checks and control. Mapping, shape functions, numerical quadrature, and solution of equations. Formulation of 2-D problems (single and multi-field)-mapping and shape functions, triangular and quad elements with straight or curved boundaries. 3-D elements, singular problems, buckling, and nonlinear problems. Error estimation and quality control. Computer implementation. Commercial packages. Prerequisite: MATH 2410, MATH 3620. FALL. [3]

## **CE6212 - Advanced Computational Mechanics**

### **Title**

Advanced Computational Mechanics

### **Catalog Description**

Nonlinear mechanics, geometric and material nonlinearities. Discrete Lagrangian, Eulerian and other formulations. Nonlinear material models. Numerical solution algorithms in space and time. Solution of nonlinear (second-order and higher) problems. Multi-disciplinary problems. Error estimation and adaptive model improvement. Multi-scale modeling and atomistic/continuum coupling. Prerequisite: CE 6210. SPRING. [3]

## **CE6215 - Structural Dynamics and Control**

### **Title**

Structural Dynamics and Control

### **Catalog Description**

Analysis of single- and multi-degree-of-freedom systems. Modal superposition method. Time and frequency domain analyses. Numerical methods and nonlinear dynamic analysis. Application to structures subject to earthquake and impact forces. Elements of feedback control systems. Control of lumped parameter systems. Active, passive, and hybrid mass dampers. Application to simple building and bridge structures. SPRING. [3]

## **CE6300 - Probabilistic Methods in Engineering Design**

### **Title**

Probabilistic Methods in Engineering Design

### **Catalog Description**

Applications of probabilistic methods in the analysis and synthesis of engineering systems. Review of basic probability concepts, random variables and distributions, modeling and quantification of uncertainty, testing the validity of assumed models, linear regression and correlation analyses, Monte Carlo simulation, reliability analysis and reliability-based design. Prerequisite: MATH 2410. FALL. [3]

## **CE6305 - Engineering Design Optimization**

### **Title**

Engineering Design Optimization

### **Catalog Description**

Methods for optimal design of engineering systems. Optimization under uncertainty, reliability-based design optimization, robust design, multidisciplinary problems, multi-objective optimization. Discrete and continuous design variables, advanced numerical algorithms, and formulations and strategies for computational efficiency. Practical applications and term projects in the student's area of interest. Prerequisite: MATH 4630, MATH 4620 or CE 6300. [3]

## **CE6310 - Uncertainty Quantification**

### **Title**

Uncertainty Quantification

### **Catalog Description**

Computational methods for analysis and design of modern engineering systems under uncertainty. Emphasis on epistemic uncertainty due to data and models. Topics include stochastic finite elements; time-dependent reliability; Bayesian methods and networks; surrogate modeling; advanced simulation; global sensitivity analysis; model verification, validation, and calibration; and optimization under uncertainty. Applications to practical engineering systems. Prerequisite: CE 6300. SPRING. [3]

## **CE6313 - Multiscale Modeling**

### **Title**

Multiscale Modeling

### **Catalog Description**

State-of-the-art and emerging multiscale computational methods for modeling of mechanics, transport, and materials phenomena. Principles of information transfer between multiple spatial and temporal scales, including atomistic-to-continuum coupling, continuum-to-continuum coupling, and bridging of time scales. Enrichment methods including generalized finite elements, partition of unity, variational multiscale methods. FALL. [3]

## **CE6318 - Prestressed Concrete**

### **Title**

Prestressed Concrete

### **Catalog Description**

Behavior and design of statically determinate prestressed concrete structures under bending moment, shear, torsion, and axial load effects. Design of statically determinate prestressed structures such as continuous beams, frames, slabs and shells. Creep and shrinkage effects and deflections of prestressed concrete structures. Application to the design and construction of bridges and buildings. Prerequisite: CE 3205. [3]

**CE6359 - Emerging Information Systems Applications****Title**

Emerging Information Systems Applications

**Catalog Description**

Role of emerging information systems technologies in improving productivity and efficiency and in managing engineering operations. Design of integrated approaches to enhance the speed, accuracy, reliability, and quantity of information available for decision support. Emphasis on case studies of innovative applications in transportation and manufacturing, leading to individual and group projects requiring new product development. Prerequisite: Background in transportation or manufacturing operations. FALL. [3]

**CE6380 - Applied Machine Learning in Science and Engineering****Title**

Applied Machine Learning in Science and Engineering

**Catalog Description**

Supervised, unsupervised and reinforced learning methods; classification, clustering and numerical prediction models; distribution learning; artificial neural networks, deep learning, recursive and convolutional neural networks; dimension reduction, data preparation, model evaluation, prediction uncertainty quantification; learning with heterogeneous data fusion (numerical, text, and image data); learning with big data; and implementation with Python software. SPRING. [3].

**CE7899 - Master of Engineering Project****Title**

Master of Engineering Project

**Catalog Description**

Master of Engineering Project. [0 to 6]

**CE7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-6]

**CE8000 - Individual Study of Civil Engineering Problems****Title**

Individual Study of Civil Engineering Problems

**Catalog Description**

Literature review and analysis of special problems under faculty supervision. FALL, SPRING, SUMMER. [1-4 each semester]

**CE8001 - Individual Study of Civil Engineering Problems****Title**

Individual Study of Civil Engineering Problems

**Catalog Description**

Literature review and analysis of special problems under faculty supervision. FALL, SPRING, SUMMER. [1-4 each semester]

**CE8002 - Individual Study of Civil Engineering Problems****Title**

Individual Study of Civil Engineering Problems

**Catalog Description**

Literature review and analysis of special problems under faculty supervision. FALL, SPRING, SUMMER. [1-4 each semester]

**CE8300 - Reliability and Risk Engineering Seminar****Title**

Reliability and Risk Engineering Seminar

**Catalog Description**

Perspectives on reliability and risk assessment and management of multi-disciplinary engineering systems. Topics on infrastructure and environmental systems, mechanical, automotive, and aerospace systems; network systems (power distribution, water and sewage systems, transportation etc.); manufacturing and construction; and electronic and software systems. FALL, SPRING. [1]

**CE8301 - Reliability and Risk Engineering Seminar****Title**

Reliability and Risk Engineering Seminar

**Catalog Description**

Seminars by expert speakers provide a wide range of perspectives on reliability and risk assessment and management of multidisciplinary engineering systems. Topics on infrastructure and environmental systems; mechanical, automotive, and aerospace systems; network systems (power distribution, water and sewage systems, transportation, etc.); manufacturing and construction; and electronic and software systems. FALL, SPRING. [1]

**CE8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

**CE9999 - Ph.D. Dissertation Research**

**Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Classics

**CLAS5000 - Classical Tradition in America**

**Title**

Classical Tradition in America

**Catalog Description**

(Also listed as CLAS 3000) Influences of classical Greece and Rome on the literature, politics, architecture, and values of the United States from the colonial period to the present. No credit for students who have earned credit for 3000. [3]

**CLAS5010 - The Ancient Origins of Religious Conflict in the Middle East**

**Title**

The Ancient Origins of Religious Conflict in the Middle East

**Catalog Description**

(Also listed as CLAS 3010) Religious oppositions in the eastern Mediterranean world from the Maccabean revolt to the Muslim conquests of the seventh century; beginnings of religious militancy; challenges of monotheism to Greco-Roman civilization; conversion, persecution, and concepts of heresy and holy war in Christianity, Judaism, and Islam. No credit for students who have earned credit for 3010. [3]

**CLAS5100 - History of the Ancient Near East**

**Title**

History of the Ancient Near East

**Catalog Description**

(Also listed as CLAS 2100) From the neolithic period to the conquests of Alexander the Great, in the geographical area from Persia to Troy and Egypt. Special attention to the history of Israel. No credit for students who have earned credit for 2100. [3]

**CLAS5110 - History of Greece to Alexander the Great**

**Title**

History of Greece to Alexander the Great

**Catalog Description**

(Also listed as CLAS 2110) The Greek world from the beginning of the Mycenaean Age (1650 B.C.) to the end of the Classical period. Special attention to the relationship between political history and the development of Hellenism. No credit for students who have earned credit for CLAS 2110. [3]

### **CLAS5120 - The Greek World from Alexander the Great to the Roman Empire**

#### **Title**

The Greek World from Alexander the Great to the Roman Empire

#### **Catalog Description**

The eastern Mediterranean from the rise of Macedon and Alexander the Great to the High Roman Empire. Social, cultural, political, and religious changes. Issues of imperialism and colonialism, and questions of identity in a geographically expansive Greek world. [3]

### **CLAS5150 - History of the Roman Republic**

#### **Title**

History of the Roman Republic

#### **Catalog Description**

(Also listed as CLAS 2150) The growth and evolution of the Roman world, from the foundation of the city in the seventh century B.C. to the reign of Caesar Augustus. The Romans' unification of Italy, conquest of the Mediterranean and western Europe, adoption of Hellenism, and overthrow of the Republic. No credit for students who have earned credit for 2150. [3]

### **CLAS5160 - History of the Roman Empire**

#### **Title**

History of the Roman Empire

#### **Catalog Description**

(Also listed as CLAS 2160) The Roman world from Augustus to the collapse of the western empire in the fifth century. Political, military, social, and religious history. Special attention given to problems arising from use of the primary sources as well as to controversies in modern scholarship. No credit for students who have earned credit for 2160. [3]

### **CLAS5180 - From Late Antiquity to Islam**

#### **Title**

From Late Antiquity to Islam

#### **Catalog Description**

(Also listed as CLAS 2180) The Eastern Roman Empire from Constantine to the Arab conquests. Political, social, cultural, and religious history, including monasticism, barbarian invasions, and the changing roles of the Emperor and Church. Special attention to developments in urban life and landscape. No credit for students who have earned credit for 2180. [3]

### **CLAS5200 - Archaic and Classical Greek Art and Architecture, 1000 to 400 B.C.E.**

#### **Title**

Archaic and Classical Greek Art and Architecture, 1000 to 400 B.C.E.

#### **Catalog Description**

(Also listed as CLAS 2200) Sculpture, vase painting, architecture, and the minor arts. Formal and stylistic developments in relation to changing cultural background. No credit for students who have earned credit for HART 2200 or 2220. [3]



### **CLAS5210 - Late Classical Greek and Hellenistic Art and Architecture**

#### **Title**

Late Classical Greek and Hellenistic Art and Architecture

#### **Catalog Description**

(Also listed as CLAS 2210) Sculpture, vase painting, architecture, and the minor arts from after the Parthenon to the Roman Empire. Media that developed significantly in this period, such as wall painting and mosaic. No credit for students who have earned credit for HART 2220. No credit for students who have earned credit for 2210. [3]

### **CLAS5250 - Roman Art and Architecture**

#### **Title**

Roman Art and Architecture

#### **Catalog Description**

(Also listed as CLAS 2250) Sculpture, architecture, and painting from the tenth century B.C.E. to the early fourth century C.E. Daily life of the Romans as seen in excavations of the towns of Pompeii and Herculaneum. No credit for students who have earned credit for 2250. [3]

### **CLAS6030 - Death, Disease, and Health in the Ancient World**

#### **Title**

Death, Disease, and Health in the Ancient World

#### **Catalog Description**

From the Bronze Age to early Christianity and Late Antiquity. Biological history of the Greeks, Romans, and other Mediterranean peoples. Changing concepts of death and afterlife; interpretations of disease; medical thought and practice. Healing, epidemics, natural catastrophe, and dietary variation. Evidence from classical literature, archaeology, bones and teeth. [3]

### **CLAS6100 - Women, Sexuality, and the Family in Ancient Greece and Rome**

#### **Title**

Women, Sexuality, and the Family in Ancient Greece and Rome

#### **Catalog Description**

(Also listed as CLAS 3100) The status and role of women, law and the regulation of the private sphere, sexuality and gender roles, demography and family structure, marriage, children, religion, domestic architecture and the household economy, ancient critiques of the family, and the impact of Christianity. No credit for students who have earned credit for 3100. [3]

### **CLAS6110 - Warfare in the Ancient Mediterranean**

#### **Title**

Warfare in the Ancient Mediterranean

#### **Catalog Description**

Continuity and change in ancient Greek and Roman warfare 800 B.C. to A.D. 120. Social, political, and religious aspects of war. Effects of war, imperialism, and militarism on internal and external populations. [3]

**CLAS6120 - Humor, Ancient to Modern****Title**

Humor, Ancient to Modern

**Catalog Description**

(Also listed as CLAS 3120) Ancient comic forms juxtaposed with modern theories of humor. Aristophanic Old Comedy, New Comedy, and Satire. Modern parallels. No credit for students who have earned credit for 3120. [3]

**CLAS6150 - Roman Law****Title**

Roman Law

**Catalog Description**

(Also listed as CLAS 3150) The relationship between law and society as illustrated by cases drawn from Roman legal and literary sources. The development of legal reasoning and the rise of an autonomous legal profession at Rome. Delicts (torts), property, contracts, and family law, taught in rotation. May be repeated for credit if in a different area of law. [3]

**CLAS6160 - Roman Law and Social History****Title**

Roman Law and Social History

**Catalog Description**

(Also listed as CLAS 3160) Relationship of law and society as illustrated by legal, literary, epigraphic, and papyrological evidence. Views and methodologies of leading modern scholars. Focus on methodology. Marriage, family, personal status, the economy, and judicial system. Basic familiarity with Roman history or law is expected. [3]

**CLAS6190 - Augustan Rome****Title**

Augustan Rome

**Catalog Description**

(Also listed as CLAS 3190W) Social, administrative, religious, and military reforms. Common themes in art, architecture, and literature; changes in national identity in the transition from Republic to Empire. No credit for students who have earned credit for 3190W. [3]

**CLAS6200 - The Greek City****Title**

The Greek City

**Catalog Description**

(Also listed as CLAS 3200) The example of ancient Athens. The stoa, the theatre, the house, and fortifications. Institutions such as the courts, the public assembly, and the family. Literary, historical, archaeological, and philosophical sources. No credit for students who have earned credit for HART 263. No credit for students who have earned credit for 3200. [3]

**CLAS6210 - Religions of the Ancient Mediterranean**  
**Title**

Religions of the Ancient Mediterranean

**Catalog Description**

Ancient religious practices and beliefs through the evidence of archaeological sites, material remains, and written texts. Cross-cultural comparisons of sanctuaries, rituals, priesthoods, and sacred texts and objects. Consideration of mystery cults, magic, and alternative groups. [3]

**CLAS6220 - The Trojan War in History, Art, and Literature**  
**Title**

The Trojan War in History, Art, and Literature

**Catalog Description**

(Also listed as CLAS 3220) Representations in Classical Greek art, literature, and archaeological evidence. The composition of the Homeric epics; the meaning of the Trojan War to later audiences. No credit for students who have earned credit for 3220. [3]

**CLAS6230 - Alexander the Great**  
**Title**

Alexander the Great

**Catalog Description**

(Also listed as CLAS 3230) Alexander's rise to power and conquests in Europe, Asia, and Africa; the legacy of his introduction of Greek culture to the East; his significance to later audiences. Offered on a graded basis only. No credit for students who have earned credit for 3230. [3]

**CLAS6240 - The Parthenon, the Akropolis, and Fifth Century Athens**  
**Title**

The Parthenon, the Akropolis, and Fifth Century Athens

**Catalog Description**

(Also listed as CLAS 3210) Ancient Athens in the fifth century BCE. Art, architecture, literature, history, and historical evidence for religious and political life in the city. No credit for students who earned credit for 295 or 295W prior to fall 2014. [3] (HCA)

**CLAS6300 - Akkadian**  
**Title**

Akkadian

**Catalog Description**

(Also listed as CLAS 3300) Introduction to the cuneiform script and to the grammar of Akkadian, the language of ancient Mesopotamia. Selected readings in Old Babylonian (CODEX Hammurabi, Mari letters) and Neo-Assyrian texts (Creation Poem, Gilgamesh Epic). No credit for students who have earned credit for 3300. [3]

**CLAS6301 - Akkadian****Title**

Akkadian

**Catalog Description**

(Also listed as CLAS 3301) Continuation of 6300. Introduction to the cuneiform script and to the grammar of Akkadian, the language of ancient Mesopotamia. Selected readings in Old Babylonian (CODEX Hammurabi, Mari letters) and Neo-Assyrian texts (Creation Poem, Gilgamesh Epic). No credit for students who have earned credit for 3301. [3]

**CLAS6310 - Culture of the Ancient Near East****Title**

Culture of the Ancient Near East

**Catalog Description**

(Also listed as CLAS 3310) A survey of highly sophisticated Near East cultures of the last three millennia before the common era (B.C.). Discussion of political histories, and the social, religious, and intellectual heritage of Mesopotamia, Egypt, and Anatolia through excavated artifacts and written documents. No credit for students who have earned credit for 3310. [3]

**CLAS6320 - The Amarna Age****Title**

The Amarna Age

**Catalog Description**

(Also listed as CLAS 3320) The Amarna period from the sixteenth through the twelfth centuries B.C.E., as illumined by excavations of palaces and temples in Egypt, Anatolia, Canaan, and Mesopotamia as well as the vast historical, legal, and literary documents of the period. Focus on the internationalism and theological speculation of the period as seen through the powerful personalities and accomplishments of leaders such as Thutmose III, Suppiluliumas, Ramses II, and the spiritually influential Akehnaten. No credit for students who have earned credit for 3320. [3]

**CLAS7000 - Seminar in Classics****Title**

Seminar in Classics

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**CLAS7100 - Seminar: Studies in Ancient History****Title**

Seminar: Studies in Ancient History

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

### **CLAS7200 - Seminar in Classical Art and Architecture**

#### **Title**

Seminar in Classical Art and Architecture

#### **Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

### **CLAS7850 - Independent Study**

#### **Title**

Independent Study

#### **Catalog Description**

An individual reading and study program on an author or area of classical antiquity not treated in the regular curriculum. No formal instruction is given, but the student's work is supervised and evaluated by one or more members of the staff. Open only to students who have completed one year of graduate study in classics. May be repeated for a total of 12 credits, but students may earn only up to 3 credits per semester of enrollment. [1-3; maximum of 12 credits for all semesters of CLAS 7850]

### **CLAS7999 - Master's Thesis Research**

#### **Title**

Master's Thesis Research

#### **Catalog Description**

[0-12]

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## **Communication of Science and Technology**

### **CSET5090 - Introduction to Science and Technology Policy Analysis**

#### **Title**

Introduction to Science and Technology Policy Analysis

#### **Catalog Description**

Interactions between science, technology, and policy, including regulatory failures, funding controversies, and the public perception of the value of scientific research. American context and comparative perspectives. Multidisciplinary approach drawing on political science, philosophy, economics, sociology, and history. [3]

### **CSET5100 - Science Communication Tools and Techniques**

#### **Title**

Science Communication Tools and Techniques

#### **Catalog Description**

(Also listed as CSET 2100) Translating technical research for a general readership. Benefits and limitations of different formats, texts, and media for telling stories about science. Serves as repeat credit for students who have earned credit for 2100. [3]

### **CSET5200 - Technical Writing**

#### **Title**

Technical Writing

#### **Catalog Description**

Introduction to technical and professional composition for careers in science, business, and industry. Prerequisite: major or minor in Communication of Science and Technology. Open to other students with permission of instructor. [3] (HCA)

### **CSET5240 - Pop Science: The Art and Impact of Popular Science Writing**

#### **Title**

Pop Science: The Art and Impact of Popular Science Writing

#### **Catalog Description**

Mechanics and influence of popular science writing in the 21st century. Students will critique bestselling books and award-winning journalism; develop and publish their own blogs with a focus on science, technology, and the environment; and interact with top science writers, editors, and podcasters. Not open to students who have earned credit for CSET 3890 section 01 offered fall 2019. [3]

### **CSET5257 - Virtual Reality Design**

#### **Title**

Virtual Reality Design

#### **Catalog Description**

Interdisciplinary, project-based introduction to Virtual Reality (VR). Creation of immersive environments. Student projects guided by faculty mentors to create real-world, consequential VR simulations relevant to, and innovative in, their respective fields. Serves as repeat credit for students who have completed UNIV 3279. [3]

### **CSET5320 - Environmental Journalism: Investigating Climate Change**

#### **Title**

Environmental Journalism: Investigating Climate Change

#### **Catalog Description**

Science, solutions, stakeholders, players, politics, history, and local impacts of climate change. Students pursue their own local reporting, investigating the effects of climate change and the emerging green economy in Nashville. Not open to students who have earned credit for 3890 section 01 offered spring 2020 or ENGL 3896 section 01 offered spring 2020 or ENGL 3896 section 01 offered spring 2019. [3]

### **CSET5890 - Special Topics**

#### **Title**

Special Topics

#### **Catalog Description**

Topics as announced. May be repeated for credit more than once if there is no duplication in topic, but students may earn only 3 credits per semester of enrollment. [1-3]

## **CSET6100 - Science Policy Bootcamp, from Concept to Conclusion**

### **Title**

Science Policy Bootcamp, from Concept to Conclusion

### **Catalog Description**

Interdisciplinary service learning. Trends that shape science and innovation policy. Active policy-making. Prerequisite: Major or minor in Communication of Science and Technology or Public Policy Studies. Open to other students with permission of instructor. [3]

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## **Comparative Media Analysis and Practice**

### **CMAP8001 - Media and the Senses**

#### **Title**

Media and the Senses

#### **Catalog Description**

Seminal theories of modern media and how different media shape sensory perception. Impact of media technologies such as phonography, photography, cinema, and digital imaging on vision, hearing, touch, smell, taste, and locomotion. How human body and brain have been theorized as media. Team-taught by interdisciplinary group of faculty. [3]

### **CMAP8002 - History of Media**

#### **Title**

History of Media

#### **Catalog Description**

History of media technologies with special emphasis on historical moments of rupture: invention of the printing press; advent of photography and phonography; transition from silent to sound film; introduction of personal computing; emergence of satellite imaging and MRI technologies. Team-taught by interdisciplinary group of faculty. [3]

### **CMAP8003 - Media and Society**

#### **Title**

Media and Society

#### **Catalog Description**

Political and economic frameworks of media practice. Authorship, copyright, privacy and publicness in times of big data. Media and power, gender, body, disability, knowledge, and identity. Social media and networks. Media literacy and accessibility. Team-taught by interdisciplinary group of faculty. [3]

### **CMAP8004 - Media Ecology**

#### **Title**

Media Ecology

#### **Catalog Description**

Interplay between technology, culture, and all aspects of human life. Media as environment. Effects of media technologies on built environments such as urban centers, academic learning spaces, museum and gallery settings, hospitals, transitory spaces, domestic interiors, and natural surroundings. Team-taught by interdisciplinary group of faculty. [3]

## **CMAP8005 - Project, Research, and Professionalization Colloquium**

### **Title**

Project, Research, and Professionalization Colloquium

### **Catalog Description**

Discussion and development of various media-based research work, including dissertations. Institutional and professionalization matters and development of various perspectives for careers, academic or alternative-academic. [3]

## **CMAP8010 - Creative Media Practice**

### **Title**

Creative Media Practice

### **Catalog Description**

Creative work with moving images and sound. Principles of web design. Text and print in the digital age. Animation and game development strategies. Tools and strategies of digital pedagogy and online education. Fundamentals in programming and coding. 3D modeling. Desktop fabrication. Team-taught by interdisciplinary group of faculty. [3-4]

## **CMAP8011 - Working with Data**

### **Title**

Working with Data

### **Catalog Description**

Fundamentals of digitization and digital curation. Working with databases: text and data mining strategies and topic modeling. Medical imaging techniques and technologies. Geographical information and mapping systems. Copyright law in the digital age. Team-taught by interdisciplinary group of faculty. [3-4]

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# **Computer Science**

## **CS5239 - Cyber-Phys Sys: Fndatn & Proj**

### **Title**

Cyber-Phys Sys: Fndatn & Proj

### **Catalog Description**

(Also listed as CS 4239). Foundations of cyber-physical systems and the Internet-of-Things. Model-based engineering of cyber-physical systems, including modeling of physical and computational systems, design and implementation techniques, analysis and verification. Includes modeling and analysis assignments, and project using a simulator and a real-time computer system. No credit for students who have earned credit for CS 4239. SPRING. [3]

## **CS5247 - Data Visualization**

### **Title**

Data Visualization

### **Catalog Description**

Visualization analysis and design. Perception, color and multiple-view design, interaction, and task analysis for visualization. Techniques for visualizing geographic data, networks, hierarchical and high-dimensional data, and uncertainty. No credit for students who have received credit for 4247. [3]



## **CS5249 - Projects in Virtual Reality Design**

### **Title**

Projects in Virtual Reality Design

### **Catalog Description**

Students work in groups on specification, design, and construction of complex immersive 3D virtual environments. Includes modeling, interaction, usability, rendering, perception, and tracking. No credit for students who have earned credit for 4249. FALL. [3].

## **CS5250 - Algorithms**

### **Title**

Algorithms

### **Catalog Description**

(Also listed as CS 3250) Advanced data structures, systematic study and analysis of important algorithms for searching; sorting; string processing; mathematical, geometrical, and graph algorithms, classes of P and NP, NP-complete and intractable problems. No credit for students who have earned credit for 3250. FALL, SPRING. [3]

## **CS5251 - Intermediate Software Design**

### **Title**

Intermediate Software Design

### **Catalog Description**

(Also listed as CS 3251) High quality development and reuse of architectural patterns, design patterns, and software components. Theoretical and practical aspects of developing, documenting, testing, and applying reusable class libraries and object-oriented frameworks using object-oriented and component-based programming languages and tools. No credit for students who have earned credit for 3251. FALL, SPRING [3]

## **CS5252 - Theory of Automata, Formal Languages, and Computation**

### **Title**

Theory of Automata, Formal Languages, and Computation

### **Catalog Description**

(Also listed as CS 3252) Finite-state machines and regular expressions. Context-free grammars and languages. Pushdown automata. Turing machines. Undecidability. The Chomsky hierarchy. Computational complexity. No credit for students who have earned credit for 3252. SPRING. [3]

## **CS5253 - Parallel Functional Programming**

### **Title**

Parallel Functional Programming

### **Catalog Description**

Conceptual and practical aspects of designing, implementing, and debugging parallel software programs using functional programming language features and frameworks. Systematic reuse of scalable and robust software patterns and architectures for parallel programs. No credit for students who have earned credit for 3253. FALL. [3]

## **CS5254 - Concurrent Object-Oriented Programming**

### **Title**

Concurrent Object-Oriented Programming

### **Catalog Description**

Conceptual and practical aspects of designing, implementing, and debugging concurrent software programs using object-oriented programming language features and frameworks. Systematic reuse of scalable and robust software patterns and architectures for concurrent programs. No credit for students who have earned credit for 3254. SPRING. [3]

## **CS5255 - Numerical Methods for Computer Science and Engineering**

### **Title**

Numerical Methods for Computer Science and Engineering

### **Catalog Description**

(Also listed as CS 3255). Numerical and mathematical methods used in computer graphics, computational physics, robotics, vision, and learning. Algorithms for solving linear systems, determining matrix eigenstructures, nonlinear optimization, interpolation and extrapolation, integration and differentiation, solving ordinary and partial differential equations, and parallel programming. Emphasis on efficient implementations and applications. No credit awarded for students who have received credit for CS 3255. FALL [3]

## **CS5258 - Computer Graphics**

### **Title**

Computer Graphics

### **Catalog Description**

(Also listed as CS 3258) 2D rendering and image-based techniques, 2D and 3D transformations, modeling, 3D rendering, graphics pipeline, ray-tracing, and texture-mapping. No credit for students who have earned credit for 3258. FALL. [3]

## **CS5259 - Project in Computer Animation Design and Technology**

### **Title**

Project in Computer Animation Design and Technology

### **Catalog Description**

(Also listed as CS 3259) Principles and techniques of computer animation. Storyboarding, camera control, skeletons, inverse kinematics, splines, keyframing, motion capture, dynamic simulation, particle systems, facial animation, and motion perception. Students work in groups on the design, modeling, animation, and rendering of a computer animation project. No credit for students who have earned credit for 3259. FALL. [3]

## **CS5260 - Artificial Intelligence**

### **Title**

Artificial Intelligence

### **Catalog Description**

(Also listed as CS 4260) Principles and programming techniques of artificial intelligence. Strategies for searching, representation of knowledge and automatic deduction, learning, and adaptive systems. Survey of applications. No credit for students who have earned credit for 4260. FALL. [3]

## **CS5262 - Foundations of Machine Learning**

### **Title**

Foundations of Machine Learning

### **Catalog Description**

Theoretical and algorithmic foundations of supervised learning, unsupervised learning, and reinforcement learning. Linear and nonlinear regression, kernel methods, support vector machines, neural networks and deep learning methods, instance-based methods, ensemble classifiers, clustering and dimensionality reduction, value and policy iteration. Explainable AI, ethics, and data privacy. SPRING. [3]

## **CS5265 - Database Management Systems**

### **Title**

Database Management Systems

### **Catalog Description**

(Also listed as CS 3265) Logical and physical organization of databases. Data models and query languages, with emphasis on the relational model and its semantics. Data independence, security, integrity, concurrency. No credit for students who have earned credit for 3265. [3]

## **CS5266 - Topics in Big Data**

### **Title**

Topics in Big Data

### **Catalog Description**

Principles and practices of big data processing and analytics. Data storage databases and data modeling techniques, data processing and querying, data analytics and applications of machine learning using these systems. SPRING. [3]

## **CS5267 - Deep Learning**

### **Title**

Deep Learning

### **Catalog Description**

Provides students with an understanding of conceptual and practical aspects of models and algorithms used in deep learning. Key topics covered in this course include: Basic mathematical tools and machine learning concepts used in deep learning; Modern practical deep feedforward, convolutional, and recurrent networks; Regularization for deep learning; Optimization for learning deep models; Practical design methods. No credit for students who have earned credit for 4267. SPRING. [3]

## **CS5269 - Project in Artificial Intelligence**

### **Title**

Project in Artificial Intelligence

### **Catalog Description**

(Also listed as CS 4269) Students work in small groups on the specification, design, implementation, and testing of a sizeable AI software project. Projects (e.g., an "intelligent" game player) require that students address a variety of AI subject areas, notably heuristic search, uncertain reasoning, planning, knowledge representation, and learning. Class discussion highlights student progress, elaborates topics under investigation, and identifies other relevant topics (e.g., vision) that the project does not explore in depth. No credit for students who have earned credit for 4269. SPRING. [3]

## **CS5270 - Programming Languages**

### **Title**

Programming Languages

### **Catalog Description**

(Also listed as CS 3270) General criteria for design, implementation, and evaluation of programming languages. Historical perspective. Syntactic and semantic specification, compilations, and interpretation processes. Comparative studies of data types and data control, procedures and parameters, sequence control, nesting, scope and storage management, run-time representations. Problem solving using non-standard languages. No credit for students who have earned credit for 3270. FALL, SPRING. [3]

## **CS5274 - Modeling and Simulation**

### **Title**

Modeling and Simulation

### **Catalog Description**

(Also listed as CS 3274) General theory of modeling and simulation of a variety of systems: physical processes, computer systems, biological systems, and manufacturing processes. Principles of discrete-event, continuous, and hybrid system modeling, simulation algorithms for the different modeling paradigms, methodologies for constructing models of a number of realistic systems, and analysis of system behavior. Computational issues in modeling and analysis of systems. Stochastic simulations. No credit for students who have earned credit for 3274. [3]

## **CS5275 - Error Analysis in Safety Critical Systems**

### **Title**

Error Analysis in Safety Critical Systems

### **Catalog Description**

Case study-based course examining errors in safety critical systems, including healthcare and aviation. Errors explored from multiple perspectives, specifically computer science and systems engineering. No credit for students who have earned credit for 4275. SPRING. [3]

## **CS5276 - Compiler Construction**

### **Title**

Compiler Construction

### **Catalog Description**

(Also listed as CS 3276) Review of programming language structures, translation, loading, execution, and storage allocation. Compilation of simple expressions and statements. Organization of a compiler including compile-time and run-time symbol tables, lexical scan, syntax scan, object code generation, error diagnostics, object code optimization techniques, and overall design. Use of a high-level language to write a complete compiler. No credit for students who have earned credit for 3276. [3]

## **CS5277 - Cyber Security**

### **Title**

Cyber Security

### **Catalog Description**

Software issues, secure software design, attacks and detection, identity, sessions, human security mistakes, and security auditing. No credit for students who have earned credit for 4277. FALL. [3]

## **CS5278 - Principles of Software Engineering**

### **Title**

Principles of Software Engineering

### **Catalog Description**

(Also listed as CS 4278) The nature of software. The object-oriented paradigm. Software life-cycle models. Requirements, specification, design, implementation, documentation, and testing of software. Object-oriented analysis and design. Software maintenance. No credit for students who have earned credit for 4278. FALL. [3]

## **CS5279 - Software Engineering Project**

### **Title**

Software Engineering Project

### **Catalog Description**

(Also listed as CS 4279) Students work in teams to specify, design, implement, document, and test a nontrivial software project. The use of CASE (Computer Assisted Software Engineering) tools is stressed. No credit for students who have earned credit for 4279. SPRING. [3]

## **CS5281 - Principles of Operating Systems I**

### **Title**

Principles of Operating Systems I

### **Catalog Description**

(Also listed as CS 3281) Resource allocation and control functions of operating systems. Scheduling of processes and processors. Concurrent processes and primitives for their synchronization. Use of parallel processes in designing operating system subsystems. Methods of implementing parallel processes on conventional computers. Virtual memory, paging, protection of shared and non-shared information. Structures of data files in secondary storage. Security issues. Case studies. No credit for students who have earned credit for 3281. FALL, SPRING. [3]

## **CS5282 - Principles of Operating Systems II**

### **Title**

Principles of Operating Systems II

### **Catalog Description**

(Also listed as CS 3282) Projects involving modification of a current operating system. Lectures on memory management policies, including virtual memory. Protection and sharing of information, including general models for implementation of various degrees of sharing. Resource allocation in general, including deadlock detection and prevention strategies. Operating system performance measurement, for both efficiency and logical correctness. Two hours lecture and one hour laboratory. No credit for students who have earned credit for 3282. [3]

## **CS5284 - Computer Systems Analysis**

### **Title**

Computer Systems Analysis

### **Catalog Description**

(Also listed as CS 4284) Techniques for evaluating computer system performance with emphasis upon application. Topics include measurement and instrumentation techniques, benchmarking, simulation techniques, elementary queuing models, data analysis, operation analysis, performance criteria, case studies. Project involving a real computer system. No credit for students who have earned credit for 4284. [3]

## **CS5285 - Network Security**

### **Title**

Network Security

### **Catalog Description**

(Also listed as CS 4285) Principles and practice of network security. Security threats and mechanisms. Cryptography, key management, and message authentication. System security practices and recent research topics. No credit for students who have earned credit for 4285. [3]

## **CS5286 - Reverse Engineering for Cybersecurity**

### **Title**

Reverse Engineering for Cybersecurity

### **Catalog Description**

Cybersecurity from a practical standpoint. Topics include x86 assembly and reverse engineering, vulnerability analysis, and binary exploitation. Types of security defenses used by modern systems. Malware analysis and Windows-based exploits. No credit for students who have earned credit for 4286. SPRING. [3]

## **CS5287 - Principles of Cloud Computing**

### **Title**

Principles of Cloud Computing

### **Catalog Description**

(Also listed as CS 4287) Fundamental concepts of cloud computing, different service models, techniques for resource virtualization, programming models, management, mobile cloud computing, recent advances, and hands-on experimentation. No credit for students who have earned credit for 4287. [3]

## **CS5288 - Web-based System Architecture**

### **Title**

Web-based System Architecture

### **Catalog Description**

(Also listed as CS 4288) Core concepts necessary to architect, build, test, and deploy complex web-based systems; analysis of key domain requirements in security, robustness, performance, and scalability. No credit for students who have earned credit for 4288. FALL. [3]

## **CS5289 - Project in Web-Based Software Architectures**

### **Title**

Project in Web-Based Software Architectures

### **Catalog Description**

Project-based course building on core concepts necessary to architect, build, test, and deploy complex web-based systems. Students form teams, propose project ideas, architect their solutions, and build the initial minimum viable project for their application. In-class discussions focus on advanced topics in web-development. No credit for students who have earned credit for 4289. SPRING. [3]

**CS5352 - Social Network Analysis****Title**

Social Network Analysis

**Catalog Description**

Explores recent research on the analysis of social networks and on models and algorithms to abstract their properties and make predictions. Random graph models, network centrality measurements, computational methods of link prediction/recommender systems, clustering and classification on graphs, and network diffusion. Deep learning on graphs including network embedding and graph neural network models and applications. No credit for students who have earned credit for CS 4352 or DS 5720. [3]

**CS5376 - Foundations of Human Computer Interaction****Title**

Foundations of Human Computer Interaction

**Catalog Description**

Skills and concepts of Human-Computer Interaction (HCI) to enable the design of systems that effectively meet human needs. Social, cognitive, behavioral and contextual aspects of information systems. Informational dimensions of the human-computer interface, and other user-centered design concepts. Includes conceptual problems in HCI and design approaches to interactive prototype construction and evaluation techniques. No credit for students who have earned credit for 4376. FALL. [3]

**CS5383 - Computer Networks****Title**

Computer Networks

**Catalog Description**

(Also listed as CS 4383) Computer communications. Network (Internet) architecture. Algorithms and protocol design at each layer of the network stack. Cross-layer interactions and performance analysis. Network simulation tools. Lab and programming assignments. No credit for students who have earned credit for 4383. [3]

**CS5884 - Internship****Title**

Internship

**Catalog Description**

Internship working in a professional setting. Departmental approval required. FALL, SPRING, SUMMER. [0]

**CS5891 - Special Topics****Title**

Special Topics

**Catalog Description**

(Also listed as CS 3891) [Variable credit: 1-3 each semester] No credit for students who have earned credit for 3891.

## **CS5892 - Special Topics**

### **Title**

Special Topics

### **Catalog Description**

(Also listed as CS 3892) [Variable credit: 1-3 each semester] No credit for students who have earned credit for 3892.

## **CS6310 - Design and Analysis of Algorithms**

### **Title**

Design and Analysis of Algorithms

### **Catalog Description**

Set manipulation techniques, divide-and-conquer methods, the greedy method, dynamic programming, algorithms on graphs, backtracking, branch-and-bound, lower bound theory, NP-hard and NP-complete problems, approximation algorithms. Prerequisite: CS 3250. SPRING. [3]

## **CS6311 - Graph Algorithms**

### **Title**

Graph Algorithms

### **Catalog Description**

Algorithms for dealing with special classes of graphs. Particular emphasis is given to subclasses of perfect graphs and graphs that can be stored in a small amount of space. Interval, chordal, permutation, comparability, and circular-arc graphs; graph decomposition. Prerequisite: CS 6310 or Math 4710. [3]

## **CS6315 - Automated Verification**

### **Title**

Automated Verification

### **Catalog Description**

Systems verification and validation, industrial case studies, propositional and predicate logic, syntax and semantics of computational tree and linear time logics, binary decision diagrams, timed automata model and real-time verification, hands on experience with model checking using the SMV, SPIN and UPPAAL tools, and state reduction techniques. [3]

## **CS6320 - Algorithms for Parallel Computing**

### **Title**

Algorithms for Parallel Computing

### **Catalog Description**

Design and analysis of parallel algorithms for sorting, searching, matrix processing, FFT, optimization, and other problems. Existing and proposed parallel architectures, including SIMD machines, MIMD machines, and VLSI systolic arrays. Prerequisite: CS 6310. [3]



## **CS6350 - Artificial Neural Networks**

### **Title**

Artificial Neural Networks

### **Catalog Description**

Theory and practice of parallel distributed processing methods using networks of neuron-like computational devices. Neurobiological inspirations, attractor networks, correlational and error-correction learning, regularization, unsupervised learning, reinforcement learning, Bayesian and information theoretic approaches, hardware support, and engineering applications. SPRING. [3]

## **CS6351 - Advanced Animation**

### **Title**

Advanced Animation

### **Catalog Description**

Current research issues and problems in computer animation, with special focus on motion capture, dynamic simulation, and key-framing. Cloth, deformable bodies, natural phenomena, geometric algorithms, procedural techniques, facial animation, hair, autonomous characters, flocking, empirical evaluation, and interfaces for animation. Prerequisite: CS 3259. FALL. [3]

## **CS6352 - Human-Computer Interaction**

### **Title**

Human-Computer Interaction

### **Catalog Description**

An overview of human computer interaction and problems of current interest. Topics include: Human factors, GOMS, user interface design and evaluation, interaction modalities, distributed cognition, ubiquitous computing. A project involving design and evaluation will be performed. [3]

## **CS6357 - Open-source Programming for Medical Image Analysis**

### **Title**

Open-source Programming for Medical Image Analysis

### **Catalog Description**

Use of open-source libraries, tools, and techniques for solving medical image analysis problems in research, commercial, and clinical settings. Open-source libraries and open-source cross-platform software packages for high-performance multi-threaded image analysis and manipulation and visualization of medical data. Application of best practices, such as version management, for generating reproducible results. Basic familiarity with C++ is strongly recommended. FALL. [3]

## **CS6358 - Computer Vision**

### **Title**

Computer Vision

### **Catalog Description**

The fundamentals of computer vision and techniques for image understanding and high-level image processing. Includes image segmentation, geometric structures, relational structures, motion, matching, inference, and vision systems. Prerequisite: EECE 6357. SPRING. [3]

## **CS6359 - Medical Image Registration**

### **Title**

Medical Image Registration

### **Catalog Description**

Foundations of medical image registration. Mathematical methods and practical applications. Image-to-image registration, image-to-physical registration, applications to image-guided procedures and the most commonly used imaging modalities with an emphasis on tomographic images. FALL. [3]

## **CS6360 - Advanced Artificial Intelligence**

### **Title**

Advanced Artificial Intelligence

### **Catalog Description**

Discussion of state-of-the-art and current research issues in heuristic search, knowledge representation, deduction, and reasoning. Related application areas include: planning systems, qualitative reasoning, cognitive models of human memory, user modeling in ICAI, reasoning with uncertainty, knowledge-based system design, and language comprehension. Prerequisite: CS 4260 or equivalent. [3]

## **CS6362 - Advanced Machine Learning**

### **Title**

Advanced Machine Learning

### **Catalog Description**

Theory and algorithms for designing systems that learn from data including modern machine learning methods that take advantage of increased complexity to provide improved performance. Data types, data pre-processing, measures of similarity and dissimilarity. Supervised learning: decision trees, logistic regression, support vector machines, Bayesian methods, and neural networks; unsupervised learning: partitional, hierarchical, density-based, and graph clustering algorithms. Feature selection for classification and clustering. Evaluation methods. Reinforcement learning: Markov Decision processes, dynamic programming, Monte Carlo methods, TD-learning. Prerequisite: CS 4262 or 5262 or 6360. FALL. [3]

## **CS6363 - Statistical Foundations of Deep Learning**

### **Title**

Statistical Foundations of Deep Learning

### **Catalog Description**

Statistical learning theory, parametric learning with high-dimensional data, optimization techniques, a unified view of deep neural architectures and broad overview of learning settings including supervised, unsupervised, self-supervised, meta, continual, and reinforcement learning. Emphasis on mathematical foundations. Prerequisite: CS 4267, CS 5267, or instructor approval. [3]

## **CS6364 - Intelligent Learning Environments**

### **Title**

Intelligent Learning Environments

### **Catalog Description**

Theories and concepts from computer science, artificial intelligence, cognitive science, and education that facilitate designing, building, and evaluating computer-based instructional systems. Development and substantiation of the concept, architecture, and implementation of intelligent learning environments. Multimedia and web-based technology in teaching, learning, collaboration, and assessment. Prerequisite: CS 5260, CS 6360, or equivalent. [3]

## **CS6365 - Representation in Deep Learning**

### **Title**

Representation in Deep Learning

### **Catalog Description**

Representation learning theory for deep learning. Variational Bayes, deep auto-encoder models, rate-distortion theory, Info-Max principles, contrastive learning, and rotating contemporary topics. Emphasis on mathematical foundations. Prerequisite: CS 4267, CS 5267, or instructor approval. [3]

## **CS6366 - Distributed Artificial Intelligence**

### **Title**

Distributed Artificial Intelligence

### **Catalog Description**

Principles and practice of multiple agent systems for distributed artificial intelligence. Game theory, distributed negotiation and decision making, distributed problem solving, cooperation, coalition formation and distributed learning. Prerequisite: CS 4260. [3]

## **CS6368 - Computational Economics**

### **Title**

Computational Economics

### **Catalog Description**

Models and methods in computational economics, such as linear and non-linear optimization, decision theory, game theory, mechanism design, and computational tools. Applications in areas such as auctions, economics of security and privacy, market design, and algorithmic trading. Prereq: CS 4260 or 5260. SPRING. [3]

## **CS6375 - Discrete-Event Systems: Supervisory Control and Diagnosis**

### **Title**

Discrete-Event Systems: Supervisory Control and Diagnosis

### **Catalog Description**

Algebraic structures, automata and formal language theory, process modeling with finite-state automata, supervisory control theory, controllability and supervision, supervisory control under partial observation, modular and hierarchical supervisory control, supervisory control of real-time systems, fault diagnosis of discrete-event systems, and modular diagnosis approaches. SPRING. [3]

## **CS6376 - Foundations of Hybrid and Embedded Systems**

### **Title**

Foundations of Hybrid and Embedded Systems

### **Catalog Description**

Modeling, analysis, and design of hybrid and embedded systems. Heterogeneous modeling and design of embedded systems using formal models of computation, modeling and simulation of hybrid systems, properties of hybrid systems, analysis methods based on abstractions, reachability, and verification of hybrid systems. FALL. [3]

## **CS6377 - Topics in Embedded Software and Systems**

### **Title**

Topics in Embedded Software and Systems

### **Catalog Description**

Specification and composition of domain-specific modeling languages. Design methodologies for embedded systems. Platforms for embedded system design and implementation. Analysis of embedded systems. SPRING. [3]

## **CS6380 - Principles of Computer Security Research**

### **Title**

Principles of Computer Security Research

### **Catalog Description**

Systems, web, and hardware security, and human involvement in safety-critical systems. Fundamental skills for computer security research. [3]

## **CS6381 - Distributed Systems Principles**

### **Title**

Distributed Systems Principles

### **Catalog Description**

Techniques and mechanisms in distributed system design, such as logical clocks, distributed consensus, distributed mutual exclusion, consistency models, fault tolerance and paradigms of communication. Contemporary distributed system case studies and open challenges. Prerequisite: CS 3281. [3]

## **CS6384 - Performance Evaluation of Computer Systems**

### **Title**

Performance Evaluation of Computer Systems

### **Catalog Description**

Techniques for computer systems modeling and analysis. Analytical modeling with emphasis on queuing network models, efficient computational algorithms for exact and approximate solutions, parameter estimation and prediction, validation techniques, workload characterization, performance optimization, communication and distributed system modeling. Prerequisite: CS 3281 or 6381. SPRING. [3]

## **CS6385 - Advanced Software Engineering**

### **Title**

Advanced Software Engineering

### **Catalog Description**

An intensive study of selected areas of software engineering. Topics may include CASE tools, formal methods, generative techniques, aspect-oriented programming, metrics, modeling, reuse, software architecture, testing, and open-source software. Prerequisite: CS 5278. FALL. [3]

**CS6386 - System-Level Fault Diagnosis****Title**

System-Level Fault Diagnosis

**Catalog Description**

An overview of the basic concepts of the theory of fault diagnosis and problems of current interest. Topics include the classical PMC and BGM models of fault diagnosis, hybrid (permanent and intermittent faults) models, diagnostic measures for one-step, sequential, and inexact diagnosis. Emphasis is on algorithmic techniques for solving the diagnosis and diagnosability problems in various models. Prerequisite: CS 6381. SPRING. [3]

**CS6387 - Topics in Software Engineering****Title**

Topics in Software Engineering

**Catalog Description**

Topics may include empirical software engineering and open-source software engineering. Prerequisite: CS 5278 or consent of instructor. SPRING. [3]

**CS6388 - Model-Integrated Computing****Title**

Model-Integrated Computing

**Catalog Description**

Problems of designing, creating, and evolving information systems by providing rich, domain-specific modeling environments including model analysis and model-based program synthesis tools. Class presentation and project are required. FALL. [3]

**CS7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-6]

**CS8390 - Individual Studies****Title**

Individual Studies

**Catalog Description**

[1-3]

**CS8395 - Special Topics****Title**

Special Topics

**Catalog Description**

[3]

**CS8396 - Special Topics****Title**

Special Topics

**Catalog Description**

[3]

**CS8991 - Seminar****Title**

Seminar

**Catalog Description**

[1-3 each semester]

**CS8992 - Seminar****Title**

Seminar

**Catalog Description**

[1-3 each semester]

**CS8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [0-12]

**CS9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Data Science

**DS5220 - Principles of Programming and Simulation****Title**

Principles of Programming and Simulation

**Catalog Description**

Students learn the foundations of effective software design and programming practice, how to program and evaluate a simulation, and how to apply modern resampling techniques in simulations in both R and Python. Students learn workflow solutions, e.g., Jupyter Notebooks, Latex, Knitr, Markdown reports, and collaboration platforms (e.g., GitHub and version control). Reproducible methods for programming and data processing are emphasized. [3]

**DS5320 - Survey of Data Science Applications****Title**

Survey of Data Science Applications

**Catalog Description**

This course introduces foundational data science concepts, terminology, and conventions, and exposes students to a wide range of data science applications, e.g., in genomics, health care, informatics, astronomy/physics, neuroimaging, cyber-physical systems, business, and finance. Specific topics vary by year as determined by guest speaker availability. [3]

**DS5340 - Data Science Rights and Responsibility****Title**

Data Science Rights and Responsibility

**Catalog Description**

This course explores the ethos, ethics, and obligations of the modern data scientist. Modern data security and privacy vulnerabilities, as well as solutions, for individual-level data and the institutions from which the data is derived will be discussed. The history, ethics, and standards for human experimentation are reviewed. The legal landscape concerning data ownership and privacy will be surveyed. [3]

**DS5360 - Data Science Research Project****Title**

Data Science Research Project

**Catalog Description**

This course provides students with a supervised data science research project experience. Students will be applying concepts and tools learned in the classroom to a domain-specific research project through a supervised, small-group research experience. Students will work closely with their instructor and a domain researcher to develop a semester-long data science project that answers real-world research questions through practical data science. This experience challenges students to become critical thinkers, sharpens their technical and teamwork skills, and enhances professional communication and professional development. [3]

**DS5380 - Data Science in Teamwork in Practice****Title**

Data Science in Teamwork in Practice

**Catalog Description**

Students will work in small groups to engage in real world problems, and apply their skills in a supervised environment where active learning is reinforced, and learn to make practical decisions. First students will learn how to process data, generate analysis reports and data summaries. Data will come from many sources, e.g. Kaggle competitions, VU/VUMC labs, and online documented data sets. Students will experience a goal-oriented teamwork environment and learn how to participate and support teams as the primary data curator and data analyst. [3]

## **DS5390 - Data Storytelling and Communications**

### **Title**

Data Storytelling and Communications

### **Catalog Description**

In this course, students will learn how to effectively communicate data insights to stakeholders through written, verbal, and visual means. The course integrates two key skills: communicating with data and data visualization. Students will explore different storytelling techniques and learn how to design effective visualizations that are both aesthetically pleasing and informative. By the end of the course, students will have the skills they need to become effective data storytellers and communicators, able to craft compelling narratives that convey complex data insights in a way that is both informative and engaging for a wide range of audiences. SPRING [3] Dorff

## **DS5420 - Data Management Systems**

### **Title**

Data Management Systems

### **Catalog Description**

This course covers database management systems, e.g., relational databases, data architecture, and security. Topics include entity-relationship models and relational theory; storage and access of data; complex SQL queries; and non-relational databases including NoSQL databases. Students are exposed to data base architectures as time allows. [3]

## **DS5440 - Data Science Algorithms**

### **Title**

Data Science Algorithms

### **Catalog Description**

An applied and practical view of computational algorithms that are relevant for data science applications and infrastructure. Topics include optimization algorithms like momentum and RMSprop and their use in (stochastic) gradient descent-based methods, Neural Networks, and streaming algorithms for computational statistics, e.g., Monte-Carlo Markov Chain; Bayesian methods like Maximum Likelihood Estimation (MLE), and Maximum A Posteriori (MAP) are also discussed. [3]

## **DS5460 - Big Data Scaling**

### **Title**

Big Data Scaling

### **Catalog Description**

This course will address key challenges that arise when working with big data and parallel processing. Practical techniques for storing, retrieving, and scaling are discussed. Topics include high-performance computing, parallel processing, commercial cloud architectures, and mapping of data science algorithms onto scalable computing platforms. [3]

## **DS5610 - Exploratory Data Analysis**

### **Title**

Exploratory Data Analysis

### **Catalog Description**

This course will teach students how to explore, summarize, and graph data (big and small). Topics include principles of perception, how to display data, scatterplots, histograms, boxplots, bar charts, dynamite plots, proper data summaries, dimensionality reduction, multidimensional scaling, and unsupervised clustering algorithms, such as principal component analysis, k-means clustering, and nearest neighbor algorithms. [3]



## **DS5620 - Probability and Statistical Inference**

### **Title**

Probability and Statistical Inference

### **Catalog Description**

This course introduces probability and inference, in which the fundamental mathematical concepts are illustrated with computer simulation. The course begins with the concepts of repeatable processes, operating characteristics, and long-run proportions. It also explores the idea of probability as an expression of belief. It then covers the properties of probabilities; random variables; discrete, continuous, and mixture probability models; sampling, summary quantities as random variables; estimating probability models from data; communicating model uncertainty via confidence intervals; and ends with basic inference. [3]

## **DS5640 - Machine Learning**

### **Title**

Machine Learning

### **Catalog Description**

This is the first course in a sequence exploring statistical modeling and machine learning techniques. Both courses emphasize unifying and high-level concepts, such as prediction and calibration, classification and discrimination, optimism and cross-validation, re-sampling methods for model assessment, the evaluation of modeling assumptions and bias-variance trade-off. This first course focuses on regression, generalized linear models, regularized regression, kernel methods, bagging and boosted trees, and simple neural networks. [3]

## **DS5660 - Deep Learning**

### **Title**

Deep Learning

### **Catalog Description**

This is the second course in a sequence exploring statistical modeling and machine learning techniques. Both courses emphasize unifying and high-level concepts such as prediction and calibration, classification and discrimination, loss functions, optimism and cross-validation, re-sampling methods for model assessment, the evaluation of modeling assumptions and bias-variance trade-off. This second course covers nonparametric regression, neural networks (convolution and recurrent), deep learning, reinforcement learning, long-short term memory models, hidden-markov models and Bayesian networks. [3]

## **DS5690 - Generative AI Models in Theory and Practice**

### **Title**

Generative AI Models in Theory and Practice

### **Catalog Description**

Transformer models are finding wide application (NLP, audio analysis or "textless NLP", computer vision, and more) and are achieving state of the art performance across multiple tasks. In this course we will discuss the theoretical underpinnings of transformers, cover the skills and tools needed to use transformers, and gain hands-on experience. Students will be assigned two papers to present over the semester, complete self-guided training using the Huggingface.co training material, and will apply a transformer-based model to solve a research problem. FALL [3]

## **DS5700 - Data Science Internship**

### **Title**

Data Science Internship

### **Catalog Description**

This course is a supervised internship external to Vanderbilt. Students have an opportunity to apply concepts learned in the classroom to real-world settings in a supervised internship experience. The experience hones technical skills, fosters professional development, and enhances communication, critical-thinking, and teamwork skills. Students must present a one-page plan for their internship and generate at least one deliverable (talk, report, etc.) based on their internship experience. Student will need to identify a Data Science faculty mentor to monitor their progress and discuss their experience. [0-3]

## **DS5720 - Social Network Analysis**

### **Title**

Social Network Analysis

### **Catalog Description**

Explores recent research on the analysis of social networks and on models and algorithms that are used to abstract their properties and make predictions. Key topics covered in this course are: Graph models; Network centrality measurements; Computational methods of link prediction, clustering and classification on graphs, and network diffusion; Deep learning on graphs including network embedding and graph neural network models and their applications. Prerequisites: DS 5440 and 5660. [3]

## **DS5730 - Context-Augmented Generative AI Applications**

### **Title**

Context-Augmented Generative AI Applications

### **Catalog Description**

This course explores techniques for leveraging generative AI to build real-world LLM-based solutions. Students will gain a deep understanding of foundational AI approaches, including the varieties of retrieval augmented generation, agent-based systems, and model fine-tuning. Through practical implementation of various AI solutions, students will learn to evaluate and select the most appropriate methods to enhance system performance based on specific client demands. By the end of the course, students will be equipped to effectively apply generative AI in practical settings, with an emphasis on operationalizing and monitoring LLM applications requiring proprietary data.

## **DS5740 - Advanced Statistics for Data Scientists**

### **Title**

Advanced Statistics for Data Scientists

### **Catalog Description**

This course develops a foundational understanding of advanced applications of statistics and applies them to specific real-world scenarios. We will cover time series analysis and various forecasting methodologies (ARIMA, SARIMAX, Prophet), PCA/clustering applied to customer segmentation and survey data, econometric techniques (regression discontinuity, difference in differences, etc.), and A/B testing methodologies. We will also explore issues around missing data and outliers/anomalies that plague real-world data sets. While theoretical foundations will be covered, the focus of this class is on case studies, real-world data, computing, and application rather than mathematical derivations or proofs.

## **DS5760 - No SQL for Modern Data Science Applications**

### **Title**

No SQL for Modern Data Science Applications

### **Catalog Description**

This course will prepare students on current and emerging practices for handling unstructured data. Many modern data science applications are highly data intensive, require heavy read/write workloads, and are often unstructured in nature, which requires storage and processing beyond relational databases and management methodologies. NoSQL, or Not-Only SQL, databases are non-schema oriented and provide additional capabilities that support these types of applications. This course will introduce NoSQL systems such as BigTable (by Google), Dynamo (by Amazon), Apache Cassandra (used by Facebook), Apache HBase (used by Twitter), and other NoSQL systems such as MongoDB. Other topics covered will include an introduction to big data analytics such as Apache Hadoop and MapReduce.

## **DS5780 - Natural Language Processing**

### **Title**

Natural Language Processing

### **Catalog Description**

This course will focus on using computers to automatically analyze language data for linguistic features. The goal of the course is to provide students with the background and computing skills necessary to independently analyze and assess language features in naturally occurring text. At the lexical level, this will include assessments of words and morphemes for features related to complexity. At the syntactic level, analyses will examine part-of-speech tagging, dependency parsing, and phrasal and clausal complexity. At the cognitive level, this will involve assessing affective language and annotating texts for named entities. At the semantic level, cohesion, topicality, and similarity will be examined. Additionally, the course will cover topics including rule-based matching and a brief introduction to large language models. The course will be taught using the Python programming language and appropriate Python packages (e.g., Pandas, spaCy). The course will be practice-based, and the final project will require students to analyze language data of interest to their field of research, discuss the data from an analytical language perspective, and model outcomes. SPRING [3] Crossley

## **DS5799 - Independent Study**

### **Title**

Independent Study

### **Catalog Description**

Designed to allow the student to explore and/or master advanced or specialized topics in Data Science. Can be used for research project credit, internship experience. [0-3]

## **DS5800 - Data Science Practicum**

### **Title**

Data Science Practicum

### **Catalog Description**

This course is a supervised practicum in data science at Vanderbilt or VUMC. Students have an opportunity to apply concepts learned in the classroom to real-world settings in a supervised lab experience. The experience hones technical skills, fosters professional development, and enhances communication, critical-thinking, and teamwork skills. Students must present a one-page plan for their practicum and generate at least one deliverable (talk, report, etc.) based on their experience. Student will need to identify a Data Science faculty mentor to monitor their progress and discuss their experience. [0-3]

### **DS5899 - Special Topics in Data Science**

#### **Title**

Special Topics in Data Science

#### **Catalog Description**

Special Topics in Data Science. May be repeated for credit once if there is no duplication of topic. [3].

### **DS5999 - Capstone Development**

#### **Title**

Capstone Development

#### **Catalog Description**

A structured environment in which students develop their capstone projects; get feedback from students, faculty, and industry mentors; learn how to construct a presentation; and practice oral presentations. Students will also learn how to set a timeline and work toward completion in a supervised environment. [0-3]

### **DS7999 - Master's Research**

#### **Title**

Master's Research

#### **Catalog Description**

Master's Research in Data Science [0-3]

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## **Digital Humanities**

### **DHUM5100 - Introduction to Digital Humanities**

#### **Title**

Introduction to Digital Humanities

#### **Catalog Description**

Hands-on experience with essential technologies including digital archives, geospatial humanities, and data and text analysis. History, sub-fields, and major debates; quantitative and qualitative research; intersections of race, gender, and technology; and software studies. Offered on a graded basis only. [3]

### **DHUM6300 - Computational Humanities**

#### **Title**

Computational Humanities

#### **Catalog Description**

Computational analysis of texts, images, video, and sound recordings. Text analysis and data analysis using Python and R, fundamentals of machine learning, creating and using databases, and statistical modeling for humanities research. Debates and controversies surrounding computational humanities. Writing about computational research for humanities audiences. No prior statistical or computing experience is necessary. [3]

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## **Earth and Environmental Sciences**

**EES5110 - Global Climate Change****Title**

Global Climate Change

**Catalog Description**

(Also listed as EES 2110) Science and policy of global climate change: history and causes of climate change in Earth's past, with emphasis on the last 2 million years; evidence of human impacts on climate since 1850; future climate change and its economic, social, and ecological consequences; economic, technological, and public policy responses. No credit for students who have earned credit for 2110. [3]

**EES5220 - Life Through Time****Title**

Life Through Time

**Catalog Description**

(Also listed as EES 3220) Ecology, classification, and evolution of important groups of fossils, emphasizing invertebrates. Change in marine ecosystems through geologic time. Causes and effects of rapid evolution events and mass extinctions. Three hours of lecture and one laboratory period per week. No credit for students who have earned credit for 3220 or 3220W. [4]

**EES5233 - Conservation Biology****Title**

Conservation Biology

**Catalog Description**

Ecological, evolutionary, social, and economic aspects of biodiversity loss and ecosystem disruption due to human activities. Climate change, habitat fragmentation, species overexploitation, and invasive species. Sustainable development, habitat restoration, and species reintroduction. [3]

**EES5238 - Ecology****Title**

Ecology

**Catalog Description**

Population biology, evolutionary ecology, community structure, with emphasis on species interactions, including competition, predation, and symbiosis. No credit for students who have earned credit for 4238. [3]

**EES5250 - Earth Materials****Title**

Earth Materials

**Catalog Description**

(Also listed as EES 3250) Solid materials that make up the earth; rock, soil, and sediment - with emphasis on the minerals that are their major constituents. Hand specimen, optical, and X-ray methods of description and identification. Physical and chemical processes that form and modify earth materials and the use of these materials in interpreting earth processes of the past and present. Field trips. Three lectures and one laboratory per week. No credit for students who have earned credit for 3250. [4]

**EES5260 - Petrology****Title**

Petrology

**Catalog Description**

(Also listed as EES 3260) Nature, distribution, and theories of origin of igneous, metamorphic, and sedimentary rocks. Mineralogy as a function of rock-forming conditions. Laboratory emphasis on description and interpretation of rocks, using hand sample and microscope techniques. Field trips. Three lectures and one laboratory period per week. No credit for students who have earned credit for 3260. [4]

**EES5300 - Earth's Natural Resources****Title**

Earth's Natural Resources

**Catalog Description**

Natural resource formation, production, and use. Geologic controls on resource distribution. Analysis of historical trends and prediction of future resource availability. Environmental impacts of mining, use, and disposal. Fossil fuels, alternative energy, nuclear fuels, metals, industrial minerals, water, soil, and elements used in agriculture. Synthesis of knowledge from the geosciences, chemistry, engineering, and economics. [3]

**EES5310 - Global Climate Change****Title**

Global Climate Change

**Catalog Description**

Scientific principles and policy applications. Earth's past; evidence of human impact; future climate change; and economic, social, and ecological consequences. Economic, technological, and public policy responses. Repeat credit for 5110. Students who have earned credit for 5110 will earn only one credit hour. [4]

**EES5340 - Structural Geology and Rock Mechanics****Title**

Structural Geology and Rock Mechanics

**Catalog Description**

(Also listed as EES 3340) Principles of rock deformation; mechanics, fractures, folds, foliation, primary structures, applications of principles. Interactions and feedbacks between tectonics, climate, and erosion. Field trips. Two lectures and one laboratory period per week. No credit for students who have earned credit for 3340. [4]

**EES5420 - Geomorphology****Title**

Geomorphology

**Catalog Description**

(Also listed as EES 4420) Analysis of the Earth's landforms, their morphology, history, and the processes that form them. The building of relief and its subsequent transformation by geologic processes on hillslopes, rivers, coasts, wetlands, and glaciers. The natural history and human impacts on land forms. Field trips. Familiarity with basic physics (mechanics) is expected. No credit for students who have earned credit for 4420. [3]

**EES5440 - Glacial Geology****Title**

Glacial Geology

**Catalog Description**

Metamorphism of snow and ice; mass balance at snow and ice surfaces; and rheology of ice. Destruction and creation of landscapes by glacial movement and debris. Response of ice bodies to changes in climate; physical, chemical, and biological evidence of climate change; and methods of paleoclimate reconstruction. Glacial impacts on societies through sea-level, hazards, coastlines, and water supplies. [3]

**EES5510 - Earth Systems through Time****Title**

Earth Systems through Time

**Catalog Description**

(Also listed as EES 2510) Effects of feedbacks between the geologic cycles on the lithosphere, hydrosphere, biosphere, and atmosphere at diverse intervals in the Earth's history. Present and future implications. Interpretations of evidence recorded in Earth materials. Three hours of lecture and one laboratory per week. No credit for students who have earned credit for 2510. [4]

**EES5550 - Transport Processes in Earth and Environmental Systems****Title**

Transport Processes in Earth and Environmental Systems

**Catalog Description**

(Also listed as EES 4550) Principles of conservation and constitutive transport laws; classic and emerging styles of modeling natural systems. Prior study of basic calculus (functions, derivatives, integrals) and physics (mechanics) is expected. No credit for students who have earned credit for 4550. [3]

**EES5580 - Environmental Geochemistry****Title**

Environmental Geochemistry

**Catalog Description**

Chemistry of Earth's surface including the interaction of solids, liquids, and gases. Earth's biogeochemical cycles. Natural and anthropogenic transformations in the Critical Zone. Collection and analysis of environmental samples in the field. [4]

**EES5600 - Geochemistry****Title**

Geochemistry

**Catalog Description**

(Also listed as EES 4600) Application of chemistry to study the distribution and cycling of elements in the crust of the earth. Includes chemical bonding and crystallization, phase rules and phase diagrams, chemical equilibria, theories on the origin of elements, earth, ocean, atmosphere, and crust. No credit for students who have earned credit for 3600. [3]

**EES5650 - Physics of the Climate System****Title**

Physics of the Climate System

**Catalog Description**

Physical processes affecting the climate system. Global energy balance of Earth and planets. Surface temperature and how it is regulated. Electromagnetic radiation and its interaction with atmospheric gases, clouds, and aerosols. Ocean heat storage, cloud and precipitation processes, and the impact of sea and inland ice on temperature. Processes that govern the water and carbon cycle. No credit for students who have earned credit for 290-01 offered spring 2014 or spring 2015. [3]

**EES5680 - Paleoclimates****Title**

Paleoclimates

**Catalog Description**

(Also listed as EES 4680) Fluctuations in Earth's climate with an emphasis on the past 700 million years. Forcings and feedback that influence climate and drive change. Techniques used to reconstruct past climate change using marine and terrestrial geologic deposits and geochronologic methods. No credit for students who have earned credit for 4680. [3]

**EES5760 - Agent- and Individual-Based Computational Modeling****Title**

Agent- and Individual-Based Computational Modeling

**Catalog Description**

Applications in natural, social, and behavioral sciences and engineering. Designing, programming, and documenting models. Using models for experiments. Examples from environmental science, ecology, economics, urban planning, and medicine. Familiarity with basic statistics and proficiency in algebra are expected. [3]

**EES5820 - Paleoecological Methods****Title**

Paleoecological Methods

**Catalog Description**

(Also listed as EES 4820) Tools used to interpret past environments and climates, including plant microfossils, pollen and phytoliths, vertebrate morphology, and dental microwear and mesowear. Geochemical tools such as stable isotopes and rare earth elements. Integrating methods for paleontological and anthropological studies, including the use of databases and meta-analyses. Readings from primary sources. Serves as repeat credit for students who completed 390 section 4 in spring 2010. No credit for students who have earned credit for 4820. [3]

**EES5830 - Volcanic Processes****Title**

Volcanic Processes

**Catalog Description**

Nature, behavior, and origin of volcanoes. Magmatic processes that lead to eruptions. Eruptive processes and volcano construction. Impacts of volcanism on Earth's surface environment. Prerequisite: 3260. No credit for students who have earned credit for 4830. [3] (MNS)



**EES5841 - Directed Study****Title**

Directed Study

**Catalog Description**

(Also listed as EES 3841) Readings in related fields and/or laboratory research in pursuit of a scholarly project conceived and executed under the supervision of a faculty member. Open to senior majors and graduate students or by consent of the department chair. Does not count toward minimum requirements for the major. May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 2 credits per semester of enrollment. [1-2] (No AXLE credit)

**EES5842 - Directed Study****Title**

Directed Study

**Catalog Description**

(Also listed as EES 3842) Readings in related fields and/or laboratory research in pursuit of a scholarly project conceived and executed under the supervision of a faculty member. Open to senior majors and graduate students or by consent of the department chair. Does not count toward minimum requirements for the major. May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 2 credits per semester of enrollment. [1-2] (No AXLE credit)

**EES5851 - Independent Study****Title**

Independent Study

**Catalog Description**

(Also listed as EES 3851) Readings with related field and/or laboratory research in pursuit of a scholarly project conceived and executed under the supervision of a faculty member. Open to senior majors and graduate students. Other students must have consent of department chair. Does not count toward minimum requirements for the major. May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. No credit for students who have earned credit for 3851. [1-3] (No AXLE credit)

**EES5852 - Independent Study****Title**

Independent Study

**Catalog Description**

(Also listed as EES 3852) Readings with related field and/or laboratory research in pursuit of a scholarly project conceived and executed under the supervision of a faculty member. Open to senior majors and graduate students. Other students must have consent of department chair. Does not count toward minimum requirements for the major. May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. No credit for students who have earned credit for 3852. [1-3] (No AXLE credit)

**EES5891 - Special Topics****Title**

Special Topics

**Catalog Description**

(Also listed as EES 3891) Topics vary. May be repeated for credit more than once by permission of the director of undergraduate studies. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3891. [3] (No AXLE credit)

**EES5990 - Mass Extinctions****Title**

Mass Extinctions

**Catalog Description**

Synthesizing causes, consequences, and dynamics of past mass extinction events. Using fossil records to interpret current and future trends in biodiversity loss. No credit for students who have earned credit for 3891-02 offered spring 2017 or spring 2018. [3]

**EES6100 - Earth Fluids****Title**

Earth Fluids

**Catalog Description**

Fluid dynamics in relation to natural Earth systems, including low and high Reynolds number flows. [3]

**EES6891 - Special Topics and Advanced Techniques in Geology****Title**

Special Topics and Advanced Techniques in Geology

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-4]

**EES7110 - Advanced Topics in Earth Materials****Title**

Advanced Topics in Earth Materials

**Catalog Description**

Selected topics in the structure, composition, properties of the materials that constitute the Earth, and the natural processes that control their stability and transformations. May be repeated for credit if there is no duplication in topic. [3]

**EES7300 - Isotopes and the Environment****Title**

Isotopes and the Environment

**Catalog Description**

Isotope systems, research techniques and applications used to trace, date, and understand environmental processes on Earth's surface. Stable, radiogenic, and cosmogenic isotope systems. Radiometric dating of low temperature processes. [3]

## **EES7350 - Magmatic Processes and the Construction of Earth's Crust**

### **Title**

Magmatic Processes and the Construction of Earth's Crust

### **Catalog Description**

Generation of magma and its role in construction of Earth's crust. Connection between magmatism and large-scale tectonics. Introduction to magmatic tracers: isotopes, trace elements, phase equilibria; geochronology; and the history of the crust, Hadean to present. [3]

## **EES7380 - Sedimentary Systems: Source-to-Sink**

### **Title**

Sedimentary Systems: Source-to-Sink

### **Catalog Description**

Generation and distribution of sediment from mountain tops to deep-sea basins. Construction of depositional landscapes and stratigraphy. Sediment dispersal and interactions between source-to-sink components along transport pathways; feedbacks with climate, tectonics, the biosphere, and humans. Earth system interactions, energy budgets, and nutrient and geochemical cycling. No credit for students who earned credit for 390 section 1 in spring 2007, section 3 in spring 2011, or section 2 in spring 2013. [3]

## **EES7620 - Macroecology and Biogeography**

### **Title**

Macroecology and Biogeography

### **Catalog Description**

Integration of evolutionary biology, paleobiology, ecology, and biogeography to understand interactions between organisms and their environments over large spatial and temporal scales, including in ancient ecosystems. The discipline of macroecology; nature of species, niches, and communities; abundance and distribution of species; species diversity; composition and assembly of continental biotas; allometry and body size; evolutionary dynamics; methodological advances. [3]

## **EES7640 - Topics in Macroevolution**

### **Title**

Topics in Macroevolution

### **Catalog Description**

Evolutionary processes that operate on geological time scales. Evolutionary theory; systematics; speciation and extinction; evolutionary benefits of sexual reproduction; co-evolution; convergence; biogeography; and relevance of evolution to modern ecology and conservation. Effects of abiotic processes on the evolution of terrestrial and marine organisms. [3]

## **EES7999 - Master's Thesis Research**

### **Title**

Master's Thesis Research

### **Catalog Description**

[0-12]

**EES8003 - Graduate Teaching Practicum****Title**

Graduate Teaching Practicum

**Catalog Description**

Discussion of best teaching practices in weekly meeting with instructor. Application of teaching strategies via teaching undergraduate lab, discussion, or lecture. [0-1]

**EES8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

**EES9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[Variable credit: 0-12]

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## Economics

**ECON5050 - Topics in Econometrics****Title**

Topics in Econometrics

**Catalog Description**

(Also listed as ECON 4050) Emphasis on applications. May include generalized method of moments, empirical likelihood, resampling methods, and nonparametric techniques. No credit for students who have earned credit for 4050. [3] (SBS)

**ECON5100 - Wages, Employment, and Labor Markets****Title**

Wages, Employment, and Labor Markets

**Catalog Description**

(Also listed as ECON 3100) Theories of wages and employment, dual labor markets, internal labor markets, and labor's share of national income. Empirical studies of labor mobility, the effects of unions on relative wages and resource allocation, occupational and industrial wage differentials, and selected labor markets. No credit for students who have earned credit for 3100. [3]

## **ECON5110 - Macroeconomic Models for Policy Analysis**

### **Title**

Macroeconomic Models for Policy Analysis

### **Catalog Description**

(Also listed as ECON 4110) Mathematical models of overlapping generations, rational expectations, and open economies with price rigidities applied to social security, government debt, exchange rates, monetary policy, and time inconsistent optimal policy. No credit for students who have earned credit for 4110. [3]

## **ECON5220 - Social Choice Theory**

### **Title**

Social Choice Theory

### **Catalog Description**

Strategic and non-strategic social choice theory. Preference aggregation, formal models of voting, and matching. Prerequisite: 3010 or 3012 or PHIL 3003 or any Mathematics course numbered 2500 or above. [3]

## **ECON5230 - Urban Economics**

### **Title**

Urban Economics

### **Catalog Description**

(Also listed as ECON 3230) Urban growth, development of suburbs, location of firms, housing markets, transportation, property taxes, and local government services. Offered on a graded basis only. No credit for students who have earned credit for 3230. [3]

## **ECON5240 - Poverty and Discrimination**

### **Title**

Poverty and Discrimination

### **Catalog Description**

Theories and empirical evidence concerning inequality, poverty, and discrimination, and their relationship to economic growth. Evaluation of anti-poverty and anti-discrimination policies. [3]

## **ECON5250 - Industrial Organization**

### **Title**

Industrial Organization

### **Catalog Description**

(Also listed as ECON 3250) The structure of contemporary industry and the forces that have shaped it, including manufacturing, trade, and transportation. The role of the large corporation in modern industrial organization. The relation of industrial structure to economic behavior and performance. No credit for students who have earned credit for 3250. [3]

## **ECON5260 - Game Theory with Economic Applications**

### **Title**

Game Theory with Economic Applications

### **Catalog Description**

(Also listed as ECON 4260) Rational decision-making in non-cooperative, multi-person games. Single play and repeated games with complete and incomplete information. Economic applications of games, such as auctions, labor-management bargaining, pricing and output decisions in oligopoly, and common property resources. No credit for students who have earned credit for 4260. [3]

## **ECON5270 - Economics of Information and Communications Technology**

### **Title**

Economics of Information and Communications Technology

### **Catalog Description**

The Internet, cloud computing, social networks, e-commerce, and Internet telephony as influencers of commerce and consumer welfare. Streaming content, big data, informatics, and open source software in economic perspective. Property rights, competition, and regulation in cyberspace. No credit for students who have earned credit for 3893-01 offered spring 2016 or 293-01 offered spring 2015. [3]

## **ECON5280 - Experimental Economics**

### **Title**

Experimental Economics

### **Catalog Description**

Design, methodology, and interpretation of economic experiments. Laboratory experiments with applications in labor markets, discrimination, and voluntary contributions. [3]

## **ECON5300 - Financial Instruments and Markets**

### **Title**

Financial Instruments and Markets

### **Catalog Description**

(Also listed as ECON 3300) Theoretical and empirical approaches to the analysis of monetary and other financial instruments. Portfolio analysis, interest rate risk, and financial futures and options markets. No credit for students who have earned credit for 3300. [3]

## **ECON5350 - Economics of Health**

### **Title**

Economics of Health

### **Catalog Description**

(Also listed as ECON 3350) An examination of some of the economic aspects of the production, distribution, and organization of health care services, such as measuring output, structure of markets, demand for services, supply of services, pricing of services, cost of care, financing mechanisms, and their impact on the relevant markets. No credit for students who have earned credit for 3350. [3]

**ECON5510 - Seminar in Macroeconomic Policy****Title**

Seminar in Macroeconomic Policy

**Catalog Description**

Intensive study of three or four current problems in economic policy. Studies in topics such as macroeconomic policy for the year ahead, financial market issues, international economic policy issues. Limited to majors in economics and public policy. [3]

**ECON5600 - International Trade****Title**

International Trade

**Catalog Description**

International trade in goods and services. Patterns of trade; gains and losses from trade, tariffs, and other commercial policies; economic integration; and international factor movements. [3]

**ECON5610 - International Finance****Title**

International Finance

**Catalog Description**

(Also listed as ECON 3610) Economics of international monetary, financial, and macroeconomic relationships. Effects of monetary and fiscal politics in open economies, balance of payments, exchange rate determination, and international monetary institutions. No credit for students who have earned credit for 3610. [3]

**ECON5650 - Development Economics****Title**

Development Economics

**Catalog Description**

(Also listed as ECON 3650) Determinants of national economic growth for pre-industrial and newly industrial countries. Inequality and poverty. Imperfect credit markets and microfinance. Political constraints and corruption. Policy issues relevant to developing economics. No credit for students who have earned credit for 3650. [3]

**ECON6100 - Microeconomic Theory (M.A. Level)****Title**

Microeconomic Theory (M.A. Level)

**Catalog Description**

The price system in consumer demand and as a mechanism for organizing production, allocating resources, and distributing the national income. [3]

**ECON6200 - Macroeconomic Theory (M.A. Level)****Title**

Macroeconomic Theory (M.A. Level)

**Catalog Description**

National income accounting. Theories of income, employment and price determination. Growth and planning models. Monetary theory. [3]

**ECON6500 - Statistical Analysis (M.A. Level)****Title**

Statistical Analysis (M.A. Level)

**Catalog Description**

Interpretation of statistical materials, the principles of statistical inference, the use of available statistics for problems of economic analysis, and the importance of statistics in economic policy and administration. [3]

**ECON6600 - Econometrics (M.A. Level)****Title**

Econometrics (M.A. Level)

**Catalog Description**

Empirical measurements with applications to basic economic relations. Specification, estimation of microeconomics and macroeconomics models for the purpose of testing hypotheses, forecasting, and evaluating policy. Prerequisite: 6500. [3]

**ECON7100 - Project Evaluation****Title**

Project Evaluation

**Catalog Description**

Social-benefit cost analysis of investment projects: investment criteria, estimation of benefits and costs, and evaluation of shadow prices and of the social discount rate. The role of national planning. Case studies utilize the experience of developing economies. [3]

**ECON7500 - The Chinese Economy****Title**

The Chinese Economy

**Catalog Description**

Growth, development, and fluctuations in the Chinese economy. Transition from central planning to markets since 1978. Implications for global economy. Primarily designed for students in the Economic Development program. [3]



**ECON7550 - Econometric Methods for Big Data****Title**

Econometric Methods for Big Data

**Catalog Description**

Econometric methods for analyzing large datasets with modern statistical and machine learning techniques. Model selection, regularization, classification, resampling, tree-based methods, and support vector machines. Research projects in development economics and related fields. Prerequisite: ECON 6600.

**ECON7600 - International Trade and Economic Development****Title**

International Trade and Economic Development

**Catalog Description**

Selected topics concerning the exchange and transfer of goods and resources between less- and more-developed countries. Possible topics include: the international monetary system, the SDR-aid link, dependence and imperialism, the role of trade in economic growth, foreign exchange strategies, and the structure of protection. Primarily designed for students in the Economic Development program. [3]

**ECON7841 - Directed Readings****Title**

Directed Readings

**Catalog Description**

Intensive study in an area of special interest beyond regular course offerings. Prerequisites: consent of the instructor and the director of graduate studies. [1-3]

**ECON7881 - Special Topics in Development Policies****Title**

Special Topics in Development Policies

**Catalog Description**

Selected topics in the economic analysis of problems in developing countries. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**ECON7882 - Special Topics in Development Policies****Title**

Special Topics in Development Policies

**Catalog Description**

Selected topics in the economic analysis of problems in developing countries. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**ECON7910 - Seminar in Research on Economic Development: Microeconomic Applications**  
**Title**

Seminar in Research on Economic Development: Microeconomic Applications

**Catalog Description**

How to select and define a microeconomic problem, assemble relevant factual and statistical information, and analyze and interpret it. Students will write a research paper. Open only to students in the Economic Development program. May be repeated for credit. [3]

**ECON7920 - Seminar in Research on Economic Development: Macroeconomic Applications**  
**Title**

Seminar in Research on Economic Development: Macroeconomic Applications

**Catalog Description**

How to select and define a macroeconomic problem, assemble relevant factual and statistical information, and analyze and interpret it. Students will write a research paper. Open only to students in the Economic Development program. May be repeated for credit. [3]

**ECON7930 - Field Experience in Economic Development**  
**Title**

Field Experience in Economic Development

**Catalog Description**

How to select and define an economic problem, assemble relevant factual and statistical information, and analyze and interpret it. Students will write a research paper. Participation in a policy relevant field experience is required. Open only to students in the Economic Development program. [3]

**ECON7998 - Internship in Economic Development**  
**Title**

Internship in Economic Development

**Catalog Description**

Internship working in professional setting appropriate to the degree program. Repeatable. Consent of faculty advisor required. Credit hours earned do not apply to the degree requirements for the Graduate Program in Economic Development. Offered on a satisfactory/unsatisfactory basis. [0-3]

**ECON7999 - Master's Research**  
**Title**

Master's Research

**Catalog Description**

[0-12]

**ECON8000 - Selected Topics in Mathematics for Economists**  
**Title**

Selected Topics in Mathematics for Economists

**Catalog Description**

Mathematics used in the analysis of economic models. [3]

### **ECON8100 - Microeconomic Theory I**

#### **Title**

Microeconomic Theory I

#### **Catalog Description**

Analysis of resource allocation and relative prices. Behavior of individual economic units and markets. Models of technology, cost, and profit and the firm; consumer preferences, constraints, and choice; expected utility theory and risk aversion; partial equilibrium under competition and monopoly; partial equilibrium welfare and surplus. [3]

### **ECON8110 - Microeconomic Theory II**

#### **Title**

Microeconomic Theory II

#### **Catalog Description**

Non-cooperative game theory, information economics, public goods. Nash equilibrium, sequential rationality, and incomplete information; oligopoly; bargaining; adverse selection, signaling and screening; principal-agent models; externalities and public goods. Prerequisite: 8100 [3]

### **ECON8120 - Microeconomic Theory III**

#### **Title**

Microeconomic Theory III

#### **Catalog Description**

General equilibrium, welfare economics, social choice, and mechanism design. Prerequisites: 8100 and 8110; or consent of the instructor and the director of graduate studies. [3]

### **ECON8200 - Macroeconomic Theory I**

#### **Title**

Macroeconomic Theory I

#### **Catalog Description**

Dynamic models and solution techniques. Development of models to study growth, business cycles, and government policies. [3]

### **ECON8210 - Macroeconomic Theory II**

#### **Title**

Macroeconomic Theory II

#### **Catalog Description**

Inflation and growth, optimal monetary and fiscal policy, overlapping-generations models and money non-neutrality. Prerequisite: 8200 or consent of the instructor and the director of graduate studies. [3]

### **ECON8220 - Macroeconomic Theory III**

#### **Title**

Macroeconomic Theory III

#### **Catalog Description**

Theories of consumption, investment, demand and supply of money, the labor market, monetary and fiscal policy, and New Keynesian economics. Prerequisite: 8210. [3]

**ECON8300 - Statistical Analysis****Title**

Statistical Analysis

**Catalog Description**

Statistical methods applicable to quantitative research in economics. Distribution theory, statistical inference, and selected multivariate statistical methods. [3]

**ECON8310 - Econometrics I****Title**

Econometrics I

**Catalog Description**

Analysis of specification errors in single-equation estimation of economic relations. Introduction to the estimation and application of simultaneous-equation models. Prerequisite: 8300. [3]

**ECON8320 - Econometrics II****Title**

Econometrics II

**Catalog Description**

Identification and estimation of econometric models with nonlinearity and/or endogeneity/simultaneity. Asymptotic theory and finite-sample properties of M-estimation and inference. Model building and testing of economic theory. Prerequisite: 8310. [3]

**ECON8400 - Introduction to Economic History****Title**

Introduction to Economic History

**Catalog Description**

Measurement and theory. Factors associated with modern economic growth and institutional change in various countries and time periods. Prerequisites: 8100 and 8200, or consent of the instructor and the director of graduate studies. [3]

**ECON8981 - Reading Course****Title**

Reading Course

**Catalog Description**

Intensive study in an area of special interest beyond regular course offerings. Prerequisites: consent of the instructor and the director of graduate studies. [1-3]

**ECON8982 - Reading Course****Title**

Reading Course

**Catalog Description**

Intensive study in an area of special interest beyond regular course offerings. [1-3]

## **ECON8999 - Non-candidate Research**

### **Title**

Non-candidate Research

### **Catalog Description**

Prerequisites: consent of the instructor and the Economics Director of Graduate Studies. [0-12]

## **ECON9110 - Topics in Microeconomics**

### **Title**

Topics in Microeconomics

### **Catalog Description**

Advanced theory and applications. Variable topics including auctions, networks, contract theory, social choice, political economy, and market design. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. Prerequisite: 8110, or consent of the instructor and the director of graduate studies. [3]

## **ECON9210 - Topics in Macroeconomics**

### **Title**

Topics in Macroeconomics

### **Catalog Description**

Advanced theory and applications. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. Prerequisite: 8210. [3]

## **ECON9250 - Theory of Money and Finance I**

### **Title**

Theory of Money and Finance I

### **Catalog Description**

Advanced topics in monetary and financial economics theory and applications. Recently developed dynamic theories of money and asset pricing. Inflationary dynamics; money, welfare, and growth; money and business cycles; financial development and growth; credit market imperfections and financial crises. Prerequisites: 8210. [3]

## **ECON9260 - Theory of Money and Finance II**

### **Title**

Theory of Money and Finance II

### **Catalog Description**

Analyses of microeconomic foundations and general equilibrium models of money and financial markets. Theory of payments structure, capital asset pricing, rational expectations, efficient markets, and contingent claims markets. Prerequisite: 8210. [3]

### **ECON9310 - Time Series Econometrics**

#### **Title**

Time Series Econometrics

#### **Catalog Description**

Methods for estimating structural vector autoregressive models and dynamic economic models, such as maximum likelihood method, Bayesian method, and generalized method of moments. Prerequisite: 8320, or consent of the instructor and the director of graduate studies. [3]

### **ECON9320 - Non-parametric and Semi-parametric Econometrics**

#### **Title**

Non-parametric and Semi-parametric Econometrics

#### **Catalog Description**

Non-parametric and semi-parametric methods for estimation and inference in econometric models. [3]

### **ECON9330 - Microeconometrics**

#### **Title**

Microeconometrics

#### **Catalog Description**

Econometric models and methods for dealing with micro data. Structural and reduced-form approaches. Statistical inference using the models and their applications in IO, labor, health, and elsewhere in economics and social sciences. Prerequisite: 8320, or consent of the instructor and the director of graduate studies. [3]

### **ECON9440 - Topics in Economic History: Microeconomic**

#### **Title**

Topics in Economic History: Microeconomic

#### **Catalog Description**

Examination of various microeconomic aspects of long-term development. Topics include demographic change, labor market outcomes, the development of institutions, industrialization, migration, health, and inequality. Prerequisites: 8310 and 8400. [3]

### **ECON9450 - Topics in Economic History: Macroeconomic**

#### **Title**

Topics in Economic History: Macroeconomic

#### **Catalog Description**

Macroeconomic aspects of long-term development. Economic growth, the development of financial markets and the role of financial markets in economic development, the history and evolution of monetary and fiscal policy, capital market integration, and business cycles, including the Great Depression. Prerequisites: 8310 and 8400. [3]

**ECON9480 - Health Economics****Title**

Health Economics

**Catalog Description**

Conceptual and empirical analysis of demand for health, medical services, and insurance. Causes and consequences of various health risk behaviors. Emphasis on tools and designs of research in modern health economics. Prerequisites: 8110 and 8310, or consent of the instructor and the director of graduate studies. [3]

**ECON9490 - Health Economics****Title**

Health Economics

**Catalog Description**

Conceptual and empirical analysis of the origins of health attributes; joint investments in skill and health capitals; health-related consumption and lifestyles; the value of health, life, and medical innovation; the demand for health insurance; and the supply of health care. Applied econometrics methods, with a particular emphasis on comparisons among alternative methods used in health economics research. Prerequisite: 8110 and 8310. [3]

**ECON9500 - Industrial Organization I****Title**

Industrial Organization I

**Catalog Description**

Primary models of imperfect competition. Topics include bargaining; monopoly and oligopoly, allowing for differentiated products and incomplete information. Applications include quality provision and product pricing; consumer search for the lowest price; auctions; network externalities; innovation and market structure; liability and market structure; the theory of the firm; and settlement bargaining. Prerequisite: 8110 [3]

**ECON9510 - Industrial Organization II****Title**

Industrial Organization II

**Catalog Description**

Emphases on empirical research in the field and application of models. Consumer demand for differentiated products, static games of imperfect competition, dynamic models of individual choice, dynamic games of imperfect competition, and the estimation of production functions. Prerequisites: 8320 and 9500, or consent of the instructor and the director of graduate studies. [3]

**ECON9540 - Applied Microeconomic Research Designs and Methods****Title**

Applied Microeconomic Research Designs and Methods

**Catalog Description**

Core methods for research in applied microeconomics with a focus on research design and the identification of causal effects. Particular focus on applied tools used in the fields of empirical labor, public, development, health, and education economics. Prerequisite: 8310. [3]

**ECON9550 - Labor Economics****Title**

Labor Economics

**Catalog Description**

Static and dynamic models of labor demand and labor supply, and models of human capital development. Applications of the theory to migration, fertility, health, wage determination, education, unionism and industrial relations, employment policies, implicit contracting and layoffs, and discrimination. Methodological problems related to the analysis of labor markets. Prerequisite: 8110 and 8310. [3]

**ECON9560 - Labor Economics****Title**

Labor Economics

**Catalog Description**

Static and dynamic models of labor demand and labor supply, and models of human capital development. Applications of the theory to topics such as migration, fertility, health, wage determination, education, unionism and industrial relations, employment policies, implicit contracting and layoffs, and discrimination. Methodological problems related to the analysis of labor markets. Prerequisite: 8110 and 8310. [3]

**ECON9600 - International Trade Theory****Title**

International Trade Theory

**Catalog Description**

Trade and growth. Models and empirical evidence. Commercial policy, tariffs, the terms of trade and income distribution, international factor movements, and trade agreements. Prerequisite: 8110. [3]

**ECON9610 - International Macroeconomics****Title**

International Macroeconomics

**Catalog Description**

Neoclassical and New Keynesian international business cycle models; interaction of asset markets and goods markets. Dynamic models of exchange rates, relative prices, and the trade balance. Monetary and fiscal policy in the open economy. Simulation and estimation of business cycle models. Prerequisite: 8210, or consent of the instructor and the director of graduate studies. [3]

**ECON9710 - Public Economics: Expenditure****Title**

Public Economics: Expenditure

**Catalog Description**

Analysis of issues. Possible topics include externalities, public goods, local public goods, and aspects of public choice and voting theory. Prerequisite: 8110. [3]



**ECON9720 - Public Economics: Taxation****Title**

Public Economics: Taxation

**Catalog Description**

Analysis of issues. Possible topics include: optimal taxation theory, tax reform, tax incidence, behavioral impacts of taxation, dynamic taxation, tax competition, and the political economy of taxation. Prerequisite: 8810 [3]

**ECON9730 - Topics in Public Economics****Title**

Topics in Public Economics

**Catalog Description**

Analysis of issues. Possible topics include externalities, public goods, local public goods, and aspects of public choice and voting theory. Prerequisite: 8110. [3]

**ECON9810 - Economic Development****Title**

Economic Development

**Catalog Description**

Contemporary theories and empirical studies. Topics include missing markets and market imperfection in developing countries; health, education, and labor market performance in low-income countries; credit, savings and insurance in rural economies; property rights, infrastructure and public provision of goods; intra-household bargaining and allocation; technology adoption; inequality and redistributive policy; and macroeconomic policy. Empirical strategies in development economics. Prerequisite: 8110, 8210, and 8310. [3]

**ECON9820 - Economic Development****Title**

Economic Development

**Catalog Description**

Contemporary theories and empirical studies. Topics include missing markets and market imperfection in developing countries; health, education, and labor market performance in low-income countries; credit, savings and insurance in rural economies; property rights, infrastructure and public provision of goods; intra-household bargaining and allocation; technology adoption; inequality and redistributive policy; and macroeconomic policy. Strategies in development economics. Prerequisite: 8110, 8210, and 8310. [3]

**ECON9890 - Workshop on Economics****Title**

Workshop on Economics

**Catalog Description**

Research seminar to aid advanced students in the selection of thesis topics and presentation of research papers. Topics covered depend on interests of students and faculty. [0-3]

**ECON9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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**Education****EDUC7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

Master's Thesis Research

**EDUC8010 - Inquiry into Education****Title**

Inquiry into Education

**Catalog Description**

An introduction to the function and means of various practices of educational research. Promotes understanding of the language of educational inquiry, aims and uses of research, various ways of framing research questions and designing studies, and procedures for obtaining, analyzing, and interpreting qualitative and quantitative data. Presents issues of procedure or design and related issues of validity: construct definition and data generation, instrumentation and data collection; and data quality, meaning, appropriateness, credibility, and inferences made based on data. For doctoral students or by permission of instructor. [3]

**EDUC8020 - Teaching as a Social Practice****Title**

Teaching as a Social Practice

**Catalog Description**

This course provides an investigation into teaching as situated in the social context of the school and school district. Classroom observation in tandem with a series of readings are the basis of the course. Assignments are intended to provide students opportunities to coordinate important aspects of the readings with observations of practice. For doctoral students or by permission of instructor. [3]

**EDUC8030 - Advanced Learning and Instruction****Title**

Advanced Learning and Instruction

**Catalog Description**

Introduces theories of learning and explores their utility for the design of learning environments. Contrasts socio-cultural and cognitive approaches toward concepts and categories, problem solving, and model-based reasoning. For doctoral students or by permission of instructor. [3]

**EDUC8040 - Diversity and Equity in Education****Title**

Diversity and Equity in Education

**Catalog Description**

Provides an introduction to the structural, systemic, and institutional dimensions and complexities of diversity that often emerge in education across multiple contexts. Central constructs of the course include race, culture, SES, gender, language, achievement, policy, epistemology, and learning. For doctoral students or by permission of instructor. [3]

**EDUC8100 - Epistemological Foundations of Mathematics and Sciences****Title**

Epistemological Foundations of Mathematics and Sciences

**Catalog Description**

Examines the social, cognitive and material mechanisms that contribute to generating, sustaining and revising knowledge in mathematics and in sciences. [3]

**EDUC8200 - Foundations in Learning and Development****Title**

Foundations in Learning and Development

**Catalog Description**

Provides a foundation in relevant developmental milestones related to children's academic behaviors from pre-kindergarten through high school. Children's development and learning is viewed in the context of school expectations with an emphasis on the diversity among learners. [3]

**EDUC8410 - Sociocognitive Perspectives of Literacy Theory and Practice****Title**

Sociocognitive Perspectives of Literacy Theory and Practice

**Catalog Description**

This seminar critically examines literacy research from a sociocognitive perspective. Critical reading of seminal and new works on theoretical models is complimented by research on effective literacy instruction and emerging promising practices in print and digital contexts. Particular attention is paid to reading comprehension, digital literacies and new media, design of scaffolded learning environments, and students who experience learning difficulties. [3]

**EDUC8420 - Sociocultural Theories of Literacy****Title**

Sociocultural Theories of Literacy

**Catalog Description**

A doctoral readings seminar on social and cultural theories in their relation to literacy and literacy learning. [3]

## **EDUC8430 - Literacy Theories and Models to inform Research and Practice**

### **Title**

Literacy Theories and Models to inform Research and Practice

### **Catalog Description**

This seminar critically examines literacy theories and connections to research and practice. Critical reading of seminal and new works on theoretical models is complimented by research on effective literacy instruction and emerging promising practices in print and digital contexts. Particular attention is paid to reading comprehension and supporting literacy skills, writing and supporting skills, digital literacies and new media, and design of scaffolded learning environments to attend to the needs of different types of learners such as readers and writers of different abilities and multilingual learners. [3]

## **EDUC8800 - Scientific Writing**

### **Title**

Scientific Writing

### **Catalog Description**

Students who have completed substantial reading in an area of their research interest participate in a lecture/workshop setting to conceptualize, draft, and revise a scientific manuscript. Most students who take the course will be in the process of completing a major area paper for the Department of Teaching and Learning. These papers take the form of a literature review (typically 50-100 pages), but other writing projects are welcome, as well. [3]

## **EDUC8810 - Discourse Analysis in Education**

### **Title**

Discourse Analysis in Education

### **Catalog Description**

This course provides a rigorous introduction to the analysis of discourse in educational contexts. The course draws on critical discourse analysis, sociocultural approaches, and other traditions to consider relations of learning, identity, and power in educational texts and communicative activity. The course provides experience and instruction through processes of data collection, transcription, and analysis. [3]

## **EDUC8820 - Methods of Educational Research: Qualitative**

### **Title**

Methods of Educational Research: Qualitative

### **Catalog Description**

Covers issues and strategies involved in collection and analysis of qualitative data. Focuses on the assumptions and related research techniques of qualitative research, framed by the post-positivist paradigm (i.e., naturalistic inquiry, ethnography). [3] Recommended for advanced doctoral students)

## **EDUC8830 - Advanced Qualitative Methods: Interaction Analysis**

### **Title**

Advanced Qualitative Methods: Interaction Analysis

### **Catalog Description**

Graduate Level research methods course for students who will use video and/or audio recordings as data in studies of learning and teaching. Readings cover conversation analysis, ethnomethodology, gesture studies, and micro-ethnographies of life in classrooms and workplaces. Assignments focus on technologies and procedures for capturing and managing video and audio recordings of human interactions that can serve as data for these kinds of studies, as well as procedures for indexing, transcribing, and conducting comparative analysis. Prerequisite: Introductory Qualitative or interpretive research methods course. [3]

**EDUC8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

**EDUC9700 - Research Groups****Title**

Research Groups

**Catalog Description**

Examination of a research issue of mutual interest in a year-long study. Multiple topics will be offered. May be repeated. [0-3]

**EDUC9995 - Half-Time Dissertation Research****Title**

Half-Time Dissertation Research

**Catalog Description**

[0-6]

**EDUC9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Electrical & Computer Engineering

**ECE5218 - Microcontrollers****Title**

Microcontrollers

**Catalog Description**

(Also listed as ECE 2218) Microprocessor and microcontroller architecture with emphasis on control applications. Usage of assembly language and interfacing with programs written in high-level languages. Interfacing and realtime I/O with 8-bit microprocessors, control algorithms, and networking with microcontrollers. Graduate credit only for non-majors. No credit for students who have earned credit for 2218. Corequisite: ECE 5218L. SPRING. [3]

**ECE5218L - Microcontrollers Laboratory****Title**

Microcontrollers Laboratory

**Catalog Description**

(Also listed as ECE 2218L) Laboratory for ECE 5218. A small structured project is required. One three-hour laboratory per week. Graduate credit only for non-majors. No credit for students who have earned credit for 2218L. Corequisite: ECE 5218. SPRING. [1]

**ECE5233 - Electromagnetics****Title**

Electromagnetics

**Catalog Description**

(Also listed as ECE 3233) Electromagnetic field theory. Maxwell's equations developed from a historical approach. Electromagnetic waves with regard to various media and boundary conditions. Graduate credit only for non-majors. No credit for students who have earned credit for 3233. FALL. [3]

**ECE5235 - Electronics I****Title**

Electronics I

**Catalog Description**

(Also listed as ECE 3235) Semiconductor devices and electronic circuits. Diodes, BJT and MOS transistors. Device models, modes of operation, biasing. Small-signal models, lowfrequency analysis of single- and multi-stage analog amplifiers, simple amplifier design. Large signal models, dc analysis of digital circuits. Graduate credit only for non-majors. Corequisite: ECE 5235L. No credit for students who have earned credit for 3235. FALL. [3]

**ECE5235L - Electronics I Laboratory****Title**

Electronics I Laboratory

**Catalog Description**

(Also listed as ECE 3235L) Laboratory for ECE 3235. One three-hour laboratory per week. Corequisite: ECE 5235. No credit for students who have earned credit for 3235L. FALL. [1]

**ECE5252 - Signal Processing and Communications****Title**

Signal Processing and Communications

**Catalog Description**

(Also listed as ECE 4252) AM and FM modulation. Also, advanced topics in signal processing are treated. No credit for students who have earned credit for 4252. SPRING. [3]

**ECE5257 - Control Systems I****Title**

Control Systems I

**Catalog Description**

(Also listed as ECE 4257) Theory and design of feedback control systems, steady-state and transient analysis, stability considerations. Model representation. State-variable models. No credit for students who have earned credit for 4257. FALL. [3]

**ECE5267 - Power System Analysis****Title**

Power System Analysis

**Catalog Description**

(Also listed as ECE 4267) Analysis of large transmission and distribution networks. Analysis of power lines, load flow, short circuit studies, economic operation, and stability are introduced. No credit for students who have earned credit for 4267. [3]

**ECE5268 - Distributed Electrical Energy Systems****Title**

Distributed Electrical Energy Systems

**Catalog Description**

Uses of photovoltaics and wind as well as micro-hydro, fuel cells, and geothermal for producing electricity. Comparison with traditional generating methods based on the prime movers (steam, gas, etc.) and types (primarily three-phase) of electrical generators used. The economics of stand-alone and grid connected systems are covered. Prerequisite: ECE 2112. [3]

**ECE5275 - Microelectronic Systems****Title**

Microelectronic Systems

**Catalog Description**

(Also listed as ECE 4275) Active devices in the context of digital systems, with an emphasis on embedded systems integration. Characteristics and utilization of different digital integrated circuit families, common bus structures and protocols and realworld interfaces (comparators, A/D/A conversion). No credit for students who have earned credit for 4275. SPRING. [3]

**ECE5283 - Principles and Models of Semiconductor Devices****Title**

Principles and Models of Semiconductor Devices

**Catalog Description**

(Also listed as ECE 4283) Physical principles of operation of the p-n junction, MOS field-effect transistor, and bipolar transistor. Fundamentals of charge transport, charge storage, and generation-recombination; application to the operation of MOSFET and BJT. Device modeling with emphasis on features and constraints of integrated circuit technologies. No credit for students who have earned credit for 4283. [3]

## **ECE5284 - Integrated Circuit Technology and Fabrication**

### **Title**

Integrated Circuit Technology and Fabrication

### **Catalog Description**

(Also listed as ECE 4284) Monolithic integrated circuit technology. Basic semiconductor properties and processes that result in modern integrated circuit. Bipolar and MOSFET processes and structures. Fabrication, design, layout, and applications as regards semiconductor microelectronic technologies. No credit for students who have earned credit for 4284. SPRING. [3]

## **ECE5286 - Audio Engineering**

### **Title**

Audio Engineering

### **Catalog Description**

(Also listed as ECE 4286) Engineering aspects of high fidelity sound reproduction, with emphasis on digital audio and loudspeakers. Analog-to-digital and digital-to-analog conversion, data storage, perceptual coding, loudspeaker design. No credit for students who have earned credit for 4286. [3]

## **ECE5287 - Engineering Reliability**

### **Title**

Engineering Reliability

### **Catalog Description**

(Also listed as ECE 4287) Topics in engineering reliability with emphasis on electrical devices and systems. Reliability concepts and models. Risk analysis. Lifetime evaluation. System examples. No credit for students who have earned credit for 4287. [3]

## **ECE5288 - Optoelectronics**

### **Title**

Optoelectronics

### **Catalog Description**

(Also listed as ECE 4288) Fundamentals and applications of light generation, propagation, and modulation in passive and active optoelectronic components. Waveguides, lasers, electro-optic modulators, and emerging optoelectronic technology for optical communication, computing, and sensing applications. No credit for students who have earned credit for 4288. SPRING. [3]

## **ECE5289 - Spacecraft Systems**

### **Title**

Spacecraft Systems

### **Catalog Description**

Spacecraft electrical and electronic subsystems with emphasis on practical limitations and hazards in space. Analysis of environments, mechanisms of failure, and implications for design. No credit for students who have earned credit for 4289. SPRING. [3]



### **ECE5334 - RF and Microwave Design**

#### **Title**

RF and Microwave Design

#### **Catalog Description**

Modeling of components and transmission structures at RF and microwave frequencies (30 MHz to 30 GHz), with emphasis on the effects of materials and geometry on passive structures for filtering and impedance matching. Modeling and design of active circuits and components such as RF amplifiers with input and output impedance matching structures. Prereq: ECE 3233. SPRING. [3]

### **ECE5335 - Fundamentals of Quantum Engineering**

#### **Title**

Fundamentals of Quantum Engineering

#### **Catalog Description**

Overview of quantum effects in microelectronics and introduction to quantum computing. The needs, opportunities, and challenges of extending current computing paradigms to quantum-enhanced microelectronics technologies are discussed. Students are introduced to basis states of quantum systems and principles of superposition and entanglement, qubits, and basic algorithms relevant to quantum computing. Practical implementations of quantum computing are illustrated. A student project on current developments in quantum computing is required. SPRING. [3]

### **ECE5353 - Image Processing**

#### **Title**

Image Processing

#### **Catalog Description**

Digital imaging and computational photography. Image formation. Point processing. Color perception and manipulation. Spatial filtering via convolution. 2D Fourier transforms. Frequency-domain filtering. Intensity quantization. High dynamic range imaging. Resampling for image resizing, rotation, and warping. Image compositing. Panorama generation. Noise reduction. Mathematical morphology. Image compression. Three lectures and one three-hour virtual laboratory. No credit for students who have earned credit for 4353. FALL. [4]

### **ECE5354 - Computer Vision**

#### **Title**

Computer Vision

#### **Catalog Description**

Computational processes. Python and OpenCV for real-time processing. Feature detection: edges, corners, and oriented histogram methods. Feature matching. Scale space. Projective geometry. Camera models. Stereopsis. Image rectification. Multi-baseline stereo. Motion estimation. 3D reconstruction. Machine learning for computer vision including multilayer neural networks. No credit for students who have earned credit for 4354. SPRING. [3]

### **ECE5356 - Digital Signal Processing**

#### **Title**

Digital Signal Processing

#### **Catalog Description**

(Also listed as ECE 4356) Applications of Digital Signal Processing (DSP) chips to sampling, digital filtering, FFTs, etc. Three lectures and one laboratory period. No credit for students who have earned credit for 4356. SPRING. [4]

**ECE5358 - Control Systems II****Title**

Control Systems II

**Catalog Description**

(Also listed as ECE 4358) Modern control design. Discrete-time analysis. Analysis and design of digital control systems. Nonlinear systems and optimum control systems. Fuzzy control systems. Two lectures and one laboratory. No credit for students who have earned credit for 4358. SPRING. [3]

**ECE5363 - Applied Statistical Machine Learning****Title**

Applied Statistical Machine Learning

**Catalog Description**

(Also listed as ECE 4363) Application of mathematical techniques that form the foundation of machine learning and artificial intelligence. Probability and statistics, applications of Bayes theorem, matrix analysis, LMS and maximum likelihood estimation. Classification techniques, linear and basis function regressions. Estimation and sampling of probability distributions. Data partitioning and n-fold cross-validation. Recursive Bayesian estimation. Methods of dimensionality reduction. The perceptron, kernel methods, support vector machines, and Gaussian processes. No credit for students who have earned credit for 4363. FALL. [3]

**ECE5370 - Engineering for Surgery****Title**

Engineering for Surgery

**Catalog Description**

(Also listed as ECE 4370). Engineering for surgery and other medical interventions, with theory and project experience. Data visualization and analysis, medical image processing, machine learning and deep learning, image registration, image-guided surgery, medical image acquisition, and bio-modeling. FALL. [3]

**ECE5371 - Mobile and Wireless Networks****Title**

Mobile and Wireless Networks

**Catalog Description**

(Also listed as ECE 4371) Design, development, and applications of mobile applications and services. Topics include wireless technologies, smart phone programming, cloud computing services. No credit for students who have earned credit for 4271. [3]

**ECE5376 - Embedded Systems****Title**

Embedded Systems

**Catalog Description**

(Also listed as ECE 4376) Design and application of embedded microcontroller-based systems. Programming for real-time systems and the Internet of Things. Embedded system modeling, design, analysis, and implementation using real-time and event-driven techniques. A structured project is required. No credit for students who have earned credit for 4376. Corequisite: ECE 5376L. FALL. [3]

**ECE5376L - Embedded Systems Laboratory****Title**

Embedded Systems Laboratory

**Catalog Description**

(Also listed as ECE 4376L) Laboratory for ECE 5376. A team-oriented structured project is required. One three-hour laboratory per week. Corequisite: ECE 5376. No credit for students who have earned credit for 4376L. FALL. [1]

**ECE5377 - FPGA Design****Title**

FPGA Design

**Catalog Description**

(Also listed as ECE 4377) Design and applications of field-programmable gate arrays, Electronic Design Automation (EDA) tools for design, placement, and routing. Hardware description languages. Implementation of designs on prototype FPGA board. No credit for students who have earned credit for 4377. [3]

**ECE5380 - Electronics II****Title**

Electronics II

**Catalog Description**

(Also listed as ECE 4380) Integrated circuit analysis and design. High frequency operation of semiconductor devices. Frequency-response and feedback analysis of BJT and MOS analog amplifier circuits, multi-stage frequency-compensated amplifier design. Transient analysis of BJT and MOS digital circuit families. Digital-to-analog and analog-to-digital conversion circuits. No credit for students who have earned credit for 4380. SPRING. [3]

**ECE5385 - VLSI Design****Title**

VLSI Design

**Catalog Description**

(Also listed as ECE 4385) Integrated circuit and fabrication techniques; CAD tools for design, layout, and verification; parasitic elements and their effects on circuit performance; system-level design experience is gained by completing design and layout phases of a project. No credit for students who have earned credit for 4385. FALL. [3]

**ECE5884 - Internship****Title**

Internship

**Catalog Description**

Internship working in a professional setting. Departmental approval required. FALL, SPRING, SUMMER. [0]

### **ECE5891 - Special Topics**

#### **Title**

Special Topics

#### **Catalog Description**

(Also listed as ECE 3891) No credit for students who have earned credit for 3891. [1-3 each semester]

### **ECE5892 - Special Topics**

#### **Title**

Special Topics

#### **Catalog Description**

(Also listed as ECE 3892) No credit for students who have earned credit for 3892. [1-3 each semester]

### **ECE6301 - Solid-State Materials**

#### **Title**

Solid-State Materials

#### **Catalog Description**

Properties of charged particles under the influence of an electric field, quantum mechanics, particle statistics, fundamental particle transport, and band theory of solids. FALL. [3]

### **ECE6302 - Electric and Magnetic Properties of Solids**

#### **Title**

Electric and Magnetic Properties of Solids

#### **Catalog Description**

Electromagnetic theory of solids using advanced mathematical and computational techniques. Dielectric, magnetic, and optical properties. Fundamental interactions of electromagnetic radiation and charged particles in solids. Prerequisite: ECE 6301. SPRING. [3]

### **ECE6303 - Nanophotonic Devices**

#### **Title**

Nanophotonic Devices

#### **Catalog Description**

Review of basic photonics concepts and investigation of applications of nanophotonic devices in free-space, photonic and optoelectronic circuits, medicine, and energy. Emphasis is placed on recent literature and new technologies. SPRING. [3]

### **ECE6304 - Radiation Effects and Reliability of Microelectronics**

#### **Title**

Radiation Effects and Reliability of Microelectronics

#### **Catalog Description**

The space radiation environment and effects on electronics, including basic mechanisms of radiation effects and testing issues. Total dose, single-event, high-dose-rate, and displacement damage radiation effects. Effects of defects and impurities on MOS long-term reliability. SPRING. [3]

**ECE6306 - Solid-State Effects and Devices I****Title**

Solid-State Effects and Devices I

**Catalog Description**

The semiconductor equations are examined and utilized to explain basic principles of operation of various state-of-the-art semiconductor devices including bipolar and MOSFET devices. FALL. [3]

**ECE6307 - Solid-State Effects and Devices II****Title**

Solid-State Effects and Devices II

**Catalog Description**

The structure of solids, phonons, band theory, scattering phenomena, and theory of insulators. [3]

**ECE6311 - Systems Theory****Title**

Systems Theory

**Catalog Description**

Use of linear algebra and matrix analysis for solving systems of linear and ordinary differential equations. State space representations of control systems. Stability, controllability, and observability. Support-vector machines as applied functional analysis. Gradient-based optimization techniques. Dimensionality reduction. SPRING. [3]

**ECE6321 - Cyber-Physical Systems****Title**

Cyber-Physical Systems

**Catalog Description**

Modeling, design, and analysis of cyber-physical systems that integrate computation and communication with physical systems. Modeling paradigms and models of computation, design techniques and implementation choices, model-based analysis and verification. Project that covers the modeling, design, and analysis of CPS. [3]

**ECE6341 - Advanced Analog Electronics****Title**

Advanced Analog Electronics

**Catalog Description**

Analysis and design of analog electronics circuits with emphasis on integrated circuits. Topics include operational amplifiers, wideband amplifiers, multipliers, and phase-locked loops. FALL. [3]

**ECE6342 - Advanced Digital Electronics****Title**

Advanced Digital Electronics

**Catalog Description**

Analysis and design of digital electronic circuits with emphasis on integrated circuits. Topics include logic families, semiconductor memories, and the analog-digital interface. [3]

### **ECE6343 - Digital Systems Architecture**

#### **Title**

Digital Systems Architecture

#### **Catalog Description**

Architectural descriptions of various CPU designs, storage systems, IO systems, parallel and von Neumann processors and interconnection networks. [3]

### **ECE6354 - Advanced Real-Time Systems**

#### **Title**

Advanced Real-Time Systems

#### **Catalog Description**

Fundamental problems in real-time systems, with focus on modeling, analysis, and design. Topics include: scheduling theory and techniques, time synchronization, time- and event-triggered systems, distributed architectures, advanced programming languages for real-time systems. Literature reviews and projects. [3]

### **ECE6356 - Intelligent Systems and Robotics**

#### **Title**

Intelligent Systems and Robotics

#### **Catalog Description**

Fundamental technologies in autonomous vehicles. Bayesian probability. Probabilistic robotics. Coordinate changes. Representations of rotation. Motion and sensor models. Bayes filters. Simultaneous localization and mapping. Current machine learning approaches. FALL. [3]

### **ECE6357 - Advanced Image Processing**

#### **Title**

Advanced Image Processing

#### **Catalog Description**

Techniques of image processing with an emphasis on medical images. Topics include image formation, digitization, linear shift-invariant processing, feature detection, segmentation, and registration. FALL. [3]

### **ECE6358 - Quantitative Medical Image Analysis**

#### **Title**

Quantitative Medical Image Analysis

#### **Catalog Description**

Image processing and statistical methods for quantitative analysis and interpretation of medical imaging data. Neuroimaging approaches related to brain structure, function, and connectivity. Massively univariate analysis (parametric mapping), multiple comparison issues, random fields, independent components, non-parametric approaches, and Monte Carlo methods. Students should have knowledge of undergraduate probability and computer programming. [3]

**ECE6361 - Random Processes****Title**

Random Processes

**Catalog Description**

Concepts of random variables, functions of random variables, and random processes. Spectral properties of random processes and of the response of linear systems to random inputs. Linear mean square estimation. Emphasis on engineering applications. FALL. [3]

**ECE6362 - Detection and Estimation Theory****Title**

Detection and Estimation Theory

**Catalog Description**

Fundamental aspects of signal detection and estimation. Formulation of maximum likelihood, maximum a posteriori, and other criteria. Multidimensional probability theory, signal and noise problems, and Kalman filter structure are studied. SPRING. [3]

**ECE7899 - Master of Engineering Project****Title**

Master of Engineering Project

**Catalog Description**

Master of Engineering Project [0-6]

**ECE7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-6]

**ECE8395 - Special Topics****Title**

Special Topics

**Catalog Description**

Based on research and current developments in electrical engineering of special interest to staff and students. [3]

**ECE8396 - Special Topics****Title**

Special Topics

**Catalog Description**

Based on research and current developments in electrical engineering of special interest to staff and students. [3]

**ECE8850 - Independent Study****Title**

Independent Study

**Catalog Description**

Readings and/or projects on advanced topics in electrical engineering under the supervision of the staff. Consent of instructor required. [Variable credit: 1-3 each semester]

**ECE8991 - Seminar****Title**

Seminar

**Catalog Description**

[1]

**ECE8992 - Advanced Seminar for Ph.D. Candidates****Title**

Advanced Seminar for Ph.D. Candidates

**Catalog Description**

[1]

**ECE8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit 0-12]

**ECE9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

**EECE6331 - Robot Manipulators****Title**

Robot Manipulators

**Catalog Description**

(Also listed as ME 8331) Dynamics and control of robot manipulators. Includes material on Jacobian matrix relating velocities and static forces, linear and angular acceleration relationships, manipulator dynamics, manipulator mechanism design, linear and nonlinear control, and force control of manipulators. Prerequisite: EECE 271 (or equivalent). SPRING. [3]



## **ENGM5000 - Enterprise System Design**

### **Title**

Enterprise System Design

### **Catalog Description**

(Also listed as ENGM 3000) Design of complex enterprise systems and processes including enterprise requirements analysis, process-mapping, modeling, performance measurement, benchmarking, solution development, and change management. No credit for students who have earned credit for 3000. FALL, SPRING. [3]

## **ENGM5010 - Systems Engineering**

### **Title**

Systems Engineering

### **Catalog Description**

(Also listed as ENGM 3010) Fundamental considerations associated with the engineering of large-scale systems. Models and methods for systems engineering and problem solving using a systems engineering approach. No credit for students who have earned credit for 3010. FALL, SPRING. [3]

## **ENGM5100 - Finance and Accounting for Engineers**

### **Title**

Finance and Accounting for Engineers

### **Catalog Description**

(Also listed as ENGM 3100) Time value of money, capital budgeting and formation, financial accounting and reporting, double entry bookkeeping, taxation, performance ratio measurements, and working capital management. Probabilistic models for expected net present value and rate of return, dividend pricing models for alternative growth scenarios, cost and market based models for average cost of capital, taxation algorithms, and regression analysis for individual firm betas. No credit for students who have earned credit for 3100. FALL, SPRING, SUMMER. [3]

## **ENGM5200 - Technology Marketing**

### **Title**

Technology Marketing

### **Catalog Description**

(Also listed as ENGM 3200) Strategies for marketing technology-based products and services. Demand analysis, segmentation, distribution, and personal selling. Economic analysis from inception to end use. No credit for students who have earned credit for 3200. FALL. [3]

## **ENGM5300 - Technology Assessment and Forecasting**

### **Title**

Technology Assessment and Forecasting

### **Catalog Description**

(Also listed as ENGM 3300) Methods of forecasting technological advancements and assessing their potential intended and unintended consequences. Delphi method, trend exploration, environmental monitoring, and scenario development. No credit for students who have earned credit for 3300. SPRING. [3]

### **ENGM5600 - Technology-Based Entrepreneurship**

#### **Title**

Technology-Based Entrepreneurship

#### **Catalog Description**

(Also listed as ENGM 3600) Identification and evaluation of opportunities: risks faced by entrepreneurs, market assessment, capital requirements, venture capital acquisition, legal structures, tax implications for sharing technology-based businesses. No credit for students who have earned credit for 3600. FALL. [3]

### **ENGM5650 - Operations and Supply Chain Management**

#### **Title**

Operations and Supply Chain Management

#### **Catalog Description**

(Also listed as ENGM 3650) Manufacturing strategy, process analysis, product and process design, total quality management, capacity planning, inventory control, supply chain design, and advanced operations topics. Modeling and analysis using cases and spreadsheets. No credit for students who have earned credit for 3650. FALL. [3]

### **ENGM5700 - Program and Project Management**

#### **Title**

Program and Project Management

#### **Catalog Description**

(Also listed as ENGM 3700) Scheduling, cost estimation/predictions, network analysis, optimization, resource/load leveling, risk/mitigation, quality/testing, international projects. Term project required. Provides validated preparation for the Project Management Institute CAPM certification for undergraduates or the PMP for graduate students. Credit given for only one of ENGM 3700 or 5700, CE 4400 or 5400, or EECE 4950. FALL, SPRING, SUMMER. [3]

### **ENGM5890 - Special Topics**

#### **Title**

Special Topics

#### **Catalog Description**

Variable credit each semester. [1-3]

### **ENGM6500 - Applied Leadership in Engineering Management**

#### **Title**

Applied Leadership in Engineering Management

#### **Catalog Description**

Application of core principles of leadership and program management for engineering professionals. Strategic planning, people management, staffing, compensation, business process improvement theory, business interruption, leadership styles, emotional intelligence, negotiation, ethical business practices. [3]

**ENGL5290 - Special Topics in Creative Writing**

**Title**

Special Topics in Creative Writing

**Catalog Description**

(Also listed as ENGL 3891) Advanced instruction in creative writing in emerging modes and hybrid genres. [3] (HCA)

**ENGL7430 - Graduate Fiction Workshop**

**Title**

Graduate Fiction Workshop

**Catalog Description**

May be repeated for credit. [4]

**ENGL7440 - Graduate Poetry Workshop**

**Title**

Graduate Poetry Workshop

**Catalog Description**

[May be repeated for credit with the program director's approval] [4]

**ENGL7450 - Graduate Nonfiction Workshop**

**Title**

Graduate Nonfiction Workshop

**Catalog Description**

[May be repeated for credit with the program director's approval] [4]

**ENGL7460 - Literature and the Craft of Writing**

**Title**

Literature and the Craft of Writing

**Catalog Description**

[May be repeated for credit with the program director's approval] [4]

**ENGL7470 - Special Topics in Creative Writing**

**Title**

Special Topics in Creative Writing

**Catalog Description**

Advanced instruction in creative writing, including new and emerging genres, special topic/author studies, professional aspects of creative writing, and interdisciplinary approaches to creative writing. May be repeated. [4]

**ENGL7997 - Teaching Creative Writing**

**Title**

Teaching Creative Writing

**Catalog Description**

Graduate level instruction in the pedagogy of creative writing. Not open to students who have earned credit for 5290 section 01 offered spring 2019 or spring 2020. [4]

**ENGL7998 - Master of Fine Arts Pedagogy Tutorial**

**Title**

Master of Fine Arts Pedagogy Tutorial

**Catalog Description**

Instruction with faculty adviser for MFA students teaching undergraduate courses. [2]

**ENGL7999 - Master's Thesis Research**

**Title**

Master's Thesis Research

**Catalog Description**

[0-12]

**ENGL8000 - Black Worlds and World-Making**

**Title**

Black Worlds and World-Making

**Catalog Description**

Black people and the modern world. Historical and contemporary thought. Experiences of people who have claimed Blackness as a political, social, and cultural identity. Struggles for social and economic justice, practices of resistance, and freedom-making across Africa and its Diaspora. [3]

**ENGL8110 - Proseminar**

**Title**

Proseminar

**Catalog Description**

[4]

**ENGL8112 - Project Publish**

**Title**

Project Publish

**Catalog Description**

Seminar/Workshop on academic writing and publishing. The structure and content of journal articles in literary criticism. Mechanics of article publication. Offered on a pass/fail basis only. [2]

**ENGL8120 - Pedagogy Seminar****Title**

Pedagogy Seminar

**Catalog Description**

[4]

**ENGL8121 - Pedagogy Workshop****Title**

Pedagogy Workshop

**Catalog Description**

Workshop on practical pedagogical strategies. Required of all third-year students as a continuation of ENGL 8120. Designed as practical support for graduate students who teach for the first time, the workshop includes bi-weekly meetings, which are also open to other graduate Instructors of Record, and class observations by the instructor. [2]

**ENGL8137 - Introduction to Literary Theory****Title**

Introduction to Literary Theory

**Catalog Description**

[4]

**ENGL8138 - Seminar in Critical Theory and Methodology****Title**

Seminar in Critical Theory and Methodology

**Catalog Description**

Topics include gender and sexuality studies, critical race studies, visibility and/or spectrality, postcolonial studies, disability studies, archival research and editorial practices, digital and public humanities, and environmental humanities. May be repeated for credit more than once if there is no duplication in topic. [4]

**ENGL8150 - Indep Study Problems in Engl/Amer Lit****Title**

Indep Study Problems in Engl/Amer Lit

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 4 credits per semester of enrollment. [1-4]

**ENGL8155 - Special Topics in English and American Literature****Title**

Special Topics in English and American Literature

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**ENGL8303 - Queer Theory****Title**

Queer Theory

**Catalog Description**

History and development of queer theory. Key intellectual antecedents, significant theorists, and current trends. How sexuality intersects with gender, race, class, nationality, ability, and religion. [3]

**ENGL8331 - Studies in Medieval and Early-Modern British Literature****Title**

Studies in Medieval and Early-Modern British Literature

**Catalog Description**

Early-modern through 17th century. May be repeated for credit more than once if there is no duplication in topic. [4]

**ENGL8340 - Seminar in Shakespeare****Title**

Seminar in Shakespeare

**Catalog Description**

[4]

**ENGL8351 - Studies in 20th and 21st Century American Literatures****Title**

Studies in 20th and 21st Century American Literatures

**Catalog Description**

Topics include modernisms, African American, Asian American, Latino/a, and Caribbean American literatures. May be repeated for credit more than once if there is no duplication in topic. [4]

**ENGL8370 - Studies in 18th Century British Literature****Title**

Studies in 18th Century British Literature

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. [4]

**ENGL8410 - Studies in Romantic and Victorian Literatures****Title**

Studies in Romantic and Victorian Literatures

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. [4]

## **ENGL8430 - Studies in Modern and Contemporary British and Irish Literatures**

### **Title**

Studies in Modern and Contemporary British and Irish Literatures

### **Catalog Description**

Topics include British and Anglo-Irish modernisms, black British writers. May be repeated for credit more than once if there is no duplication in topic. [4]

## **ENGL8440 - Studies in Comparative Literatures**

### **Title**

Studies in Comparative Literatures

### **Catalog Description**

Topics include classical or ancient legacies; hemispheric American literatures, Caribbean literatures in different languages; translation studies; studies of literary genres and forms; global modernisms; transatlantic and transpacific studies. May be repeated for credit more than once if there is no duplication in topic. [4]

## **ENGL8441 - Studies in Anglophone World Literatures**

### **Title**

Studies in Anglophone World Literatures

### **Catalog Description**

Topics in global colonial and global postcolonial Anglophone literatures, including Asian, African, and Caribbean writers; global modernisms. May be repeated for credit more than once if there is no duplication in topic. [4]

## **ENGL8442 - Media Studies**

### **Title**

Media Studies

### **Catalog Description**

Topics include new models of science and the humanities; modes of reality and representation in the age of cyberspace; American literature and the cinema; early cinema (1893-1920). May be repeated for credit more than once if there is no duplication in topic. [4]

## **ENGL8450 - Studies in Early and 19th-Century American Literatures**

### **Title**

Studies in Early and 19th-Century American Literatures

### **Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. [4]

## **ENGL8998 - Non-Candidate Research**

### **Title**

Non-Candidate Research

### **Catalog Description**

[0]

**ENGL8999 - Non-candidate Research****Title**

Non-candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**ENGL9995 - Half-time Ph.D. Dissertation Research****Title**

Half-time Ph.D. Dissertation Research

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

**ENGL9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Environmental Engineering

**ENVE5305 - Enterprise Risk Management****Title**

Enterprise Risk Management

**Catalog Description**

(Also listed as ENVE 4305) Development of an organization-wide risk management program for protecting human health, the environment and business continuity. Focus on defining an all-hazards risk management process and program implementation, performing risk assessments, determining and selecting appropriate risk reduction strategies, and influencing risk management decisions internally and externally. Applications drawn from natural disasters, man-made accidents and intentional acts. No credit for students who have earned credit for ENVE 4305. SPRING. [3]

**ENVE5600 - Environmental Chemistry****Title**

Environmental Chemistry

**Catalog Description**

(Also listed as ENVE 4600) Theoretical aspects of physical, organic, and inorganic chemistry applied to environmental engineering. Estimation of chemical parameters based on thermodynamic and structural activity relationships, kinetics of chemical reactions, equilibrium processes in the environment, including the carbonate system, metal complexation and precipitation. No credit for students who have earned credit for 4600. FALL. [3]



**ENVE5605 - Environmental Thermodynamics, Kinetics, and Mass Transfer**  
**Title**

Environmental Thermodynamics, Kinetics, and Mass Transfer

**Catalog Description**

(Also listed as ENVE 4605) Examination of fundamental environmental processes and phenomena that provide the analytical tools necessary to solve a broad range of environmental problems. These tools include equilibrium phenomena, process rate and mass transport phenomena. No credit for students who have earned credit for 4605. SPRING. [3]

**ENVE5610 - Biological Processes in Environmental Systems**  
**Title**

Biological Processes in Environmental Systems

**Catalog Description**

(Also listed as ENVE 4610) Principles of biology and their application to wastewater treatment processes with emphasis on microbial ecology, bioenergetics, and the role of chemical structure in biodegradability. Utilization kinetics of inhibitory and non-inhibitory organic compounds. Biological process analysis and design (aerobic and anaerobic) for municipal and industrial wastewaters, using a mass balance approach. No credit for students who have earned credit for ENVE 4610. SPRING. [3]

**ENVE5615 - Environmental Assessments**  
**Title**

Environmental Assessments

**Catalog Description**

(Also listed as ENVE 4615) Design and conduct of environmental assessments to evaluate risks posed by infrastructure systems or environmental contamination. Impact analyses for sources, infrastructure modifications, due diligence environmental audits, and contaminated site remedial investigations. No credit for students who have earned credit for 4615. FALL. [3]

**ENVE5620 - Environmental Characterization and Analysis**  
**Title**

Environmental Characterization and Analysis

**Catalog Description**

(Also listed as ENVE 4620) Acquisition and interpretation of environmental data. Principles of chemical measurement, sample collection and sample program design; laboratory safety and good laboratory practices; analytical instrumentation and methods; quality assurance and quality control; and statistical interpretation of data. Hands-on experience through demonstrations featuring state-of-the-art analytical instrumentation. No credit for students who have earned credit for 4620. SPRING. [3]

**ENVE5625 - Environmental Separations Processes**  
**Title**

Environmental Separations Processes

**Catalog Description**

(Also listed as ENVE 4625) Fundamentals and applications of separations processes relevant to water and wastewater treatment and other environmental systems. Topics include coagulation/flocculation, sedimentation, granular filtration; advanced separation processes such as various membrane processes, absorption, ion exchange, thermally driven separations, and electrically driven separations including electrodialysis and capacitive deionization. No credit for students who have earned credit for ENVE 4625. SPRING. [3]

**ENVE5700 - Energy and Water Resources****Title**

Energy and Water Resources

**Catalog Description**

(Also listed as ENVE 4700) Scientific, technological, philosophical, and social issues surrounding approaches to carbon-based energy and alternative energy resources, management of carbon through sequestration, supplying and treating water for agriculture, communities, and industry, and changing climate impacts on regional distribution of water resources. No credit for students who have earned credit for 4700. SPRING. [3]

**ENVE5705 - Physical Hydrology****Title**

Physical Hydrology

**Catalog Description**

(Also listed as ENVE 4705) Development of fundamental bases of hydrological processes. Landatmosphere processes, surfacewater flows, soil moisture dynamics, and groundwater flows. Exposition of physical principles, their embodiment in mathematical models, and their use in interpreting observations in the field and laboratory. No credit for students who have earned credit for 4705. FALL. [3]

**ENVE5710 - Hydrology****Title**

Hydrology

**Catalog Description**

(Also listed as ENVE 4710) The hydrologic cycle, study of precipitation, evapotranspiration, hydrometeorology, stream flow, flood flow, flood routing, storm sewer design, detention basin design, and water quality. No credit for students who have earned credit for 4710. FALL. [3]

**ENVE5715 - Groundwater Hydrology****Title**

Groundwater Hydrology

**Catalog Description**

(Also listed as ENVE 4715) The occurrence and flow of ground water. Basic concepts of the effects of varying permeability and capillarity on seepage flow. Flow toward wells, through dikes, and beneath dams. No credit for students who have earned credit for 4715. SPRING. [3]

**ENVE5720 - Surface Water Quality Modeling****Title**

Surface Water Quality Modeling

**Catalog Description**

(Also listed as ENVE 4720) Analysis of physical, chemical, biological, and physiological contaminants in streams, lakes, and estuaries, and surface water/groundwater interfaces. Analytical and numerical modeling techniques. One- and two-dimension computer simulation of surface water quality. No credit for students who have earned credit for 4720. SPRING. [3]

**ENVE5800 - Nuclear Environmental Engineering****Title**

Nuclear Environmental Engineering

**Catalog Description**

(Also listed as ENVE 4800) The nuclear fuel cycle and environmental and societal impacts associated with its traditional implementation. Technical and programmatic challenges associated with fuel production, and waste management including processing, storage, transportation, decontamination, decommissioning, and environmental restoration. Technologies and approaches for reducing impacts of the nuclear fuel cycle. No credit for students who have earned credit for 4800. SPRING. [3]

**ENVE5884 - Internship****Title**

Internship

**Catalog Description**

Internship working in a professional setting. Departmental approval required. FALL, SPRING, SUMMER. [0]

**ENVE6800 - Nuclear Facilities Life Cycle Engineering****Title**

Nuclear Facilities Life Cycle Engineering

**Catalog Description**

The life cycle (including siting, licensing, construction, operations and decommissioning) of the nuclear facilities that comprise the nuclear fuel cycle--from mining uranium ore through the potential recycling of used nuclear fuel. SPRING. [3]

**ENVE6805 - Storage, Treatment and Disposal of Radioactive Waste****Title**

Storage, Treatment and Disposal of Radioactive Waste

**Catalog Description**

Evolution of current domestic and international approaches, including waste forms, classification, storage and disposal locations, and environmental and safety assessments. FALL. [3]

**ENVE7531 - Nuclear Chemistry and Processes****Title**

Nuclear Chemistry and Processes

**Catalog Description**

Chemistry and chemical processing of the actinides and important fission products and byproducts. Development of nuclear chemical engineering processes for these materials. SPRING. [3]

**ENVE7533 - Nuclear Process Safety****Title**

Nuclear Process Safety

**Catalog Description**

Approaches for evaluating the safety of nuclear radiochemical processing systems. Safety analysis practices from the chemical industry, the nuclear power community, and the United States nuclear weapons complex, and other quantitative and qualitative risk assessment methods. FALL. [3]

**ENVE7534 - Nuclear Environmental Regulation, Law and Practice****Title**

Nuclear Environmental Regulation, Law and Practice

**Catalog Description**

Environmental laws and regulations governing radionuclides and radioactive waste, including those concerning hazardous chemicals and wastes and those impacting commercial nuclear fuel cycle facilities and former nuclear weapons and materials sites. Interplay between regulatory agencies such as the US Nuclear Regulatory Commission, the US Environmental Protection Agency, and the states. Self-regulation of activities by the U.S. Department of Energy. SUMMER. [3]

**ENVE7899 - Master of Engineering Project****Title**

Master of Engineering Project

**Catalog Description**

Master of Engineering Project

**ENVE7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-6]

**ENVE8000 - Individual Study****Title**

Individual Study

**Catalog Description**

Literature review and analysis, or laboratory investigation of special problems under faculty supervision. FALL, SPRING, SUMMER. [Variable credit: 1-4 each semester]

**ENVE8001 - Individual Study****Title**

Individual Study

**Catalog Description**

Literature review and analysis, or laboratory investigation of special problems under faculty supervision. FALL, SPRING, SUMMER. [Variable credit: 1-4 each semester]

### **ENVE8002 - Individual Study**

#### **Title**

Individual Study

#### **Catalog Description**

Literature review and analysis, or laboratory investigation of special problems under faculty supervision. FALL, SPRING, SUMMER. [Variable credit: 1-4 each semester]

### **ENVE8300 - Research Methods Seminar**

#### **Title**

Research Methods Seminar

#### **Catalog Description**

Coverage of graduate-level skills required to conduct critical review of a topic and produce research proposals, research presentations, and peer-reviewed journal publications. Includes discussion of responsible conduct in research and ethics. FALL. [0]

### **ENVE8999 - Non-Candidate Research**

#### **Title**

Non-Candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

### **ENVE9999 - Ph.D. Dissertation Research**

#### **Title**

Ph.D. Dissertation Research

#### **Catalog Description**

[0-12]

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## **Epidemiology**

### **EPID8301 - Introduction To Statistical Computing And Programming Workshop**

#### **Title**

Introduction To Statistical Computing And Programming Workshop

#### **Catalog Description**

This course is designed for students who seek to develop skills in statistical computing. Students will learn how to use R and STATA for data management, database querying, reporting generating, data presentation, and data tabulation and summarization. Topics include: organization and documentation of data, input and export of data sets; methods of cleaning data; tabulation and graphing of data; programming capabilities; and an introduction to simulations and bootstrapping. Students will also be introduced to LATEX and SWEAVE for report writing. Students will also be briefly introduced to SAS. [2]

## **EPID8310 - Causal Inference**

### **Title**

Causal Inference

### **Catalog Description**

This course will concentrate on conceptually grasping tools of logic and critical thinking as they apply to epidemiologic research. Our emphasis will be on rigorous definition of a causal effect and the minimal conditions necessary to consistently estimate such effects. In a small group format, we will examine case studies and anchor our discussions in readings from philosophy of science, logic, and probability. We will cover examples of valid and fallacious arguments, probability calculus, probabilistic fallacies, applications of Bayes theorem, the frequentist and Bayesian perspective, counterfactual logic, introduction of directed acyclic graphs (DAG), and interpretation of p-values and confidence intervals in epidemiologic research. [3]

## **EPID8311 - Epidemiologic Theory And Methods I**

### **Title**

Epidemiologic Theory And Methods I

### **Catalog Description**

This is the first of a three-course series on advanced epidemiologic concepts and methods that includes measures of disease frequency, measures of effect, descriptive epidemiology, study designs, bias, misclassification and effect measure modification, and ethics in epidemiologic research. A case-based approach will engage students in demonstrating concepts using actual research data and in critical appraisal of case studies and publications that feature strong and weak examples. [4]

## **EPID8312 - Epidemiologic Theory And Methods II**

### **Title**

Epidemiologic Theory And Methods II

### **Catalog Description**

This second in a three-course series provides an in-depth treatment of concepts and skills in epidemiologic research, including problem conceptualization, study design, data analysis and interpretation. Includes emphasis on how to design studies to best measure etiologic effects and includes advanced discussion of confounding, interaction, and missing data. A continued case-based approach will engage students in demonstrating concepts and methods using the students' own data. Prerequisite: 8311: Epidemiologic Theory and Methods I. [4]

## **EPID8313 - Epidemiology Theory & Methods III**

### **Title**

Epidemiology Theory & Methods III

### **Catalog Description**

EPID 8313. Epidemiology Theory & Methods III. Continued instruction in the theory and application of epidemiologic methods in multiple study designs, including specification of generalized linear mixed models, model building strategies for explanation and prediction, additive and multiplicative interaction, effect measure modification, techniques appropriate for clustered and longitudinal data, and graphical exploration. Includes discussion of causal methods such as Propensity Score and Inverse Probability Weighting, causal mediation analysis, and marginal structural models to handle time-dependent confounding. Also includes computer-based experience with real data. Instructor TBD, FALL [4]

### **EPID8315 - Scientific Writing I**

#### **Title**

Scientific Writing I

#### **Catalog Description**

Scientific Writing I. Participatory course in which students develop skills in presenting research results in manuscripts, abstracts, and posters. Students work in small groups to write and critique published and unpublished manuscripts, with a focus on understanding the essential components of a scientific manuscript or presentation, as well as the process of publishing in the peer-reviewed literature and managing reviewer and editor comments and requests. [2]

### **EPID8323 - Epidemiologic Methods: Design and Analysis with Time-to-Event Data**

#### **Title**

Epidemiologic Methods: Design and Analysis with Time-to-Event Data

#### **Catalog Description**

Epidemiologic Methods: Design and Analysis with Time-to-Event Data. Concepts and applications in survival analysis and analysis of incidence rates, including truncation and censoring, life tables, nonparametric approaches (e.g. Kaplan-Meier, log-rank), semi-parametric approaches (e.g. Cox models, proportional hazards regression), parametric approaches (e.g. Weibull, gamma regression) accommodating time-dependent exposures, Poisson regression, sensitivity analysis, bootstrapping, and multiple imputation. [4]

### **EPID8325 - Scientific Writing II - Proposal Development in Epidemiology**

#### **Title**

Scientific Writing II - Proposal Development in Epidemiology

#### **Catalog Description**

Scientific Writing II - Proposal Development in Epidemiology. Participatory course in which each student develops a high quality, detailed research proposal suitable for submission to NIH or AHRQ that includes both a technical proposal and a draft budget justification. Includes lecture, in-class exercises and group processes. SPRING

### **EPID8330 - Training in Molecular and Genetic Epidemiology of Cancer (MAGEC)**

#### **Title**

Training in Molecular and Genetic Epidemiology of Cancer (MAGEC)

#### **Catalog Description**

To provide advanced training in concepts and issues central to cancer epidemiology. Topics will include methodology for conducting a cancer epidemiology study, state-of-the-art technologies for such studies, key cancer exposures, biology and major risk factors for common cancers. [1]

### **EPID8331 - Seminar In Quantitative Methods And Measurement**

#### **Title**

Seminar In Quantitative Methods And Measurement

#### **Catalog Description**

Concepts and application of cross-cutting tools used for unique and/or specialized types of measurement and instrument development for areas such as physical activity, clinical laboratory tests, and imaging studies. May be repeated. [2]

### **EPID8332 - Advanced Methods For Epidemiology**

#### **Title**

Advanced Methods For Epidemiology

#### **Catalog Description**

These methods electives will be taught in modular format, most often with three modules on related quantitative methods topics, which will vary annually. Students will explore enhanced study design and advanced analytic methods in epidemiology like quantitative bias analysis, double-sampling and computational methods to handle missing data, causal mediation analysis, meta-analysis, propensity score methods, network analysis, spatial analysis, and simulation. Exercises with provided datasets and the student's own data will be included. May be repeated. [1-3]

### **EPID8333 - Analytic Techniques for Genetic Epidemiology**

#### **Title**

Analytic Techniques for Genetic Epidemiology

#### **Catalog Description**

This course will take an example-based approach to provide students with the skills necessary to conduct statistical association analysis of genetic data from human populations for genetic epidemiology studies. Topics will include quality control, statistical methods for association testing, common study design issues, future directions of genetic epidemiology and advanced topics. HGEN 8330, HGEN 8340, MP&B 8341 recommended. [3]

### **EPID8334 - Critical Perspectives on Sex, Gender, and Medical Research**

#### **Title**

Critical Perspectives on Sex, Gender, and Medical Research

#### **Catalog Description**

This course is designed to provide students with the foundation necessary to critically assess research protocols and published literature on the inclusion and omission of sex and/or gender. This course will also provide understanding of the biological mechanisms involved in sex as a biological variable and will investigate the differences and relationship between sex and gender. Topics discussed include: basic definitions and measurements of sex and gender, biological and sociological contributions to sex and gender, review of sex chromosomes, health disparities and ethical implications, and study designs and statistical assessment of sex and/or gender in research. Examples are stressed with reference to assumptions and limitations. Students should have a basic knowledge of introductory biology (what one would learn in an introductory biology course) and they should have taken, or be taking concurrently, an introductory course in epidemiology, genetics, public health, statistics or biostatistics. If unsure about pre-requisites contact course instructors and exceptions will be considered. [2]

### **EPID8340 - Content Area Intensives**

#### **Title**

Content Area Intensives

#### **Catalog Description**

These intensives are offered on a rotating basis and taught by faculty with research expertise in the content area of focus. Areas of epidemiology may include cancer, cardiovascular disease, child health, chronic disease/diabetes, genetics, global health, health care, infectious disease, nutrition, pharmacoepidemiology, reproductive, and social. May be repeated. [1-3]



### **EPID8370 - Current Topics In Research**

#### **Title**

Current Topics In Research

#### **Catalog Description**

Students attend weekly presentations selecting from the Vanderbilt Epidemiology Center Seminar Series, Biostatistics Clinic, clinical grand rounds on topics related to content area interests, and other relevant seminars. Students will convene with faculty to reflect on and critique components of research presentations relevant to the students' interests and to the contemporaneous topics being covered in the core epidemiology curriculum. Course assignments will focus on critical appraisal of a methodologic challenge identified in a seminar setting that has immediate relevance to the student's own research. May be repeated. [1]

### **EPID8371 - Special Topics Seminar In Epidemiology**

#### **Title**

Special Topics Seminar In Epidemiology

#### **Catalog Description**

Faculty offer small groups of students a study course on a topic of mutual interest and concern in the faculty member's area of expertise. May be repeated with topic change. [1-3]

### **EPID8372 - Advanced Readings In Epidemiology**

#### **Title**

Advanced Readings In Epidemiology

#### **Catalog Description**

Additional readings in specialized epidemiologic topics will be explored in depth under the guidance of a faculty member. May be repeated. [1-3]

### **EPID8373 - Independent Study In Epidemiology**

#### **Title**

Independent Study In Epidemiology

#### **Catalog Description**

Designed to allow the student an opportunity to master advanced skills in epidemiology while pursuing special projects under individual members of the faculty in their areas of expertise. May be repeated. [1-3]

### **EPID8374 - Advanced Readings in Epidemiologic Context, Thought, and History**

#### **Title**

Advanced Readings in Epidemiologic Context, Thought, and History

#### **Catalog Description**

Reading and discussion of seminal literature in the history of epidemiology as well as contemporary literature that provides social and cultural context for the development of the field, challenges to the application of epidemiologic findings, consideration of roles and history of public health advocacy, and exploration of topics like social justice and research ethics through the lens of fiction, nonfiction, and scientific literature. A core reading will be selected to launch each semester and students will work as a group to select the balance of the readings for the semester from a recommended source list. Discussions will be facilitated by faculty and students including guest lecturers. Minimum of masters training in quantitative discipline and research experience in epidemiology or related field is required; other graduate students with permission of the instructor.

### **EPID8999 - Non-Candidate Research**

#### **Title**

Non-Candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

### **EPID9999 - Ph.D. Dissertation Research**

#### **Title**

Ph.D. Dissertation Research

#### **Catalog Description**

[0-12]

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## **Establishing Multimessenger Astronomy and Inclusive Training**

### **EMIT8010 - Radiative Processes**

#### **Title**

Radiative Processes

#### **Catalog Description**

Electromagnetic radiation from astrophysical sources. Radiative transfer; blackbody radiation; atomic and molecular absorption and emission; radiation from moving charges. [3]

### **EMIT8060 - Observational Methods in Astronomy**

#### **Title**

Observational Methods in Astronomy

#### **Catalog Description**

Observational tools of the professional astronomer. Observation planning including: telescope and instrument selection, conducting observations, calculation of expected signal-to-noise ratio, data reduction, and extraction of photometric and spectroscopic measurements. [3]

### **EMIT8070 - Astrostatistics**

#### **Title**

Astrostatistics

#### **Catalog Description**

Statistical and computational techniques for data-mining and inference in an astronomical context. Probability theory, comparison of frequentist and Bayesian inference. Strategies for data exploration and visualization. Approaches to regression, parameter estimation, and model selection (e.g. Markov chain Monte Carlo). Overview of time-series analysis and deep-learning techniques. [3]

### **EMIT8080 - Astronomical Techniques: Data Mining in Large Astronomical Surveys**

#### **Title**

Astronomical Techniques: Data Mining in Large Astronomical Surveys

#### **Catalog Description**

The manipulation and analysis of catalog-level data from large astronomical surveys. Survey observations, cross-matching catalogs, statistical analysis, version control. Emphasis on development of code and best practices. Not open to students who have completed ASTR 3890 section 01 offered fall 2019/20 or ASTR 8020 section 01 offered fall 2019/20. [3]

### **EMIT8090 - Relativistic Astrophysics**

#### **Title**

Relativistic Astrophysics

#### **Catalog Description**

Studying the Universe through the extreme relativistic environments of neutron stars and black holes, along with the gravitational waves they produce. Differential geometry, spacetime curvature, the Einstein Field Equations, the Schwarzschild Metric for black holes, production and detection of Gravitational Waves, and the Friedmann-Robertson-Walker metric for cosmology. [3]

### **EMIT8593 - Professional Skills for Graduate Studies**

#### **Title**

Professional Skills for Graduate Studies

#### **Catalog Description**

At Fisk. Development of professional skills. To be taken twice for a total of 1 credit. [.5]

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## **European Studies**

### **EUS5220 - Religion and Politics in Modern Europe, 1648-Present**

#### **Title**

Religion and Politics in Modern Europe, 1648-Present

#### **Catalog Description**

(Also listed as EUS 2220) Toleration in the Enlightenment; the French Revolution; antisemitism; genocide; secularism and political Islam. No credit for students who have earned credit for 2220. [3]

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## **French**

### **FREN5111 - French for Graduate Reading**

#### **Title**

French for Graduate Reading

#### **Catalog Description**

Survey of grammar and vocabulary, with extensive reading. Available to graduate students for "no credit" only. [0]

**FREN5850 - Independent Study****Title**

Independent Study

**Catalog Description**

(Also listed as FREN 3850) Content varies according to the needs of the individual student. Primarily designed to cover pertinent material not otherwise available in the regular curriculum. May be repeated for a total of 12 credits over a four-semester period, but students may earn only up to 3 credits per semester of enrollment. [1-3; maximum of 12 credits total for four semesters of FREN 5850] No credit for students who have earned credit for 3850. (No AXLE credit)

**FREN6030 - Foreign Language Learning and Teaching****Title**

Foreign Language Learning and Teaching

**Catalog Description**

(Also listed as German 5310, Portuguese 6030, and Spanish 6030) Principles and practices of teaching a second language, with concentration on recent interactive and communicative models of foreign language instruction. Goals of the course are 1) to introduce principles of Second Language Acquisition and learning, 2) to critically read relevant literature in the area(s), and 3) to develop FL instructor's awareness through reflective and critical thinking. Classroom observations, journal writing, development of materials, and a small action-research project are expected. Required of all entering teaching assistants. [3]

**FREN7010 - Introduction to Research****Title**

Introduction to Research

**Catalog Description**

Materials and methods of scholarly research, with attention to their relation to theories of literature. [3]

**FREN7020 - History of the French Language: Medieval Period****Title**

History of the French Language: Medieval Period

**Catalog Description**

Syntax, morphology, phonology, emphasis on textual explication. Prerequisite: elementary knowledge of Latin. [3]

**FREN7040 - Second Language Acquisition Theories and Research****Title**

Second Language Acquisition Theories and Research

**Catalog Description**

A review of current sociocultural and cognitive theories and research in SLA. [3]

**FREN7050 - Applied French Linguistics****Title**

Applied French Linguistics

**Catalog Description**

Phonetics, morphology, syntax, and semantics, with application to teaching; theories of second language acquisition. [3]

**FREN7060 - French Literary Theory****Title**

French Literary Theory

**Catalog Description**

Literary theory as it has been shaped by and shapes the French tradition. [3]

**FREN8000 - Apprenticeship in Undergraduate Teaching****Title**

Apprenticeship in Undergraduate Teaching

**Catalog Description**

Supervised experience and instruction of pedagogical practices in foreign language and literature courses. Consent of supervisor and Director of Graduate Studies required. [3]

**FREN8010 - Seminar in Medieval French Literature****Title**

Seminar in Medieval French Literature

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**FREN8020 - French Feminism from de Beauvoir to the Present****Title**

French Feminism from de Beauvoir to the Present

**Catalog Description**

Ideological, political, and cultural contexts. French feminist theory explored through essays, novels, drama, and poetry. Principal theoretical feminists (Beauvoir, Delphy, Guillaumin, Leclerc, Cixous, Irigaray, Kristeva), as well as lesser-known figures (Halimi, Badinter, Agacinsky, Roudinesco, Amara) and literary figures (Duras, Abv©cassis, Schwarz-Bart, Ednan and Bvç. [3]

**FREN8030 - Seminar in Seventeenth-Century French Literature****Title**

Seminar in Seventeenth-Century French Literature

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**FREN8040 - Seminar in Eighteenth-Century French Literature**

**Title**

Seminar in Eighteenth-Century French Literature

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**FREN8050 - Seminar in Nineteenth-Century French Literature**

**Title**

Seminar in Nineteenth-Century French Literature

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**FREN8060 - Seminar in Twentieth-Century French Literature**

**Title**

Seminar in Twentieth-Century French Literature

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**FREN8070 - Seminar in Francophone Literature**

**Title**

Seminar in Francophone Literature

**Catalog Description**

Literature of the French-speaking world ("La Francophonie"). May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**FREN8075 - Seminar in Francophone Caribbean Literature**

**Title**

Seminar in Francophone Caribbean Literature

**Catalog Description**

Major literary figures and intellectual traditions. No credit for students who earned credit for 388 section 1 in fall 2012. [3]

**FREN8080 - Seminar in French Film**

**Title**

Seminar in French Film

**Catalog Description**

Theory and practice of French-language film, often in comparative context, for example in a side-by-side study of French and Italian New Wave. No credit for students who completed 390 section 1 in fall 2009. [3]

**FREN8090 - Special Topics in French Studies****Title**

Special Topics in French Studies

**Catalog Description**

Problems, themes, or issues in literature, language, or culture approached in ways that transcend traditional chronological distinctions. [3]

**FREN9999 - Non-candidate Research****Title**

Non-candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**FREN9995 - Half-time Ph.D. Dissertation Research****Title**

Half-time Ph.D. Dissertation Research

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

**FREN9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Gender and Sexuality Studies

**GSS5201 - Women and Gender in Transnational Context****Title**

Women and Gender in Transnational Context

**Catalog Description**

(Also listed as GSS 3201) Gender as a social construction. Feminist critiques of knowledge, family and work, sexuality, health and medicine, and the women's movement. The future of feminism in global context. No credit for students who have earned credit for 3201. [3]

**GSS5305 - Gender and Sexuality in Times of Pandemic**

**Title**

Gender and Sexuality in Times of Pandemic

**Catalog Description**

Integration of science and medicine to the social construction of race, gender and identity. Interconnections with national security, economic growth, and natural risks: sex, death and illness. Challenges to gender and sexual justice by infectious diseases. Historical and literary research; sex, sexuality and gender during times of disease. Expressions, regulations, and resistance of sex, sexuality, and gender during medical/scientific crises. [3]

**GSS5970 - Sexing the Archive: Research Methods in Women's and Gender Studies**

**Title**

Sexing the Archive: Research Methods in Women's and Gender Studies

**Catalog Description**

Conducting research through a feminist and queer lens. Archival research; examining oral histories using specialized Vanderbilt resources, as well as other local and online archives. Offered on a graded basis only. [3]

**GSS6244 - The Body, Culture, and Feminism**

**Title**

The Body, Culture, and Feminism

**Catalog Description**

The body as a cultural, social, and historical construction. Western culture and narratives of "normalcy" and their impact on identity and representation. Body image and eating disorders. Cultural politics of size, weight, and shape. Disability. Cosmetic surgery. [3]

**GSS8301 - Gender and Sexuality: Feminist Approaches**

**Title**

Gender and Sexuality: Feminist Approaches

**Catalog Description**

Interdisciplinary introduction to the major debates, theoretical terms, and research methods in feminist, gender, sexuality, and queer studies. [3]

**GSS8302 - Gender and Pedagogy**

**Title**

Gender and Pedagogy

**Catalog Description**

Feminist theories of teaching and learning; gender and diversity in the classroom; critical pedagogy. Classroom practicum. [1-4]

**GSS8303 - Queer Theory**

**Title**

Queer Theory

**Catalog Description**

History and development of queer theory. Key intellectual antecedents, significant theorists, and current trends. How sexuality intersects with gender, race, class, nationality, ability, and religion. [3]



**GSS8304 - Gender, Power, and Justice**

**Title**

Gender, Power, and Justice

**Catalog Description**

Theoretical, historical, and cultural analysis of power structures and politics; analysis of activist and academic responses to contemporary political questions. [3]

**GSS8305 - Sexual Politics: Theory and Practice**

**Title**

Sexual Politics: Theory and Practice

**Catalog Description**

Connections and conflicts between academic theory and activist practice. Gender and sexuality theories in relation to community formation, collective action, and inclusive social justice. [4]

**GSS8989 - Independent Study**

**Title**

Independent Study

**Catalog Description**

Work in a tutorial relationship with an individual faculty member or in a student seminar, subject to faculty approval, should several students share a common interest. May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3]

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## German

**GER4999 - Honors Research**

**Title**

Honors Research

**Catalog Description**

Senior Honors Thesis. Open only to honors candidates. [1-3] (No AXLE credit)

**GER5111 - German for Graduate Reading**

**Title**

German for Graduate Reading

**Catalog Description**

Survey of grammar and vocabulary, with extensive reading. Available only to graduate students for "No Credit". [0]

### **GER5310 - Foreign Language Learning and Teaching**

#### **Title**

Foreign Language Learning and Teaching

#### **Catalog Description**

(Also listed as French 6030, Portuguese 6030, and Spanish 6030) Principles and practices of teaching a second language, with concentration on recent interactive and communicative models of foreign language instruction. Goals of the course are 1) to introduce principles of Second Language Acquisition and learning, 2) to critically read relevant literature in the area(s), and 3) to develop FL instructor's awareness through reflective and critical thinking. Classroom observations, journal writing, development of materials, and a small action-research project are expected. Required of all entering teaching assistants. [3]

### **GER5343 - The Aesthetics of Violence: Terror, Crime, and Dread in German Literature**

#### **Title**

The Aesthetics of Violence: Terror, Crime, and Dread in German Literature

#### **Catalog Description**

(Also listed as GER 3343) The "dark" side of imagination in twentieth-century German literature including history and theory of modern art, emphasis on literary representation, mutual influences between aesthetic reflection and political action. No knowledge of German required. No credit for students who have earned credit for 3343. [3]

### **GER5344 - Women at the Margins: German-Jewish Women Writers**

#### **Title**

Women at the Margins: German-Jewish Women Writers

#### **Catalog Description**

(Also listed as GER 3344) Examination of themes, forms, and sociocultural issues shaping the work of German-Jewish women writers from the Enlightenment to the present. Readings and discussions in English. No credit for students who have earned credit for 3344. [3]

### **GER5345 - Love and Friendship**

#### **Title**

Love and Friendship

#### **Catalog Description**

(Also listed as GER 3345) Concepts of life and friendship, Greek antiquity to Romanticism, modern and postmodern times. Philosophical and literary texts, letters, and essays. Taught in English. No credit for students who have earned credit for 3345. [3]

### **GER5375 - Art and Rebellion: Literary Experiment in the 1960s and 1970s**

#### **Title**

Art and Rebellion: Literary Experiment in the 1960s and 1970s

#### **Catalog Description**

(Also listed as GER 3375) German literature under the conditions of protest and rebellion. Experiments in poetry, prose, and theatre; new directions in art and media theory; historical influences. Taught in English. No credit for students who have earned credit for 3375. [3]

**GER5378 - Dreams in Literature****Title**

Dreams in Literature

**Catalog Description**

(Also listed as GER 3378) The difference between sleeping and being awake. Literary and philosophical texts. Novels, short stories, diaries, poems, and drama written within the last two hundred years. Taught in English. No credit for students who have earned credit for 3378. [3]

**GER5443 - A History of German Cinema, With Subtitles****Title**

A History of German Cinema, With Subtitles

**Catalog Description**

A curated presentation of the history of German cinema with special emphasis on its sociocultural contexts and artistic achievements. Discussion will include pertinent theories of cinematography and cinematic narration. Taught in English. [3]

**GER5445 - Nazi Cinema: The Manipulation of Mass Culture****Title**

Nazi Cinema: The Manipulation of Mass Culture

**Catalog Description**

(Also listed as GER 2445) Nazi manipulation of mass culture through film (propaganda, musicals, westerns). Some comparison with American film of the era, additional examination of "fascist" aesthetic legacy in American culture today. No knowledge of German required. No credit for students who have earned credit for 2445. [3]

**GER5535 - German Romanticism****Title**

German Romanticism

**Catalog Description**

(Also listed as GER 4535) The contributions of Schlegel, Tieck, Novalis, Eichendorff, and others to literature, philosophy, and theory. Intellectual, social, and political currents. No credit for students who have earned credit for 4535. [3]

**GER5537 - Women and Modernity****Title**

Women and Modernity

**Catalog Description**

(Also listed as GER 4537) Women in German literature from the eighteenth century to the present, focusing on questions of sexuality, political emancipation, artistic identity. No knowledge of German required. No credit for students who have earned credit for 4537. [3]

**GER5548 - German Lyric Poetry-Form and Function****Title**

German Lyric Poetry-Form and Function

**Catalog Description**

(Also listed as GER 4548) Lyric forms as a reaction to personal trauma, collective desire, scientific and technological advances, and social change since the Thirty Years' War. Love, loss, liberation. Students compose poems in imitation of classic examples of the folk song, ballad, sonnet. No credit for students who have earned credit for 4548. [3]

**GER5555 - Topics in German Studies (ENGL)****Title**

Topics in German Studies (ENGL)

**Catalog Description**

Seminal aspects of German literature, culture, and civilization through interdisciplinary focus. Taught in English. May be repeated for credit if there is no duplication in topic. [3]

**GER5563 - The Age of Goethe-Weimar 1775 to 1805****Title**

The Age of Goethe-Weimar 1775 to 1805

**Catalog Description**

(Also listed as GER 4563) Rational pragmatism, aesthetic innovation in response to Kant and French Revolution. Readings drawn from Goethe's Iphigenia, Hermann und Dorothea, Schiller's Maria Stuart and Wallenstein, and Wieland's Oberon. No credit for students who have earned credit for 4563. [3]

**GER5564 - Pleasures and Perils in Nineteenth-Century Theatre****Title**

Pleasures and Perils in Nineteenth-Century Theatre

**Catalog Description**

(Also listed as GER 4564) The German drama and dramatic theory from Romanticism up to Naturalism with emphasis on selected works by Kleist, Büchner, Grillparzer, and Hebbel. No credit for students who have earned credit for 4564. [3]

**GER5565 - Revolutionizing Twentieth-Century Theatre****Title**

Revolutionizing Twentieth-Century Theatre

**Catalog Description**

(Also listed as GER 4565) German drama and dramatic theory from Naturalism to the present. Emphasis on Brecht and post-Brechtian drama. No credit for students who have earned credit for 4565. [3]

**GER5566 - Nineteenth-Century Prose****Title**

Nineteenth-Century Prose

**Catalog Description**

(Also listed as GER 4566) A study of representative works of the main literary trends from Romanticism to Naturalism. No credit for students who have earned credit for 4566. [3]

**GER5567 - The German Novel from Kafka to Grass****Title**

The German Novel from Kafka to Grass

**Catalog Description**

(Also listed as GER 4567) A study and interpretation of the main literary trends and major figures in twentieth-century narrative. No credit for students who have earned credit for 4567. [3]

**GER5569 - Writing under Censorship****Title**

Writing under Censorship

**Catalog Description**

(Also listed as GER 4569) An introduction to the main literary trends and authors of the former East Germany (1949-1989). No credit for students who have earned credit for 4569. [3]

**GER5574 - Who Am I? German Autobiographies****Title**

Who Am I? German Autobiographies

**Catalog Description**

(Also listed as GER 4574) Canonical and non-canonical texts from the nineteenth and twentieth centuries constructing cultural, religious, and gender identities. Taught in English. No credit for students who have earned credit for 4574. [3]

**GER5852 - Independent Readings****Title**

Independent Readings

**Catalog Description**

(Also listed as GER 3852) Designed for majors and qualified undergraduates. Projects are carried out under the supervision of a member of the department. All projects must be approved by the department. May be repeated for a total of 6 credits over a four-semester period in 289a and 289b combined if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3; maximum of 6 credits total for four semesters of GER 289a and 289b] (No AXLE credit)

**GER5884 - Teaching Program Option: Internship in Advanced Language and Literature Courses**  
**Title**

Teaching Program Option: Internship in Advanced Language and Literature Courses

**Catalog Description**

Graduate interns participate in the teaching of advanced language or literature courses and receive training in the writing of syllabi, text selection, testing, the development of supplementary materials, the selection of visual aids. May be repeated for a total of 6 credits, but students may earn only up to 2 credits per semester of enrollment. [1-2; maximum of 6 credits for all semesters of GER 5884]

**GER5890 - Selected Topics**

**Title**

Selected Topics

**Catalog Description**

May be repeated if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3; maximum of 12 credits for all semesters of GER 5890 and 5891].

**GER5891 - Selected Topics**

**Title**

Selected Topics

**Catalog Description**

May be repeated if there is no duplication in topic. Students may enroll in more than one section of this course per semester. [3; maximum of 12 credits for all semesters of GER 5890 and 5891].

**GER6555 - Topics in German Studies (GER)**

**Title**

Topics in German Studies (GER)

**Catalog Description**

Seminal aspects of German literature, culture, and civilization through interdisciplinary focus. May be repeated for credit if there is no duplication in topic. Readings and instruction in German; advanced German is presumed. [3]

**GER6556 - Topics in Intellectual History (GER)**

**Title**

Topics in Intellectual History (GER)

**Catalog Description**

Major trends and figures from the Enlightenment to the contemporary age. May be repeated for credit if there is no duplication in topic. [3]

**GER7101 - Foundations I: Transition Points of Modern German Culture**

**Title**

Foundations I: Transition Points of Modern German Culture

**Catalog Description**

Analysis and practice of scholarly genres and related academic texts. Different forms of presentation. Efficient time and project management. [3]

**GER7102 - Foundations II: Theories of Literary and Cultural Analysis**

**Title**

Foundations II: Theories of Literary and Cultural Analysis

**Catalog Description**

Key texts on modern thought, media, and the human condition. Twentieth and twenty-first century. From Hermeneutics to Neuraesthetics. [3]

**GER7103 - Foundations III: Modes of Scholarly Work and Writing**

**Title**

Foundations III: Modes of Scholarly Work and Writing

**Catalog Description**

Analysis and practice of scholarly genres and related academic texts. Different forms of presentation. Efficient time and project management. [3]

**GER7104 - Pre-Exam Colloquium**

**Title**

Pre-Exam Colloquium

**Catalog Description**

Preliminary Exam preparation. Exam topics. Major works, writers, and genres. [3]

**GER7105 - Graduate Tutorials**

**Title**

Graduate Tutorials

**Catalog Description**

Graduate Tutorials. Supervised reading in special areas of German language and literature according to a fixed syllabus. Number, content, and schedule of meetings with the instructor are predetermined, as are reading assignments, tests, term papers, and grading procedure. Units are related to the content and method of period seminars and other graduate courses and allow students to deepen their knowledge of subjects not covered in depth in formal courses offered by the department. Students may not take more than one unit per semester. [3]

**GER7999 - Master's Thesis Research**

**Title**

Master's Thesis Research

**Catalog Description**

[0-12]

**GER8102 - Problems in Germanic Languages and Literatures**

**Title**

Problems in Germanic Languages and Literatures

**Catalog Description**

[3]

**GER8103 - Seminar: Studies in Medieval Literature**

**Title**

Seminar: Studies in Medieval Literature

**Catalog Description**

[3]

**GER8104 - Seminar: Studies in Literature 1400-1680**

**Title**

Seminar: Studies in Literature 1400-1680

**Catalog Description**

[3]

**GER8201 - Seminar: Eighteenth-Century German Literature**

**Title**

Seminar: Eighteenth-Century German Literature

**Catalog Description**

[3]

**GER8202 - Seminar: Nineteenth-Century German Literature**

**Title**

Seminar: Nineteenth-Century German Literature

**Catalog Description**

[3]

**GER8203 - Seminar: Twentieth-Century German Literature**

**Title**

Seminar: Twentieth-Century German Literature

**Catalog Description**

[3]

**GER8204 - Seminar: Problems of Theory in German Studies**

**Title**

Seminar: Problems of Theory in German Studies

**Catalog Description**

Author, Archive, Work. [3]

**GER8205 - Seminar: Intellectual Constellations**

**Title**

Seminar: Intellectual Constellations

**Catalog Description**

[3]



**GER8206 - Seminar: Society and Ethics**

**Title**

Seminar: Society and Ethics

**Catalog Description**

[3]

**GER8207 - Nature. History of an Illusion**

**Title**

Nature. History of an Illusion

**Catalog Description**

Concepts such as genuineness, authenticity, and purity, 1750 to the present. Focus on Enlightenment, Romanticism, Realism, and post-war literature and media in Germany and Austria. [3]

**GER8208 - Romanticism: An Aesthetic Idea and Its Transformation.**

**Title**

Romanticism: An Aesthetic Idea and Its Transformation.

**Catalog Description**

German culture, art, and politics, 1790-1830. From artistic avant-garde movement to political conservatism. Introduction of genres such as fragment and fairy tale. Origins of literary criticism and hermeneutics. [3]

**GER8301 - Pre-Dissertation Colloquium**

**Title**

Pre-Dissertation Colloquium

**Catalog Description**

Qualifying Exam Colloquium. Dissertation topics. Major thinkers, works, genres, and eras. [3]

**GER8999 - Non-candidate Research**

**Title**

Non-candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**GER9995 - Half-time Ph.D. Dissertation Research**

**Title**

Half-time Ph.D. Dissertation Research

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

**GER9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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**Greek****GRK5101 - Beginning Greek I****Title**

Beginning Greek I

**Catalog Description**

(Also listed as GRK 1101) Elements of classical Greek. Reading of simplified texts from authors of the fifth and fourth centuries B.C. No credit for students who have earned credit for a more advanced Greek language course. No credit for students who have earned credit for GRK 1101. [3]

**GRK5102 - Beginning Greek II****Title**

Beginning Greek II

**Catalog Description**

(Also listed as GRK 1102) Continuation of 5101. Completion of the elements of classical Greek through readings from classical authors. Introduction to Homeric and Hellenistic Greek. No credit for students who have earned credit for a more advanced Greek language course. No credit for students who have earned credit for 1102. [3]

**GRK5201 - Intermediate Greek I: Classical and Koin<sup>v</sup>© Greek****Title**

Intermediate Greek I: Classical and Koin<sup>v</sup>© Greek

**Catalog Description**

(Also listed as GRK 2201) Review of Greek grammar, and reading from classical and biblical texts. No credit for students who have earned credit for a more advanced Greek language course. No credit for students who have earned credit for 2201. [3]

**GRK5202 - Intermediate Greek II: Homer's Iliad****Title**

Intermediate Greek II: Homer's Iliad

**Catalog Description**

(Also listed as GRK 2202) Selected reading and interpretation; history and literary characteristics of the Homeric epic; practice in reading of meter. No credit for students who have earned credit for a more advanced Greek language course. No credit for students who have earned credit for 2202. [3]

**GRK6010 - The Greek Orators****Title**

The Greek Orators

**Catalog Description**

(Also listed as GRK 3010) Classical Athenian orators, with a focus on Lysias and Demosthenes. Historical context, rhetorical technique, and prose style. No credit for students who have earned credit for 3010. [3]

**GRK6020 - The Greek Historians****Title**

The Greek Historians

**Catalog Description**

(Also listed as GRK 3020) Selections from the major Greek historians, especially Herodotus and Thucydides, and study of their philosophy of history; investigation of the development of historical prose writing. No credit for students who have earned credit for 3020. [3]

**GRK6040 - Readings in Plato and Aristotle****Title**

Readings in Plato and Aristotle

**Catalog Description**

(Also listed as GRK 3040) Selected readings from the dialogues of Plato and from the ethical writings of Aristotle. Corollary readings and discussions of the pre-Socratic philosophers and the post-Aristotelian schools. No credit for students who have earned credit for 3040. [3]

**GRK6100 - The Greek Tragedians****Title**

The Greek Tragedians

**Catalog Description**

(Also listed as GRK 3100) Selections from the plays of Aeschylus, Sophocles, and Euripides. Survey of the development of tragedy. May be repeated for credit with change of subject matter. No credit for students who have earned credit for 3100. [3]

**GRK6110 - Greek Lyric Poetry****Title**

Greek Lyric Poetry

**Catalog Description**

(Also listed as GRK 3110) The Greek melic, elegiac, and iambic traditions, with an introduction to the Greek dialects and special emphasis on Archilochus, Tyrtaeus, Alcaeus, and Sappho. No credit for students who have earned credit for 3110. [3]

**GRK6200 - Early Christian Writers****Title**

Early Christian Writers

**Catalog Description**

(Also listed as GRK 3200) Writings of Greek Christians, from the New Testament to critical works and letters by the Cappadocian fathers. Historical and intellectual context. Rhetoric and style. The Roman East. No credit for students who have earned credit for 3200. [3]

**GRK6890 - Special Topics in Greek Literature****Title**

Special Topics in Greek Literature

**Catalog Description**

(Also listed as GRK 3890) May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3890. [3] (HCA)

**GRK7000 - Seminar in Classical Greek Prose****Title**

Seminar in Classical Greek Prose

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**GRK7010 - Seminar in Classical Greek Poetry****Title**

Seminar in Classical Greek Poetry

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**GRK7850 - Independent Study****Title**

Independent Study

**Catalog Description**

(Also listed as GRK 3850) Designed for majors wanting to familiarize themselves with works and authors not covered in the regular curriculum. May be repeated for a total of 6 credits if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. No credit for students who have earned credit for 3850. [1-3; maximum of 6 credits total for all semesters of GRK 7850] (No AXLE credit)

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**Haitian Creole Language**

**CREO5101 - Elementary Creole I (Duke)****Title**

Elementary Creole I (Duke)

**Catalog Description**

(Also listed as CREO 1101) Essential elements of Haitian Creole or Kreyòl language and Haitian culture. Understanding, speaking, reading, and writing in contexts of health care, Haitian women's rights, and unpaid child servants (restavèk). Vocabulary and idioms. Offered on a graded basis only. [3]

**CREO5102 - Elementary Creole II (Duke)****Title**

Elementary Creole II (Duke)

**Catalog Description**

Essential elements of Creole language and aspects of Haitian culture. Speaking, listening, reading, and writing. Exposure to Haitian culture through films, storytelling, games, music, and proverbs. Prerequisite: 1101 or a comparable level of previous Creole language experience, such as familial background in Creole. Offered on a graded basis only. [3]

**CREO5201 - Intermediate Creole I (Duke)****Title**

Intermediate Creole I (Duke)

**Catalog Description**

(Also listed as CREO 2201) Understanding, speaking, reading, and writing in cultural context; issues of rural life in Haiti, religion, Frenchified Creole vs popular Creole. Texts, poems, novel excerpts. Focus on contemporary events and debates in Haitian culture. Offered on a graded basis only. Prerequisite: 1102. [3]

**CREO5202 - Intermediate Creole II (Duke)****Title**

Intermediate Creole II (Duke)

**Catalog Description**

Second semester of Intermediate Creole. Offered on a graded basis only. Prerequisite: 2201 or equivalent. [3]

**CREO5301 - Advanced Haitian-Creole I (Duke)****Title**

Advanced Haitian-Creole I (Duke)

**Catalog Description**

Listening, speaking, reading, and writing skills. Themes related to Ayiti such as literature(s), language(s), education, history, and different types of Haitian music. Pioneers of Haitian Kreyòl literature and works of Haitian scholars/authors published in the past ten years. Music groups that left their mark on Haitian music. [3]

**CREO5302 - Advanced Haitian-Creole II****Title**

Advanced Haitian-Creole II

**Catalog Description**

TBD

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## Health Policy

### **HPOL8225 - Health Policy Research Seminar**

#### **Title**

Health Policy Research Seminar

#### **Catalog Description**

This seminar series will give students the opportunity to engage with Health Policy faculty on active research projects as well as join discussions on the latest health policy topics and methodologies. [1]

### **HPOL8520 - Introduction to Health Policy**

#### **Title**

Introduction to Health Policy

#### **Catalog Description**

The aim of this course is to provide students with an overview of the U.S. health care system and key features of its financing and delivery. We will discuss the strengths and weaknesses of our health care system, historical trends, and how we compare to other countries. Moreover, we will discuss the major components of the Affordable Care Act and implementation challenges going forward. Drawing on materials from different academic disciplines, including economics, political science, and sociology, the course will place particular emphasis on analytic approaches to evaluate policy impact. The course will address a range of topics, including the structure of the delivery system, drivers of spending growth, quality of care, and long-term care. [2]

### **HPOL8521 - Introduction to Health Policy Lab**

#### **Title**

Introduction to Health Policy Lab

#### **Catalog Description**

This is a discussion section/lab for Intro to Health Policy. Students are required to take HPOL 8520 concurrently. [1]

### **HPOL8525 - Health Economics**

#### **Title**

Health Economics

#### **Catalog Description**

This course is intended to survey the major topics in Health Economics. Each class is organized around a topical theme: those themes include health reform, health insurance, health promotion and disease prevention, and the health care workforce. Each theme will be approached from an economic perspective using recent articles from the literature. [2]

### **HPOL8526 - Health Economics Lab**

#### **Title**

Health Economics Lab

#### **Catalog Description**

This is a discussion section/lab for Health Econ. Students are required to take HPOL 8525 concurrently. [1]

**HPOL8530 - Health Policy II****Title**

Health Policy II

**Catalog Description**

This goal of this course is to twofold: 1) to give students an in-depth look at parts of the delivery and financing systems of the U.S. health care system and 2) to help students critically examine study designs and methodologies used in assessments of the U.S. health care system. Health system topics covered in the course will include variation in the costs and quality of the U.S. health care system, how a health system might assess new technologies, and the ethical implications embedded in the US health care system. Methodological topics will include types of validity, risk adjustment, randomized controlled trials, quasi-experimental study designs, and cost effectiveness analysis. This course will draw on multiple disciplines, including bioethics, economics, sociology, and biostatistics. The prerequisite for this course is HPOL 8520. [2]

**HPOL8531 - Health Policy II Lab****Title**

Health Policy II Lab

**Catalog Description**

This is a discussion section/lab for Health Policy II. Students are required to take HPOL 8530 concurrently. [1]

**HPOL8538 - Health Services Administration: Program and Policy Evaluation****Title**

Health Services Administration: Program and Policy Evaluation

**Catalog Description**

This course addresses the evaluation of changes in the health care delivery system, either through programs specifically implemented to achieve such changes or through changes in health care delivery/financing policies. The primary designs--before/after, concurrent/retrospective control, interrupted time-series--and their strengths and limitations. The course includes didactic lectures and small group critical reading/presentation of current program/policy evaluations published in leading medical journals. [3]

**HPOL8539 - Advanced Program and Policy Evaluation Lab****Title**

Advanced Program and Policy Evaluation Lab

**Catalog Description**

This is a discussion section/lab that will cover advanced methods for program and policy evaluation. Students are required to have taken HPOL 8538 or an equivalent course in graduate econometrics or biostatistical methods for causal inference. [2]

## **HPOL8540 - Introduction to Healthcare Database Research**

### **Title**

Introduction to Healthcare Database Research

### **Catalog Description**

The goals of the course are to provide students with foundational knowledge for using administrative health care claims data and other sources of relational data for health services research. Students will learn how to manage large databases in SAS, how to identify key variables in administrative data and how to design and implement a study protocol. At the end of the course student should be able to create an analytic dataset consisting of a study population of interest and measures for key variables needed to address a specific research question. Students will gain an understanding of how and why administrative data are collected, how diseases and treatments are identified in the data and the strengths and limitations of using administrative data for health services research. This course will consist of a lecture and lab format. Students are expected to bring laptop computers to the classroom in order to connect to the secure server environment for lab sessions.

## **HPOL8550 - Decision Analysis in Medicine and Public Health**

### **Title**

Decision Analysis in Medicine and Public Health

### **Catalog Description**

This course provides an overview of qualitative and quantitative decision making with a dominant focus on quantitative techniques, using clinical and economic endpoints and their role in clinical strategies of care and health policy. Topics include: cognitive heuristics, Bayes' theorem, ROC analysis, the study of diagnostic tests, meta-analysis, health states and utility measurement using expected value decision making, decision tree analysis, Markov processes and network simulation modeling, quantitative management of uncertainty, cost theory and accounting, cost-effectiveness and cost-utility analysis. FALL [3]

## **HPOL8551 - Methods and Applied Research in Decision Analysis**

### **Title**

Methods and Applied Research in Decision Analysis

### **Catalog Description**

This course offers an intermediate-level exploration into medical decision-making. Course topics include formulating a decision problem, Markov cohort models, microsimulation, discrete event simulation, calibration and validation of models, uncertainty analysis, value of information analysis, and equity-informative cost-effectiveness analysis (e.g. distributional cost-effectiveness analysis). While we emphasize practical application, the understanding of fundamental theoretical concepts and modeling skills is also highlighted. Students will undertake a semester-long project, commencing from a real-world decision problem in a clinical or policy context to the development of a fully-fledged model. This hands-on project takes students through all stages of research, from formulating a question to presenting the final results, which may also lead to conference-ready models and potential manuscript development. The course welcomes PhD and Master's students, as well as medical students and residents, with an interest in decision analytic methods, simulation modeling, and cost-effectiveness analysis.

## **HPOL8990 - Independent Study**

### **Title**

Independent Study

### **Catalog Description**

Designed to allow the student to explore and/or master advanced or specialized topics in Health Policy under the guidance of faculty with relevant expertise. May be repeated. [1-4]



**HPOL8995 - Independent Study - Proposal Writing**  
**Title**

Independent Study - Proposal Writing

**Catalog Description**

This course is intended to provide students with the skills necessary to prepare a grant proposal related to their Ph.D. dissertation project. This course will be an independent study with required readings and milestones to ensure adequate feedback and progression throughout the semester. [3]

**HPOL8999 - Non-Candidate Research**  
**Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

**HPOL9999 - PhD Dissertation Research**  
**Title**

PhD Dissertation Research

**Catalog Description**

Ph.D. candidate dissertation research.

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## Hearing & Speech Sciences

**HRSP8000 - Introduction to Doctoral Studies and Research**  
**Title**

Introduction to Doctoral Studies and Research

**Catalog Description**

This course covers professional issues and interdisciplinary research in communicative disorders and related fields, use of common research tools and methods, human and animal research issues, philosophy of science, and provides opportunities to learn key disciplinary skills needed for career success.FALL. [0-3] Duff.

**HRSP8001 - Language and Memory**  
**Title**

Language and Memory

**Catalog Description**

This course focuses on the relationship between language and memory, two quintessential human abilities. Taking a multiple memory systems perspective, we will discuss theoretical accounts and empirical data on the interaction of language and memory in language acquisition, language use and processing in healthy and disordered populations (e.g., specific language impairment, Alzheimer's disease and other dementias, aphasia, healthy aging) and the implications for rehabilitation of disorders of language and memory. SPRING., [3] Duff.

### **HRSP8327 - Hearing Loss and Speech Understanding**

#### **Title**

Hearing Loss and Speech Understanding

#### **Catalog Description**

This seminar course will use student-led journal discussions and a group research project to examine various factors that contribute to the speech understanding difficulties of persons with hearing loss (with a focus on older adults with hearing loss). The contribution of individual factors, such as variations in degree of hearing loss (audibility), suprathreshold processing abilities (e.g., frequency and temporal resolution), and cognitive abilities will be discussed. In addition, the impact of environmental factors, such as the level and type of background noise, reverberation, and talker characteristics, on unaided and aided speech understanding will be discussed. Finally, students will complete a group research project using ANSI S3.5 Methods for Calculation of the Speech Intelligibility Index to explore the impact of some of these factors on speech understanding. prerequisites - undergraduate degree in Hearing and Speech Sciences or permission of the instructor. Offered Spring semester, biennially (even numbered years). [3]

### **HRSP8341 - Seminar: Research In Audiology**

#### **Title**

Seminar: Research In Audiology

#### **Catalog Description**

An advanced study of research for the second-year doctoral student. Directed individual research culminating in oral presentation and a manuscript. Prerequisite: consent of instructor. [2-2] (Offered on demand)

### **HRSP8342 - Seminar In The Neurobiology Of Hearing And Multisensory Processes**

#### **Title**

Seminar In The Neurobiology Of Hearing And Multisensory Processes

#### **Catalog Description**

(Also listed as Neuroscience 8342) Study at the doctoral level of the neural processes underlying auditory and multisensory perception. The course will focus on critical readings of recently published findings that emphasize the connection between plasticity, neural systems, and behavior. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING. [Variable credit: 1-2] Polley, Wallace.

### **HRSP8344 - Grant Writing in Communication Sciences and Disorders**

#### **Title**

Grant Writing in Communication Sciences and Disorders

#### **Catalog Description**

A discussion of the grant writing and grant review processes in communication disorders. Emphasis is on fellowship (F31 and F32) proposals, with additional information on K series training and R series research grants to the National Institutes of Health with a focus on the National Institute on Deafness and Other Communication Disorders. Content includes writing research and training plans and on how proposal is peer reviewed. Spring. [2-3] Duff

### **HRSP8351 - Special Problems In Speech Pathology**

#### **Title**

Special Problems In Speech Pathology

#### **Catalog Description**

Areas and problems not included in other courses in speech pathology, chosen to fit the students' interests and the needs of their programs. May be repeated to a total of 12 hours. FALL, SPRING, SUMMER. [Variable credit: 1-6]

### **HRSP8352 - Special Problems In Audiology**

#### **Title**

Special Problems In Audiology

#### **Catalog Description**

Areas and problems not included in other courses in audiology, chosen to fit the students' interests and the needs of their programs. May be repeated to a total of 12 hours. FALL, SPRING, SUMMER. [Variable credit: 1-4]

### **HRSP8366 - Practical Electrophysiology**

#### **Title**

Practical Electrophysiology

#### **Catalog Description**

This course will provide a hands-on introduction to human electrophysiology research methods. The theoretical and practical issues related to experimental design, data acquisition, and analytic procedures will be discussed. Students will collect sample EEG/ERP data. Summer of odd numbered years. Instructor: Key. [3]

### **HRSP8371 - Research Design And Statistical Analysis**

#### **Title**

Research Design And Statistical Analysis

#### **Catalog Description**

Covers topics in research design and statistics for students preparing for research careers in hearing science, speech science, and communication disorders. Reviews mathematical bases for probability theory and statistical inference. Covers fundamental parametric and nonparametric statistical tests, with extensive discussion of research design in the context of analysis of variance. Presents statistical properties of psychophysical methods and signal detection theory. FALL, SPRING. [3-3] Woynaroski (Also listed as AUD 5371)

### **HRSP8372 - Research Design And Statistical Analysis**

#### **Title**

Research Design And Statistical Analysis

#### **Catalog Description**

Covers topics in research design and statistics for students preparing for research careers in hearing science, speech science, and communication disorders. Reviews mathematical bases for probability theory and statistical inference. Covers fundamental parametric and nonparametric statistical tests, with extensive discussion of research design in the context of analysis of variance. Presents statistical properties of psychophysical methods and signal detection theory. FALL, SPRING. [3-3] Woynaroski.

### **HRSP8373 - Signals And Systems For Hearing And Speech Sciences**

#### **Title**

Signals And Systems For Hearing And Speech Sciences

#### **Catalog Description**

A hands-on course that covers theory and applications for the communication sciences. The course covers (i) time- and frequency-domain representation of analog signals, and Fourier transforms; (ii) filters, and the effects of analog signals that pass through filters; (iii) impulse responses, system characterization, and the basics of systems identification; and (iv) an introduction to digital signals and systems, with an eye on filter design. The course will assume some familiarity with Matlab, including FOR loops. Requirement: Basic knowledge of Matlab (online Matlab course, or Matlab MOOC); permission of advisor for Ph.D. students and permission of instructor for AuD and SLP students. [3] Ramachandran

**HRSP8376 - Language Research Methods****Title**

Language Research Methods

**Catalog Description**

This doctoral-level seminar provides an in-depth analysis of research methods to study language development in children of all ages. Methods used within various fields (e.g. linguistics, communication sciences and disorders, developmental psychology) are reviewed. Critical analysis of research articles with typical and atypical language learners. Spring of even-numbered years. [3] Schuele/Camarata.

**HRSP8379 - Cognitive Neuroscience of Language****Title**

Cognitive Neuroscience of Language

**Catalog Description**

The neural and cognitive underpinnings of language are examined from the perspective of cognitive neuroscience, integrating findings from experimental methods including functional neuroimaging, lesion symptom mapping, direct and transcranial cortical stimulation, and electrocorticography. This course is geared toward graduate students in Hearing and Speech Sciences, Psychology, Neuroscience, and related fields. FALL. [3] Wilson.

**HRSP8380 - Advanced Seminar In Speech Language Pathology****Title**

Advanced Seminar In Speech Language Pathology

**Catalog Description**

A doctoral-level course focusing on special topics of interest to faculty and students and based on recent research developments in speech pathology. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING, SUMMER. [3]

**HRSP8381 - Advanced Seminar In Language****Title**

Advanced Seminar In Language

**Catalog Description**

A doctoral-level course focusing on special topics of interest to faculty and students and based on recent research developments in language. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING, SUMMER. [3]

**HRSP8382 - Seminar: Research In Audiology****Title**

Seminar: Research In Audiology

**Catalog Description**

An advanced study of research for the second-year doctoral student. Directed individual research culminating in oral presentation and a manuscript. Prerequisite: consent of instructor. [2-2] (Offered on demand)

### **HRSP8383 - Seminar in Auditory and Vestibular Neuroscience**

#### **Title**

Seminar in Auditory and Vestibular Neuroscience

#### **Catalog Description**

This is a full semester course that combines a small amount of didactic teaching with seminar style discussions to introduce students to the neuroscience of the auditory and vestibular systems. For each topic discussed in the course (see below for possible list of topics), the short didactic component introduces/refamiliarizes the students with the basic knowledge requisite for that particular topic; the seminar component following the didactic material involves a presentation of both classic papers as well as recent papers that represent the state of art in the field. The seminar component will train students to critically read primary literature, to present scientific information in clear and concise fashion, and provide a theoretical foundation for understanding sensory function and dysfunction, and the neuroscience of possible therapeutic interventions. The group discussion will also explore the impact of the findings in the papers on various aspects of the field. Specific topics will be based on student interest, and may include: auditory and vestibular sensory encoding o stimuli, synaptic specializations, peripheral and central mechanisms of dysfunction, auditory processing disorders, hair cell regeneration, and therapeutics for auditory and vestibular disorders. NOTE: Open to all graduate students. Permission of instructor required for registration, in addition to approval of academic advisor or completion of introductory neuroscience course. [3]

### **HRSP8384 - Advanced Seminar In Audiology**

#### **Title**

Advanced Seminar In Audiology

#### **Catalog Description**

A doctoral-level course focusing on special topics of interest to faculty and students based on recent research developments in audiology. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING, SUMMER. [3] Staff.

### **HRSP8388 - Independent Study and Readings In Speech Pathology**

#### **Title**

Independent Study and Readings In Speech Pathology

#### **Catalog Description**

FALL, SPRING, SUMMER. [1-3]

### **HRSP8389 - Ind Study and Readings in Aud**

#### **Title**

Ind Study and Readings in Aud

#### **Catalog Description**

FALL, SPRING, SUMMER. [1-3]

### **HRSP8995 - Research Colloquium**

#### **Title**

Research Colloquium

#### **Catalog Description**

The Hearing and Speech Sciences Research Colloquium provides a weekly forum for research presentations by faculty and students of the Department, and by invited guest speakers. The Colloquium is attended by all students in the Program, by Program faculty, and by faculty and guests from other departments and programs on campus. [0-1]

**HRSP8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

**HRSP9995 - Half-Time Ph****Title**

Half-Time Ph

**Catalog Description**

D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

**HRSP9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Hebrew

**HEBR5101 - Elementary Hebrew****Title**

Elementary Hebrew

**Catalog Description**

Introduction to alphabet, the basics of grammar, and elementary conversation. Classes meet three times per week with an additional two hours a week required in the language laboratory. No credit for students who have earned credit for a more advanced Hebrew language course. [4]

**HEBR5102 - Elementary Hebrew II****Title**

Elementary Hebrew II

**Catalog Description**

Continuation of 5101. Greater stress upon conversation and grammar. Classes meet three times a week with an additional two hours a week required in the language laboratory. No credit for students who have earned credit for a more advanced Hebrew language course. Prerequisite: 5101. [4]

**HEBR5111 - Hebrew for Graduate Reading****Title**

Hebrew for Graduate Reading

**Catalog Description**

Survey of grammar and vocabulary, with extensive reading. Available only to graduate students for "No Credit". [0]

**HEBR5201 - Intermediate Hebrew I****Title**

Intermediate Hebrew I

**Catalog Description**

Introduction to modern Hebrew reading, conversation, advanced grammar, and conversation. Classes meet three times a week with an additional three hours a week spent in independent work in the language laboratory. No credit for students who have earned credit for a more advanced Hebrew language course. Prerequisite: 5102. [3]

**HEBR5202 - Intermediate Hebrew II****Title**

Intermediate Hebrew II

**Catalog Description**

Continuation of 5201. Greater emphasis on reading and writing. Classes meet three times a week with an additional three hours a week spent in independent work in the language laboratory. No credit for students who have earned credit for a more advanced Hebrew language course. Prerequisite: 5201. [3]

**HEBR5301 - Advanced Hebrew Grammar****Title**

Advanced Hebrew Grammar

**Catalog Description**

(Also listed as HEBR 2301) Emphasis on syntax and grammar supplemented by listening, speaking, and reading. No credit for students who have earned credit for a more advanced Hebrew language course. No credit for students who have earned credit for 2301. [3]

**HEBR5302 - Advanced Hebrew Composition****Title**

Advanced Hebrew Composition

**Catalog Description**

(Also listed as HEBR 2302W) Development of writing skills through the study of short stories, poems, articles, television, and web materials. No credit for students who have earned credit for 2302W. [3]

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## History

## **HIST5101 - Chinese Empire from the Margins**

### **Title**

Chinese Empire from the Margins

### **Catalog Description**

(Also listed as HIST 2101) Qing dynasty 1644 to 1912. Contemporary China's territorial, ethnic, and environmental issues in the historical context of the Qing imperial expansion and frontier management. Demographic composition of China's 56 officially-recognized ethnic groups. Territorial reach from the Gobi deserts in the northwest to subtropical forests in the south. Minority ruling group the Manchus over the Han majority and other culturally distinct groups. No credit for students who have earned credit for 2101. [3]

## **HIST5107 - Chinese Economic History**

### **Title**

Chinese Economic History

### **Catalog Description**

China's economic history from the Bronze Age to the present. Creation and development of markets. Links among political power, transportation, trade, and money. 12th century proto-Industrial Revolution, early modernization, Communism, and hybrid free market under socialism. Not open to students who have completed HIST 2107. [3]

## **HIST5108 - Environment and Economy in China since 1700**

### **Title**

Environment and Economy in China since 1700

### **Catalog Description**

Economic activities and their interactions with the environment. Long-term patterns in imperial China and the modern period. Water control and the Chinese state. Property rights and resource management. Demography and food security. Waste and recycling. Development, revolution, and nature. Global China and ecological civilization. [3]

## **HIST5111 - Debates in Chinese History**

### **Title**

Debates in Chinese History

### **Catalog Description**

Contentious topics in historical scholarship on Qing and twentieth-century China. Borderland studies, the New Qing History, and China-Europe Great Divergence. The tribute system, models of international order, colonialism and law, and the Communist Revolution. Definitions of "China." [3]

## **HIST5115 - Play and Pleasure in Early Modern Japan**

### **Title**

Play and Pleasure in Early Modern Japan

### **Catalog Description**

(Also listed as HIST 2115) Cultural history of Tokugawa Japan (1603-1868), with emphasis on daily life and popular entertainment in the capital of the warrior government, Edo (present-day Tokyo). Woodblock prints, pleasure quarters, kabuki theatre, commoner carnivals, and popular literature. No credit for students who have earned credit for 2115. [3]



## **HIST5120 - Japan's War and Postwar, 1931-1989**

### **Title**

Japan's War and Postwar, 1931-1989

### **Catalog Description**

(Also listed as HIST 2120) Japan's war in Asia and the Pacific in the mid-twentieth century and its legacies. The effect of defeat on the nation; reconstruction efforts and economic success. Hirohito's death. [3]

## **HIST5130 - Russia: Old Regime to Revolution**

### **Title**

Russia: Old Regime to Revolution

### **Catalog Description**

(Also listed as HIST 2130) Russian history from the early nineteenth-century old regime through the Russian Revolution of 1917. Culture, society, and serfdom; the Great Reforms, ideology, and radicalism; industrialization; modernity in an agrarian society; twentieth-century revolutions. No credit for students who have earned credit for 2130. [3]

## **HIST5135 - Russia: The U.S.S.R. and Afterward**

### **Title**

Russia: The U.S.S.R. and Afterward

### **Catalog Description**

(Also listed as HIST 2135) Russian history since the 1917 Revolution. Overview of the old regime; revolution and civil war; the Soviet "Roaring '20s"; Stalinism and the totalitarianized society; World War II. Postwar Soviet society and culture; de-Stalinization and the sixties generation; Gorbachev, perestroika, and disintegration; contemporary history. No credit for students who have earned credit for 2135. [3]

## **HIST5138 - Blood Diamonds, Blood Oil, Commodities, and Conflicts in Africa**

### **Title**

Blood Diamonds, Blood Oil, Commodities, and Conflicts in Africa

### **Catalog Description**

(Also listed as HIST 2138) 1870s to the present. Role of diamonds, gold, rubber, and oil in the resulting conflicts in modern Africa. Multinationals, mineral extraction, and politics. Poverty, war, child labor, and corruption. Local and international mining and mineral syndicates. Implications for Africans and their livelihoods. [3]

## **HIST5140 - The Mughal World**

### **Title**

The Mughal World

### **Catalog Description**

(Also listed as HIST 2140) Mughal history from 1500-1750. The early modern world and Islamic empires. Akbar and Hindu-Muslim interactions in South Asia. Oriental despotism and the idea of the monarch. Gender and authority. English, Dutch, and Portuguese views. Trade and the decline of Mughal authority. Globalization, the rise of Indian entrepreneurs, and the East India company. No credit for students who have earned credit for 2140. [3]

### **HIST5150 - India and the Indian Ocean**

#### **Title**

India and the Indian Ocean

#### **Catalog Description**

(Also listed as HIST 2150) Cultures along the Indian Ocean coastline from Roman times to 1800, especially South Asia. Coastal societies and politics, Islam, pilgrimage and trade, economic zones, and cultural ties. Pirates, seafarers and merchants; diasporas and genealogies. The entry of European trading companies and debates on trade and empire. No credit for students who have earned credit for 2150. [3]

### **HIST5155 - Muhammad and Early Islam**

#### **Title**

Muhammad and Early Islam

#### **Catalog Description**

(Also listed as HIST 2155) Early Arabian society, Judaism and Christianity in Arabia; Muhammad and the birth of Islam, the conquests, Islamization, Arabization; Jewish influences in early Islam, the medieval Islamic world. No credit for students who have earned credit for 2155. [3]

### **HIST5160 - Medicine in Islam**

#### **Title**

Medicine in Islam

#### **Catalog Description**

(Also listed as HIST 2160) Emergence of medicine in the Islamic world. Links with other traditions. Doctors and society; conventional medical practice in hospitals; prophetic medicine; Jewish and Christian doctors in Islam; pharmacology; developments in the nineteenth-century. No credit for students who have earned credit for 1111 section 21. No credit for students who have earned credit for 2160. [3]

### **HIST5170 - Islam and the Crusades**

#### **Title**

Islam and the Crusades

#### **Catalog Description**

(Also listed as HIST 2170) Ideology; successes and failures; history and character of Crusader enterprises in the Holy Land and elsewhere. Muslim religious, political, ideological, and social reactions. Islamic culture and the West; relations among Crusaders, Muslims, and Jews. No credit for students who have earned credit for 2170. [3]

### **HIST5190 - Last Empire of Islam**

#### **Title**

Last Empire of Islam

#### **Catalog Description**

(Also listed as HIST 2190) The Ottoman "long nineteenth century," 1789 to 1923. The Reforms (Tanzimat), state patriotism, intercommunal relations, national "awakenings," and the emergence of a public sphere. Historiographical issues, such as perceptions of the empire as the "Sick Man of Europe" and debates over its decline. No credit for students who have earned credit for 2190. [3]

## **HIST5215 - The Other 1492: Muslims and Jews in Iberia and Beyond**

### **Title**

The Other 1492: Muslims and Jews in Iberia and Beyond

### **Catalog Description**

History of Muslims and Jews in Iberia and diaspora from the Medieval through modern eras. Muslim Spain (Al-Andalus) and Christian Spain; forced conversions, the Inquisition, expulsion, resettlement, and real and imagined return. [3]

## **HIST5220 - Medieval and Renaissance Italy, 1000-1700**

### **Title**

Medieval and Renaissance Italy, 1000-1700

### **Catalog Description**

(Also listed as HIST 2220) Transformation of Italy from "medieval" society to the "Renaissance." Cultural, economic, and social developments, especially connections among wealth, status, and patronage. Meaning and applicability of the term "Renaissance." No credit for students who have earned credit for 2220. [3]

## **HIST5230 - Medieval Europe, 1000-1350**

### **Title**

Medieval Europe, 1000-1350

### **Catalog Description**

(Also listed as HIST 2230) Economic expansion and the formation of national states; the medieval Church and the revival of learning in the twelfth and thirteenth centuries. No credit for students who have earned credit for 2230. [3]

## **HIST5238 - Crime and Criminal Law in Western Antiquity**

### **Title**

Crime and Criminal Law in Western Antiquity

### **Catalog Description**

Ancient Athens and Rome. Social values and the quest for justice through the legal system. Definition of offenses, procedures, and penalties. Impact of social, economic, and legal status as well as gender. No credit for students who have earned credit for CLAS 5160. [3]

## **HIST5250 - Reformation Europe**

### **Title**

Reformation Europe

### **Catalog Description**

(Also listed as HIST 2250) The political, intellectual, and social conditions underlying the Protestant revolt. The Reformation of Luther, Calvin, Zwingli, Loyola, and other religious reformers considered within the context of the general developments of sixteenth-century history. No credit for students who have earned credit for 2250. [3]

### **HIST5260 - Revolutionary Europe, 1789-1815**

#### **Title**

Revolutionary Europe, 1789-1815

#### **Catalog Description**

(Also listed as HIST 2260) Political, cultural, and economic upheavals in the late eighteenth and early nineteenth centuries; the French Revolution and Napoleon, romanticism, and early industrialization. Emphasis on Britain, France, and Germany. No credit for students who have earned credit for 2260. [3]

### **HIST5270 - Nineteenth-Century Europe**

#### **Title**

Nineteenth-Century Europe

#### **Catalog Description**

(Also listed as HIST 2270) Major political, social, economic, and cultural developments from 1815 to 1914. No credit for students who have earned credit for 2270. [3]

### **HIST5280 - Europe, 1900-1945**

#### **Title**

Europe, 1900-1945

#### **Catalog Description**

(Also listed as HIST 2280) Political, socioeconomic, cultural, and colonial history of Europe from 1914 to the fall of Hitler. No credit for students who have earned credit for 2280. [3]

### **HIST5290 - Europe since 1945**

#### **Title**

Europe since 1945

#### **Catalog Description**

(Also listed as HIST 2290) Origins of the Cold War; political and social transformations, East and West; the breakup of colonial empires; ideological and military tensions; intellectual and cultural trends. No credit for students who have earned credit for 2290. [3]

### **HIST5291 - Nazism, Genocide, and the Law**

#### **Title**

Nazism, Genocide, and the Law

#### **Catalog Description**

Legal responses to genocide in the aftermath of Nazism. Prosecution of Holocaust perpetrators and war criminals from Nuremberg Trials to today. Restitution and compensation. Later prosecution for crimes against humanity and its relation to post-WWII precedents. Transitional justice and witnessing. [3]

### **HIST5293 - Muslims in Modern Europe**

#### **Title**

Muslims in Modern Europe

#### **Catalog Description**

Eighteenth century to the present. Eastern and Western Europe. Legal, political, and cultural integration and discrimination; questions of secularism and religious freedom; and gender, family law, and democracy. Muslim responses to modernity and formation of global Islamic movements. [3]

### **HIST5294 - Eastern Europe: Critical Encounters**

#### **Title**

Eastern Europe: Critical Encounters

#### **Catalog Description**

Eastern Europe from Enlightenment to 1989. Nineteenth century imperial competition, birth of nation-states. Minority rights, World War II and the Holocaust, socialist experimentation, police state, and dissent. Revolutions of 1989. [3]

### **HIST5300 - Twentieth-Century Germany**

#### **Title**

Twentieth-Century Germany

#### **Catalog Description**

(Also listed as HIST 2300) The turbulent history of Germany, as it went from authoritarian state to volatile democracy, to National Socialist dictatorship, to divided country, and to reunification. Special emphasis placed on the Nazi dictatorship, its origins and legacy. No credit for students who have earned credit for 2300. [3]

### **HIST5310 - France: Renaissance to Revolution**

#### **Title**

France: Renaissance to Revolution

#### **Catalog Description**

(Also listed as HIST 2310) Social and cultural history from 1515 to 1815. Conditions of life, ambitions, ideas, and tastes of the various social groups. Development of arts, music, and literature in a sociopolitical context. Causes and consequences of the French Revolution of 1789. No credit for students who have earned credit for 2310. [3]

### **HIST5340 - Modern France**

#### **Title**

Modern France

#### **Catalog Description**

(Also listed as HIST 2340) The fall of Napoleon in 1815 to the present. Emphasis on politics. Major economic, social, cultural, and intellectual developments. No credit for students who have earned credit for 2340. [3]

### **HIST5380 - Shakespeare's Histories and History**

#### **Title**

Shakespeare's Histories and History

#### **Catalog Description**

(Also listed as HIST 2380) Readings from a variety of plays by Shakespeare and his contemporaries. Significant political and cultural issues from the 1590s in early English history. [3]

### **HIST5385 - The Real Tudors**

#### **Title**

The Real Tudors

#### **Catalog Description**

(Also listed as HIST 2385) Marital, dynastic history of the Tudors in relation to religious and political change through and after the English Reformation. Court politics, ideological conflict, and the rise of an increasingly confessionalized international politics. Offered on a graded basis only. No credit for students who have earned credit for 2385. [3]

### **HIST5410 - Victorian England**

#### **Title**

Victorian England

#### **Catalog Description**

(Also listed as HIST 2410) Cultural values, liberal reform; urbanization; women and gender; imperialism. No credit for students who have earned credit for 2410. [3]

### **HIST5450 - Reform, Crisis, and Independence in Latin America, 1700-1820**

#### **Title**

Reform, Crisis, and Independence in Latin America, 1700-1820

#### **Catalog Description**

(Also listed as HIST 2450) Reorganization of the Spanish and Portuguese empires; maturation of transatlantic societies; and revolutions for independence. No credit for students who have earned credit for 2450. [3]

### **HIST5470 - Revolutionary Mexico**

#### **Title**

Revolutionary Mexico

#### **Catalog Description**

(Also listed as HIST 2470) Revolutionary politics and radical expression in 20th century Mexico. Causes of popular unrest; violent political change; post-conflict state-building; government attempts to alter popular culture; radical muralism and graphic art; revolutionary expression and gender; literature and disenchantment. [3]

### **HIST5480 - Central America**

#### **Title**

Central America

#### **Catalog Description**

(Also listed as HIST 2480) Iberian and Amerindian background, colonial society; independence; growth of the plantation economy; the U.S. presence; political and social revolutions in the twentieth century. No credit for students who have earned credit for 2480. [3]

### **HIST5490 - Brazilian Civilization**

#### **Title**

Brazilian Civilization

#### **Catalog Description**

(Also listed as HIST 2490) From pre-Columbian times to the present. Clash and fusion of Portuguese, Amerindian, and African cultures; sugar and slavery; coffee and industrialization; race relations; dictatorship and democracy in the twentieth century. No credit for students who have earned credit for 2490. [3]

### **HIST5510 - Reform and Revolution in Latin America**

#### **Title**

Reform and Revolution in Latin America

#### **Catalog Description**

(Also listed as HIST 2510) Comparative analysis of revolutions and reform movements in twentieth-century Latin America focusing on land tenure, social classes, political culture, economic structures, and foreign influences. No credit for students who have earned credit for 2510. [3]

### **HIST5530 - African Religions in the Americas**

#### **Title**

African Religions in the Americas

#### **Catalog Description**

(Also listed as HIST 2530) An interdisciplinary study of Islam, Christianity, and Animist religions in pre-colonial Africa; their transformation and practice in the Americas. Case studies of Brazil, Cuba, and the American South. Material culture studies and visits to local museum exhibits. No credit for students who have earned credit for 2530. [3]

### **HIST5535 - Latin America and the United States**

#### **Title**

Latin America and the United States

#### **Catalog Description**

(Also listed as HIST 2535) The complicated relationship between Latin America and the United States from the early nineteenth century to the present. Role of ideology, national security, economic interests, and cultural factors in shaping inter-American affairs. No credit for students who have earned credit for 2535. [3]

## **HIST5540 - Race and Nation in Latin America**

### **Title**

Race and Nation in Latin America

### **Catalog Description**

(Also listed as HIST 2540) Late nineteenth century to the present. Social, political, and cultural constructions of belonging. Citizenship and state building. Immigration, education, urbanization, civil and international wars, and gender and sexuality. Case studies draw from the Andes, Spanish Caribbean, Southern cone, and Brazil. No credit for students who have earned credit for 2540. [3]

## **HIST5542 - Cuba and the United States**

### **Title**

Cuba and the United States

### **Catalog Description**

History of Cuba. European conquest, the colonial period, independence, U.S. intervention, the Cuban Revolution, Cold War to present. Special consideration given to the global impact of the Cuban Revolution. [3]

## **HIST5570 - Caribbean History, 1492-1983**

### **Title**

Caribbean History, 1492-1983

### **Catalog Description**

(Also listed as HIST 2570) Amerindian society; age of encounter; imperial contest; slavery and abolition. U.S. influence; independence movements; cultural movements; invasion of Grenada. No credit for students who have earned credit for 2570. [3]

## **HIST5580 - American Indian History before 1850**

### **Title**

American Indian History before 1850

### **Catalog Description**

(Also listed as HIST 2580) Indian nations' interaction with each other and with European colonies. Resistance and adaptation to colonialism. Early development of United States Indian policy. No credit for students who have earned credit for 2580. [3]

## **HIST5590 - American Indian History since 1850**

### **Title**

American Indian History since 1850

### **Catalog Description**

(Also listed as HIST 2590) American Indians in the United States and Canada. Their responses to government policies and other forces. Cultural, socioeconomic, and political change among Indian communities. No credit for students who have earned credit for 2590. [3]



## **HIST5595 - The English Atlantic World, 1500-1688**

### **Title**

The English Atlantic World, 1500-1688

### **Catalog Description**

(also listed as HIST 2595W) English overseas expansion, including conquest of Ireland, exploration and conquest of the New World. Formation of imperial and American cultures and of racism, the slave trade, Indian relations, and migration from the British Isles. No credit for students who have earned credit for 2595W. [3]

## **HIST5610 - The Founding Generation**

### **Title**

The Founding Generation

### **Catalog Description**

(Also listed as HIST 2610) American history from the 1760s to the 1820s. The Revolutionary War, the Constitution, formation of national government. Political conflict, national culture, commerce, diplomacy, and race and gender in an age of revolution. No credit for students who have earned credit for 2610. [3]

## **HIST5620 - The Old South**

### **Title**

The Old South

### **Catalog Description**

(Also listed as HIST 2620) The South's origins in European expansion; the rise of the plantation economy and society, and its identification with slavery; the differing experiences of whites and blacks, planters and nonplanters; the relationship of the region to the larger United States; the Confederate attempt at independence and the collapse of the slave regime. No credit for students who have earned credit for 2620. [3]

## **HIST5630 - The New South**

### **Title**

The New South

### **Catalog Description**

(Also listed as HIST 2630) The aftermath of war and emancipation and the era of Reconstruction; social change and dislocation in the late nineteenth century; the Populist Revolt; the origins of segregation and one-party politics. Twentieth-century efforts to modernize the region; the economic, political, and Civil Rights revolutions of the mid-twentieth century; the South in modern American society and politics. No credit for students who have earned credit for 2630. [3]

## **HIST5640 - Appalachia**

### **Title**

Appalachia

### **Catalog Description**

(Also listed as HIST 2640) The region from first European intrusions to the present. Frontier-era white-indigenous contact, antebellum society and economy, relations with the slave South, the Civil War and postwar politics, increasing social strainings, industrialization and labor conflict, poverty and outmigration. Examination of mountain culture, tourism, and the construction of the "hillbilly" image. No credit for students who have earned credit for 2640. [3]

## **HIST5690 - The Civil Rights Movement**

### **Title**

The Civil Rights Movement

### **Catalog Description**

(Also listed as HIST 2690) Following two decades of progress from Brown v. Board of Education in 1954 toward racial justice and equality in the United States. Leaders, organizations, and milestones. No credit for students who have earned credit for 2690. [3]

## **HIST5692 - Biographies of Struggle**

### **Title**

Biographies of Struggle

### **Catalog Description**

Struggles for social justice. Identity, politics, and protest. Exploration of issues, traditions, and targets. Biography, personal testimonies, and oral life narratives of people engaged in efforts to challenge oppression. [3]

## **HIST5700 - The U.S. and the World**

### **Title**

The U.S. and the World

### **Catalog Description**

(Also listed as HIST 2700) From the winning of independence to the Great Depression. Relationships among foreign policy, ideology, domestic politics, and social and economic change. No credit for students who have earned credit for 2700. [3]

## **HIST5710 - The U.S. as a World Power**

### **Title**

The U.S. as a World Power

### **Catalog Description**

(Also listed as HIST 2710) From the origins of World War II, through the Cold War, to the present day. Relationships among foreign policy ideology, domestic politics, and social economic change. No credit for students who have earned credit for 2710. [3]

## **HIST5800 - Modern Medicine**

### **Title**

Modern Medicine

### **Catalog Description**

(Also listed as HIST 2800) Scientific, social, and cultural factors influencing the rise of modern medicine. Europe and the U.S., 1750 to the present. No credit for students who have earned credit for 2800. [3]

### **HIST5810 - Women, Health, and Sexuality**

#### **Title**

Women, Health, and Sexuality

#### **Catalog Description**

(Also listed as HIST 2810) Women as patients and healers in the U.S. from 1750 to the present. Topics include women's diseases and treatments; medical constructions of gender, sexuality; childbirth, birth control, abortion; midwives, nurses, and doctors. No credit for students who have earned credit for 2810. [3]

### **HIST5830 - Medicine, Culture, and the Body**

#### **Title**

Medicine, Culture, and the Body

#### **Catalog Description**

(Also listed as HIST 2830) Concepts of the human body from historical and cross-cultural perspectives. Exploration of experiences, representations, and medical theories of the body in birth, death, health, and illness in Western and non-Western societies. Comparison of methodologies of anthropology and history. No credit for students who have earned credit for 2830 or ANTH 3142 or 6142. [3]

### **HIST5880 - Weimar Germany: Modernism and Modernity, 1918-1933**

#### **Title**

Weimar Germany: Modernism and Modernity, 1918-1933

#### **Catalog Description**

(Also listed as HIST 3120) Culture and politics. Mass politics, mass media, economic crisis, and social tensions. Architecture, film, theater, painting, and philosophy. No credit for students who have earned credit for 3120. [3]

### **HIST5885 - Cities of Europe and the Middle East**

#### **Title**

Cities of Europe and the Middle East

#### **Catalog Description**

(Also listed as HIST 3150) Cities of "East" and "West" in the modern period; distinguishing characteristics and shared patterns of urban modernity across different geographies. Conceptions of the European, Middle Eastern, and Islamic metropolis. No credit for students who have earned credit for 3150. [3]

### **HIST5890 - Religion and the Occult in Early Modern Europe**

#### **Title**

Religion and the Occult in Early Modern Europe

#### **Catalog Description**

(Also listed as HIST 3270) Popular and learned ideas about religion and the supernatural within the context of the religious reforms of the sixteenth century. Alchemical and astrological practices to ghosts, werewolves, fairies, and other supernatural beings. The witch craze phenomenon of 1560-1650. Offered on a graded basis only. [3]

## **HIST6010 - Comparative History of Empires and Colonialisms**

### **Title**

Comparative History of Empires and Colonialisms

### **Catalog Description**

Imperial strategies from ancient to modern times. Colonialism and colonization; settler and non-settler colonialism; comparing empires and modes of imperial rule. Political, economic, and cultural dimensions: race, gender, violence, migration, mobility, and slavery. Land, labor, and colonialism; anti-colonial movements. [3]

## **HIST6100 - Introduction to Historical Methods and Research**

### **Title**

Introduction to Historical Methods and Research

### **Catalog Description**

[4]

## **HIST6110 - Introduction to Historical Methods and Research**

### **Title**

Introduction to Historical Methods and Research

### **Catalog Description**

[4]

## **HIST6299 - Teaching Workshop**

### **Title**

Teaching Workshop

### **Catalog Description**

Workshop for new teaching assistants in the Department of History. [0]

## **HIST6300 - The Art and Craft of Teaching History**

### **Title**

The Art and Craft of Teaching History

### **Catalog Description**

Readings on pedagogical theory and current research on college-level teaching and learning. Hands-on exercises in course design, preparing and grading tests and assignments, lecturing, leading discussion, cooperative and service learning, and use of technology to enhance teaching. Normally limited to graduate students in History. [4]

## **HIST6400 - Readings in American History**

### **Title**

Readings in American History

### **Catalog Description**

To the Civil War. [4]

**HIST6410 - Readings in American History**

**Title**

Readings in American History

**Catalog Description**

Civil War to the present. [4]

**HIST6500 - Readings in Colonial Latin American History**

**Title**

Readings in Colonial Latin American History

**Catalog Description**

[4]

**HIST6510 - Readings in Modern Latin American History**

**Title**

Readings in Modern Latin American History

**Catalog Description**

[4]

**HIST6600 - The Art of Public Scholarship**

**Title**

The Art of Public Scholarship

**Catalog Description**

Effective ways to communicate scholarly findings to a broad, general audience. Discussions of the role of scholarship in society, crafting vivid and accessible prose, and the practicalities of publishing, interviewing, and social media. [4]

**HIST7999 - Master's Thesis Research**

**Title**

Master's Thesis Research

**Catalog Description**

[0-12]

**HIST8000 - Independent Study**

**Title**

Independent Study

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3]

**HIST8001 - Black Worlds and World-Making****Title**

Black Worlds and World-Making

**Catalog Description**

Black people and the modern world. Historical and contemporary thought. Experiences of people who have claimed Blackness as a political, social, and cultural identity. Struggles for social and economic justice, practices of resistance, and freedom-making across Africa and its Diaspora. [3]

**HIST8010 - Independent Study****Title**

Independent Study

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3]

**HIST8050 - Studies in Comparative History****Title**

Studies in Comparative History

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8055 - Methods in Legal History****Title**

Methods in Legal History

**Catalog Description**

Theoretical, methodological, and analytical tools for studying law and society. Comparative, interdisciplinary overview of leading approaches to and themes in legal history. [4]

**HIST8060 - Visual Culture****Title**

Visual Culture

**Catalog Description**

Methods and interdisciplinary debates. Histories of traditional art objects. Aesthetics, built environments, iconoclasm, war, urbanism, consumerism, gender/sexual identities, race and ethnicity, cross-cultural exchange, and politics. [4]

**HIST8077 - Gender, Sex, and Society****Title**

Gender, Sex, and Society

**Catalog Description**

Historiography of gender and sexuality since the 1970s; reform movements; history of the body; urban geography; feminist and queer theory in historical practice. [4]

**HIST8090 - Between History and Anthropology: Theory, Method, Matter**

**Title**

Between History and Anthropology: Theory, Method, Matter

**Catalog Description**

Methods, theories, and analytical approaches from history and anthropology. Comparative, interdisciplinary overview of leading debates in anthrohistory. [4]

**HIST8100 - Studies in the History of Medicine, Science, and Technology (Formerly 347)**

**Title**

Studies in the History of Medicine, Science, and Technology (Formerly 347)

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8110 - Studies in the History of the Human Sciences (Formerly 350)**

**Title**

Studies in the History of the Human Sciences (Formerly 350)

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8150 - Studies in Environmental History**

**Title**

Studies in Environmental History

**Catalog Description**

Approaches to writing about human interactions with the natural world and the role of the environment in human history. Methods and preoccupations characteristic of work in environmental history. Comparisons to works in intellectual and cultural history, social history, history of science, and animal studies. [4]

**HIST8200 - Third-Year Seminar**

**Title**

Third-Year Seminar

**Catalog Description**

For third-year students preparing a dissertation prospectus and starting work on a dissertation. [4]

**HIST8220 - Topics in the History of Islam**

**Title**

Topics in the History of Islam

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8250 - Studies in Early Modern History****Title**

Studies in Early Modern History

**Catalog Description**

Interdisciplinary study of early modern societies, including, but not limited to, non-European contexts. Themes may include land and seaborne empires, political, diplomatic, social, and religious history, material culture, environmental history, and globalization. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8300 - Studies in Early Modern European History****Title**

Studies in Early Modern European History

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8310 - Studies in European History, 1815-1914****Title**

Studies in European History, 1815-1914

**Catalog Description**

May be repeated for credit once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8320 - Studies in European History****Title**

Studies in European History

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8330 - Studies in Recent European History****Title**

Studies in Recent European History

**Catalog Description**

May be repeated for credit once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8340 - Studies in German History****Title**

Studies in German History

**Catalog Description**

May be repeated for credit once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]



### **HIST8350 - Studies in Early Modern English History**

#### **Title**

Studies in Early Modern English History

#### **Catalog Description**

May be repeated for credit once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

### **HIST8400 - Studies in Modern England (Formerly 344a)**

#### **Title**

Studies in Modern England (Formerly 344a)

#### **Catalog Description**

May be repeated for credit once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

### **HIST8450 - Gender and Rights in the United States**

#### **Title**

Gender and Rights in the United States

#### **Catalog Description**

Women's struggle for rights and inclusion in early America and the United States. Law as a gendered system. Meanings of citizenship and belonging through the pursuit of economic, social, and political rights. Legal categories of gender and sexuality shaping household (including marriage, divorce, and custody), economy (including employment, property, and credit), and the political sphere (including voting, jury duty, and military service).

### **HIST8475 - United States in the World**

#### **Title**

United States in the World

#### **Catalog Description**

Recent trends in internationalizing the historiography of the modern United States, both to deepen the study of the past and to identify alternative, non-national frames of historical analysis. Immigration and nativism, transnational social movements, cultural borrowings, colonialism, war, missionary projects, and international dimensions of civil rights politics. [4]

### **HIST8500 - Studies in East Asian History**

#### **Title**

Studies in East Asian History

#### **Catalog Description**

[4]

### **HIST8600 - Comparative Slavery in the Colonial Americas**

#### **Title**

Comparative Slavery in the Colonial Americas

#### **Catalog Description**

Interdisciplinary and cross-cultural study of slavery and resistance in Spanish, British, French, Dutch, and Portuguese America. Does not cover antebellum slavery in the United States. [4]

### **HIST8610 - Atlantic World History, Fifteenth to the Nineteenth Century**

#### **Title**

Atlantic World History, Fifteenth to the Nineteenth Century

#### **Catalog Description**

Interdisciplinary readings examining disparate colonizations and the creation of an Atlantic world system. Major themes include the consequences of Atlantic expansion on indigenous societies, the African slave trade, and the rise of Atlantic economics, the circulation of peoples, ideas, and material culture throughout the Atlantic and how imperial competition, political ideologies, and subaltern resistance shaped the Atlantic revolutions. Optional instruction in early modern paleography. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

### **HIST8615 - Readings in African History**

#### **Title**

Readings in African History

#### **Catalog Description**

Themes, sources, debates, and methods in the historiography of pre-modern and modern Africa. [3]

### **HIST8620 - Studies in Latin American History**

#### **Title**

Studies in Latin American History

#### **Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

### **HIST8625 - Readings in African American History**

#### **Title**

Readings in African American History

#### **Catalog Description**

Chronological and thematic exploration of major themes, debates, and subjects of inquiry. Classic works; historiography; recent trends in the field. [4]

### **HIST8630 - Research Seminar in Latin American History**

#### **Title**

Research Seminar in Latin American History

#### **Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8640 - Readings in Global History****Title**

Readings in Global History

**Catalog Description**

Methods and critiques. Topics include long-distance trade, labor and migration, empires and states, human rights and citizenship, international law and politics, capitalism, cross-cultural exchange, environmental issues, and transnational movements. [4]

**HIST8700 - Studies in Early American History to 1783****Title**

Studies in Early American History to 1783

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8710 - Studies in the Middle Period of American History, 1783-1861****Title**

Studies in the Middle Period of American History, 1783-1861

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8720 - Studies in U.S. History, 1861-1900****Title**

Studies in U.S. History, 1861-1900

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8730 - Studies in Recent American History****Title**

Studies in Recent American History

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8732 - Religion & Civil Rights****Title**

Religion & Civil Rights

**Catalog Description**

Influence of religion in the shaping of the civil rights movement. Impact of Gandhi; white and black religious leaders; nonviolence. [4]

**HIST8733 - African American Methodism****Title**

African American Methodism

**Catalog Description**

African American Methodists' interpretation and implementation of Wesleyan theology. Blending of African American religious sensibilities with Methodism. [4]

**HIST8740 - Research Seminar in Recent American History****Title**

Research Seminar in Recent American History

**Catalog Description**

May be repeated for credit once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8750 - Studies in American History****Title**

Studies in American History

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8760 - Studies in U.S. International History (Formerly 380)****Title**

Studies in U.S. International History (Formerly 380)

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8770 - Research Seminar in U.S. International History****Title**

Research Seminar in U.S. International History

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [4]

**HIST8800 - Dissertation Seminar****Title**

Dissertation Seminar

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. Offered on a pass/fail basis only. [0-4]

### **HIST8999 - Non-candidate Research**

#### **Title**

Non-candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

### **HIST9995 - Half-time Ph.D. Dissertation Research**

#### **Title**

Half-time Ph.D. Dissertation Research

#### **Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

### **HIST9999 - Ph.D. Dissertation Research**

#### **Title**

Ph.D. Dissertation Research

#### **Catalog Description**

[0-12]

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## **History Of Art**

### **HART5100 - Architecture and the Mapping of Empire in Asia**

#### **Title**

Architecture and the Mapping of Empire in Asia

#### **Catalog Description**

Use of architecture to express and delimit empire in Asia from the 3rd century BCE through the 20th century CE. Cosmology in the construction of cities, temples, and tombs. Physical manifestations of divine kingship and royal divinities. Appropriation of ancient models to enhance legitimacy. Architecture as an expression of ethnic/state identities. [3]

### **HART5110 - Arts of China**

#### **Title**

Arts of China

#### **Catalog Description**

Artistic production from the Neolithic period through the Qing dynasty in relation to religious and cultural contexts. [3]

## **HART5112 - The Arts of China during the Liao-Song Period**

### **Title**

The Arts of China during the Liao-Song Period

### **Catalog Description**

(Also listed as HART 3112) Art and architecture of China during the Liao-Song period from C.E. 907 to C.E. 1279. Political, religious, and aesthetic contexts. Influence of coastal trade and pilgrimage in transformations of painting, sculpture, ceramics, and architecture. No credit for students who have earned credit for 3112. [3]

## **HART5120 - Arts of Korea**

### **Title**

Arts of Korea

### **Catalog Description**

History of Korean art and visual culture from ancient times to the present. Intersections of art, literature, religion, and politics, and cultural interactions with China and Japan. [3]

## **HART5130 - Arts of Japan**

### **Title**

Arts of Japan

### **Catalog Description**

Artistic production from the Neolithic through Meiji periods in relation to religious and cultural contexts. [3]

## **HART5134 - Art of the Samurai: Myth, Politics, and Visual Culture**

### **Title**

Art of the Samurai: Myth, Politics, and Visual Culture

### **Catalog Description**

(Also listed as HART 2134) From twelfth century to present. Dispelling myths through analysis of origins and history in premodern Japan. Autobiographical writings, art and architectural commissions, artistic depictions, exhibitions, and films of samurai. No credit for students who have earned credit for 2134. [3]

## **HART5140 - Healing and Art in East Asia**

### **Title**

Healing and Art in East Asia

### **Catalog Description**

Influence of early healing practices on the development of the arts of East Asia. Magical healing texts, talismans, and tattoos; diagramming the body and the landscape; and the art of the Buddha of Medicine. Gardens and growing transformative herbs. Tea as medicine and art. [3]

## **HART5150 - East Asian Architecture and Gardens**

### **Title**

East Asian Architecture and Gardens

### **Catalog Description**

East Asian religious, vernacular, and garden architecture from the second century CE to the present. Influence of Buddhism on East Asian architecture, fengshui and site selection, garden as religious landscape, Asia in modern architecture. [3]

**HART5151 - Architecture and Gardens in Imperial China****Title**

Architecture and Gardens in Imperial China

**Catalog Description**

Built environment of imperial China from the 2nd century BCE to the 19th century. City planning, palaces, temples, monasteries, gardens, and vernacular architecture; historical developments and regional variation. [3]

**HART5160 - Art and Architecture of Buddhist Asia****Title**

Art and Architecture of Buddhist Asia

**Catalog Description**

Appearance, creation, and function of Buddhist art works from South to East Asia. Iconographic and stylistic analysis of architecture, sculpture, painting, and other arts; relationship between ideology, text, and image; Buddhism and state formation. [3]

**HART5164 - Art of Buddhist Relic and Reliquary****Title**

Art of Buddhist Relic and Reliquary

**Catalog Description**

(Also listed as HART 3164W) From second century BCE to present. Relic veneration and construction of reliquaries from a visual perspective. Beautification, ritualization, use and abuse, and bodily issues spanning India, China, Korea, Japan, and Southeast Asia. No credit for students who have earned credit for 3164W. [3]

**HART5165 - Modern and Contemporary Asian Art****Title**

Modern and Contemporary Asian Art

**Catalog Description**

Arts of East, South, and Southeast Asia, 1800 to present, from the emergence of modernity to participation in the "global turn" in contemporary art. Painting, sculpture, architecture; new media including installation, performance, photography, film, and video. Social, political, and historical contexts. [3]

**HART5172 - Himalayan Art: Art of the Divine Abode****Title**

Himalayan Art: Art of the Divine Abode

**Catalog Description**

(Also listed as HART 3172) Art of Nepal and Tibet from its inception to the present. Religious and cultural contexts. Initial western responses; Hindu and Buddhist art and architecture in Nepal; Tibetan Buddhist Art; artistic productions in the Tibetan diaspora; and souvenir art in Nepal. No credit for students who have earned credit for 3172. [3]

### **HART5173 - Art and Empire in India**

#### **Title**

Art and Empire in India

#### **Catalog Description**

Art of India between the Mughal and British empires. Rise of colonialism and nationalism; cross-cultural encounters; and emergence of new institutions and technology. [3]

### **HART5174 - The South Asian Temple**

#### **Title**

The South Asian Temple

#### **Catalog Description**

(Also listed as HART 3174) From its inception to the present. Morphological and stylistic analysis. Anthropological and ethnographical approach to temples as living communal entities. No credit for students who have earned credit for 3174. [3]

### **HART5200 - Cities of the Ancient Mediterranean World: Architecture & Built Environments**

#### **Title**

Cities of the Ancient Mediterranean World: Architecture & Built Environments

#### **Catalog Description**

Comparative studies around the Mediterranean and adjacent regions, 4th millennium BCE to 4th century CE. Origins and evolution; environmental, social, and economic determinants of urban form; city planning and amenities; engineering and architecture. Formal, material, comparative, and theoretical approaches. [3]

### **HART5210 - Art and Architecture of Ancient Egypt**

#### **Title**

Art and Architecture of Ancient Egypt

#### **Catalog Description**

(Also listed as HART 2210) Art, architecture, and culture of Egypt from the fourth millennium through the Old, Middle, and New Kingdoms. Sculpture, wall painting, architecture, and material culture. No credit for students who have earned credit for 2210. [3]

### **HART5224 - Greek Sculpture**

#### **Title**

Greek Sculpture

#### **Catalog Description**

(Also listed as HART 3224) Style, materials, and techniques ca. 900-31 B.C. Sculptors' craft and their reasons for the creation of both free-standing and architectural sculpture. No credit for students who have earned credit for 3224. [3]



### **HART5226 - Greek Vases and Society**

#### **Title**

Greek Vases and Society

#### **Catalog Description**

(Also listed as HART 3226) Ancient Greek vases as social documents. Interdisciplinary approaches, including historiographic, stylistic, semiotic, contextual, and scientific. Production, trade, and the functions of vases in funerary and ritual contexts, particularly the symposium. The development of black- and red-figure vase painting and iconography. No credit for students who have earned credit for 3226. [3]

### **HART5228 - Gender and Sexuality in Greek Art**

#### **Title**

Gender and Sexuality in Greek Art

#### **Catalog Description**

(Also listed as HART 3228W) Iconography of vase-painting and sculpture, from the Archaic through the Hellenistic periods. Visual constructions of bodies, poses, gestures, and dress, reflecting cultural attitudes towards courtship, marriage, rape, prostitution, and homosexuality. Emphasis on methodological approaches and comparisons with modern societies. Offered on a graded basis only. No credit for students who have earned credit for 3228W. [3]

### **HART5233 - Climate and Society: Drowning Cities**

#### **Title**

Climate and Society: Drowning Cities

#### **Catalog Description**

Climate change, sea-level fluctuations, and floods from antiquity to the present. Science of climate, coasts, and rivers. Interdisciplinary analysis of urban form and history. Physical, social, technological, and aesthetic influences. Past, present, and future cities in Near East, Europe, Asia, and North America, including Nashville, New Orleans, and New York. Not open to students who completed 3333 or EES 3333 offered fall 2020. [3]

### **HART5240 - Ancient Landscapes**

#### **Title**

Ancient Landscapes

#### **Catalog Description**

(Also listed as HART 3240W) Greco-Roman attitudes toward nature. Exploitation and stewardship of resources. Country-house and garden design. Representations of mythological and sacred landscapes in painting and poetry. No credit for students who have earned credit for 3240W. [3]

### **HART5252 - Cities of the Roman East**

#### **Title**

Cities of the Roman East

#### **Catalog Description**

(Also listed as HART 3252) Provincial centers, sanctuaries, and monuments from Greece to Arabia. Major centers and case studies of public and private commissions. Architectural reflections of Romanization and resistance; local and imperial patronage; patrimony and memory; borderland architecture. No credit for students who have earned credit for 3252. [3]

**HART5256 - Roman Architecture and Power****Title**

Roman Architecture and Power

**Catalog Description**

Prestige building projects and architectural expressions of social, political, religious, and technological power in Rome and across its Empire. Public and private architecture; state institutions, infrastructure, and city dwellers; Romanization and resistance. Late antique transformations, modern legacies. [3]

**HART5260 - The Art of Pagans, Christians, and Jews****Title**

The Art of Pagans, Christians, and Jews

**Catalog Description**

(Also listed as HART 2260) Religious art of the Roman Empire in late antiquity. Visual art reflecting religious beliefs and practices. Greco-Roman cults, early Christianity, and Rabbinical Judaism. No credit for students who have earned credit for 2260. [3]

**HART5270 - Early Christian and Byzantine Art****Title**

Early Christian and Byzantine Art

**Catalog Description**

(Also listed as HART 2270) The development of architecture, sculpture, painting, and the minor arts from the third through eleventh centuries. [3]

**HART5274 - Art and Empire from Constantine to Justinian****Title**

Art and Empire from Constantine to Justinian

**Catalog Description**

(Also listed as HART 3274) An interdisciplinary study of Roman social, political, religious, and art historical developments in the fourth through sixth centuries CE. No credit for students who have earned credit for 3274. [3]

**HART5285 - Medieval Art****Title**

Medieval Art

**Catalog Description**

Development of architecture, sculpture, painting, and the minor arts in Europe from the eleventh through the fifteenth centuries. [3]

### **HART5288 - Art of the Book**

#### **Title**

Art of the Book

#### **Catalog Description**

Material and visual composition of medieval manuscripts; working with medieval and contemporary artists' books in Vanderbilt's Special Collections. Audience, changing popularity of texts and illustrations, and concerns of patrons and artists. Exemplary works include the Book of Kells, Luttrell Psalter, and Trivis Riches Heures. [3]

### **HART5290 - Gothic Paris**

#### **Title**

Gothic Paris

#### **Catalog Description**

From the twelfth to the fifteenth century. Architecture, sculpture, painting, and the luxury arts. No credit for students who have earned credit for 5285. [3]

### **HART5310 - Italian Art to 1500**

#### **Title**

Italian Art to 1500

#### **Catalog Description**

(Also listed as HART 2310) Early development of art and architecture primarily in central Italy from the late thirteenth through the fifteenth centuries. The works of Giotto, Duccio, Donatello, Masaccio, and Botticelli. The age of the Medici in Florence. No credit for students who have earned credit for 3320 or 3320W. No credit for students who have earned credit for 2310. [3]

### **HART5325 - Great Masters of the Italian Renaissance**

#### **Title**

Great Masters of the Italian Renaissance

#### **Catalog Description**

From the late Gothic to the High Renaissance. Landmarks in painting, sculpture, and architecture in central Italy. Trecento Siennese masters; Giotto, Donatello, Botticelli, and Leonardo in Florence; and Michelangelo and Raffaello in Rome. Tempera and fresco technique; civic, ecclesiastic, and domestic buildings; and stylistic progression. [3]

### **HART5334 - Michelangelo's Life and Works**

#### **Title**

Michelangelo's Life and Works

#### **Catalog Description**

(Also listed as HART 3334) Sculpture, painting, architecture, and graphic works. Poetry and letters. Cultural, historical, religious, and political climate of his day. Influence upon artists. Critical reception. No credit for students who have completed 3334 or 3334W. [3] (HCA)

### **HART5362 - Fifteenth-Century Northern European Art**

#### **Title**

Fifteenth-Century Northern European Art

#### **Catalog Description**

(Also listed as HART 2362) Painting, sculpture, prints, and court art in the Low Countries, France, and Germany. Historical, social, economic, religious, and technical analysis. Jan van Eyck, Rogier van der Weyden, and Hieronymus Bosch. No credit for students who have earned credit for 2360 or 2362. [3]

### **HART5364 - The Court of Burgundy**

#### **Title**

The Court of Burgundy

#### **Catalog Description**

The visual arts of the Dukes of Burgundy (1363-1477) in cultural context. Portraiture, chivalry, costume, storytelling, and ceremony. Artists include Claus Sluter, Jan van Eyck, and Rogier van der Weyden. [3]

### **HART5366 - Sixteenth-Century Northern European Art**

#### **Title**

Sixteenth-Century Northern European Art

#### **Catalog Description**

(Also listed as HART 3366) Painting, sculpture, prints, and court art in the Low Countries, France, England, and Germany. Historical, social, economic, religious, and technical analysis. Albrecht Dürer, Matthias Grünewald, Hans Holbein, and Peter Bruegel. No credit for students who have earned credit for 212 or 3366. [3] (HCA)

### **HART5390 - Seventeenth-Century Art**

#### **Title**

Seventeenth-Century Art

#### **Catalog Description**

European painting, sculpture, architecture, and graphic arts. Caravaggio, Bernini, Velazquez, Rubens, and Rembrandt. [3]

### **HART5610 - Art and Politics in Revolutionary and Napoleonic Europe, 1785-1830**

#### **Title**

Art and Politics in Revolutionary and Napoleonic Europe, 1785-1830

#### **Catalog Description**

Art patronage, politics, and propaganda of the ancien régime, French Revolution, reign of Napoleon Bonaparte, and Bourbon Restoration. French art policies on national patrimony, looting, and the confiscation of artworks; cultural centralization at the Musée du Louvre. Painting, sculpture, printmaking, and decorative arts. David, Ingres, Gérard, Canova, Géricault. Not open to students who have completed HART 4960-01 offered spring 2019. [3]

## **HART5650 - Nineteenth-Century Architecture: Theory and Practice**

### **Title**

Nineteenth-Century Architecture: Theory and Practice

### **Catalog Description**

(Also listed as HART 2650) European and North American architecture from the French Revolution to the First World War. The relationships among architecture and technology, political regimes, social formations, and conceptions of history. Neoclassicism, Gothic Revival, Second Empire, the Arts-and-Crafts Movement, and Commercial Architecture. No credit for students who have earned credit for 2650. [3]

## **HART5662 - Art and the Environment in the United States**

### **Title**

Art and the Environment in the United States

### **Catalog Description**

Environmental concerns as conveyed through the visual arts, 1800 to present. Nature and the formation of national identity and empire; landscape painting, materials and ecology; land art and environment as medium; photography and the visualization of disaster. [3]

## **HART5680 - British Art: Tudor to Victorian**

### **Title**

British Art: Tudor to Victorian

### **Catalog Description**

(Also listed as HART 2680) Art and visual culture in the British Isles from the reign of Henry VIII in the sixteenth century to Queen Victoria and the rise of the pre-Raphaelites in the nineteenth century. Portraiture and landscape painting, relationship between art and empire, rise of the Royal Academy, and patterns of patronage. Holbein, Hogarth, Gainsborough, Reynolds, Lawrence, and Turner. No credit for students who have earned credit for 2680. [3]

## **HART5737 - History of Performance Art**

### **Title**

History of Performance Art

### **Catalog Description**

History and theory of performance art in the twentieth century. Interdisciplinary approach covering dance, theater, film/video, and cabaret with focus on performance activities of artists trained in visual arts. Futurism, Dada, Ballet Russes, Bauhaus, Modern Dance, Drag, and Feminist Body Art. Serves as repeat credit for HART 2737. [3]

## **HART5740 - History of Sound Art**

### **Title**

History of Sound Art

### **Catalog Description**

(Also listed as HART 3740) From twentieth century to present. Use of sound as artistic medium. Experimental practices; the relationship of art and technology; sound art's position between music, performance and installation art. Cage, Cardiff, Paik, Rosenfeld, and Trimpin. No credit for students who have earned credit for 3740. [3]

**HART5750 - African American Art****Title**

African American Art

**Catalog Description**

(Also listed as HART 2750) Colonial Era to the present. Artwork and artists in their political, cultural, social, historical, and aesthetic contexts. Relationship between race and representation. No credit for students who have earned credit for 2750. [3]

**HART5753 - Imaging the "Other" in Art****Title**

Imaging the "Other" in Art

**Catalog Description**

Representations of racial difference in North America and Europe, 19th-21st centuries. Orientalism, colonialism, primitivism, anthropology, the use of racial and ethnic stereotypes, and the politics of display. [3]

**HART5755 - Women in Art since 1850****Title**

Women in Art since 1850

**Catalog Description**

Painting, sculpture, photography, and performance by European and American women artists. Intersections of gender, race, and sexuality in visual production. Feminist methods in art history. [3]

**HART5757 - Women in Architecture****Title**

Women in Architecture

**Catalog Description**

Women's contributions to the built environment as architects, patrons, critics, and social reformers, primarily in the 19th and 20th centuries. Perspectives of feminism, gender, race, and sexuality studies. Julia Morgan, Eileen Gray, Charlotte Perriand, Denise Scott Brown, and Zaha Hadid. [3]

**HART5760 - Early American Modernism, 1865-1945****Title**

Early American Modernism, 1865-1945

**Catalog Description**

(Also listed as HART 2760) Painting and sculpture of the United States between the Civil War and the Second World War with emphasis on iconography, social history, class, and gender. No credit for students who have earned credit for 2760. [3]

**HART5765 - Art since 1945****Title**

Art since 1945

**Catalog Description**

(Also listed as HART 2765) A survey of art produced in the United States and Europe since 1945 with an emphasis upon theory and the social and intellectual factors. No credit for students who have earned credit for 2765. [3]

**HART5766 - Post-1871 Berlin Monuments, Memorials, and City Planning****Title**

Post-1871 Berlin Monuments, Memorials, and City Planning

**Catalog Description**

Berlin's city planning; monuments and memorials from the beginning of the German Empire. Political, social, and cultural history, including World War II, the Holocaust, and the Cold War. Brandenburg Gate, Berlin Palace, Reichstag, Holocaust Memorial, Jewish Museum, and Berlin Wall. [3]

**HART5772 - Contemporary Art and Biennial Exhibitions****Title**

Contemporary Art and Biennial Exhibitions

**Catalog Description**

From 1850 to present. Origins of world fairs, the Crystal Palace, Venice Biennale, and modern exhibitions. Core themes: Globalization of art, decolonized thinking and art making, the relation between locality and globality, and the commercialization of contemporary art. Offered on a graded basis only. [3]

**HART5775 - History of Prints****Title**

History of Prints

**Catalog Description**

Woodcut, engraving, etching, and lithography from the fifteenth to the twentieth century. Scientific, devotional, ornamental, and documentary functions. Dürer, Piranesi, Hogarth, Daumier, and Kollwitz. Advances in technique and marketing, relationship to fine art, and place in popular culture. [3]

**HART5780 - Hist Western Urbanism****Title**

Hist Western Urbanism

**Catalog Description**

(Also listed as HART 2780) Urban form and planning from antiquity to the present. The integration of architecture and landscape. Diachronic surveys. Case studies, including Nashville. No credit for students who have earned credit for 2780. [3] (P)

## **HART5781 - Los Angeles Architecture and Urbanism**

### **Title**

Los Angeles Architecture and Urbanism

### **Catalog Description**

Urban planning, everyday people, and analysis of multicultural life of a contemporary city and its suburbs, 1920s to present. Popular culture, high technology, and histories of art, music, and architecture under late capitalism. Serves as repeat credit for HART 2781. [3]

## **HART5782 - Storied Places: History of Landscape Design**

### **Title**

Storied Places: History of Landscape Design

### **Catalog Description**

(Also listed as HART 2782) Landscape architecture as art form in Europe, Western Asia, and North America, from antiquity to the present. Stewardship and manipulation of land and water. Design of gardens and green spaces. Social and political meanings and messages. No credit for students who have earned credit for 2782. [3]

## **HART5805 - Introduction to Museum Studies**

### **Title**

Introduction to Museum Studies

### **Catalog Description**

Fundamentals of museum history; diversity, theory, current practices, and ethics related to collecting and collection management, interpretation, and display. Global perspective with emphasis on Euro-American museums. Museums of Art, Anthropology, History, and Science. Includes site visits to local museums. [3]

## **HART5808 - Contemporary Issues in Museums**

### **Title**

Contemporary Issues in Museums

### **Catalog Description**

Current practices and controversies. Museum ethics, collection care, finances, and administration. Historical and contemporary global events and case studies. Guest speakers and site visits to local museums. [3]

## **HART5810 - Exhibiting Historical Art**

### **Title**

Exhibiting Historical Art

### **Catalog Description**

(Also listed as HART 3810W) Research and exhibition of art in the permanent collection of the Vanderbilt University Fine Arts Gallery. Research methods and principles of object organization and display, illustrated via selected objects that vary annually. No credit for students who have earned credit for 3810W. May be repeated for credit once if there is no duplication in topic and not twice from the same instructor. Offered on a graded basis only. (Maximum of 6 credits total for all semesters of 5810). [3]



**HART5815 - Digital Heritage: Methods and Practice**  
**Title**

Digital Heritage: Methods and Practice

**Catalog Description**

Case-based introduction to digital applications in history of art and archaeology. Theory, research design, current methods of photogrammetry, 2D and 3D modeling, and immersive environments. Mapping and spatial analysis. Data management and digital publishing. May be repeated for credit with permission of the faculty. [3]

**HART5820 - Architectural Heritage: Research and Documentation**  
**Title**

Architectural Heritage: Research and Documentation

**Catalog Description**

Case-based. Immersive and collaborative analysis of buildings of architectural and historical importance. On-site survey, exploration, and archival investigation; consideration of design, function, renovation, and historic preservation. May be repeated for credit with no duplication in content. [3]

**HART5825 - Meaning and Form in Architecture**  
**Title**

Meaning and Form in Architecture

**Catalog Description**

Human-made environment in various cultural contexts; historical and theoretical perspectives. Diverse approaches and methodologies for addressing formalism in architecture and the visual arts. [3]

**HART6010 - The Methods of Art History**  
**Title**

The Methods of Art History

**Catalog Description**

Comparative analysis of art historical methods including social history, post-structuralism, feminism, gender studies, stylistic analysis, and iconography. Assessment of methods in action through critiques and exercised in independent application. [3]

**HART6285 - SEM: PROBS MEDIEVAL ARCH**  
**Title**

SEM: PROBS MEDIEVAL ARCH

**Catalog Description**

[3]

**HART6390 - Seminar: Problems in Baroque Art**  
**Title**

Seminar: Problems in Baroque Art

**Catalog Description**

[3]

**HART6600 - Seminar: Problems in Eighteenth Century Art  
Title**

Seminar: Problems in Eighteenth Century Art

**Catalog Description**

[3]

**HART6680 - Seminar in British Art and Culture  
Title**

Seminar in British Art and Culture

**Catalog Description**

[3]

**HART6700 - Seminar: Studies in Twentieth-Century Art  
Title**

Seminar: Studies in Twentieth-Century Art

**Catalog Description**

[3]

**HART6740 - Modern Design  
Title**

Modern Design

**Catalog Description**

From 1850 to present. How thinkers shaped practice. Relationships among modernity, modernism, and design. Historical debates over utopia, gender, social reform, inequality, and aura. Role in world's fairs, empire, fashion, international politics, domesticity. Close study of design exhibitions. [3]

**HART6760 - Seminar: Studies in American Art  
Title**

Seminar: Studies in American Art

**Catalog Description**

[3]

**HART6765 - Monuments and Memorials, 1900 to present  
Title**

Monuments and Memorials, 1900 to present

**Catalog Description**

Global memorialization practices in Europe, North America, and post-colonial settings. Memorials to Holocaust, civil rights movements, acts of terrorism. Monuments in and of multiple wars. Themes include counter-monuments, history and memory, and preservation. Offered on a graded basis only. [3]

**HART6840 - Directed Study****Title**

Directed Study

**Catalog Description**

May be repeated for credit, but students may earn only up to 3 credit hours per semester of enrollment. [1-3]

**HART6850 - Independent Research****Title**

Independent Research

**Catalog Description**

Supervised work in extension of regular offerings in the curriculum. Registration only with agreement of instructor involved and with written approval of the director of graduate studies. May be repeated for credit if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3]

**HART6990 - Special Topics****Title**

Special Topics

**Catalog Description**

Topics vary. May be repeated for credit if there is no duplication in topic, but students may earn no more than 3 credits per semester of enrollment. [3]

**HART6999 - Qualifying Paper****Title**

Qualifying Paper

**Catalog Description**

Research and writing of scholarly paper conceived and executed under supervision of a faculty member. [3]

**HART7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-12]

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## Human & Organizational Development

**HOD7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

Open to Graduate School students only. [1-6]

### **HOD8000 - Community Research in Action Proseminar**

#### **Title**

Community Research in Action Proseminar

#### **Catalog Description**

The Pro-seminar course provides professional development and practical skills to help new Community Research in Action (CRA) students maximize the graduate school experience. Students are given foundational information, instruction, and skill-building exercises on subjects related to teaching, grant-writing, epistemology, research, and service. [2-3]

### **HOD8100 - Theories of Inequality, Diversity, and Social Justice**

#### **Title**

Theories of Inequality, Diversity, and Social Justice

#### **Catalog Description**

This course is designed to acquaint incoming Community Research in Action (CRA) students with the core theories and theoretical perspectives germane to the study of inequality broadly defined. The course includes readings that critically address structural, community, and individual levels of analysis. [3]

### **HOD8120 - Community Organizing**

#### **Title**

Community Organizing

#### **Catalog Description**

This course provides graduate students an introduction to theories, processes and models for community organizing. Focus of the course is on post-Alinsky models, particularly congregation-based models in the US. Methods of civic engagement, leadership development, organizational processes and community change are addressed through readings and cases studies. Exposure to and analysis of local organizing efforts are part of this course. [3]

### **HOD8130 - Public Policy and Advocacy**

#### **Title**

Public Policy and Advocacy

#### **Catalog Description**

This course will provide students with a hands on-opportunity to learn about the social policy development process with a focus on community health, youth development, and urbanization and the environment. Students will gain an understanding of the different ways in which policies are made through the legislative, executive, and judicial branches of government at the federal and local levels, as well as the role of the media and advocates/stakeholder groups in shaping social policy. Students will also gain practical experience designing and implementing a campaign aimed at changing social policy. Specifically, students will be asked to select a problem that has policy implications, and then develop a policy analysis and advocacy strategy around their chosen topic. [3]

### **HOD8200 - Community Development and Urban Policy**

#### **Title**

Community Development and Urban Policy

#### **Catalog Description**

Provides the beginning graduate student with an introduction to theory, practice and research in community development (CD) and in urban social policy. It has a laboratory portion in which the student works on a CD project in the local community and uses that to propose to the relevant authorities, a new social policy to implement the findings of the CD project. [3]

## **HOD8400 - Theory and Application in Action Research**

### **Title**

Theory and Application in Action Research

### **Catalog Description**

This course is designed to provide students with both intellectual and practical exposure to action research and applied research methods-particularly in relation to working for social change. The course will focus on the issue of knowledge generation and the role of knowledge production in social power. Practical experience will be gained by conducting research on community projects and applying the concepts gained in course work. Prerequisite: one graduate statistics course. [3]

## **HOD8810 - Doctoral Community Inquiry**

### **Title**

Doctoral Community Inquiry

### **Catalog Description**

Overview of issues and methods in community research. Epistemology, theory, research design, critical analysis, levels of inquiry, and the range of data collection and analysis methods available for community research. Doctoral students only. [3]

## **HOD8820 - Ethnographic Research Methods in Communities**

### **Title**

Ethnographic Research Methods in Communities

### **Catalog Description**

Through empirical data collection on human behavior in communities, ethnography and other qualitative research methods build hypotheses and theory grounded in the values, beliefs, and aspirations of different societies and cultures. This course introduces and explores the tools and techniques of ethnography and their uses in (1) research problem conceptualization, delineation of assumptions, and generation of culturally competent hypotheses and (2) identification and construction of data sets, field research to collect data, and theory building and practical application derived from data analysis. The course is explicitly interdisciplinary. [3]

## **HOD8830 - Evaluation Research**

### **Title**

Evaluation Research

### **Catalog Description**

This course is a doctoral-level introduction to evaluation research. It is designed for people who expect to work as university faculty members or principal investigators in research organizations with a commitment to using research to understand the contribution of social programs and social change efforts to ending social problems. The first half of the course will be devoted to understanding multiple approaches and types of evaluations and how they are embedded in social and political contexts. The second half will introduce design and analytic techniques particularly useful in large scale social experiments, and some of their limitations. [3]

**HOD8850 - Practical Meta-Analysis****Title**

Practical Meta-Analysis

**Catalog Description**

The topics covered in this seminar will include the major steps involved in conducting a meta-analysis, with particular emphasis on the technical issues and statistical analyses distinctive to this form of research. Specifically, the course will focus on providing students with the skills needed to be intelligent consumers of systematic reviews and meta-analyses; conduct a systematic, replicable search of the literature used to identify studies eligible for a meta-analysis; create and analyze meta-analytic databases using appropriate statistical techniques; and prepare written reports of meta-analytic findings. [3]

**HOD8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

**HOD9995 - Half-time Ph.D Dissertation Research****Title**

Half-time Ph.D Dissertation Research

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

**HOD9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

Variable credit [0-12]

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## Human Genetics

**HGEN8320 - Human Genetics****Title**

Human Genetics

**Catalog Description**

Research/techniques in human genetics. Human Genetics students only, by arrangement. [Variable credit]

### **HGEN8330 - Special Topics In Human Genetics**

#### **Title**

Special Topics In Human Genetics

#### **Catalog Description**

This course will provide students with an introduction to special topics in human genetics research, with emphasis on unanswered questions in the field. An introductory module will give students a basic understanding of human genetic principles. This will be followed by discussion of current special topics. Potential topics include: What do we know about the human genome and what do we have to learn? Is there a gene for everything? Is personalized medicine feasible? SPRING. [3].

### **HGEN8335 - Genetics Interest Group Seminar Part 1**

#### **Title**

Genetics Interest Group Seminar Part 1

#### **Catalog Description**

The class meets weekly and is a seminar course that involves four revolving formats: journal club presentations, clinical and ethics talks, directed discussion on current topics of interest in human genetics, and student research in progress presentations. For Human Genetics graduate students only. Fall and Spring [1]

### **HGEN8336 - Genetics Interest Group Seminar Part 2**

#### **Title**

Genetics Interest Group Seminar Part 2

#### **Catalog Description**

The class meets weekly and is a seminar course that involves four revolving formats: journal club presentations, clinical and ethics talks, directed discussion on current topics of interest in human genetics, and student research in progress presentations. For Human Genetics graduate students only. Fall and Spring [1]

### **HGEN8340 - Human Genetics I**

#### **Title**

Human Genetics I

#### **Catalog Description**

(Also listed as Molecular Physiology and Biophysics 8340) Designed to cover background and latest advances in human molecular genetics. Topics will include the content of the human genome; human gene structure, function, and expression; cytogenetics and chromosomal abnormalities; the landscape of human genetic variation; genotyping and sequencing methods; the basis of human genetic disease; approaches to treating genetic disease, such as gene therapy; genetic counseling; ethical considerations of genetic testing and human gene editing. Topics will be discussed with reference to specific genetic diseases. FALL. [3] Mortlock

### **HGEN8341 - Human Genetics II**

#### **Title**

Human Genetics II

#### **Catalog Description**

(Also listed as Molecular Physiology and Biophysics 8341) This course will cover the statistical, population, and analytical aspects of modern human genetics research. Topics to be covered include human population genetics, quantitative genetics, disease gene discovery (emphasizing design, statistical and molecular techniques), linkage and association analyses, computational genetics, and evolutionary genetics. Clinical examples, subject ascertainment, and study design will also be emphasized. Students must have a strong understanding of Mendelian genetics and basic biostatistics. Prerequisite: consent of instructor. SPRING. [4]

## **HGEN8349 - Genetics Of Model Organisms**

### **Title**

Genetics Of Model Organisms

### **Catalog Description**

(Also listed as Cell and Developmental Biology 8349, Molecular Physiology and Biophysics 8349) Basic genetic principles across a broad range of organisms (yeast, C. elegans, Drosophila melanogaster, plants, mouse, zebrafish) that are used in genetic analyses to investigate molecular pathways of interest for human disease will be presented. This course will provide students with in-depth terminology and understanding of the advantages, applications, and approaches specific to each organism. Genomic and bioinformatics tools that facilitate genetic analysis in each species will be emphasized. Specific examples of how each model organism has successfully contributed to elucidation of a human disease gene, pathway, or genetic principle will be presented. Course combines faculty lectures with student presentation and discussion of original articles to emphasize the uniqueness of each model system. Prerequisite: one statistics course at the upper undergraduate level or higher and Fundamentals of Genetic Analysis (MPB 8385), or permission of instructor. Offered every other year. SPRING. [3]

## **HGEN8350 - Directed Study In Human Genetics**

### **Title**

Directed Study In Human Genetics

### **Catalog Description**

Introduction to current research through readings of the genetics literature. Given on an individual basis by arrangement. May be taken more than once, but not for more than 4 hours credit with a single adviser, nor for more than 5 hours total. Prerequisite: consent of instructor and DGS. FALL, SPRING, SUMMER. [Variable credit: 1-4]

## **HGEN8370 - Tutorials In Human Genetics**

### **Title**

Tutorials In Human Genetics

### **Catalog Description**

A weekly seminar critically evaluating current and past scientific literature from many areas of genetic research. The focus will be on study methods and analysis. FALL. [1]

## **HGEN8371 - Tutorials In Human Genetics II**

### **Title**

Tutorials In Human Genetics II

### **Catalog Description**

The class meets once weekly for faculty presentations and class discussions on professional science skills, such as research article and project proposal writing, and oral and poster presentations. SPRING [1] Samuels



## **HGEN8381 - Molecular Foundations Of Medicine**

### **Title**

Molecular Foundations Of Medicine

### **Catalog Description**

Molecular Foundations of Medicine is designed to familiarize students with the cellular structures, biomolecules, and processes that constitute life, human health, and disease at the molecular level. The course employs an integrated approach to teach underlying principles of biochemistry, cell and tissue biology, and genetics with an emphasis on human systems and medical conditions. The inclusion of clinical correlation sessions, small groups, and laboratory sessions will further integrate and broaden course material and relate molecular processes to the study of human disease. Prerequisite: THSP students only. FALL. [Variable credit: 1-6]

## **HGEN8384 - The Brain And Behavior**

### **Title**

The Brain And Behavior

### **Catalog Description**

Brain and Behavior provides a basic understanding of the human central nervous system and human behavior. The format includes lectures, lab exercises, small group discussions, and patient and case presentations. Brain and Behavior integrates three areas of medical science: (1) neuroanatomy, physiology, and biochemistry; (2) psychopathology and systems neuroscience; and (3) pathology, pharmacology, and radiology. Prerequisite: THSP students only. SPRING. [1]

## **HGEN8385 - Fundamental Literature in Genetics & Human Genetics**

### **Title**

Fundamental Literature in Genetics & Human Genetics

### **Catalog Description**

ew description: This course is designed to: (1) introduce students to historically critical topics of genetic research; (2) promote an understanding of classical genetic analysis by learning genetics using the original literature, and (3) place the development of the field of human genetics in the broader context of genetics research as a whole. SPRING [1] Samuels

## **HGEN8390 - Human Genetic Epidemiology**

### **Title**

Human Genetic Epidemiology

### **Catalog Description**

This course will cover in detail the study design and methods of modern genetic epidemiology. This will include concepts of familial aggregation, linkage analyses, population genetics as it is applied to studies of human traits, and association studies, both candidate genes and genome-wide association. The concept of linkage disequilibrium and its use in disease-gene studies will be extensively discussed. The underlying principles of each approach will be developed and current methods and software programs used to perform these will be discussed. Emphasis will be placed on the advantages and disadvantages of each approach and how to best design a genetic epidemiology study. [3]

## **HGEN8391 - Biobank Study Design**

### **Title**

Biobank Study Design

### **Catalog Description**

This is a practical course designed to train you to conduct research using de-identified electronic medical records (EMR) for genetics research. The course will cover three major biobanks, Vanderbilt's BioVU, the NIH biobank All of Us, and the UK BioBank. After completion of this course you will have the skills to independently execute biobank projects and assist colleagues who wish to utilize these resources. Through a combination of lectures, demonstrations, and hands-on workshops, you will develop competence in all aspects of the biobank research process, including project design, data extraction and cleaning, and analysis. Topics covered will include an overview of the clinical data available in an EMR, techniques for defining phenotypes within the EMR, proper control definition, limitations of biobanks for research, common problems with biobank study design and how to address them, population stratification, IRB approval procedures and other RCR topics, and the project application process. The goal of the course is to develop your own biobank research proposal. SPRING [3] Samuels

## **HGEN8392 - Structure, Function, And Development**

### **Title**

Structure, Function, And Development

### **Catalog Description**

Structure, Function, and Development is designed to provide students with the means to develop an effective understanding of the normal micro and macroscopic structure, function, and development of the human body. The course employs a coordinated, integrated approach to the presentation and learning of the disciplines of human gross anatomy, cell and tissue biology (histology), human development (embryology), and physiology in a context of clinical application. Prerequisite: THSP students only. SPRING. [Variable credit: 1-3]

## **HGEN8394 - Practical Python Programming and Algorithms for Data Analysis**

### **Title**

Practical Python Programming and Algorithms for Data Analysis

### **Catalog Description**

This course is intended for students who are focused on big data analysis in the Python programming language, from large scale epidemiologic datasets, electronic medical records, or next generation sequence data. It will cover basic programming, including strings, arrays, dictionaries, conditional statements, data visualization, external data sources, and algorithms, with a focus on using programming to solve challenges within the students' own research projects. At the end of the course, students will have an understanding of the foundation of programming in Python. They will understand the importance and use of regular expressions and efficient data search tools and will demonstrate proficiency in algorithms and data visualization. Evaluations will be based on a midterm exam, homework, a final project, and class participation. SPRING. Instructor: Jennifer Below and staff. [2-4]

## **HGEN8395 - Anti-Racism and Human Genetics**

### **Title**

Anti-Racism and Human Genetics

### **Catalog Description**

History of racial injustice in genetics and provide foundations for anti-racist development of scientific and academic identity. Students must have successfully completed their qualifying exam and must be engaged in their thesis research. [2]

### **HGEN8999 - Non-Candidate Research**

#### **Title**

Non-Candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

### **HGEN9999 - Ph.D. Dissertation Research**

#### **Title**

Ph.D. Dissertation Research

#### **Catalog Description**

[0-12]

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## **Interdisciplinary Grad Programs**

### **IGP8001 - Bioregulation I**

#### **Title**

Bioregulation I

#### **Catalog Description**

Fundamental aspects of biomedical sciences, experimental approaches, problem solving, and skill development for first year PhD students entering any of the graduate programs that make up the IGP. FALL. [1-8] IGP director and additional faculty.

### **IGP8002 - Bioregulation II**

#### **Title**

Bioregulation II

#### **Catalog Description**

Fundamental aspects of biomedical sciences taught in modular format covering cells, molecules, cell-cell communication, information flow and regulation of these processes. Strong emphasis on quantitative experimental approaches analyses. SPRING. [Variable credit: 1-8] IGP director and additional faculty.

### **IGP8004 - Responsible Conduct in Research**

#### **Title**

Responsible Conduct in Research

#### **Catalog Description**

Formal lectures and small group discussions on a range of issues encountered in research activities. Included are responsibilities of researchers and the university to the federal government; scientific misconduct, ethical use of animals in research; ethics of publication, lab management, and grant writing.

## **IGP8999 - Non-Candidate Research**

### **Title**

Non-Candidate Research

### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

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## **Interdisciplinary Materials Science**

### **IMS5300 - Imaging Techniques in Materials Science and Engineering**

#### **Title**

Imaging Techniques in Materials Science and Engineering

#### **Catalog Description**

Also listed as NANO 3000) Principles and practical applications. Processes behind signal formation and use in characterizing materials and biological systems at the nanoscale. Includes hands-on laboratory experiments that highlight the characterization capabilities of modern transmission electron, scanning electron, and focused ion beam scanning electron microscopes for imaging nanostructures. No credit for students who have earned credit for NANO 3000 or MSE 6343. FALL. [3]

### **IMS5320 - Nanoscale Science And Engineering**

#### **Title**

Nanoscale Science And Engineering

#### **Catalog Description**

A multidisciplinary study of the fundamentals uniquely pertaining to the processing, structure, and performance of materials on the dimensional scale of tens to hundreds of atoms. The science and engineering of nanomaterials. Methods for synthesis and fabrication, techniques for characterization, and the attainment of special properties at the nanoscale. An examination of applications in biotechnology, medicine, and engineering. FALL. [3]

### **IMS6310 - Atomic Arrangements in Solids**

#### **Title**

Atomic Arrangements in Solids

#### **Catalog Description**

Atomic arrangements in metals, ceramics, semiconductors, glasses, and polymers. Lattice geometry and crystal symmetry to describe crystal structures. Nanocrystalline materials. Scattering theory and diffraction phenomena for structural characterization. FALL. [3]

### **IMS6391 - Special Topics**

#### **Title**

Special Topics

#### **Catalog Description**

Based on faculty research projects and highly specialized areas of concentration. FALL, SPRING. [Variable credit: 1-3 each semester]

**IMS6392 - Special Topics****Title**

Special Topics

**Catalog Description**

Based on faculty research projects and highly specialized areas of concentration. FALL, SPRING. [Variable credit: 1-3 each semester]

**IMS7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-6]

**IMS8991 - Seminar****Title**

Seminar

**Catalog Description**

A required noncredit course for all graduate students in the program. Topics of special interest consolidating the teachings of previous courses by considering topics which do not fit simply into a single course category. FALL, SPRING. [0] Staff.

**IMS8992 - Seminar****Title**

Seminar

**Catalog Description**

A required noncredit course for all graduate students in the program. Topics of special interest consolidating the teachings of previous courses by considering topics which do not fit simply into a single course category. FALL, SPRING. [0] Staff.

**IMS8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

**IMS9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

# Italian

## **ITA8090 - Special Topics in Italian Studies**

### **Title**

Special Topics in Italian Studies

### **Catalog Description**

[3]

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# Japanese

## **JAPN5101 - Elementary Japanese I**

### **Title**

Elementary Japanese I

### **Catalog Description**

(Also listed as JAPN 1101) Acquisition of oral-aural skills and basic grammar. Introduction to reading and writing Japanese syllabaries and Chinese characters. No credit for students who have earned credit for a more advanced Japanese language course. No credit for students who have earned credit for 1101. [4]

## **JAPN5102 - Elementary Japanese II**

### **Title**

Elementary Japanese II

### **Catalog Description**

(Also listed as JAPN 1102) No credit for students who have earned credit for a more advanced Japanese language course. No credit for students who have earned credit for 1102. [4]

## **JAPN5201 - Intermediate Japanese I**

### **Title**

Intermediate Japanese I

### **Catalog Description**

(Also listed as JAPN 2201) Development of conversational skills and linguistic competence. Syntax, writing, and reading. No credit for students who have earned credit for a more advanced Japanese language course. No credit for students who have earned credit for 2201. [4]

## **JAPN5202 - Intermediate Japanese II**

### **Title**

Intermediate Japanese II

### **Catalog Description**

(Also listed as JAPN 2202) No credit for students who have earned credit for a more advanced Japanese language course. No credit for students who have earned credit for 2202. [4]

**JAPN5301 - Advanced Japanese I****Title**

Advanced Japanese I

**Catalog Description**

(Also listed as JAPN 3301) Reading and writing in contemporary Japanese texts. Conversation, discussion, and development of pragmatic competence. No credit for students who have earned credit for a more advanced Japanese language course. No credit for students who have earned credit for 3301. [3]

**JAPN5302 - Advanced Japanese II****Title**

Advanced Japanese II

**Catalog Description**

(Also listed as JAPN 3302) No credit for students who have earned credit for a more advanced Japanese language course. No credit for students who have earned credit for 3302. [3]

**JAPN5851 - Independent Study****Title**

Independent Study

**Catalog Description**

(Also listed as JAPN 3851) A reading course which may be repeated with variable content according to the needs of the individual student. Primarily designed to cover materials not otherwise available in the regular curriculum. May be repeated for a total of 12 credits in 289a and 289b combined if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3; maximum of 12 credits total for all semesters of JAPN 289a and 289b] (No AXLE credit)

**JAPN5852 - Independent Study****Title**

Independent Study

**Catalog Description**

(Also listed as JAPN 3852) A reading course which may be repeated with variable content according to the needs of the individual student. Primarily designed to cover materials not otherwise available in the regular curriculum. May be repeated for a total of 12 credits in 3851 and 3852 combined if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3; maximum of 12 credits total for all semesters of JAPN 3851 and 3852] No credit for students who have earned credit for 3852. (No AXLE credit)

**JAPN5891 - Special Topics in Advanced Japanese****Title**

Special Topics in Advanced Japanese

**Catalog Description**

(Also listed as JAPN 3891) Reading, writing, and discussion in authentic Japanese cultural, literary, and historical texts. Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3891. [3] (INT)

# Jewish Studies

## **JS5000 - Major Themes in Jewish Studies**

### **Title**

Major Themes in Jewish Studies

### **Catalog Description**

(Also listed as JS 3000) The study of Jews, Judaism, and Jewish culture. History of Jewish Studies, core perspectives, key methodologies, critical debates. Classical literature, current trends. No credit for students who have earned credit for 3000. [3]

## **JS5100 - The New Testament in Its Jewish Contexts**

### **Title**

The New Testament in Its Jewish Contexts

### **Catalog Description**

(Also listed as JS 2100) Documents of the origin of Christianity and the social, literary, ideological, and theological contexts in which they emerged and which they reflect. Various critical methodologies employed in interpreting them. No credit for students who have earned credit for 2100. [3]

## **JS5150 - Issues in Rabbinic Literature**

### **Title**

Issues in Rabbinic Literature

### **Catalog Description**

(Also listed as JS 2150) History of Rabbinic thought from its origins to the Middle Ages through the reading of central Rabbinic texts. Capital punishment, women in Rabbinic culture, sectarianism, and the power structures of Roman Palestine and Sasanian Babylonia. May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 6 credits per semester of enrollment. No credit for students who have earned credit for 2150. [3]

## **JS5210 - Reading Across Boundaries: Jewish and Non-Jewish Texts**

### **Title**

Reading Across Boundaries: Jewish and Non-Jewish Texts

### **Catalog Description**

(Also listed as JS 3210) Jewish and non-Jewish literary and historical texts studied in parallel so as to discover the differences between them. The course will consider texts from the ancient world to the early modern period and ask what constitutes Jewish writing and how it has been defined through time and geography. All readings will be in English. No credit for students who have earned credit for 3210. [3]

## **JS5250 - Witnesses Who Were Not There: Literature of the Children of Holocaust Survivors**

### **Title**

Witnesses Who Were Not There: Literature of the Children of Holocaust Survivors

### **Catalog Description**

(Also listed as JS 2250W) Fiction and non-fiction produced by children of Holocaust survivors. No credit for students who have earned credit for 2250W. [3]



### **JS5260 - Coming of Age in Jewish Literature and Film**

#### **Title**

Coming of Age in Jewish Literature and Film

#### **Catalog Description**

(Also listed as JS 2260) The transition of young Jewish protagonists into adulthood as portrayed in literary works and films from Europe, Africa, and the Americas. No credit for students who have earned credit for 2260 or 2260W. [3]

### **JS5270 - Jewish Storytelling**

#### **Title**

Jewish Storytelling

#### **Catalog Description**

(Also listed as JS 2270) Twentieth-century short fiction and narrative traditions. The transition from religious to secular cultural forms. Immigration and ethnic literary forms. All works are in English or English translation from Yiddish, Hebrew, and Russian. No credit for students who have earned credit for 2270 or 2270W. [3]

### **JS5300 - Modern Jewish Thought**

#### **Title**

Modern Jewish Thought

#### **Catalog Description**

(Also listed as JS 2300) Jewish intellectual responses to major transformations of modernity. Impact of secularization, universalism, pluralism, nationalism, and gender theories on Jewish thought and identity. Conflicting perspectives of tradition, education, culture, and religion. Relationship between Israel and the diaspora. No credit for students who have earned credit for 2300. [3]

### **JS5301 - Jewish Language and Paleography**

#### **Title**

Jewish Language and Paleography

#### **Catalog Description**

(Also listed as JS 4301) Advanced study in a language of the Jewish people with a particular focus on the linguistic and paleographic features that define its cultural context. Each section focuses on one of the following languages: Aramaic, Ladino, Judaeo-Arabic, Rabbinic Hebrew, or Yiddish. May be repeated for credit up to two times when the language studied differs. Consent of instructor required. No credit for students who have earned credit for 4301. [3]

### **JS5320 - Freud and Jewish Identity**

#### **Title**

Freud and Jewish Identity

#### **Catalog Description**

(Also listed as JS 2320) Analysis of rhetoric and themes in selected writings of Sigmund Freud and his times, development of assimilation and of anti-Semitic repudiation. No credit for students who have earned credit for 2320. [3]

### **JS5330 - Is G-d Guilty? The Problem of Evil in Judaism**

#### **Title**

Is G-d Guilty? The Problem of Evil in Judaism

#### **Catalog Description**

(Also listed as JS 2330) Origin, nature, and representations of evil from Scripture through the Hasidic masters. Reflections of modern thinkers. No credit for students who have earned credit for 2330. [3]

### **JS5340 - Jewish Philosophy after Auschwitz**

#### **Title**

Jewish Philosophy after Auschwitz

#### **Catalog Description**

(Also listed as JS 2340) Critical responses to social and political institutions and the corresponding modes of thought that made Auschwitz possible and continue to sustain the barbarism that many leading philosophers have identified at the heart of culture. No credit for students who have earned credit for 2340. [3]

### **JS5520 - Zionism: Politics, Religion, and Ethnicity**

#### **Title**

Zionism: Politics, Religion, and Ethnicity

#### **Catalog Description**

(Also listed as JS 2520) Tensions among religion, nationalism, and political activism. Translations of Messianism into a secular program. Criticism from within and without the movement. No credit for students who have earned credit for 2520. [3]

### **JS5540 - Power and Diplomacy in the Modern Middle East**

#### **Title**

Power and Diplomacy in the Modern Middle East

#### **Catalog Description**

(Also listed as JS 2540) History of the Middle East in the 19th and 20th centuries with an emphasis on U.S. involvement after 1945. U.S. relationship with Israel, and its impact on the region. No credit for students who have earned credit for 2540. [3]

### **JS5560 - Social Movements in Modern Jewish Life**

#### **Title**

Social Movements in Modern Jewish Life

#### **Catalog Description**

(Also listed as JS 2560) How social movements shape contemporary American Jewish culture and politics. Explores movements internal to Judaism and those bringing religion into the public sphere. No credit for students who have earned credit for 2560. [3]

**JS5620 - Jews in Egypt****Title**

Jews in Egypt

**Catalog Description**

(Also listed as JS 2620) Jewish life and experience under Egyptian, Greek, Roman, and Muslim rule in Egypt from the Ptolemies to 1956. Jewish self-government, economic life, and culture over twenty-two centuries, through letters, documents, and imaginative literature. No credit for students who have earned credit for 2620. [3]

**JS5640 - Jews and Greeks****Title**

Jews and Greeks

**Catalog Description**

(Also listed as JS 2640) From the seventh century BCE to ca. 1500 CE. Sites of interaction, languages, cultural ties, religious tensions, political conflicts, and competing philosophies. Works by Elephantine, Alexander the Great, the Maccabees, the Septuagint, Aristeeas, Josephus, Philo, the rabbis, the New Testament, Ezekiel the Tragedian, Byzantium. No credit for students who have earned credit for 2640. [3]

**JS5700 - Judaism and Medicine****Title**

Judaism and Medicine

**Catalog Description**

Medicine, healing, health, and disease in Jewish text, history, ritual, literature, and lived experience. Jewish encounters with Jewish and gentile medical expertise, disability, aging, and death. Jewish approaches to problems in biomedical ethics. Intersection of health, Jewish identity, and sex and gender. [3]

**JS5840 - Directed Readings****Title**

Directed Readings

**Catalog Description**

Advanced readings and research on a selected topic done under the supervision of a faculty mentor. [1-3]

**JS5890 - Special Topics****Title**

Special Topics

**Catalog Description**

(Also listed as JS 3890) Topics as announced. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3890. [3] (No AXLE credit)

### **JS5892 - Topics in Ancient and Medieval Jewish History**

#### **Title**

Topics in Ancient and Medieval Jewish History

#### **Catalog Description**

(Also listed as JS 3892) From antiquity to 1492. Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3892. [3] (No AXLE credit)

### **JS5894 - Topics in Modern Jewish History**

#### **Title**

Topics in Modern Jewish History

#### **Catalog Description**

(Also listed as JS 3894) From 1492 to the present. Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3894. [3] (No AXLE credit)

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## **K'iche' - Mayan Language**

### **KICH5101 - Elementary K'iche' I**

#### **Title**

Elementary K'iche' I

#### **Catalog Description**

(Also listed as KICH 1101) Kaqchikel, K'iche', or Q'eqchi'. Basic speaking, reading, and writing skills. Offered on a graded basis only. Serves as repeat credit for students who have earned credit for ANTH 2612. No credit for students who have earned credit for 1101. [3]

### **KICH5102 - Elementary K'iche' II**

#### **Title**

Elementary K'iche' II

#### **Catalog Description**

Intermediate level course with advanced grammar. Counterfactual constructions, deixis, verbal derivations of positional roots, sound symbolic verbs, and verbal nominalizations. Vocabulary and idioms. Various literary genres. No credit for students who have earned credit for ANTH 2614. Offered on a graded basis only. Prerequisite: 5101 or ANTH 2612. [3]

### **KICH5201 - Intermediate K'iche' I**

#### **Title**

Intermediate K'iche' I

#### **Catalog Description**

Vocabulary, listening, and speaking skills. Modern and colonial texts. Cultural context of linguistic practices in K'iche' communities. No credit for students who have earned credit for Anthropology 278. Offered on a graded basis only. Prerequisite: 5102. [3]

**KICH5202 - Intermediate K'iche' II****Title**

Intermediate K'iche' II

**Catalog Description**

Taught in K'iche'. Advanced vocabulary, grammar, syntax, reading, and writing. Colonial and modern texts. No credit for students who have earned credit for ANTH 3615. Offered on a graded basis only. Prerequisite: 5201 or ANTH 3614. [3]

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**Latin****LAT5102 - Beginning Latin II****Title**

Beginning Latin II

**Catalog Description**

Transition to literary Latin. Emphasis on comprehension of texts. No credit for students who have earned credit for a more advanced Latin language course. Graded basis only. Prerequisite: 5101. [3]

**LAT5201 - Intermediate Latin Prose****Title**

Intermediate Latin Prose

**Catalog Description**

Review of Latin grammar and selected reading from major Latin authors. No credit for students who have earned credit for a more advanced Latin language course except 5202. [3]

**LAT5202 - Intermediate Latin Poetry****Title**

Intermediate Latin Poetry

**Catalog Description**

Selected reading from the major Latin poets. No credit for students who have earned credit for a more advanced Latin language course. [3]

**LAT6010 - The Writings of Caesar****Title**

The Writings of Caesar

**Catalog Description**

(Also listed as LAT 3010) Selections from The Civil War and The Gallic War. Literary style and historical context. No credit for students who have earned credit for 3010. [3]

**LAT6020 - Cicero and the Humanistic Tradition****Title**

Cicero and the Humanistic Tradition

**Catalog Description**

(Also listed as LAT 3020) Study of Cicero's career and thought, and of his contribution to the development of the concept of humanitas. Readings from his letters, speeches, or philosophical works. No credit for students who have earned credit for 3020. [3]

**LAT6030 - Latin Letters****Title**

Latin Letters

**Catalog Description**

(Also listed as LAT 3030) The literary letters of Seneca and Pliny, with a brief introduction to the personal correspondence of Cicero and the letters discovered at Vindolanda. No credit for students who have earned credit for 3030. [3]

**LAT6040 - The Roman Historians****Title**

The Roman Historians

**Catalog Description**

(Also listed as LAT 3040) Selections from Sallust, Livy, and Tacitus, with attention to their objectives and methods; analysis of Roman historiography and its relation to Greek and early Christian historiography. No credit for students who have earned credit for 3040. [3]

**LAT6050 - Suetonius****Title**

Suetonius

**Catalog Description**

(Also listed as LAT 3050) Selections from the works of one of Rome's most important biographers, read in the context of the Latin biographical tradition as well as the political and social background. No credit for students who have earned credit for 3050. [3]

**LAT6060 - Tacitus****Title**

Tacitus

**Catalog Description**

(Also listed as LAT 3060) Selections from the works of one of Rome's most important historians, read in the context of historiographical tradition and political and social background. No credit for students who have earned credit for 3060. [3]

**LAT6100 - Roman Comedy****Title**

Roman Comedy

**Catalog Description**

(Also listed as LAT 3100) Reading of selected comedies of Plautus and Terence: study of the form of Roman comedy and its relation to the Greek New Comedy. No credit for students who have earned credit for 3100. [3]

**LAT6110 - Catullus****Title**

Catullus

**Catalog Description**

(Also listed as LAT 3110) Reading and interpretation of Catullus' poems; aesthetic, political, and rhetorical contexts; fundamentals of Latin meter. No credit for students who have earned credit for 3110. [3]

**LAT6120 - Lucretius: De Rerum Natura****Title**

Lucretius: De Rerum Natura

**Catalog Description**

(Also listed as LAT 3120) Lucretius' poem studied both in the tradition of Epicurean philosophy and as a landmark in the development of the Latin didactic epic; background material in the fragments of Epicurus and some treatment of the Epicurean movement in Italy and especially in Rome. No credit for students who have earned credit for 3120. [3]

**LAT6130 - Vergil: The Aeneid****Title**

Vergil: The Aeneid

**Catalog Description**

(Also listed as LAT 3130) An intensive study of the entire poem, in the context of the epic tradition. No credit for students who have earned credit for 3130. [3]

**LAT6140 - The Lyric Poetry of Horace****Title**

The Lyric Poetry of Horace

**Catalog Description**

(Also listed as LAT 3140) Reading and interpretation of Horace's Epodes and Odes; relation to the Greco-Roman lyric tradition and to Augustan politics. No credit for students who have earned credit for 3140. [3]

**LAT6150 - Latin Elegy****Title**

Latin Elegy

**Catalog Description**

(Also listed as LAT 3150) Authors who created a new type of love poetry during the rule of emperor Augustus: Tibullus, Propertius, Ovid, and Sulpicia. Construction and contestation of gender roles; political contexts; development of the elegiac couplet; modern responses. No credit for students who have earned credit for 3150. [3]

**LAT6160 - Ovid****Title**

Ovid

**Catalog Description**

(Also listed as LAT 3160) Reading and interpretation of selections from the Metamorphoses or other works of Ovid. No credit for students who have earned credit for 3160. [3]

**LAT6170 - Roman Satire****Title**

Roman Satire

**Catalog Description**

(Also listed as LAT 3170) The satires of Horace and Juvenal; the origins of Roman satire; history and conventions of the genre; background reading in other Roman satirists. No credit for students who have earned credit for 3170. [3]

**LAT6180 - Neronian Writers****Title**

Neronian Writers

**Catalog Description**

(Also listed as LAT 3180) Selections from authors in the literary renaissance during the reign of the artistic Emperor Nero, including Seneca, Lucan, Persius, and Petronius. Stylistic innovations, literary merits, and cultural contexts. No credit for students who have earned credit for 3180. [3]

**LAT6200 - Early Christian Writers****Title**

Early Christian Writers

**Catalog Description**

(Also listed as LAT 3200) Selections from the writings of Latin Christians, from the account of Perpetua's martyrdom to the Confessions of Augustine. No credit for students who have earned credit for 3200. [3]



**LAT6890 - Special Topics in Latin Literature****Title**

Special Topics in Latin Literature

**Catalog Description**

(Also listed as LAT 3890) May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3] (HCA)

**LAT7000 - Seminar in Classical Latin Prose****Title**

Seminar in Classical Latin Prose

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**LAT7010 - Seminar in Classical Latin Poetry****Title**

Seminar in Classical Latin Poetry

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**LAT7850 - Independent Study****Title**

Independent Study

**Catalog Description**

(Also listed as LAT 3850) Designed for majors wanting to familiarize themselves with works or authors not covered in the regular curriculum. Prerequisite: 6 hours above 2202. May be repeated for a total of 6 credits if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. No credit for students who have earned credit for 3850. [1-3; maximum of 6 credits total for all semesters of LAT 3850] (No AXLE credit)

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## Latin American Studies

**LAS5851 - Independent Study****Title**

Independent Study

**Catalog Description**

A program of independent readings and research in a minimum of two disciplines, to be selected in consultation with the center's graduate adviser. [3]

**LAS5852 - Independent Study**

**Title**

Independent Study

**Catalog Description**

A program of independent readings and research in a minimum of two disciplines, to be selected in consultation with the center's graduate adviser. [3]

**LAS5891 - Special Topics in Latin American Studies**

**Title**

Special Topics in Latin American Studies

**Catalog Description**

(Also listed as LAS 3891) Selected special topics suitable for interdisciplinary examination from the perspective of the social sciences and humanities. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3891. [3] (No AXLE credit)

**LAS5901 - Research Seminar**

**Title**

Research Seminar

**Catalog Description**

(Also listed as LAS 4901) Selected topics for the interdisciplinary study of Latin America. [3]

**LAS7999 - Master's Thesis Research**

**Title**

Master's Thesis Research

**Catalog Description**

[0-12]

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## Latino and Latina Studies

**LATS5850 - Independent Study**

**Title**

Independent Study

**Catalog Description**

[1-3]

**LATS5961 - Seminar**

**Title**

Seminar

**Catalog Description**

Overview of cultural production, history, and political and socioeconomic experiences of Hispanic people living in the United States. Synthesis of issues, traditions, approaches, and problems. [3]

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## Law and Economics

### **LWEC8349 - Reading Course**

#### **Title**

Reading Course

#### **Catalog Description**

Designed to permit graduate students to do more intensive study in the area of their special interest than regular course offerings provide. Admission by consent of director of graduate studies and supervising professor. [Variable credit]

### **LWEC8401 - Law and Economics Theory I**

#### **Title**

Law and Economics Theory I

#### **Catalog Description**

Principles of economic analysis as applied to legal issues. Topics include, among others, torts, property, litigation, and government regulation. Pre- or corequisite ECON 8100. [3]

### **LWEC8402 - Law and Economics Theory II**

#### **Title**

Law and Economics Theory II

#### **Catalog Description**

Economic analysis of the law with applications from civil and criminal procedure, law enforcement, property, torts, decision making by courts, settlement negotiation, contracts, and antitrust. Prerequisite: LWEC 8401; pre- or corequisite: ECON 8110. [3]

### **LWEC8403 - Behavioral Law and Economics I**

#### **Title**

Behavioral Law and Economics I

#### **Catalog Description**

Economic principles underlying behavioral law and economics research. Analyses of the rationality of individual choice will be undertaken, including research that involves the interaction of economics, psychology, and decision sciences. Applications of behavioral law and economics methods will be applied to the analysis of jury behavior. Pre- or corequisite: ECON 8100. [3]

### **LWEC8404 - Behavioral Law and Economics II**

#### **Title**

Behavioral Law and Economics II

#### **Catalog Description**

Research contributions at the frontier of behavioral law and economics research. Each student will structure a controlled experiment to test the rationality of jury behavior, the effect of alternative jury instructions, or a similar kind of scientifically controlled study of behavior relating to the performance of the legal system. Students will administer and analyze the survey results and will prepare an original research paper on their chosen topic. Prerequisite: LWEC 8403. [3]

**LWEC8405 - Econometrics For Legal Research****Title**

Econometrics For Legal Research

**Catalog Description**

Analysis and critique of empirical legal research using advanced econometric techniques. Topics will be drawn from the program's core fields. Students will perform independent empirical research using primary data sources. Pre- or corequisite: ECON 8300, ECON 8310, LWEC 8401. [3]

**LWEC8406 - Research in Law And Economics****Title**

Research in Law And Economics

**Catalog Description**

Students will develop and complete an original research paper. The paper may pose an original research question or may be a replication of an existing empirical result. [3]

**LWEC8420 - Labor Markets And Human Resources I****Title**

Labor Markets And Human Resources I

**Catalog Description**

Economic, econometric, and legal analysis of the labor market. Topics include analysis of the economic impact of employment laws with a particular focus on antidiscrimination laws, use of labor market studies to estimate the value of statistical life, and behavioral labor economics and economic models of fairness in the employment relationship. Prerequisite: ECON 8100, ECON 8300, ECON 8310. [3]

**LWEC8421 - Labor Markets and Human Resources II****Title**

Labor Markets and Human Resources II

**Catalog Description**

Application of economic and legal analysis to labor market and demographic transformations, including changes in the gender composition of labor market participants, aging of the workforce, immigration, education, poverty, inequality, and provision of health services. Prerequisites ECON 8100, ECON 8300, ECON 8310. [3]

**LWEC8430 - Risk and Environmental Regulation I****Title**

Risk and Environmental Regulation I

**Catalog Description**

Analysis of the sources of market failure that create a rationale for risk and environmental regulation. Methodologies pertaining to appropriate valuation and enforcement of these regulatory policies. Applications include procedures for estimating the value of statistical life, perception of risk, the role of hazard warnings, risk analysis by government agencies, and the enforcement of regulatory programs. Prerequisite: ECON 8100, ECON 8300, ECON 8310. [3]

**LWEC8431 - Risk and Environmental Regulation II****Title**

Risk and Environmental Regulation II

**Catalog Description**

Risk and Environmental Regulation II. Analysis of the sources of market failure that create a rationale for risk and environmental regulation. Methodologies pertaining to appropriate valuation and enforcement of these regulatory policies. This course will focus on theoretical economic models of risk and environmental regulation. Among the topics included will be the economics of risk and uncertainty, discounting, and benefit-cost analysis. Prerequisite: ECON 8100, ECON 8300, ECON 8310. [3]

**LWEC8490 - Ph.D. Law And Economics Workshop****Title**

Ph.D. Law And Economics Workshop

**Catalog Description**

Research workshop on the presentation and interpretation of research and literature on law and economics. Topics vary with student and faculty interest. [3]

**LWEC8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [3]

**LWEC9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0]

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## **Leadership, Policy & Organization**

**LPO7100 - Leadership in the Professions****Title**

Leadership in the Professions

**Catalog Description**

Professions are distinct from ordinary occupations in that professional work involves the application of unique abstract knowledge as part of practice and doing so with integrity and a commitment to particular values that transcend any particular job or organization. Leadership in such contexts must go beyond generic leadership theories that focus solely individual or organizational performance to include theories that incorporate broader commitments to public, professional, and social values. In this course, leadership will be explored and supporting the dual roles of professionals as autonomous knowledge workers and as stewards of broader social values. [3]

**LPO7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

Master's Thesis Research for Graduate School Ph.D. masters in passing students only [0-6]

**LPO8100 - History of American Education****Title**

History of American Education

**Catalog Description**

This doctoral seminar will examine the social, political, intellectual, and organizational history of American education in the twentieth century. The class will read and analyze some of the best work on the history of K-12 and higher education together. My hope is to begin to erase the intellectually expedient but artificial boundary that scholars have erected between the two sectors by deploying a comparative approach. By thinking of the study of K-16 as a single pipeline, albeit a circuitous one with many blockages and leaks, this class will broaden students' understanding of the American education system writ large, alerting them to the distant origins of the nation's education debates and to the longstanding efforts to improve the system in the last century. At the end of this course, students will possess a more historically grounded conception of the American way of education - an appreciation of the system as an institution deeply rooted in the nation's history that endures despite the many calls for its reform if not reconstruction. [3]

**LPO8110 - Economics of Education****Title**

Economics of Education

**Catalog Description**

This course focuses on key issues and challenges in education systems, drawing on theory, econometric methods and related social sciences research to investigate and understand their implications for educational effectiveness. We will study leading concerns in early education, K-12 and higher education policy, including the following topics: education as an investment in future productivity and returns to education; the education production function; the role of education in economic growth; the organization of education and education markets; school quality and choice, and education reforms efforts. [3]

**LPO8120 - Governance and Politics in Education****Title**

Governance and Politics in Education

**Catalog Description**

This course deals with a central question in political science and public policy--how can public institutions be redesigned to improve accountability? This question is examined with particular attention to governance and politics in public school systems. Specifically, students will examine three sets of issues: (1) What is the role of politics in allocating resources in public schools? (2) What are key political challenges in the governance of urban school systems? (3) What is the politics of school choice? Ph.D. only) [3]

**LPO8130 - Social Context of Education****Title**

Social Context of Education

**Catalog Description**

Explores contemporary social, philosophical, and political dimensions of education and their relationship to leadership, including issues related to social class and culture, democracy and diversity, and equality and choice. Ph.D. students only. [3]

**LPO8140 - International Issues in Education Policy****Title**

International Issues in Education Policy

**Catalog Description**

This course covers education outside the United States, including primary, secondary, and higher education. Depending on student demand, it can cover any country in any region. It is designed for those who intend to enter the field of education policy or administration and who need to be able to bring knowledge and experience with education in diverse global contexts to bear on issues of policy and practice. Ph.D. students only. [3]

**LPO8150 - Education Policy in Low- and Middle-Income Countries: Evidence from Experimental and Quasiexperimental Evaluations****Title**

Education Policy in Low- and Middle-Income Countries: Evidence from Experimental and Quasiexperimental Evaluations

**Catalog Description**

The social returns to investing in basic education are high in developing countries. However, countries are still facing significant challenges in ensuring that children go to school and learn critical skills. This course will examine new emerging evidence from interventions designed to increase school enrollment and student learning in basic education (K-12 grades) through two lenses: the decisions of families to invest in basic education, and the decision of schools on how to use and organize key elements in the production of education. The course will take advantage of an emerging and growing body of studies from developing countries that provide compelling causal evidence about the factors that influence the decisions of students, parents, and teachers, and the effectiveness of different strategies to enhance students' learning. [3]

**LPO8200 - Ph.D. Proseminar****Title**

Ph.D. Proseminar

**Catalog Description**

The purpose of this seminar is to inform and support LPO PhD students as they move through graduate school and in the transition to their future roles as education researchers and faculty members. Seminar topics vary each semester and are based on student and faculty input. [.5]

**LPO8500 - Special Topics in Leadership and Policy Studies****Title**

Special Topics in Leadership and Policy Studies

**Catalog Description**

Explores special issues or topics related to leadership and policy studies. May be repeated with change of topic. [1-6]

**LPO8610 - Ph. D. Seminar in K-12 Education Leadership and Policy****Title**

Ph. D. Seminar in K-12 Education Leadership and Policy

**Catalog Description**

This course for Ph.D. students in the K-12 Leadership and Policy Program focuses on research and policy issues that are studied in depth by LPO faculty. The content of the course changes each year, based on the research interests and focus of the faculty member teaching it. Rotating topics have included Measurement and Assessment; Instructional Leadership: Urban School Reform: and Teacher Policy. [3]

**LPO8620 - Ph.D. Seminar in Higher Education Leadership and Policy****Title**

Ph.D. Seminar in Higher Education Leadership and Policy

**Catalog Description**

This course for Ph.D. students in the Higher Education Leadership and Policy Program focuses on research and policy issues that are studied in depth by LPO higher education faculty. The content of the course changes each year, based on the research interests and focus of the faculty members teaching it. Rotating topics have included History of American Higher Education; Organization and Governance of Higher Education; The Academic Profession: Structure and Roles; The College Student: Structure, Processes, and Effects; and Comparative Issues in Higher Education Policy Reform. [3]

**LPO8800 - Statistical Methods in Education Research****Title**

Statistical Methods in Education Research

**Catalog Description**

This course is an introduction to the theory, methods, and practice of statistics. It is intended as a foundational prerequisite for graduate students who intend to complete the core quantitative methods sequence in the Leadership & Policy Studies program (Regression I & II, Causal Inference, and Research Practicum). Topics will include probability theory, descriptive statistics, population distributions, hypothesis testing and confidence interval estimation, correlation, and regression. While concepts will be introduced with some mathematical rigor, the primary emphasis of the class will be the practical application and conceptual understanding of statistics. The course will be taught using the Stata statistical software package, and using large-sample data sets commonly used in educational policy research. [3]

**LPO8810 - Research Design and Methods of Education Policy****Title**

Research Design and Methods of Education Policy

**Catalog Description**

The purpose of this course is to provide an introduction to the practice of research and a survey of various research designs used in the study of education policy. The course develops understandings of the principles, processes and techniques used in educational research. The course is based on the premise that final published research develops and evolves through an iterative process. This research process requires decisions and judgements and careful consideration of alternatives. The goal for this course is for students to learn the formal principles of research design and to begin to understand how to conduct research by identifying and evaluating advantages and disadvantages and trade-offs of various research designs and data collection strategies. Ph.D. students only. [3]



## **LPO8840 - Modeling Context Effects in Educational Organizations**

### **Title**

Modeling Context Effects in Educational Organizations

### **Catalog Description**

This seminar explores the methodological challenges and substantive implications of studying schools as complex organizations. Substantively, this course covers the literature on school effects, moving from early input-output studies to current research that examines the organizational context of schools, particularly the impact of within- and between-school stratification on student outcomes. Methodologically, this course provides an introduction to hierarchical linear modeling, including the conceptual background of hierarchical models, preparing data sets for use with HLM software, using the HLM software, strategies for analysis of data, applications of two- and three-level models, interpreting HLM output, and presenting results. Ph.D. students only. [3]

## **LPO8851 - Regression Analysis I**

### **Title**

Regression Analysis I

### **Catalog Description**

Regression analysis is a widely used technique that allows us to 1) to describe average patterns of association among multiple variables observed in a sample and 2) to make inferences about the patterns of association among these variables in a population. The goal of this course is to develop an understanding of the basic methods, including their limitations, and to develop skill in using regression analysis to analyze non-experimental data. As an important part of any analysis is communicating the results to an audience, we will also place considerable emphasis on learning to present (in writing, tables, and figures) the results. [3]

## **LPO8852 - Regression II**

### **Title**

Regression II

### **Catalog Description**

This is a practical, hands-on course in statistical research methods. The focus is on drawing casual inferences from observational (i.e., non-experimental) data, with particular emphasis on instrumental variables and longitudinal (panel) data estimators. Additional topics include binary and categorical dependent variables models and methods for dealing with missing data, including multiple imputation. [3]

## **LPO8860 - Qualitative Research Methods**

### **Title**

Qualitative Research Methods

### **Catalog Description**

This graduate seminar leads students through the process of designing and conducting qualitative research. Students will learn the fundamentals of qualitative research design, data collection, and data analysis. The course will cover topics such as: constructing qualitative research questions, choosing appropriate sampling strategies, conducting ethical research, interviewing for concrete details, and coding interview transcripts. [3]

## **LPO8999 - Non-Candidate Research**

### **Title**

Non-Candidate Research

### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. Ph.D. students only. [Variable credit: 0-12]

**LPO9951 - Ph.D. Student Research Practicum****Title**

Ph.D. Student Research Practicum

**Catalog Description**

LPO 9951, 9952, and 9953 are a single practicum that is taken over three semesters (Fall, Spring, Maymester) by first-year PHD students in LPO. The three courses must be taken in sequence. This practicum is designed to introduce students to the practice of research, particularly the applied side of quantitative research. This class has a strong emphasis on using programming skills to aid in the replication of work and to simplify complex analyses. [3]

**LPO9952 - Ph.D. Student Research Practicum****Title**

Ph.D. Student Research Practicum

**Catalog Description**

LPO 9951, 9952, and 9953 are a single practicum that is taken over three semesters (Fall, Spring, Maymester) by first-year PHD students in LPO. The three courses must be taken in sequence. This practicum is designed to introduce students to the practice of research, particularly the applied side of quantitative research. This class has a strong emphasis on using programming skills to aid in the replication of work and to simplify complex analyses. [3]

**LPO9953 - Ph.D. Student Research Practicum****Title**

Ph.D. Student Research Practicum

**Catalog Description**

LPO 9951, 9952, and 9953 are a single practicum that is taken over three semesters (Fall, Spring, Maymester) by first-year PHD students in LPO. The three courses must be taken in sequence. This practicum is designed to introduce students to the practice of research, particularly the applied side of quantitative research. This class has a strong emphasis on using programming skills to aid in the replication of work and to simplify complex analyses. [3]

**LPO9960 - Readings and Research in Leadership Policy Studies****Title**

Readings and Research in Leadership Policy Studies

**Catalog Description**

Semi-independent readings and research on selected topics in leadership policy studies. May be repeated. Consent of instructor required. [1-3]

**LPO9995 - Part-Time Dissertation****Title**

Part-Time Dissertation

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

**LPO9999 - Ph.D. Dissertation Research**

**Title**

Ph.D. Dissertation Research

**Catalog Description**

Ph.D. Dissertation Research. [0-12]

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## Malagasy

**MALA5101 - Elementary Malagasy I (Duke)**

**Title**

Elementary Malagasy I (Duke)

**Catalog Description**

Malagasy language, spoken by 25 million people in Madagascar and the Comoro Islands. Speaking, listening, reading, and writing. [3]

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## Master of Liberal Arts and Science

**MLAS6100 - Seminar In Humanities**

**Title**

Seminar In Humanities

**Catalog Description**

Seminar In Humanities. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**MLAS6200 - Seminar in Fine and Creative Arts**

**Title**

Seminar in Fine and Creative Arts

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**MLAS6400 - Seminar in Literature and Creative Writing**

**Title**

Seminar in Literature and Creative Writing

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**MLAS6500 - Seminar In Natural Science****Title**

Seminar In Natural Science

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**MLAS6600 - Seminar In Social Science****Title**

Seminar In Social Science

**Catalog Description**

Seminar In Social Science. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**MLAS6700 - Interdisciplinary Seminar****Title**

Interdisciplinary Seminar

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**MLAS7340 - Interdisciplinary Selected Topics****Title**

Interdisciplinary Selected Topics

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**MLAS7840 - Independent Study****Title**

Independent Study

**Catalog Description**

Individual reading and study program on a topic of the student's choice not treated in the regular curriculum. No formal instruction is given, but the student's work is supervised and evaluated by the instructor of record. [1-3]

**MLAS7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-3]

## **MATH5000 - History of Mathematics**

### **Title**

History of Mathematics

### **Catalog Description**

(Also listed as MATH 3000) Major developments in mathematics from ancient times to the early twentieth century. Emphasis both on the historical perspective and the mathematics; assignments include many exercises and theorems. Highly recommended for teacher candidates. No credit for students who have earned credit for 3000. [3]

## **MATH5100 - Introduction to Analysis**

### **Title**

Introduction to Analysis

### **Catalog Description**

(Also listed as MATH 3100) Properties of real numbers, compactness and completeness. Limits, sequences and series, uniform convergence, and power series. Basic properties of functions on the real line, and the elementary theory of differentiation and integration. Emphasis on methods of proof used in advanced mathematics courses. No credit for students who have earned credit for 3100. [3]

## **MATH5110 - Complex Variables**

### **Title**

Complex Variables

### **Catalog Description**

(Also listed as MATH 3110) Complex numbers, analytic and elementary functions, transformations of regions. Complex integrals, Cauchy's integral theorem and formula, Taylor and Laurent series. The calculus of residues with applications, conformal mappings. No credit for students who have earned credit for 3110. [3]

## **MATH5120 - Introduction to Partial Differential Equations**

### **Title**

Introduction to Partial Differential Equations

### **Catalog Description**

(Also listed as MATH 3120) Initial- and boundary-value problems for partial differential equations using separation of variables in conjunction with Fourier series and integrals. Explicit solutions of problems involving the heat equation, the wave equation, and Laplace's equation. No credit for students who have earned credit for 3120. [3]

## **MATH5130 - Fourier Analysis**

### **Title**

Fourier Analysis

### **Catalog Description**

Fourier series topics including convolution, Poisson kernels, Dirichlet kernels, and pointwise and mean-square convergence. Integral transforms including one-dimensional and multidimensional Fourier integrals, Fourier inversion formula and Plancherel theorem, Poisson summation formula, Radon transform, and X-ray transform. Fourier analysis on Abelian groups including finite Fourier analysis and fast Fourier transform. Applications to signal processing, Shannon sampling theory, and/or compressed sensing. Repeat credit for students who have earned credit for 267 section 1 in spring 2011 or spring 2013. [3]

**MATH5165 - Advanced Calculus****Title**

Advanced Calculus

**Catalog Description**

(Also listed as MATH 3165) Advanced treatment of multivariable calculus. Differentiation of functions of several variables, including inverse and implicit function theorems. Vector differential calculus. Integration of functions of several variables. Vector integral calculus, including Stokes' theorem. No credit for students who have earned credit for 3600 {229}. No credit for students who have earned credit for 3165. [3]

**MATH5200 - Introduction to Topology****Title**

Introduction to Topology

**Catalog Description**

(Also listed as MATH 3200) Open sets, closed sets, continuity, compactness, and connectivity. Subspaces, product spaces, and quotient spaces. Knot theory, topology of surfaces, and applications. No credit for students who have earned credit for 3200. [3]

**MATH5210 - Transformation Geometry****Title**

Transformation Geometry

**Catalog Description**

(Also listed as MATH 3210) Transformations of the plane, groups of transformations, reflections, glide reflections, classification of the isometries of the plane, frieze groups, analysis of frieze patterns, wall paper groups, and analysis of wall paper patterns. Especially recommended for prospective teachers of mathematics. No credit for students who have earned credit for 3210. [3]

**MATH5220 - Differentiable Manifolds****Title**

Differentiable Manifolds

**Catalog Description**

(Also listed as MATH 4220) Manifolds in n-dimensional Euclidean space, smooth maps; inverse and implicit function theorems. Regular value theorem, immersions and submersions, Sard's theorem, and transversality. Degree of a map; winding numbers and the Fundamental Theorem of Algebra; intersection theory modulo 2. No credit for students who have earned credit for 4220. [3]

**MATH5230 - Intro to Differential Geometry****Title**

Intro to Differential Geometry

**Catalog Description**

Smooth maps, tangent space, and surfaces and hypersurfaces in n-dimensional Euclidean space. Inverse and Implicit Function theorems. Sard's theorem. Transversality. Degree of a map; intersection theory modulo 2. Orientability and oriented intersection number. [3]

**MATH5300 - Abstract Algebra****Title**

Abstract Algebra

**Catalog Description**

(Also listed as MATH 3300) Fundamental properties of integers and polynomials. Elementary properties of groups, rings, integral domains, fields, and lattices. No credit for students who have earned credit for 3300. [3]

**MATH5310 - Introduction to Mathematical Logic****Title**

Introduction to Mathematical Logic

**Catalog Description**

(Also listed as MATH 3310) Development of the first order predicate calculus and fundamental metamathematical notions. No credit for students who have earned credit for 3310. [3]

**MATH5320 - Error-Correcting Codes and Cryptography****Title**

Error-Correcting Codes and Cryptography

**Catalog Description**

(Also listed as MATH 3320) Applications of algebra to reliability and secrecy of information transmission. Error-correcting codes, including linear, Hamming, and cyclic codes, and possibly BCH or Reed-Solomon codes. Cryptography, including symmetric-key, DES and RSA encryption. No credit for students who have earned credit for 3320. [3]

**MATH5330 - Advanced Linear Algebra****Title**

Advanced Linear Algebra

**Catalog Description**

Orthogonal bases, orthogonal projections, Gram-Schmidt orthogonalization, Householder transformations, and Courant-Fisher min-max Theorem. Normal, self-adjoint matrices, pseudo inverses, and positive definite and semi-definite matrices. Matrix decompositions including QR factorization, diagonalization, Jordan decomposition, and singular value decomposition. Hilbert spaces, linear functionals, and Riesz Representation Theorem. Applications include least squares problems, regression models, optimization, data denoising, principle component analysis, and dimension reduction for data analysis. [3]

**MATH5600 - Linear Algebra****Title**

Linear Algebra

**Catalog Description**

(Also listed as MATH 2600) Algebra of matrices, real and complex vector spaces, linear transformations, and systems of linear equations. Eigenvalues, eigenvectors, inner product spaces, and orthonormal bases. [3]

**MATH5610 - Ordinary Differential Equations****Title**

Ordinary Differential Equations

**Catalog Description**

(Also listed as MATH 2610) First- and second-order differential equations, applications. Matrix methods for linear systems; stability theory of autonomous systems; existence and uniqueness theory. Intended for mathematics and advanced science majors. No credit for students who have earned credit for 2400 or 2420. No credit for students who have earned credit for 2610. [3]

**MATH5620 - Introduction to Numerical Mathematics****Title**

Introduction to Numerical Mathematics

**Catalog Description**

(Also listed as MATH 3620) Numerical solution of linear and nonlinear equations, interpolation and polynomial approximation, non-numerical differentiation and integration. Least-squares curve fitting and approximation theory, numerical solution of differential equations, errors and floating point arithmetic. Application of the theory to problems in science, engineering, and economics. Student use of the computer is emphasized. Familiarity with computer programming is expected. No credit for students who have earned credit for 3620. [3]

**MATH5630 - Mathematical Modeling in Biology and Medicine****Title**

Mathematical Modeling in Biology and Medicine

**Catalog Description**

(Also listed as MATH 3630) Basic mathematical modeling tools, such as interpolation, least-squares regression, difference equations, and ordinary and partial differential equations. Statistical analysis of data, support vector machines, and computer simulation. Familiarity with computer programming is expected. No credit for students who have earned credit for 3630. [3]

**MATH5640 - Probability****Title**

Probability

**Catalog Description**

(Also listed as MATH 3640) Combinatorics, probability models (binomial, Poisson, normal, gamma, etc.), Stochastic independence, generating functions, limit theorems and types of convergence, bivariate distributions, transformations of variables. Markov processes and applications. Prerequisite: MATH 5820. [3]

**MATH5641 - Mathematical Statistics****Title**

Mathematical Statistics

**Catalog Description**

(Also listed as MATH 3641) Distribution theory, order statistics, theory of point estimation and hypothesis testing, normal univariate inference, Bayesian methods, sequential procedures, regression, nonparametric methods. No credit for students who have earned credit for 3641. [3]



**MATH5650 - Financial Stochastic Processes****Title**

Financial Stochastic Processes

**Catalog Description**

(Also listed as MATH 4650) The theory of stochastic processes and applications to financial economics. Brownian motion; martingales; Itô's Lemma; stochastic integration. Monte Carlo simulations with variance reduction techniques. Applications include discrete-time option pricing and delta hedging. No credit for students who have earned credit for 4650. [3]

**MATH5651 - Evaluation of Actuarial Models****Title**

Evaluation of Actuarial Models

**Catalog Description**

(Also listed as MATH 4651) Applications of statistics to the evaluation and selection of actuarial models. Severity, frequency, and aggregate models. Measure of risk. Applications of Bayesian analysis to credibility theory. Simulation and bootstrap methods. No credit for students who have earned credit for 4651. [3]

**MATH5660 - Mathematical Modeling in Economics****Title**

Mathematical Modeling in Economics

**Catalog Description**

(Also listed as MATH 3660) Modeling microeconomic problems of supply and demand, profit maximization, and Nash equilibrium pricing. Auctions and bargaining models. Statistical models and data analysis. Computational experiments. No credit for students who have earned credit for 3660. [3]

**MATH5670 - Mathematical Data Science****Title**

Mathematical Data Science

**Catalog Description**

Linear methods for regression and classification, bias-variance tradeoff, and basis expansions and regularization. Kernel methods, support vector machines, dimension reduction, and clustering algorithms. No credit for students who completed Math 3890/5890 section 01 offered fall 2017. [3]

**MATH5700 - Discrete Mathematics****Title**

Discrete Mathematics

**Catalog Description**

(Also listed as MATH 3700) Elementary combinatorics including permutations and combinations, the principle of inclusion and exclusion, and recurrence relations. Graph theory including Eulerian and Hamiltonian graphs, trees, planarity, coloring, connectivity, network flows, some algorithms and their complexity. Selected topics from computer science and operations research. No credit for students who have earned credit for 3700. [3]

## **MATH5710 - Mathematical Game Theory**

### **Title**

Mathematical Game Theory

### **Catalog Description**

Zero-sum games and the Minimax Theorem. General-sum games and existence of Nash equilibria. Extensive games with incomplete and imperfect information and construction of normal forms. Repeated games and repetition with discounting. Cooperative games, Shapley's Theorem, and Nash bargaining. Construction and verification of strategies. Serves as repeat credit for 3710. [3]

## **MATH5800 - Theory of Numbers**

### **Title**

Theory of Numbers

### **Catalog Description**

(Also listed as MATH 3800) Factorization of integers, Fundamental Theorem of Arithmetic, congruences, Wilson's theorem. Fermat's theorem, arithmetic functions, perfect numbers, Law of Quadratic Reciprocity. Diophantine equations, Pythagorean triples, sums of squares. No credit for students who have earned credit for 3800. [3]

## **MATH5820 - Introduction to Probability and Mathematical Statistics**

### **Title**

Introduction to Probability and Mathematical Statistics

### **Catalog Description**

(Also listed as MATH 2820) Discrete and continuous probability models, mathematical expectation, joint densities. Laws of large numbers, point estimation, confidence intervals. Hypothesis testing, nonparametric techniques, applications. Students taking 5820 are encouraged to take 5820L concurrently. No credit for students who have earned credit for 2810 or 2820. [3]

## **MATH5821 - Introduction to Applied Statistics**

### **Title**

Introduction to Applied Statistics

### **Catalog Description**

(Also listed as MATH 2821) Review of basic applied statistics. Development of the analysis of variance as a technique for interpreting experimental data. Generalized likelihood ratio principle, confounding, multiple comparisons, introduction to response surface methodology, and nonparameteric methods. Experimental design including: completely randomized, nested, orthogonal contrasts, randomized block, Latin squares, factorial, and fractional factorial. Prerequisite: 5820. [3]

## **MATH5859 - Independent Study**

### **Title**

Independent Study

### **Catalog Description**

(Also listed as MATH 3859) Reading and independent study in mathematics under the supervision of an adviser. Designed primarily for honors candidates, but open to others with approval by department chair. No credit for students who have earned credit for 3859. [Variable credit: 1-3 each semester, not to exceed 6 without departmental permission] (No AXLE credit)

**MATH5890 - Selected Topics****Title**

Selected Topics

**Catalog Description**

Topics vary. May be repeated if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH6100 - Theory of Functions of a Real Variable****Title**

Theory of Functions of a Real Variable

**Catalog Description**

The real number system, transfinite numbers, spaces, point sets in metric spaces, sequences and series of functions, measure. Lebesgue integration, convergence theory, inversion of derivatives. Prerequisite: 3100. [3]

**MATH6101 - Theory of Functions of a Real Variable****Title**

Theory of Functions of a Real Variable

**Catalog Description**

Continuation of 6100. The real number system, transfinite numbers, spaces, point sets in metric spaces, sequences and series of functions, measure. Lebesgue integration, convergence theory, inversion of derivatives. Prerequisite: 6100. [3]

**MATH6200 - Topology****Title**

Topology

**Catalog Description**

(Also listed as MATH 4200) Connectedness, compactness, countability, and separation axioms. Complete metric spaces. Function spaces. No credit for students who have earned credit for 4200. [3]

**MATH6201 - Topology****Title**

Topology

**Catalog Description**

(Also listed as MATH 4201) The fundamental group and covering spaces. Topology of surfaces. Simplicial complexes and homology theory. Homotopy theory. No credit for students who have earned credit for 4201. [3]

**MATH6210 - Differential Topology****Title**

Differential Topology

**Catalog Description**

Manifolds; submanifolds; tangent and vector bundles. Vector fields and flows, Lie brackets, distributions, and the Frobenius theorem. Sard's theorem; transversality and intersection theory; degree theory and applications. Tensors and differential forms; the exterior derivative; Stokes' theorem and integration; de Rham cohomology. No credit for students who have earned credit for 270. Prerequisite: either 2410, 2600, or 2501, and either 3200, 4220, or 4200. [3] (MNS)

**MATH6300 - Modern Algebra****Title**

Modern Algebra

**Catalog Description**

(Also listed as MATH 4300) Group theory through Sylow theorems and fundamental theorem of finitely generated abelian groups. No credit for students who have earned credit for 4300. [3]

**MATH6301 - Modern Algebra****Title**

Modern Algebra

**Catalog Description**

(Also listed as MATH 4301) Introductory theory of commutative rings and fields, and additional topics such as Galois theory, modules over a principal ideal domain and finite dimensional algebras. No credit for students who have earned credit for 4301. [3]

**MATH6310 - Set Theory****Title**

Set Theory

**Catalog Description**

(Also listed as MATH 4310) The basic operations on sets. Cardinal and ordinal numbers. The axiom of choice. Zorn's lemma, and the well-ordering principle. Introduction to the topology of metric spaces, including the concepts of continuity, compactness, connectivity, completeness, and separability. Product spaces. Applications to Euclidean spaces. Strongly recommended for beginning graduate students and for undergraduates who plan to do graduate work in mathematics. No credit for students who have earned credit for 4310. [3]

**MATH6600 - Numerical Analysis****Title**

Numerical Analysis

**Catalog Description**

(Also listed as MATH 4600) Finite difference and variational methods for elliptic boundary value problems, finite difference methods for parabolic and hyperbolic partial differential equations, and the matrix eigenvalue problem. Student use of the computer is emphasized. No credit for students who have earned credit for 4600. [3]

**MATH6620 - Linear Optimization****Title**

Linear Optimization

**Catalog Description**

(Also listed as MATH 4620) Linear programming and its applications. Formulation of linear programs. The simplex method, duality, complementary slackness, dual simplex method, and sensitivity analysis. The ellipsoid method. Interior point methods. Applications to networks, management, engineering, and physical sciences. Familiarity with computer programming is expected. No credit for students who have earned credit for 4620. [3]

**MATH6630 - Nonlinear Optimization****Title**

Nonlinear Optimization

**Catalog Description**

(Also listed as MATH 4630) Mathematical modeling of optimization problems. Theory of unconstrained and constrained optimization, including convexity and the Karush-Kuhn-Tucker conditions. Derivative- and non-derivative-based methods. Familiarity with computer programming is expected. No credit for students who have earned credit for 4630. [3]

**MATH6700 - Combinatorics****Title**

Combinatorics

**Catalog Description**

(Also listed as MATH 4700) Elements of enumerative analysis including permutations, combinations, generating functions, recurrence relations, the principle of inclusion and exclusion, and Polya's theorem. Some special topics will be treated as class interest and background indicate (e.g., Galois fields, theory of codes, and block designs). No credit for students who have earned credit for 4700. [3]

**MATH6710 - Graph Theory****Title**

Graph Theory

**Catalog Description**

(Also listed as MATH 4710) The mathematical theory of networks. Traversing graphs using paths, cycles, and trails. Matchings and other graph factors. Coloring of vertices and edges. Connectivity and its relation to paths and flows. Embeddings of graphs in surfaces, especially the plane. Prerequisite: linear algebra. Students unfamiliar with basic ideas of graph theory, including paths, cycles, and trees, should take 5700 prior to 6710. No credit for students who have earned credit for 4710. [3]

**MATH7100 - Theory of Functions of a Complex Variable****Title**

Theory of Functions of a Complex Variable

**Catalog Description**

Complex integration, calculus of residues, harmonic functions, entire and meromorphic functions, conformal mapping, normal families, analytic continuation, Riemann surfaces, analytic functions of several complex variables. Prerequisite: 3110. [3]

**MATH7101 - Theory of Functions of a Complex Variable****Title**

Theory of Functions of a Complex Variable

**Catalog Description**

Continuation of 7100. Complex integration, calculus of residues, harmonic functions, entire and meromorphic functions, conformal mapping, normal families, analytic continuation, Riemann surfaces, analytic functions of several complex variables. Prerequisite: 7100. [3]

**MATH7110 - Partial Differential Equations****Title**

Partial Differential Equations

**Catalog Description**

(Also listed as MATH 4110) Classification of equations: equations of elliptic, parabolic, and hyperbolic type. Separation of variables, orthonormal series, solutions of homogeneous and nonhomogeneous boundary value problems in one-, two-, and three-dimensional space. Possible additional topics include subharmonic functions and the Perron existence theorem for the Laplace equation of Sturm-Liouville theory. No credit for students who have earned credit for 4110. [3]

**MATH7120 - Functional Analysis****Title**

Functional Analysis

**Catalog Description**

Function spaces, topological vector spaces, linear operators, conjugate spaces, Hilbert and Banach spaces, Banach algebras. Applications to function theory, differential equations, and integral equations. Prerequisite: 6100. [3]

**MATH7121 - Functional Analysis****Title**

Functional Analysis

**Catalog Description**

Continuation of 7120. Function spaces, topological vector spaces, linear operators, conjugate spaces, Hilbert and Banach spaces, Banach algebras. Applications to function theory, differential equations, and integral equations. Prerequisite: 7120. [3]

**MATH7130 - Harmonic Analysis****Title**

Harmonic Analysis

**Catalog Description**

Fourier series; Wiener's Lemma; Fourier integral; Plancherel Theorem; Haar measure on an LCA group  $G$ , Dual group and the Fourier integral; Hausdorff-Young inequality; Hilbert transform; Hardy-Littlewood maximal functions; Marcinkiewicz Interpolation theorem; Singular integrals and the Calderon-Zygmund decomposition; multiresolution approximations; special topics from harmonic analysis, such as wavelets, frames, abstract harmonic analysis, symmetric spaces. Prerequisite: 6101. [3]

## **MATH7140 - Approximation Theory**

### **Title**

Approximation Theory

### **Catalog Description**

Best approximation in metric and normed vector spaces; Tchebycheff approximation, Weierstrass-type theorems, rational approximation, orthogonal polynomials, trigonometric approximation, moduli of continuity, spline approximation; expansions and bases in function spaces. Prerequisite: 3110 and 6100. [3]

## **MATH7200 - Algebraic Topology**

### **Title**

Algebraic Topology

### **Catalog Description**

Homology, cohomology, homotopy theory. Prerequisite: 4201. [3]

## **MATH7210 - Riemannian Geometry**

### **Title**

Riemannian Geometry

### **Catalog Description**

Vector fields, brackets; Riemannian metrics; Riemannian connections; geodesic flow; curvature: sectional curvature, Ricci curvature, scalar curvature; Jacobi fields; Hopf-Rinow Theorem; Hadamard Theorem. Complex manifolds, Hermitian metrics, Kahler metrics, complex projective space, first Chern class of a line bundle. Prerequisite: 270. [3]

## **MATH7300 - Universal Algebra**

### **Title**

Universal Algebra

### **Catalog Description**

Theory of general algebraic systems. Concepts discussed will include subalgebras, congruences, automorphism groups, direct and subdirect products, ultraproducts, free algebras, varieties and quasi-varieties, with applications to groups, rings fields, lattices, Boolean algebras, semilattices, and semi-groups. Connections with model theory and category theory will be included as time permits. Prerequisite: 4300. [3]

## **MATH7320 - Lattice Theory and the Theory of Ordered Sets**

### **Title**

Lattice Theory and the Theory of Ordered Sets

### **Catalog Description**

(Also listed as MATH 4320) An introduction to basic concepts and theorems in lattice theory and the theory of ordered sets with connections to universal algebra and computer science. Boolean algebras, modular and distributive lattices, ordered topological spaces, algebraic lattices and domains, fixed point theorems, cosets, free lattices. No credit for students who have earned credit for 4320. [3]

**MATH7610 - Methods of Mathematical Physics****Title**

Methods of Mathematical Physics

**Catalog Description**

(Also listed as MATH 4610) Linear operators on vector spaces, matrix theory, and Hilbert spaces. Functions of a complex variable and calculus of residues. Ordinary and partial differential equations of mathematical physics, boundary value problems, special functions. No credit for students who have earned credit for 4610. [3]

**MATH7899 - Selected Advanced Topics****Title**

Selected Advanced Topics

**Catalog Description**

Topics of special interest at a level suitable for graduate students in mathematics. [Variable credit: 1-3]

**MATH7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-12]

**MATH8100 - Theory of Ordinary Differential Equations****Title**

Theory of Ordinary Differential Equations

**Catalog Description**

Existence and uniqueness theorems, systems of linear differential equations, self-adjoint eigenvalue problems, asymptotic behavior, stability properties, perturbation theory, and applications. Prerequisite: 6100 and either 2420 or 2610. [3]

**MATH8110 - Theory of Partial Differential Equations****Title**

Theory of Partial Differential Equations

**Catalog Description**

Equations of the first order. Classification of equations of second order, existence and uniqueness, methods for solving elliptic, parabolic, and hyperbolic equations. Prerequisite: 3120 and 6100. [3]

**MATH8120 - Operator Algebras****Title**

Operator Algebras

**Catalog Description**

Banach algebras. The Gelfand transform.  $C^*$ -algebras and von Neumann algebras. Positivity. States. The Gelfand-Naimark-Segal construction.  $*$ -representations of  $C^*$ -algebras. Von Neumann's bicommutant theorem. Kaplansky's density theorem. Comparison theory of projections. Examples and applications. Prerequisites: 6101 and 7120. [3]



### **MATH8300 - Combinatorial and Geometric Group Theory**

#### **Title**

Combinatorial and Geometric Group Theory

#### **Catalog Description**

Generators and defining relations of groups; Cayley graphs and Van Kampen diagrams; subgroups and automorphisms of free groups; graphs of groups; fundamental groups of topological spaces; Magnus embedding; homology of groups; residual properties of groups; hyperbolic groups; small cancellation groups; 1-relator groups; algorithmic problems in groups. Prerequisite: 4300. [3]

### **MATH8301 - Combinatorial and Geometric Group Theory**

#### **Title**

Combinatorial and Geometric Group Theory

#### **Catalog Description**

Continuation of 8300. Generators and defining relations of groups; Cayley graphs and Van Kampen diagrams; subgroups and automorphisms of free groups; graphs of groups; fundamental groups of topological spaces; Magnus embedding; homology of groups; residual properties of groups; hyperbolic groups; small cancellation groups; 1-relator groups; algorithmic problems in groups. Prerequisite: 8300. [3]

### **MATH8310 - Lie Groups and Lie Algebras**

#### **Title**

Lie Groups and Lie Algebras

#### **Catalog Description**

Continuous groups; classical groups; real and complex Lie algebras; applications to physics, geometry, and mechanics. Prerequisite: 3300 or 4300. [3]

### **MATH8997 - Advanced Independent Study**

#### **Title**

Advanced Independent Study

#### **Catalog Description**

Reading and independent study in an advanced area of mathematics under the supervision of an adviser. Requires approval of director of graduate studies. [Variable credit: 1-3]

### **MATH8999 - Non-candidate Research**

#### **Title**

Non-candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**MATH9100 - Seminar in Analysis****Title**

Seminar in Analysis

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9101 - Seminar in Analysis****Title**

Seminar in Analysis

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9200 - Seminar in Topology****Title**

Seminar in Topology

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9201 - Seminar in Topology****Title**

Seminar in Topology

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9300 - Seminar in Algebra****Title**

Seminar in Algebra

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9301 - Seminar in Algebra****Title**

Seminar in Algebra

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9600 - Seminar in Applied Mathematics**

**Title**

Seminar in Applied Mathematics

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9601 - Seminar in Applied Mathematics**

**Title**

Seminar in Applied Mathematics

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9700 - Seminar in Discrete Mathematics**

**Title**

Seminar in Discrete Mathematics

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9701 - Seminar in Discrete Mathematics**

**Title**

Seminar in Discrete Mathematics

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9800 - Seminar in Number Theory**

**Title**

Seminar in Number Theory

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9801 - Seminar in Number Theory**

**Title**

Seminar in Number Theory

**Catalog Description**

Recent topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MATH9996 - Directed Study****Title**

Directed Study

**Catalog Description**

A reading course designed to give graduate students more background. [Variable credit: 1-3 each semester]

**MATH9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Mechanical Engineering

**ME5236 - Linear Control Theory****Title**

Linear Control Theory

**Catalog Description**

(Also listed as ME 4236) Classical and modern approaches to the analysis and design of single-input/single-output (SISO) and multiple-input/multiple-output (MIMO) linear time invariant control systems. Classical (frequency-domain) and modern (state-space) approaches to SISO and MIMO control, including optimal control methods. No credit for students who have earned credit for 4236. [3]

**ME5251 - Modern Manufacturing Processes****Title**

Modern Manufacturing Processes

**Catalog Description**

(Also listed as ME 4251) Manufacturing science and processes. A quantitative approach dealing with metals, ceramics, polymers, composites, and nanofabrication and microfabrication technologies. No credit for students who have earned credit for 4251. [3]

**ME5258 - Engineering Acoustics****Title**

Engineering Acoustics

**Catalog Description**

(Also listed as 4258) The wave equation and its solutions; acoustic sources; reflection and transmission of sound; propagation in pipes, cavities, and waveguides; noise standards and effects of noise on people; principles of noise and vibration control; signal processing in acoustics; environmental noise measurement and control; and various contemporary examples. No credit for students who have earned credit for 4258. [3]

## **ME5259 - Engineering Vibrations**

### **Title**

Engineering Vibrations

### **Catalog Description**

(Also listed as ME 4259) Theory of vibrating systems and application to problems related to mechanical design. Topics include single degree of freedom systems subject to free, forced, and transient vibrations; systems with several degrees of freedom, methods of vibration suppression and isolation, and critical speed phenomena. No credit for students who have earned credit for 4259. [3]

## **ME5260 - Energy Conversion**

### **Title**

Energy Conversion

### **Catalog Description**

(Also listed as ME 4260) Energy resources, use, and conservation are studied. The fundamentals of positive displacement machinery, turbo-machinery, and reactive mixture are introduced and used to examine various forms of power-producing systems. No credit for students who have earned credit for 4260. [3]

## **ME5261 - Basic Airplane Aerodynamics**

### **Title**

Basic Airplane Aerodynamics

### **Catalog Description**

(Also listed as ME 4261) Study of the atmosphere; analysis of incompressible and compressible flows, shock waves, boundary layer and skin friction drag, lift and drag forces over airfoils and wings, and flight performance; aircraft stability and control, wing icing, and parachute-based recovery; history of flight and aerodynamics. No credit for students who have earned credit for 4261. [3]

## **ME5262 - Environmental Control**

### **Title**

Environmental Control

### **Catalog Description**

(Also listed as ME 4262) Heating and cooling systems, energy conservation techniques, use of solar energy and heat pumps. No credit for students who have earned credit for 4262. [3]

## **ME5263 - Computational Fluid Dynamics and Multiphysics Modeling**

### **Title**

Computational Fluid Dynamics and Multiphysics Modeling

### **Catalog Description**

(Also listed as ME 4263) Computational modeling of viscous fluid flows and thermal-fluid-structure interaction. Computational techniques including finite-difference, finite-volume, and finite-element methods; accuracy, convergence, and stability of numerical methods; turbulence modeling; rotating machinery; multiphase flows; and multiphysics modeling. No credit for students who have earned credit for 4263. SPRING. [3]

## **ME5264 - Internal Combustion Engines**

### **Title**

Internal Combustion Engines

### **Catalog Description**

(Also listed as ME 4264) Thermodynamics of spark ignition and compression ignition engines; gas turbines and jet propulsion. No credit for students who have earned credit for 4264. [3]

## **ME5265 - Direct Energy Conversion**

### **Title**

Direct Energy Conversion

### **Catalog Description**

(Also listed as ME 4265) The principles and devices involved in converting other forms of energy to electrical energy. Conversion devices: electro-mechanical, thermoelectric, thermionic, fluid dynamic, and fuel cell. No credit for students who have earned credit for 4265. [3]

## **ME5267 - Aerospace Propulsion**

### **Title**

Aerospace Propulsion

### **Catalog Description**

(Also listed as ME 4267) Application of classical mechanics and thermodynamics to rocket and aircraft propulsion. Design and performance analysis of air-breathing and chemical rocket engines. Advanced propulsion systems for interplanetary travel. Contemporary issues in aerospace propulsion: space exploration, renewable fuels. No credit for students who have earned credit for 4267. [3]

## **ME5271 - Robotics**

### **Title**

Robotics

### **Catalog Description**

History and application of robots. Robotic mechanical architecture, mobility analysis of linkages, rotations and rigid body transformations and their parametrizations. Homogeneous coordinates of points and lines, exponential coordinates of rotation and twist coordinates, direct and inverse position analysis of serial manipulators and elimination theory. Serial robot statics and compliance, motion interpolation/path planning, instantaneous kinematics and Jacobian formulations. Lagrangian dynamics of serial robots, and motion control. No credit for students who have earned credit for 4271. [3]

## **ME5275 - Finite Element Analysis**

### **Title**

Finite Element Analysis

### **Catalog Description**

(Also listed as ME 4275) Development and solution of finite element equations for solid mechanics and heat transfer problems. Commercial finite element and pre- and post-processing software. No credit for students who have earned credit for 4275. [3]

**ME5280 - Advanced Dynamics of Mechanical Systems****Title**

Advanced Dynamics of Mechanical Systems

**Catalog Description**

(Also listed as ME 4280) Development of methods for formulating differential equations to model mechanical systems, including formalisms of Newton-Euler, Lagrange, and virtual work methods to two- and three-dimensional systems. No credit for students who have earned credit for 4280. [3]

**ME5284 - Modeling and Simulation of Dynamic Systems****Title**

Modeling and Simulation of Dynamic Systems

**Catalog Description**

(Also listed as ME 4284) Incorporates bond graph techniques for energybased lumped-parameter systems. Includes modeling of electrical, mechanical, hydraulic, magnetic and thermal energy domains. Emphasis on multi-domain interaction. No credit for students who have earned credit for 4284. [3]

**ME5884 - Internship****Title**

Internship

**Catalog Description**

Internship working in a professional setting. Departmental approval required. FALL, SPRING, SUMMER. [0]

**ME5890 - Special Topics****Title**

Special Topics

**Catalog Description**

(Also listed as ME 3890.) No credit for students who have earned credit for a corresponding 3890 course. [1-3]

**ME7899 - Master of Engineering Project****Title**

Master of Engineering Project

**Catalog Description**

Master of Engineering Project [0-6]

**ME7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-6]

### **ME8320 - Statistical Thermodynamics**

#### **Title**

Statistical Thermodynamics

#### **Catalog Description**

Old and modern quantum theory, including H atom, rigid rotor, and harmonic oscillator. Atomic and molecular structure and spectra. Maxwell-Boltzmann statistical model for ideal, chemically reacting, electron, or photon gas. Gibbs method. Prerequisite: ME 2220. [3]

### **ME8321 - Spectroscopic Methods**

#### **Title**

Spectroscopic Methods

#### **Catalog Description**

Spectroscopic methods for chemical, physical and engineering systems, including optical, electron-beam, magnetic resonance, and mass spectrometry techniques. Content includes basic physical concepts, theory of operation, mechanics of implementing techniques, and the application to research. The class requires one in-class presentation, a white paper and a proposal.[3]

### **ME8323 - Micro/NanoElectroMechanical Systems**

#### **Title**

Micro/NanoElectroMechanical Systems

#### **Catalog Description**

Fabrication techniques and mechanical behavior of modern MEMS/NEMS structures. Application of NEMS/MEMS devices to sensing and actuation. [3]

### **ME8326 - Gas Dynamics**

#### **Title**

Gas Dynamics

#### **Catalog Description**

Study of compressible fluid flow from subsonic to supersonic regimes in confined regions and past bodies of revolutions. Includes heat transfer, frictional effects, and real gas behavior. Prerequisite: ME 3224. [3]

### **ME8327 - Energy Conversion Systems**

#### **Title**

Energy Conversion Systems

#### **Catalog Description**

An advanced study of energy conversion systems that include turbomachinery, positive displacement machinery, solar energy collection and combustion, with consideration for optimizing the systems. [3]



### **ME8331 - Robot Manipulators**

#### **Title**

Robot Manipulators

#### **Catalog Description**

Constrained optimization for robotics. Jacobian subspaces/singular value decomposition and redundancy resolution methods in robotics. Performance measures for robot design and modeling. Quaternions and dual quaternions in robotics. Parallel robot modeling: instantaneous kinematics and screw-based formulation for parallel robot Jacobians. Singularity analysis of parallel robots. Parallel robot direct kinematics (homotopy methods and resultants). Robot stiffness. Modeling of wire-actuated robots and multi-fingered hands. Motion control of serial robots, robust min/max control of serial robots, hybrid motion/force control. [3]

### **ME8333 - Topics in Stress Analysis**

#### **Title**

Topics in Stress Analysis

#### **Catalog Description**

An investigation of thermal stress, transient stress, and temperatures in idealized structures; consideration of plasticity at elevated temperatures; and some aspects of vibratory stresses. [3]

### **ME8348 - Convection Heat Transfer**

#### **Title**

Convection Heat Transfer

#### **Catalog Description**

A wide range of topics in free and forced convection is discussed. Solutions are carried out using analytical, integral, and numerical methods. Internal and external flows are considered for both laminar and turbulent flow cases. Convection in high speed flow is also studied. Prerequisite: ME 3248. [3]

### **ME8351 - Adaptive Control**

#### **Title**

Adaptive Control

#### **Catalog Description**

Real-time parameter estimation methods. Self-tuning regulators. Model reference adaptive control. Adaptive control for nonlinear systems. A research project is required. Prerequisite: ME 5236. [3]

### **ME8352 - Non-linear Control Theory**

#### **Title**

Non-linear Control Theory

#### **Catalog Description**

Phase plane analysis, nonlinear transformations, Lyapunov stability, and controllability/observability calculations. A multidimensional geometric approach is emphasized. Prerequisite: MATH 2410. [3]

### **ME8353 - Design of Electromechanical Systems**

#### **Title**

Design of Electromechanical Systems

#### **Catalog Description**

Analog electronic design for purposes of controlling electromechanical systems, including electromechanical sensors and actuators, analog electronic design of filters, state-space and classical controllers, and transistor-based servoamplifiers and high voltage amplifiers. Significant laboratory component with design and fabrication circuits to control electromechanical systems. Implementation of digital controllers. Prerequisite: ME 3234. [3]

### **ME8359 - Advanced Engineering Vibrations**

#### **Title**

Advanced Engineering Vibrations

#### **Catalog Description**

The development and application of Lagrange's equations to the theory of vibrations. Nonlinear systems and variable spring characteristics are analyzed by classical methods and by digital computer techniques. Applications to the design of high speed machines are emphasized. Prerequisite: ME 4259; MATH 3120, MATH 4110. [3]

### **ME8363 - Conduction and Radiation Heat Transfer**

#### **Title**

Conduction and Radiation Heat Transfer

#### **Catalog Description**

A comparative study of available methods for solution of single and multidimensional conduction heat transfer problems. Both steady and transient problems are considered. Mathematical and numerical methods are stressed. Radiant exchange between surfaces separated by non-participating media is studied. Numerical methods are developed and discussed for non-isothermal surfaces and combined radiation and conduction problems are solved. Prerequisite: ME 3248. [3]

### **ME8364 - Nanophotonic Materials**

#### **Title**

Nanophotonic Materials

#### **Catalog Description**

Physics, design, modeling, and applications of nanophotonic materials in modern optical systems. Topics include waveguides and chip-based photonics, photonic crystals, plasmonics, and metamaterials. [3]

### **ME8365 - Micro/Nano Energy Transport**

#### **Title**

Micro/Nano Energy Transport

#### **Catalog Description**

Theoretical examination of energy transport by electrons and phonons and modeling of transport phenomena in crystalline solids at reduced length scales. Particle transport models and solution methods for energy carriers in the context of semiconductor electronics, direct energy conversion devices and nanostructure. [3]

**ME8366 - Combustion****Title**

Combustion

**Catalog Description**

Processes, thermodynamics, chemical kinetics, premixed flame theory, diffusion flame theory, ignition and detonation. Prerequisite: ME 3224, ME 4221. [3]

**ME8391 - Special Topics****Title**

Special Topics

**Catalog Description**

A course based on faculty research projects and highly specialized areas of concentration. [Variable credit: 1-3 each semester]

**ME8393 - Independent Study****Title**

Independent Study

**Catalog Description**

Readings and/or projects on advanced topics in mechanical engineering under the supervision of the faculty. Consent of instructor required. [Variable credit: 1-3 each semester]

**ME8991 - Seminar****Title**

Seminar

**Catalog Description**

[0]

**ME8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit 0-12]

**ME9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

## **MSTP8310 - MSTP Seminar Series**

### **Title**

MSTP Seminar Series

### **Catalog Description**

The MSTP Seminar Series is a student-driven course in research guided by faculty preceptors. Formal objectives are to: (1) foster development of critical-thinking skills by appraisal of contemporary scientific literature; (2) enhance scientific creativity through discussion of experimental approaches and techniques; and (3) develop oral presentation skills. The seminar series is interdisciplinary in scope with topics drawn from all areas of biomedical research. The primary focus is on cutting-edge, discovery-based, and hypothesis-driven science. Students in the MSTP have primary responsibility for choosing the manuscripts to be presented as centerpieces of the seminars. More advanced students are expected to play a key role in mentoring before, during, and after junior student presentations. Prerequisites: None. MSTP students only. Other students with specific permission of the Course Director. [1]

## **MSTP8314 - MSTP Clinical Preceptorship Program**

### **Title**

MSTP Clinical Preceptorship Program

### **Catalog Description**

The MSTP Clinical Preceptorship Program (CPP) provides MSTP students with exposure to clinical medicine during the period of research training. The CPP course objectives are to: (1) maintain and enhance their competency in clinical skills developed during the FCC year; (2) provide an opportunity for students to explore subspecialties of interest to help them determine a target residency track; and (3) help students identify potential clinical mentorship in the area of their future clinical training. The program is a required component of the MSTP curriculum for all students initiating graduate studies following completion of the second year of Medical School. Students meet with preceptors monthly during the academic year. The course is P/F. Prerequisites: None. For MSTP students only. Course Director: John Stafford. [0]

## **MSTP8315 - Foundations of Biomedical Research I**

### **Title**

Foundations of Biomedical Research I

### **Catalog Description**

The major goals of Foundations of Biomedical Research I (for MSTP students in their first year of Medical School) will be to: 1) recognize and interpret the significance of rigorous experimental design and its impact to reproducible research and 2) to gain familiarity in working with the primary research literature. These goals will be accomplished in a small group, informal setting through interactions with potential MSTP-eligible faculty and lab members, consultation with the course directors, and through primary literature paper discussions. Students will be assessed based upon attendance, course presentations, and class contributions. The course is P/F. Prerequisites : none; MSTP students only. Fall, Spring [2]

## **MSTP8316 - Foundations of Biomedical Research II**

### **Title**

Foundations of Biomedical Research II

### **Catalog Description**

The major goals of Foundations of Biomedical Research II (for MSTP students in their second year of Medical School) will be to: 1) describe the foundational principles of rigorous experimental design, fundamental principles of biostatistics, and access to campus resources that promote reproducibility; 2) enhance critical analysis skills with primary research literature, including emphasis on understanding statistical techniques; and 3) discuss effective pre-doctoral fellowship strategies. These goals will be accomplished in a small group, informal setting through discussion with course faculty and peers. Students will be assessed based upon class contributions. The course is P/F. Prerequisites : none; For MSTP students only. Fall, Spring [2]

### **MSTP8317 - Responsible Conduct of Research Training, Phase I.**

#### **Title**

Responsible Conduct of Research Training, Phase I.

#### **Catalog Description**

Responsible Conduct of Research Training, Phase I. The MSTP RCR Training Phase I course is offered at the end of June to coincide with the arrival of the entering class of MSTP students and immediately prior to the first laboratory rotation. The course consists of four two-hour sessions. The topics covered include (1) Mentor/Trainee Responsibilities; (2) Research Misconduct, (3) Publication Practices, Responsible Authorship, and Peer Review; and (4) Data Acquisition, Management, Sharing, and Ownership. Each session consists of didactic presentations, followed by small-group case-based discussions focusing on the issues presented. The course is P/F. Prerequisites: None. For MSTP students only. Others with permission of the course director. [0]

### **MSTP8318 - MSTP Responsible Conduct of Research, Phase II**

#### **Title**

MSTP Responsible Conduct of Research, Phase II

#### **Catalog Description**

MSTP Responsible Conduct of Research, Phase II. The MSTP RCR Phase II course is offered at the beginning of the first year of graduate research. This component of the RCR curriculum is offered in a single four-hour session, which begins with a brief review of the RCR Phase I course. The topics covered in this session include (1) Ethics of Human Research; (2) Ethics of Animal Welfare and Use of Animals in Research; (3) Conflict of Interest; and (4) Collaborative Science. Similar to the format for the RCR Phase I course, topics in the Phase II course are presented first in didactic form, followed by small-group case-based discussions for analysis and debate. All nine topics in the NIH RCR guidelines are covered during the two courses. The course is P/F. Prerequisites: None, but MSTP RCR Phase I normally completed first. For MSTP students only. Others with permission of the course director.[0]

### **MSTP8999 - Non-candidate Research**

#### **Title**

Non-candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. Fall, Spring, Summer [Variable credit: 0-12]

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## **Medicine, Health, and Society**

### **MHS5010 - Global Health Principles and Practice**

#### **Title**

Global Health Principles and Practice

#### **Catalog Description**

(Also listed as MHS 3010) Introduction to major global health principles and practices in the developing and developed world. Perspectives of public health practitioners and critical thinking about global health challenges and solutions. [3]

## **MHS5020 - U.S. Public Health Ethics and Policy**

### **Title**

U.S. Public Health Ethics and Policy

### **Catalog Description**

(Also listed as MHS 3020) Critical perspectives on ethical and policy issues in U.S. public health. No credit for students who have earned credit for 3020. [3]

## **MHS5030 - Community Health Research**

### **Title**

Community Health Research

### **Catalog Description**

(Also listed as MHS 3030) Conceptual and methodological challenges. Focus on descriptive studies and intervention research to address health disparities in chronic diseases and psychiatric disorders. No credit for students who have earned credit for 3030. [3]

## **MHS5120 - Medicine, Technology, and Society**

### **Title**

Medicine, Technology, and Society

### **Catalog Description**

(Also listed as MHS 3120) Tensions between art and science in medicine. The effect of science and technology on the doctor-patient relationship. Social and ethical issues raised by new biomedical developments. No credit for students who have earned credit for 3120. [3]

## **MHS5140 - Afrofuturism and Cultural Criticisms of Medicine**

### **Title**

Afrofuturism and Cultural Criticisms of Medicine

### **Catalog Description**

(Also listed as MHS 3140) Exploration of Afrofuturism as a literary genre and its critique of the impact of technoscience and medicine on black health, life, and futurity. Multidisciplinary approach in understanding novels, memoirs, and secondary texts. [3]

## **MHS5210 - Examining Care & Caregiving**

### **Title**

Examining Care & Caregiving

### **Catalog Description**

Various cultural conceptions of what counts as good care, drawn from anthropology, sociology, films, and literature. Medicare, Medicaid; home healthcare of older adults in the United States, South Korea, Denmark, and Thailand. Drug treatment and sexual assault survivor programs. Provision of care during epidemics and pandemics. Not open to students who have completed MHS 3890-01 offered Spring 2021.[3]

**MHS5230 - Masculinity and Men's Health****Title**

Masculinity and Men's Health

**Catalog Description**

(Also listed as MHS 2230) Interdisciplinary approach to men's health issues and to perceptions of masculinity. The history of men's diseases. Men in clinical settings. Social policies that affect men's health behaviors. No credit for students who earned credit for 290 section 5 in fall 2012. No credit for students who have earned credit for 2230. [3]

**MHS5240 - Bionic Bodies, Cyborg Cultures****Title**

Bionic Bodies, Cyborg Cultures

**Catalog Description**

(Also listed as MHS 2240) Historical and cultural evolution of prosthetics, artificial limbs, and other assistive technologies. Shifts in social views resulting from war, economics, and art and design. Critical texts, films, art practices, and technological advancements. No credit for students who have earned credit for 2240. [3]

**MHS5250 - War and the Body****Title**

War and the Body

**Catalog Description**

(Also listed as MHS 2250) Impact of war on the human body. Anthropology of the body and theories of bodily experience. Production, representation, and experience of war and of military and medical technologies on a bodily level. Acceptable and unacceptable types of harm. [3]

**MHS5330 - Men's Health Research****Title**

Men's Health Research

**Catalog Description**

(Also listed as MHS 2330) Concepts and theories of men's health. Global and domestic issues. Effect of men's social and economic advantages on health outcomes. Strategies to improve men's health; relationships between cultural values and health policy; and cultural explanations that shape men's health campaigns. [3]

**MHS5350 - Perspectives on Trauma****Title**

Perspectives on Trauma

**Catalog Description**

(Also listed as MHS 3250) Trauma as a framework for understanding individual and collective suffering. Trauma in the context of medicine, war, and politics, and of racial, sexual, and gender inequalities. Alternative ways of conceptualizing feeling, memory and loss. [3]

**MHS5410 - HIV/AIDS in the Global Community****Title**

HIV/AIDS in the Global Community

**Catalog Description**

(Also listed as MHS 2410) Medical, social, political, economic, and public policy dimensions of HIV/AIDS. Prevention and treatment strategies, social stigma, and discrimination. No credit for students who have earned credit for 2410. [3]

**MHS5420 - Economic Demography and Global Health****Title**

Economic Demography and Global Health

**Catalog Description**

(Also listed as MHS 2420) Economic consequences of demographic change in developing and developed countries. Links between socioeconomic status and health; relationship between health and economic growth; determinants of fertility, mortality, and migration. [3] (SBS)

**MHS6010 - Psychiatry, Culture, and Globalization****Title**

Psychiatry, Culture, and Globalization

**Catalog Description**

(Also listed as MHS 4010) Cross-cultural analysis of mental illness; the emergence of cultural psychiatry; and the globalization of biopsychiatry and neuroscience. No credit for students who earned credit for 295 section 2 in fall 2012. No credit for students who have earned credit for 4010. [3]

**MHS6100 - Theories and Methods in Critical Health Studies****Title**

Theories and Methods in Critical Health Studies

**Catalog Description**

Introduction to graduate-level research and professionalization. Core social theories and forms of evidence. Practical skills related to scholarly engagement, presentation, and writing. [3]

**MHS6110 - Interdisciplinary Writing****Title**

Interdisciplinary Writing

**Catalog Description**

Instruction in identifying, summarizing, and contributing to scholarly conversations in interdisciplinary health research. No credit for students who have earned credit for MHS 6500 section 02 offered fall 2020 or section 03 offered fall 2021. [3]



**MHS6120 - Writing and Presentation****Title**

Writing and Presentation

**Catalog Description**

Instruction in writing of academic and professional documents for interdisciplinary audiences. Emphasis on writing and defending a thesis, developing good writing habits, and working with a writing group. No credit for students who have earned credit for MHS 6500 section 03 offered spring 2020 or sections 01 and 03 offered spring 2021. [1-3]

**MHS6150 - Death and Dying in America****Title**

Death and Dying in America

**Catalog Description**

Interdisciplinary introduction to thanatology; changes in medicine and attitudes towards dying as they reshape the American way of death in a multicultural landscape. No credit for students who have earned credit for 3150. [3]

**MHS6200 - Concepts and Methods in Health Disparities Research****Title**

Concepts and Methods in Health Disparities Research

**Catalog Description**

Conceptual and methodological challenges faced in conducting studies on racial/ethnic, SES, and gender disparities. Descriptive and intervention research with emphasis on community-based studies. No credit for students who have earned credit for MHS 6500-01 offered spring 2016. [3]

**MHS6250 - Interdisciplinary Health Research****Title**

Interdisciplinary Health Research

**Catalog Description**

Key concepts and approaches in the study of medicine, health, and society. Emphasis on science communication, advocacy, and translating the social foundations of health to non-academics. [3]

**MHS6300 - Social Studies of Science and Medicine****Title**

Social Studies of Science and Medicine

**Catalog Description**

Technologies, social groups, institutions, and other factors shaping the human and natural sciences. Qualitative research methods. No credit for students who have earned credit for MHS 6500-01 offered fall 2015. [3]

**MHS6350 - Critical Bioethics****Title**

Critical Bioethics

**Catalog Description**

Bioethics as a professional field in the U.S. and globally. Debates in data justice and indigenous ethics regimes. Readings taken from ancient texts, modern law, and fiction. No credit for students who have earned credit for MHS 6500 section 01 offered spring 2020 or section 02 offered spring 2021. [3]

**MHS6400 - Quantitative Research Methods****Title**

Quantitative Research Methods

**Catalog Description**

Basic skills in generating, interpreting, and presenting statistical evidence. Emphasis on applied skills. No credit for students who have earned credit for 6500 section 02 offered fall 2016. [3]

**MHS6500 - Special Topics in the Social Foundations of Health****Title**

Special Topics in the Social Foundations of Health

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [1-3]

**MHS7000 - Interdisciplinary Research Methods****Title**

Interdisciplinary Research Methods

**Catalog Description**

Key methods in the analysis of health and medicine from epidemiology, anthropology, sociology, history, and philosophy. [3]

**MHS7100 - Research Workshop****Title**

Research Workshop

**Catalog Description**

Research presentations by faculty members, visiting scholars, and graduate students. Assists students in the selection of research topics and in the presentation of research. May be repeated for credit. [1]

**MHS7150 - Graduate Proseminar****Title**

Graduate Proseminar

**Catalog Description**

Introduction to graduate study and future careers in healthcare. Professional skills necessary to succeed in the field of medicine, health, and society including oral and written communication. [1]

**MHS7200 - Thesis Seminar****Title**

Thesis Seminar

**Catalog Description**

Preparation of a thesis proposal and development of a thesis. May be repeated for credit. [1]

**MHS7210 - Gender, Sex, and Medicine****Title**

Gender, Sex, and Medicine

**Catalog Description**

Intersections of biological and cultural approaches to sex, gender, and medicine. Interdisciplinary examination of the ways gender and sexuality shape health norms, well-being, treatment, and medical belief systems. Serves as repeat credit for students who earned credit for MHS 6500-01 offered spring 2023. [3]

**MHS7305 - Foundations of Global Health****Title**

Foundations of Global Health

**Catalog Description**

Determinants of health and interventions used to better health, particularly in low-resource settings. Core research and evaluation methodologies used in the field. [3]

**MHS7306 - Essential Skills in Global Health****Title**

Essential Skills in Global Health

**Catalog Description**

Core field tools, needs assessment, implementation techniques, and methodologies in global health program implementation. Determinants of global health and development from an interdisciplinary perspective. Global health theories and practices with an emphasis on collective, partnership-based action. No credit for students who have earned credit for IGHM 5240 or PUBH 5550. [3]

**MHS7308 - Ethics, Law, and Medicine****Title**

Ethics, Law, and Medicine

**Catalog Description**

Explores intersection of ethical, legal, and medical concerns in the modern world of health care. Case-based and discussion format. Serves as repeat credit for students who have completed DIV 3452, MED 5240, or LAW 9078 [3]

**MHS7311 - Ethics in Global Health****Title**

Ethics in Global Health

**Catalog Description**

Overview of ethical issues and standards in global health, particularly ethics in international research. Serves as repeat credit for students who have completed VIGH 5244 or IGHM 5244. [1]

**MHS7312 - Informatics for Global Health Professionals****Title**

Informatics for Global Health Professionals

**Catalog Description**

Medical informatics with emphasis on a global health care setting. As global health bridges both patient care and public health, so informatics. Patient-based information systems and public health information systems. Serves as repeat credit for students who have completed VIGH 5242 or IGHM 5242. [1]

**MHS7313 - Introduction to Medical Anthropology****Title**

Introduction to Medical Anthropology

**Catalog Description**

The study of illness, suffering, and healing in cultures around the world. Medical anthropology topics, theoretical approaches, and research techniques. Case studies on chronic illness, sorcery and traditional healing, modern pandemics, and treatment/illness expectations. Serves as repeat credit for students who have completed PUBH 5548 or IGHM 5248. [1]

**MHS7314 - Global Health Politics and Policy****Title**

Global Health Politics and Policy

**Catalog Description**

Global health problems facing the world's populations today and efforts taken to improve health at a global level. Political movements of global health issues in the US and among the G8 nations from 2000-2011. Serves as repeat credit for students who have completed PUBH 5550 or IGHM 5250. [1]

**MHS7315 - Leadership and Development in Global Health****Title**

Leadership and Development in Global Health

**Catalog Description**

Leadership theory and practice in the area of global health. Serves as repeat credit for students who have completed VIGH 5246 or IGHM 5246. [1]

**MHS7316 - Case Studies in Tropical Diseases****Title**

Case Studies in Tropical Diseases

**Catalog Description**

Tropical diseases and parasitology in a clinical case study format. Serves as repeat credit for students who have completed VIGH 5249 or IGHM 5249. [1]

**MHS7317 - Introduction to Quality Improvement****Title**

Introduction to Quality Improvement

**Catalog Description**

Concept and methodology of Quality Improvement (QI) science as it applies to health care delivery in the U.S. and in the developing world. Serves as repeat credit for students who have completed VIGH 5252 or IGHM 5252. [1]

**MHS7319 - Laboratory Technologies in Low Resource Settings****Title**

Laboratory Technologies in Low Resource Settings

**Catalog Description**

Core laboratory principles, technologies, and applications used in the delivery of care and the performance of clinical research in resource-limited settings. Strengths, limitations, and appropriate use of laboratory technologies in the changing landscape of international research and clinical care. [3]

**MHS7830 - Graduate Service Learning****Title**

Graduate Service Learning

**Catalog Description**

Must be taken concurrently with 7831 and/or 7832. After completing the experience, all students must write a thorough report. [1-3].

**MHS7831 - Service Learning Research****Title**

Service Learning Research

**Catalog Description**

Students will write a substantial research paper under the supervision of a Vanderbilt faculty member, on a topic related to their service learning experience. [1-3]

**MHS7832 - Service Learning Readings****Title**

Service Learning Readings

**Catalog Description**

Readings and a substantial interpretive essay on topics related to the service learning experience, under the supervision of a Vanderbilt faculty member. [1-3]

**MHS7850 - Independent Study****Title**

Independent Study

**Catalog Description**

Readings and research in a minimum of two disciplines, to be selected in consultation with a faculty adviser and subject to the approval of the program director. [1-3]

**MHS7851 - Independent Study****Title**

Independent Study

**Catalog Description**

Readings and research in a minimum of two disciplines, to be selected in consultation with a faculty adviser and subject to the approval of the program director. [1-3]

**MHS7880 - Internship Training****Title**

Internship Training

**Catalog Description**

Must be taken concurrently with 7881 and/or 7882. [1-3]

**MHS7881 - Internship Research****Title**

Internship Research

**Catalog Description**

Students will write a substantial research paper under the supervision of a Vanderbilt faculty member. [1-3]

**MHS7882 - Internship Readings****Title**

Internship Readings

**Catalog Description**

Readings and a substantial interpretive essay on topics related to the internship training, under the supervision of a Vanderbilt faculty member. [1-3]

**MHS7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-12]

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## Microbe - Host Interactions

**M&IM8328 - Molecular Virology****Title**

Molecular Virology

**Catalog Description**

This course focuses on interactions of animal viruses with their host cells, discussed at the molecular and cellular level as model systems. Special emphasis is placed on current literature and methodology. Prerequisite: IGP 8001 or an undergraduate course in biochemistry or microbiology. FALL. [2] (Aiken)

## **M&IM8329 - Principles of Immunology and the Immune System**

### **Title**

Principles of Immunology and the Immune System

### **Catalog Description**

The immune system plays a vital role to protect from pathogens and is intimately linked to a wide range of diseases. The goal of this course is to introduce the basics of immunology through discussion of principles of immunobiology and clinical immunology. Topics to be covered include principles of innate and adaptive immunity, antigen recognition and signaling, immune disease processes, discussion of clinical cases including immunodeficiencies, autoimmunity, inflammation, neuroinflammation, and tumor immunology. The class will consist of lectures followed by small group discussions of how those topics apply to basic and clinical immunology and will include discussions of current literature. Following the class, students will have the background to understand and interpret basic principles of immune function and understand how the immune system contributes to health and disease.

## **M&IM8332 - Foundations in Microbiology and Immunology**

### **Title**

Foundations in Microbiology and Immunology

### **Catalog Description**

In this reading/discussion-based course students study the functions of specific immune cell types and their roles in controlling infections. SUMMER. [2]

## **M&IM8334 - Special Topics in Molecular Pathogenesis**

### **Title**

Special Topics in Molecular Pathogenesis

### **Catalog Description**

This course provides Ph.D. students in the biomedical sciences with the opportunity to study various topics of relevance to their thesis research and within their broader field of study. Class time will be devoted to a discussion of those topics with peers and faculty who share similar interests (topic leaders). In consultation with the course director and the research mentor, students will select from a menu of two-week modules to create a personalized course syllabus. Credit hours: variable (1-4). Students will receive one credit hour per two course modules completed for four total. Students in the MHI and MPI programs must have completed Foundations II prior to this course. For students in other Ph.D. programs, completion of the first-year IGP or QCB curriculum and permission of the course directors are required. [1-4]

## **M&IM8335 - Research Proposals: Preparation and Critical Review**

### **Title**

Research Proposals: Preparation and Critical Review

### **Catalog Description**

An essential skill for scientists in an academic setting is the ability to obtain extramural research funding through peer reviewed grant applications. This course will offer didactic sessions in which the process of preparing and reviewing grant applications is discussed. Each student will write a grant application using the NRSA format for postdoctoral fellowships. The student should propose research in one of the four major emphasis areas of the department: microbial genetics, virology, immunology, or microbial pathogenesis. The initial grant submission will be reviewed by the faculty thesis mentor and a course instructor. The student will amend the application according to the reviewer's comments and submit a final version. Procedures for reviewing grant applications will then be discussed. A student and a faculty member will provide a written review for each of the final grants. The course will conclude with a mock NIH study section in which grants are reviewed orally and scored. SPRING. [2]

## **M&IM8350 - Bacteriology Through the Lens of NanoMachines**

### **Title**

Bacteriology Through the Lens of NanoMachines

### **Catalog Description**

The objective of this course is to provide learners with in-depth knowledge on core processes of bacterial physiology in the context of bacterial motors and machines that drive them. In addition, examples will be provided in which such bacterial motors are deployed and regulated (to the benefit of the bacteria) during the course of infection. FALL. [2] (Hadjifrangiskou)

## **M&IM8999 - Non-Candidate Research**

### **Title**

Non-Candidate Research

### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

## **M&IM9999 - Ph.D. Dissertation Research**

### **Title**

Ph.D. Dissertation Research

### **Catalog Description**

[0-12]

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# **Molecular Pathology and Immunology**

## **PATH-GS8322 - Preprints and Publishing in Immunology**

### **Title**

Preprints and Publishing in Immunology

### **Catalog Description**

The course focuses on current topics in immunology. This class will use a journal club format to discuss current and impactful literature in immunology. Students will select and present papers for discussion and in some cases have opportunities to interact with the authors of those papers for a "behind the scenes" view of the key issues and process of each paper. Prerequisite: M&IM 8332, Foundations in Microbiology and Immunology I or equivalent experience with instructor's approval. SPRING [1]. Rathmell



**PATH-GS8329 - Lipoprotein Metabolism****Title**

Lipoprotein Metabolism

**Catalog Description**

The immune system plays a vital role to protect from pathogens and is intimately linked to a wide range of diseases. The goal of this course is to provide an introduction to the basics of immunology through discussion of principles of immunobiology and clinical cases where the immune system plays a key role in the disease process. Topics to be covered include principles of innate and adaptive immunity, antigen recognition and signaling, immune disease processes, discussion of clinical cases including immunodeficiencies, autoimmunity, inflammation, and tumor immunology. The first portion of the class will consist of instruction and discussion of the language and basic principles of immunology. The second portion of the class will be directed towards the application of immunology in human diseases, including autoimmunity, diabetes, and cancer. Following the class, students will have the background to understand and interpret basic principles of immune function and understand how the immune system contributes to health and disease. [2-3]. Staff. Course is offered as needed by arrangement with the Director of Graduate Studies.

**PATH-GS8331 - Seminar In Experimental Pathology****Title**

Seminar In Experimental Pathology

**Catalog Description**

Seminar In Experimental Pathology. Students and faculty participate in a weekly discussion of current research projects and literature. FALL. [1] Lannigan and Staff.

**PATH-GS8332 - Current Topics In Experimental Pathology****Title**

Current Topics In Experimental Pathology

**Catalog Description**

Students and faculty participate in a weekly discussion of current research projects and literature. SPRING. [1] Lannigan and Staff

**PATH-GS8335 - Molecular Pathology Of Extracellular Matrix****Title**

Molecular Pathology Of Extracellular Matrix

**Catalog Description**

Lectures on the structure, genes, metabolism, and regulation of the collagens, structural glycoproteins, proteoglycans, and elastin. The role of these macromolecules in maintaining normal tissue integrity and function and in development and wound healing is emphasized, as is the molecular basis for the involvement of these proteins in both inherited and acquired diseases (e.g., atherosclerosis, diabetes, and cancer). Prerequisite: biochemistry and/or cell biology. SPRING. [2] Staff. Course is offered as needed by arrangement with the Director of Graduate Studies.

**PATH-GS8337 - Cellular And Molecular Basis Of Vascular Disease****Title**

Cellular And Molecular Basis Of Vascular Disease

**Catalog Description**

Lectures on contemporary research in cell biology, protein and lipid biochemistry, and molecular biology of the vascular system. Open to graduate and medical students, postdoctoral fellows, and undergraduate students with consent of instructors and the Graduate School. [3] Staff. Course is offered as needed by arrangement with the Director of Graduate Studies.

**PATH-GS8339 - Foundations of Immunology****Title**

Foundations of Immunology

**Catalog Description**

This course is a comprehensive study of Immunology in the Molecular Pathology and Immunology Ph.D. program. Students in other programs may enroll with consent of the course director. FALL [1-3] Van Kaer

**PATH-GS8345 - Human Biology and Disease****Title**

Human Biology and Disease

**Catalog Description**

The aim of this course is to provide students with a comprehensive, organ-based overview, of human biology and disease pathophysiology from a clinical perspective. What distinguishes the proposed course from any other courses or programs that are currently offered at Vanderbilt, is that it will be comprehensive, covering all the major organ systems in the human body, and will be taught by clinicians from a clinical, rather than a basic science, perspective. There will be 15 topics taught covering 12 organ systems, each over 2-hour blocks coordinated by a physician or physician scientist involved in treating patients with common diseases affecting that organ system. Students will be instructed to register with UpToDate (or Medscape), an online portal for students, physicians, and healthcare professionals, and to read about and write brief reports on clinical topics being discussed each day. The last session of each block will be in a case report format in which instructors bring along a patient suffering from the disease being discussed, so that students can develop an intimate understanding of what it is like to suffer from the disease being discussed during that teaching block. To complete three credit hours (quality hours for full credit), students will be expected to attend in person 15 mornings of didactic and interactive teaching blocks over the three-week Human Biology and Disease immersion course. Some students may elect to attend 5 to 10 selected morning blocks for 1 or 2 credit hours rather than complete the whole course. There are no prerequisites for attending this course other than being a Ph.D. student or post-doctoral fellow enrolled in one of the biomedical sciences programs at Vanderbilt University. The course will be graded based on attendance and on grading daily entries for each of the topic areas using a time-stamped, online course management system.

**PATH-GS8351 - Cellular And Molecular Basis Of Disease****Title**

Cellular And Molecular Basis Of Disease

**Catalog Description**

An introduction to human disease and the accompanying changes in normal structure and function. The course consists of modules focused on a physiologic system and its related diseases. The course emphasis hands-on experience to supplement and enhance didactic material. [3] FALL. Lannigan and Staff

### **PATH-GS8355 - Introduction to Clinical Research Methods**

#### **Title**

Introduction to Clinical Research Methods

#### **Catalog Description**

This course will use didactic and case-based approaches to demonstrate practical tools to facilitate translational research. There will be 12 topics taught each over one-hour blocks coordinated by a basic scientist or physician scientist with experience in translational research. The last session will conclude with student proposals to incorporate a clinical or translational component into their research program using methods discussed in the course. Students will be expected to attend at least 10 mornings of didactic and interactive teaching blocks over the twelve Intro to Translational Research Methods course. At the end of each session, the course directors will hold a Q&A session to discuss material covered in the session, answer questions students may have. Course directors will attempt to facilitate a connection between the student and clinical researchers at VUMC as appropriate during the course. There are no prerequisites for attending this course other than being a PhD student or post-doctoral fellow enrolled in one of the biomedical sciences programs at Vanderbilt University. The course will be graded as standard grading based on attendance and on completion of daily entries for each of the topic areas using a time stamped, on-line course management system that has been developed for the ASPIRE Program of Molecular Medicine. FALL [1] Brown, Luther

### **PATH-GS8356 - Introduction to Clinical Research Methods**

#### **Title**

Introduction to Clinical Research Methods

#### **Catalog Description**

This course will demonstrate practical tools to facilitate the implementation of clinical research methods. At the conclusion of the course, students will present plans to incorporate a clinical research component into their research program using methods discussed in the course. Course directors will attempt to facilitate a connection between the student and clinical researchers at VUMC as appropriate during the course. The two prerequisites for registering in this course are (1) current status as a Ph.D. student or post-doctoral fellow in one of the biomedical sciences programs at Vanderbilt University and (2) successful completion of the Fall semester Introduction to Clinical Research Methods course. SPRING [1] Brown, Luther

### **PATH-GS8999 - Non-Candidate Research**

#### **Title**

Non-Candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

### **PATH-GS9999 - Ph.D. Dissertation Research**

#### **Title**

Ph.D. Dissertation Research

#### **Catalog Description**

[0-12]

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## **Molecular Physiology and Biophysics**

### **MP&B7999 - Master's Thesis Research**

#### **Title**

Master's Thesis Research

#### **Catalog Description**

Students who decide against continuing their Ph.D. studies can opt to take a Master's degree if they meet the requirements. At that point students would be registered under MP&B 7999. Carrasco and Staff.

### **MP&B8323 - Advanced Neurophysiology**

#### **Title**

Advanced Neurophysiology

#### **Catalog Description**

(Also listed as Pharmacology 8323 and Neuroscience 8324) This class is a tutorial in methods for recording electrical signals in neurons. We will begin with a crash course on ion channels and transporters, spending a significant proportion of class time on discussion of recent primary research papers. In the latter part of the semester, we will move on to live demonstrations and personal training in the details of electrophysiological recording methods in several preparations. By the end of the course, students will be prepared to perform electrophysiological experiments as part of their dissertation research. SPRING. Greuter and Staff.

### **MP&B8324 - Tutorials In Physiology**

#### **Title**

Tutorials In Physiology

#### **Catalog Description**

The class meets once weekly. In the fall semester, graduate students critically evaluate research publications in areas of active research in the department (e.g., gene transcription, molecular biology, electrophysiology, membrane transport, intercellular signaling, beta cell biology, and regulation of intermediary metabolism). Also, there are faculty presentations on ancillary science skills, such as oral and poster presentations, and grant and proposal writing. In the spring semester, each student presents and defends a short research proposal based on their current research area in preparation for their Candidacy Examination. FALL, SPRING. [1] McGuinness, Karakas, Simerly and Jacobson

### **MP&B8326 - Exercise Physiology**

#### **Title**

Exercise Physiology

#### **Catalog Description**

The responses of different physiological systems to exercise. The effect and role of exercise under special conditions such as diabetes, reproduction, heart disease, and orthopedics and rehabilitation. Invited speakers will discuss the clinical and scientific aspects of the above topics. Prerequisite: consent of instructor. SPRING. [1-2] Wasserman.

## **MP&B8327 - Molecular Endocrinology**

### **Title**

Molecular Endocrinology

### **Catalog Description**

A survey of the molecular biology of hormone action from the target cell surface to the nucleus. Special emphasis on (i) diabetes and obesity and (ii) how receptors and intracellular messengers mediate hormone action, (iii) how hormones regulate gene expression, and (iv) signaling in adipocytes. Discussion of the use of genetic, molecular biology, and biochemical techniques to study hormone action. The faculty encourage an interactive atmosphere in the class through the discussion of seminal papers. This is an advanced course so some prior background in cell signaling is recommended. Prerequisite: consent of instructor. FALL. [2] O'Brien, Colbran, Carrasco, and Vickers.

## **MP&B8329 - Experimental Statistics Short Course**

### **Title**

Experimental Statistics Short Course

### **Catalog Description**

The goal of this course is to insure basic proficiency in statistical concepts, methods for analysis of experimental data, and enhance statistical communication skills. Core concepts to be discussed are: (1) Sources of data variation, data types that lead to different analyses (e.g. parametric vs nonparametric); (2) Variation in samples and populations, real world vs theoretical data distributions; (3) Importance and use of confidence intervals, effect size, power related to experimental design; (4) Meaning of statistical vs functional significance; and (5) Aspects of data analysis pitfalls (e.g., outliers, multiple tests, clustered data). Prerequisite: consent of instructor. SPRING [1] Carrasco and Staff

## **MP&B8330 - Human Physiology And Molecular Medicine**

### **Title**

Human Physiology And Molecular Medicine

### **Catalog Description**

Lectures and research correlations on advanced aspects of human physiology, with emphasis on communication between and control of the major tissue types and organ systems. Recent biochemical and molecular biology research findings will be incorporated into the study of normal physiology and pathophysiology. This course is required of all graduate students majoring in Molecular Physiology and Biophysics. Prerequisite: consent of instructor. The class size limit is 16. Preference will be given to Ph.D. students in the Molecular Physiology and Biophysics Graduate Program, students in the Master's Program in Biomedical Sciences and second year Ph.D. students who matriculated through the IGP/QCB. FALL. [3] Bosma

## **MP&B8332 - Scientific Reasoning and Logic in Gene Regulation**

### **Title**

Scientific Reasoning and Logic in Gene Regulation

### **Catalog Description**

Objective: To gain a detailed understanding of rigorous approaches to experimental design, strategies, and data interpretation using one of the most developed fields in modern biology - gene regulation - as a contextual backdrop. Drawing on over 40 years of primary research papers in gene control, this course will dissect how important problems are identified, how questions are framed to give rigorous answers, and how data are interpreted and new hypotheses generated. The topics to be covered include eukaryotic RNA polymerase and basal factor structure and function, chromatin and nucleosome structure, DNA and nucleosome modification and the effects of these components and factors on transcription, cell- and tissue-specific transcription factors and molecular mechanisms of gene control. As these topics are discussed, particular emphasis will be placed upon accessing the appropriateness of controls, techniques, data interpretation, and formulation of future experimentation in these areas. Class meetings are fully interactive, and require extensive input and critical evaluation from students. All class meetings revolve around the detailed discussion of assigned reading materials and require students to perform extensive reading of the original research literature. Prerequisite: IGP Bioregulation I. SPRING. [2] Tansey, Stein and Staff

## **MP&B8335 - Assessment of Metabolism in vivo: A Laboratory Course**

### **Title**

Assessment of Metabolism in vivo: A Laboratory Course

### **Catalog Description**

The objective of the course is to give students the tools needed to assess whether an experimental intervention (pharmacologic, genetic, dietary, or environmental) alters macronutrient metabolism, energy balance, cardiovascular homeostasis, or animal behavior. Students will learn how to measure whole body and tissue specific kinetics, the principles of which can be applied to the kinetics of drugs, substrates, and hormones. To accomplish this, we will use a combination of lectures, hands-on laboratories, demonstrations, and data-problem sessions. Prerequisite: consent of instructor. McGuinness and Staff

## **MP&B8340 - Human Genetics I**

### **Title**

Human Genetics I

### **Catalog Description**

(Also listed as Human Genetics HGENI 8340) Designed to cover background and latest advances in human molecular genetics. Topics will include the content of the human genome; human gene structure, function, and expression; cytogenetics and chromosomal abnormalities; the landscape of human genetic variation; genotyping and sequencing methods; the basis of human genetic disease; approaches to treating genetic disease, such as gene therapy; genetic counseling; ethical considerations of genetic testing and human gene editing. Topics will be discussed with reference to specific genetic diseases. FALL. [3] Mortlock

## **MP&B8341 - Human Genetics II**

### **Title**

Human Genetics II

### **Catalog Description**

(Also listed as HGEN 8341) This course will cover the statistical, population, and analytical aspects of modern human genetics research. Topics to be covered include human population genetics, quantitative genetics, disease gene discovery (emphasizing design, statistical and molecular techniques), linkage and association analyses, computational genetics, and evolutionary genetics. Clinical examples, subject ascertainment, and study design will also be emphasized. Students must have a strong understanding of Mendelian genetics and basic biostatistics. Prerequisite: consent of instructor. SPRING. [3]

## **MP&B8342 - Introduction to Physiology, Metabolism and Endocrinology**

### **Title**

Introduction to Physiology, Metabolism and Endocrinology

### **Catalog Description**

This course is designed to introduce first-year students in the "Masters Program in Biomedical Sciences" to essential basic concepts in the fields of physiology, metabolism and endocrinology. In the first part of the course the lecturers will discuss basic concepts in physiology with respect to: the circulatory system, heart, the pulmonary system, kidney, acid/base balance, muscle, liver and the autonomic nervous system. In the second part of the course the lecturers will discuss basic concepts in metabolism with respect to: glycolysis, the citric acid cycle, fatty acids and amino acids. This section will use exercise to illustrate how metabolism changes under different physiological conditions. In the third part of the course the lecturers will discuss basic concepts in endocrinology with respect to: thyroid hormone, insulin, glucagon and glucocorticoids. This section will also describe the critical role of the hypothalamic-pituitary axis in regulating secretion of multiple hormones with an emphasis on the regulation of energy balance and how this balance is perturbed in obesity. This course is designed to prepare students for two, more advanced second year courses: MPB 8330 (Human Physiology and Molecular Medicine) and MPB 8327 (Molecular Endocrinology). This course will be held in the Spring Semester. For students other than those in the Master's program, prior approval of the course director is required before signing up for this class. O'Brien and Staff. [2]

## **MP&B8345 - Cellular And Molecular Neuroscience**

### **Title**

Cellular And Molecular Neuroscience

### **Catalog Description**

(Also listed as Cell Biology 8345, Neuroscience 8345, Pharmacology 8345) This course is a required entry-level course for students in the Cell and Molecular Track of the Neuroscience Graduate Program at Vanderbilt that should be taken in the first graduate school year. It also serves as an elective for medical students and graduate students in a number of other programs. Its goal is to expose students to fundamental concepts and techniques in molecular and cellular neuroscience and provide a theoretical context for experimental analysis of brain function and disease. The course is divided into three modules. Module I: Neural Anatomy and Development provides an overview of the anatomy of the nervous system and neurotransmitters and examines concepts in neural pattern formation, neuronal migration, axon guidance, and synapse formation. Module II. Signaling, Plasticity, and Modulation reviews biophysical and molecular concepts relating to neuronal membrane excitability, secretion, and plasticity. Module III: Neural Diseases and Disease Models focuses on specific brain disorders such as epilepsy, pain disorders, Alzheimer's disease, depression, and schizophrenia and current models used to investigate their origin and/or treatment. This course combines faculty lecture with discussion of original articles, with an emphasis on fundamental concepts and the elucidation of important research paradigms in the discipline. Faculty and assistants guide students through important research paradigms with a critical analysis of the primary literature in the topic area. Prerequisite: Bioregulation I (IGP 8001) or consent of instructor. Course directors may consider undergraduate course work in cell biology or biochemistry to meet this requirement. SPRING. [4] Nakagawa, Emeson and Staff

## **MP&B8350 - Independent Study**

### **Title**

Independent Study

### **Catalog Description**

Students who are having difficulty in a specific area of biomedical sciences can obtain individual or small group coaching through this class. Carrasco and Staff. [1-3]

### **MP&B8999 - Non-Candidate Research**

#### **Title**

Non-Candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. Carrasco and Staff. [Variable credit: 0-12]

### **MP&B9999 - Ph.D. Dissertation Research**

#### **Title**

Ph.D. Dissertation Research

#### **Catalog Description**

This course is used for research following entry into Ph.D. candidacy (following successful completion of the Candidacy Examination). Carrasco and Staff. [0-12]

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## **Music Teacher Education**

### **MUED5000 - Philosophical Foundations and Contemporary Issues in Music Teaching**

#### **Title**

Philosophical Foundations and Contemporary Issues in Music Teaching

#### **Catalog Description**

A comprehensive study of historical trends and philosophies relevant to music teaching. Readings and discussions of the practical application of educational research studies to music teaching. SUMMER. [3] Perez.

### **MUED5010 - Methods and Materials in Instrumental Music**

#### **Title**

Methods and Materials in Instrumental Music

#### **Catalog Description**

Techniques and materials for teaching instrumental music from elementary through senior high school. Emphasizes instrumental organization, administration, pedagogical practices, and developing school instrumental music programs. FALL. [3] Verrier.

### **MUED5020 - Methods and Materials in Vocal/Choral Music**

#### **Title**

Methods and Materials in Vocal/Choral Music

#### **Catalog Description**

Techniques and materials for teaching vocal/choral music from elementary through senior high school. Emphasizes vocal music organization, administration, and pedagogical practices. FALL. [3] Biddlecombe.



### **MUED5030 - Methods and Materials in General Music, PreK through 12**

#### **Title**

Methods and Materials in General Music, PreK through 12

#### **Catalog Description**

Techniques and materials for teaching general music, PreK through 12. Classroom organization, administration, pedagogical practices, and general musical activities such as Orff, Kodaly, Dalcroze. [3]

### **MUED5100 - Advanced Studies for the Wind Band Conductor**

#### **Title**

Advanced Studies for the Wind Band Conductor

#### **Catalog Description**

Knowledge of concert band repertoire as applicable to band programs from intermediate to advanced levels. Score preparation, rehearsal strategies, and expansion of conducting skills to include longer and more complex musical structures. Specific emphasis on developing historical and pedagogical context for repertoire evaluation and selection. Repertoire to encompass a broad range of genres, styles, and levels of difficulty. FALL. [2] Verrier.

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## **Musicianship**

### **MUSC5110 - Intensive Musicianship I**

#### **Title**

Intensive Musicianship I

#### **Catalog Description**

Intensive immersive musical instruction modeled on language acquisition process, designed to provide musicians with practical skills in real-time aural processing, including interval identification, reading and notating pitch and rhythm, facility in each of the diatonic modes, aural tracking of multiple simultaneous parts. Open by instructor approval. SUMMER. [1] Ploger.

### **MUSC5120 - Intensive Musicianship II**

#### **Title**

Intensive Musicianship II

#### **Catalog Description**

Intensive immersive musical instruction modeled on language acquisition process, designed to provide musicians with practical skills in real-time aural processing, including interval identification, reading and notating pitch and rhythm, facility in each of the diatonic modes, aural tracking of multiple simultaneous parts. Open by instructor approval. SUMMER. [1] Ploger.

### **MUSC5130 - Intensive Musicianship III**

#### **Title**

Intensive Musicianship III

#### **Catalog Description**

Continuation of materials covered in Intensive Musicianship MUSC 5110 and 5120, including further real-time aural processing, with discussion of pedagogical approaches to teaching musicianship using a language-acquisition model. Prerequisite: MUSC 5120. SUMMER. [1] Ploger.

# Neurodiversity Inspired Science and Engineering

## **NISE6100 - The Science of Neurodiversity-Inspired Science and Engineering** **Title**

The Science of Neurodiversity-Inspired Science and Engineering

### **Catalog Description**

An overview of neurodiversity generally and autism specifically, for engineering and science students having no prior exposure. The course content will be custom-developed from primary literature on the basic neuroscience of autism (cell biology, electrophysiology, anatomy, neural networks), the clinical understanding of challenges faced by individuals with autism, the psychology and neuro-imaging research into autism-related capabilities, engineering examples of assistive technologies, and case studies of businesses hiring neurodiverse talent. [3]

## **NISE6200 - Applications of Neurodiversity-Inspired Science and Engineering** **Title**

Applications of Neurodiversity-Inspired Science and Engineering

### **Catalog Description**

Real-life applications of NISE are explored to inspire thesis projects and to gain appreciation for the connections across the broad swath of STEM disciplines involved. For example, students will learn about new artificial-intelligence approaches modeled on autistic visual thinking, virtual reality environments to develop social skills for the workplace, eye-tracker enabled apps for assessing visual cognitive skills, business approaches for matching neurodiverse individuals to jobs, and data visualization tools invented and commercialized by autistic developers. [3]

## **NISE6300 - Collaborative Approaches to Neurodiversity-Inspired Science and Engineering** **Title**

Collaborative Approaches to Neurodiversity-Inspired Science and Engineering

### **Catalog Description**

In this project-based course, student pairs will undertake future of work at the human-technology frontier design challenges directly connected to Autism & Innovation Research themes, which include but not limited to: 1) understanding the unique capabilities of neurodiverse individuals and learning how to match these capabilities to 21st-century workforce needs, 2) prototyping assistive technologies to enable employment and workplace success and 3) Exploring organizational practices that leverage the talents of autistic individuals and enhance innovation. In parallel, the students will be introduced to topics in robotics, psychometrics, apps development, data visualization, and others. Students identify a specific science or engineering challenge question, and final project presentations will be conducted. [3]

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# Neuroscience

## **NSC5240 - Neurobiology of Addiction** **Title**

Neurobiology of Addiction

### **Catalog Description**

Neural basis of the regulation and dysregulation of reward processing. Pathophysiology of addiction. Prerequisite 5201. [3]

**NSC5260 - Psychopharmacology****Title**

Psychopharmacology

**Catalog Description**

(Also listed as NSC 3260) Actions of therapeutic drugs for psychiatric disorders and of drugs of abuse. Molecular mechanisms of effects on perception, cognition, and emotion. No credit for students who have earned credit for 3260. [3]

**NSC5269 - Developmental Neuroscience****Title**

Developmental Neuroscience

**Catalog Description**

(Also listed as NSC 3269) Normal and abnormal brain development. Cell division, migration, and death; synapse formation and plasticity; and clinical syndromes. No credit for students who have earned credit for 3269. [3]

**NSC5272 - Structure and Function of the Cerebral Cortex****Title**

Structure and Function of the Cerebral Cortex

**Catalog Description**

(Also listed as NSC 3272) Classic and current concepts of cerebral function. Species differences, receptive field organization, neurotransmitters, modifications by experience, and behavioral effects. No credit for students who have earned credit for 3272. [3]

**NSC5274 - Neuroanatomy****Title**

Neuroanatomy

**Catalog Description**

(Also listed as NSC 3274) Functional and comparative anatomy of nervous systems, emphasis on vertebrate brains. Fundamental concepts, organizational principles, structure, connectivity, and how these relate to function and behavior. Demonstrations using plates with human brain sections. Prerequisite: 5201. [3]

**NSC5892 - Special Topics in Systems and Integrative Neuroscience****Title**

Special Topics in Systems and Integrative Neuroscience

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

## **NSC6270 - Computational Neuroscience**

### **Title**

Computational Neuroscience

### **Catalog Description**

Theoretical, mathematical, and simulation models of neurons, neural networks, or brain systems. Computational approaches to analyzing and understanding data from behavior, neurophysiology, electrophysiology, or brain imaging. Simulation methods for neural models. Course taught using Python. [3]

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## **Neuroscience (GS)**

### **NURO8302 - Techniques And Preparations**

#### **Title**

Techniques And Preparations

#### **Catalog Description**

Laboratory rotations undertaken by Integrative Track students that culminate in the selection of a thesis adviser. May be repeated for credit more than once if there is no duplication of topic. Students may enroll in more than one section of this course each semester. FALL, SPRING. [0-7]

### **NURO8320 - Neuroscience Research Forum**

#### **Title**

Neuroscience Research Forum

#### **Catalog Description**

Required of all students, and second-year students are required to take this course for credit. Students make oral presentations and are evaluated based on the clarity of the presentation and visual aids, as well as the ability of the presenter to answer questions. The course meets every week for one hour with two students presenting at each session. FALL, SPRING. [0]

### **NURO8324 - Advanced Neurophysiology**

#### **Title**

Advanced Neurophysiology

#### **Catalog Description**

(Also listed as Molecular Physiology and Biophysics 8323 and Pharmacology 8323) This class is a tutorial in methods for recording electrical signals in neurons. We will begin with a crash course on ion channels and transporters, spending a significant proportion of class time on discussion of recent primary research papers. In the latter part of the semester, we will move on to live demonstrations and personal training in the details of electrophysiological recording methods in several preparations. By the end of the course, students will be prepared to perform electrophysiological experiments as part of their dissertation research. SPRING. [3] Grueter.

## **NURO8325 - Experimental Design and Statistical Methodology**

### **Title**

Experimental Design and Statistical Methodology

### **Catalog Description**

The course provides an understanding of statistical methodology relevant to contemporary neuroscience research and uses computer software packages. Experimental design, constructing and deconstructing hypotheses are built into the course work. Statistical topics include descriptive statistics, analysis of variance, regression, correlation, contingency analysis, and the testing of methods for sampling natural populations. The course supports the goal of the Vanderbilt Neuroscience Program to produce a cohort of quantitatively savvy neuroscientists prepared to become future leaders in their area of research interest. FALL. [2] Konradi, Leich Hilbun

## **NURO8326 - Neuroscience Grant Writing**

### **Title**

Neuroscience Grant Writing

### **Catalog Description**

This self-guided course provides applied training in grant writing. Students will write an NRSA proposal and are assigned two faculty reviewers who will provide feed-back. Input from the mentor is essential but needs to be limited to verbal discussions with the student. The proposal will be written and submitted to the reviewers in stages, with three required face-to-face meetings. Passing of the course depends on the final quality of the proposal, the ability of the student to incorporate suggestions and to respond to criticism, and the adherence to deadlines laid out by the course directors at the beginning of the course. Eligible students: Neuroscience Direct Admit students in their first year, IGP students in their first year in the Neuroscience program, second overall year in graduate school. SPRING. [2] Konradi

## **NURO8327 - Graduate Neuroanatomy**

### **Title**

Graduate Neuroanatomy

### **Catalog Description**

This is a course on functional and comparative neuroanatomy, that is, on the structure of nervous systems and their commonalities and differences across different types of animals, including humans, and how that structure underlies function and behavior. The course is offered to up to 40 undergraduate and 10 graduate students, and consists of lectures that will also be heavily based on the discussion of reading materials that must be read prior to each class. Anatomical demonstrations will occur in the classroom. [3] Herculano

## **NURO8330 - Cognitive Neuroscience**

### **Title**

Cognitive Neuroscience

### **Catalog Description**

This course provides a broad understanding of the state of our knowledge in cognitive neuroscience. The emphasis is on the findings and concepts in the major branches of cognitive neuroscience, rather than techniques (although these will be discussed). The level of analysis will focus on human and non-human primate systems. Prerequisite: an introductory-level undergraduate course in neuroscience or physiological psychology. Basic knowledge of experimental cognitive psychology is desirable but not necessary. FALL. [3] Marois.

## **NURO8332 - Experimental Statistics Short Course**

### **Title**

Experimental Statistics Short Course

### **Catalog Description**

The goal of this course is to insure basic proficiency in statistical concepts, methods for analysis of experimental data, and enhance statistical communication skills. Core concepts to be discussed are: (1) Sources of data variation, data types that lead to different analyses (e.g. parametric vs nonparametric); (2) Variation in samples and populations, real world vs theoretical data distributions; (3) Importance and use of confidence intervals, effect size, power related to experimental design; (4) Meaning of statistical vs functional significance; and (5) Aspects of data analysis pitfalls (e.g., outliers, multiple tests, clustered data). Prerequisite: Permission of faculty. [1] Summer.

## **NURO8338 - Principles of Pharmacology in Neurobiological Research**

### **Title**

Principles of Pharmacology in Neurobiological Research

### **Catalog Description**

Most biological research depends on principles of pharmacology. Neuroscience is no exception. This course will focus on the application of fundamental principles in pharmacology for understanding the brain and behavior in rodents, as well as how this relates to observations in humans. Throughout the course we will discuss traditional and modern tools used to answer precise questions about the neural control of behavior. The course will incorporate a historical and modern perspective, highlighting neuroscience's roots in pharmacology and the future of applied neuropharmacology. Prerequisites: Fundamentals of Neuroscience I (NURO 8345) is strongly encouraged. Exceptions will be determined on a case-by-case basis. SPRING. [3] Calipari, Siciliano, and Konradi.

## **NURO8340 - Fundamentals of Neuroscience II**

### **Title**

Fundamentals of Neuroscience II

### **Catalog Description**

This is the second part of a two-semester course required for all Neuroscience graduate students. Parts I and II can be taken individually as electives for medical students and graduate students in other programs. The goal is for students to learn the general organization of the nervous system and its circuitry and understand the fundamental molecular and cellular bases underlying its development and function in normal and pathological conditions. In addition, the students learn how the cellular systems in the brain relate to the major branches of cognitive neuroscience. There are three themes that will be woven into the course to provide a continuum from molecules to cognition and disease: sensory systems, motor systems and memory. This course combines faculty lecture with discussion of original articles with an emphasis on fundamental concepts and the elucidation of important research paradigms in the discipline. Part I (NURO 8345) will emphasize the cellular and molecular aspects of neuroscience. Part II (NURO 8340) will emphasize systems in the brain and principles of cognition. Fall. [3] Womelsdorf

## **NURO8342 - Seminar In The Neurobiology Of Hearing And Multisensory Processes**

### **Title**

Seminar In The Neurobiology Of Hearing And Multisensory Processes

### **Catalog Description**

(Also listed as Hearing and Speech Sciences 8342) Study at the doctoral level of the neural processes underlying auditory and multisensory perception. The course will focus on critical readings of recently published findings that emphasize the connection between plasticity, neural systems, and behavior. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING. [Variable credit: 1-2] Polley, Wallace.

## **NURO8345 - Fundamentals of Neuroscience I**

### **Title**

Fundamentals of Neuroscience I

### **Catalog Description**

This is the first part of a 2-semester course required for all Neuroscience graduate students. Parts I and II can be taken individually as electives for medical students and graduate students in other programs. The goal is for students to learn the general organization of the nervous system and its circuitry and understand the fundamental molecular and cellular bases underlying its development and function in normal and pathological conditions. In addition, the students learn how the cellular systems in the brain relate to the major branches of cognitive neuroscience. There are 3 themes that will be woven into the course to provide a continuum from molecules to cognition and disease: sensory systems, motor systems and memory. This course combines faculty lecture with discussion of original articles with an emphasis on fundamental concepts and the elucidation of important research paradigms in the discipline. Part I (NURO 8345) will emphasize the cellular and molecular aspects of neuroscience. Part II (NURO 8340) will emphasize systems in the brain and principles of cognition. Prerequisite: Undergraduate coursework in cell biology or biochemistry or permission of the course directors. SPRING [4]. Emeson, Nakagawa and staff.

## **NURO8346 - Advanced Molecular Neurobiology**

### **Title**

Advanced Molecular Neurobiology

### **Catalog Description**

(Also listed as Pharmacology 8346) This course examines molecular components and interactions that regulate neuronal development, signaling, and disease. Topics include development of neuronal identity, axonal transport, growth factors and cell death, axon guidance and synapse formation, electrical and chemical transmission, regulation of neuronal excitability and genetic analysis of signaling and neural disorders. Didactic and literature discussions provide students with a sound foundation for understanding the molecular bases underlying the development and function of the nervous system. Prerequisite: Neuroscience 8345 or Pharmacology 8320, or consent of instructor. SPRING. [3] Emeson and Staff.

## **NURO8347 - The Visual System**

### **Title**

The Visual System

### **Catalog Description**

(Also listed as Cell and Developmental Biology 8347, Psychology 5780) An interdisciplinary approach to how humans see and interpret their visual environment. Topics include the structure of the eye and brain (including optics), the physiology of individual cells and groups of cells, machine vision and models of visual function, visual attention, and mechanisms of complex visual perception. Lectures by faculty from Psychology and Cell and Developmental Biology. Graduate students attend one hour discussion section per week in addition to lecture, and turn in a more extensive paper than undergraduates. SPRING. [3] Roe.

## **NURO8350 - Independent Study**

### **Title**

Independent Study

### **Catalog Description**

Qualified students work with individual faculty members in areas not covered in available courses. Prerequisite: approval by individual faculty member and program director. FALL, SPRING, SUMMER. [Variable credit: 1-3, with total credit limited to 3]

## **NURO8352 - Methods and Experimental Design in Neuroscience Research**

### **Title**

Methods and Experimental Design in Neuroscience Research

### **Catalog Description**

This course will focus on professional development and early-career planning, as well as guide students in the independent production of a National Science Foundation Graduate Research Fellowship Program grant, which will be submitted as part of the course. The class meets weekly to discuss topics including scientific ethics, communication, time management, as well as hear presentations on career options. [1] Grueter

## **NURO8365 - Neurobiology Of Disease**

### **Title**

Neurobiology Of Disease

### **Catalog Description**

Neurobiology of Disease. The goal of this graduate-level neuroscience course is to provide comprehensive understanding of pathology and pathophysiology of neuropsychiatric disorders. The course is divided in three modules: neurodevelopmental, neurological/neurodegenerative and psychiatric/addiction diseases. The course prepares students for intensive collaborations along the basic-translational-clinical continuum. The lectures will discuss clinical presentation and pathological features epidemiology, treatment, status of clinical research, animal models, and postulated cellular/molecular bases for >30 diseases. Prerequisite: NURO 8340 and 8345 and consent of instructor. [3] Spring , Deutch.

## **NURO8383 - Seminar in Auditory and Vestibular Neuroscience**

### **Title**

Seminar in Auditory and Vestibular Neuroscience

### **Catalog Description**

The course is a full semester course that combines a small amount of didactic teaching with seminar discussions to introduce students to the neuroscience of the auditory and vestibular systems. For each topic, the short didactic component introduces/refamiliarizes the students with the basic knowledge requisite for that particular topic; the seminar component following the didactic material involves a presentation of both classic papers as well as recent papers that represent the state of art in the field. The seminar component will train students to critically read primary literature, to present scientific information in clear and concise fashion, and provide a theoretical foundation for understanding sensory coding and its relationship with perception using the auditory brain as a model system. The group discussion will also explore the impact of the findings in the papers on various aspects of the field. NOTE: For Ph.D. students, completion of an introductory neuroscience course, or advisor approval required. For other students, permission of instructor required. FALL [3]

## **NURO8999 - Non-Candidate Research**

### **Title**

Non-Candidate Research

### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

## **NURO9999 - Ph.D. Dissertation Research**

### **Title**

Ph.D. Dissertation Research

### **Catalog Description**

[0-12]



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# Nursing Science

## **NRSC8301 - Foundations in Health Research: Concepts, Theories, and Approaches**

### **Title**

Foundations in Health Research: Concepts, Theories, and Approaches

### **Catalog Description**

This course focuses on the research continuum from initial idea to dissemination. The student will examine organizational theory and concepts as they will apply to their own area of research. Health research resources including funding organizations, research agendas and the state of the science will be emphasized. Students will gain an understanding of publishing and disseminating their own research in the literature. Through the course, understanding of research interests within the current health research environment is emphasized as a foundation for developing and disseminating focused research. [2] SPRING

## **NRSC8304 - Ethical and Legal Issues in Research**

### **Title**

Ethical and Legal Issues in Research

### **Catalog Description**

This course provides an overview of issues related to the responsible conduct of research, including data management, vulnerable populations, authorship and publication, conflicts of interest and collaboration. Federal and institutional guidelines are included. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [2] FALL

## **NRSC8305 - Leveraging Technology for Scholarly Inquiry**

### **Title**

Leveraging Technology for Scholarly Inquiry

### **Catalog Description**

This course provides an overview of informatics, a specialty that joins nursing science with information and analytical sciences throughout the data, information, knowledge, wisdom continuum. To take advantage of the current data-rich healthcare environment, scholars need to understand core informatics principles in order to use data for knowledge generation. In addition, this course familiarizes the student with technology tools to organize, interpret, and present data. [1]. FALL

## **NRSC8306 - Research Design**

### **Title**

Research Design

### **Catalog Description**

This course focuses on understanding, critiquing and applying concepts of causal inference and research design. Students will be introduced to a range of experimental and quasi-experimental designs available to address research aims and support strong causal inferences. Students will examine the relationship of research aims to research design, as well as the nature of threats to causal inference in research design. External validity and related threats to it will be reviewed and weighed against the need for high internal validity. Published research will be reviewed in group and individual assignments and used to develop the student's ability to evaluate the strength and weaknesses of research decision-making and designs. Prerequisites: Enrollment in the PhD program or consent of faculty. [3] FALL

## **NRSC8307 - Statistical Methods I**

### **Title**

Statistical Methods I

### **Catalog Description**

The focus of this course is on the foundational concepts of regression analysis and linear models. Coverage includes statistical control, preparatory work in conducting appropriate regression analyses including assumptions, model construction and estimation, use of regression diagnostics for adequacy of the model, assessment of multivariate and partial associations, as well as the use and interpretation of results from models incorporating multi-categorical variables. The use of computer software for conducting these analyses will be incorporated into the content. Published research is used to further develop the learner's ability to critically evaluate the appropriateness and rigor of the written presentations of results from the approaches being studied. Prerequisite: Enrollment in the VUSN PhD program (or consent of the instructor) and completion of a series of foundational statistical modules made available to the incoming student throughout the first year in the PhD in Nursing Science program. [2] Summer

## **NRSC8308 - Statistical Methods II**

### **Title**

Statistical Methods II

### **Catalog Description**

The extension of foundational linear modeling approaches to the analysis of data collected from longitudinal research designs is the focus of this course. Both traditional and modern approaches to analyzing longitudinal data from the simple two-group, pre-post design to considerably more complex mixed-effects longitudinal designs are included. Students are expected to interpret results generated from statistical software and to present relevant information in figures, tables, and text. Published research is used to further develop the learner's ability to evaluate the appropriateness and rigor of the written presentations of results from the approaches being studied. Prerequisite: Completion of NRSC8307 [2] Fall

## **NRSC8309 - Special Topics In Quantitative Methods**

### **Title**

Special Topics In Quantitative Methods

### **Catalog Description**

This course provides an overview of varied and timely topics in the field of quantitative methods. Exemplar topics may include issues in data collection methods such as using online or other resources, an examination of how quantitative data collection methods influence data management and analytic approaches, collection methods for physiological or psycho-social outcomes, and the benefits and drawbacks of using public data sets, conventional and new analytic techniques, as well as broader issues in the evolution of quantitative methods. Prerequisites: NRSC 8308, NRSC 8313; NRSC 8352 or NRSC 8382; or with permission from instructor(s). [2] FALL

## **NRSC8310 - Health, Health Care, Research, And Public Policy**

### **Title**

Health, Health Care, Research, And Public Policy

### **Catalog Description**

This course explores and critically analyzes theoretical and empirical approaches to understanding dynamic synergies between research, nursing practice, health care organization, and public policy and their impact on health. Strategies for dissemination, translation, and evaluation of evidence-based research findings to support health care practices and public policies to measurably improve health outcomes for selected populations and the student's phenomenon of interest will be discussed. Local, national, and global implications will be explored. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [2] SPRING

### **NRSC8311 - Role of the Scientist**

#### **Title**

Role of the Scientist

#### **Catalog Description**

This course consists of a series of lectures and learning activities directed at providing students with knowledge and skills to become stewards of the discipline and understand the responsibilities of a nurse scientist, including the ability to write about and orally defend positions within their area of science. Prerequisite: Enrollment in the PhD program and completion of Doctoral Seminar series. [2] SUMMER

### **NRSC8313 - Structure and Process of Scientific Inquiry**

#### **Title**

Structure and Process of Scientific Inquiry

#### **Catalog Description**

This course provides students with an introduction to theoretical and philosophical issues concerning the nature of science, contemporary issues in the funding and practice of generating and disseminating scientifically-generated knowledge, and criteria for evaluating knowledge claims. The course will enable students to become knowledgeable about forces affecting the practice of science and evaluate critical assumptions commonly embedded in the conduct of research. Prerequisite: enrollment in the PhD program or consent of faculty. [2] Fall.

### **NRSC8316 - Intro to Implementation Science**

#### **Title**

Intro to Implementation Science

#### **Catalog Description**

This course offers students an immersive experience in implementation science, the scientific study of methods and strategies that facilitate the uptake of evidence-based practice and research into regular use by practitioners and policymakers. Students are introduced to pertinent concepts, theories, frameworks, measures, and evaluation of implementation. Through selected readings, case studies, and independent activities, students will learn the principles and tools of implementation science. Students will begin to apply these principles and tools in select assignments. As part of this course, students will have the opportunity to enhance their leadership and teamwork. [2] Stolldorf

### **NRSC8321 - Doctoral Seminar I**

#### **Title**

Doctoral Seminar I

#### **Catalog Description**

This course is one in the series of nursing science doctoral seminars focusing on issues related to professional development and one's role as a scientist, preparation for qualifying examinations and professional presentations, the dissertation, and continued development of a program of research. The topics are selected by course faculty and the students based on emerging issues in the profession. Topics and experiences may include proposal development, grant applications, mock proposal reviews, qualifying examination situations, peer review processes, and dissemination of research findings. Prerequisite: Admission to the PhD program. FALL [1]

## **NRSC8322 - Doctoral Seminar II**

### **Title**

Doctoral Seminar II

### **Catalog Description**

This course is one in the series of nursing science doctoral seminars focusing on issues related to professional development and one's role as a scientist, preparation for qualifying examinations and professional presentations, the dissertation, and continued development of a program of research. The topics are selected by course faculty and the students based on emerging issues in the profession. Topics and experiences may include proposal development, grant applications, mock proposal reviews, qualifying examination situations, peer review processes, and dissemination of research findings. Prerequisite: Admission to the PhD program and completion of previous seminar course(s) in the series. SPRING [1]

## **NRSC8323 - Doctoral Seminar III**

### **Title**

Doctoral Seminar III

### **Catalog Description**

This course is one in a series of nursing science doctoral seminars focusing on issues related to professional development and one's role as a scientist, preparation for qualifying examinations and professional presentations, the dissertation, and continued development of a program of research. The topics are selected by course faculty and the students based on emerging issues in the profession. Topics and experiences may include proposal development, grant applications, mock proposal reviews, qualifying examination situations, peer review processes, and dissemination of research findings. Prerequisite: Admission to the Ph.D. program and completion of previous seminar course(s) in the series. SUMMER [1]

## **NRSC8342 - Informatics for Healthcare Research**

### **Title**

Informatics for Healthcare Research

### **Catalog Description**

This course provides an overview of informatics, a specialty that studies how people, processes, and technology are used to manage the data, information, knowledge, and wisdom continuum. To take advantage of the current data-rich healthcare environment, scholars need to understand core informatics principles to use data for knowledge generation. [1 credit]. FALL

## **NRSC8352 - Measurement in Research**

### **Title**

Measurement in Research

### **Catalog Description**

In this course, the student will develop expertise in the design, measurement, and analysis of studies employing generic outcomes. The impact of the researcher's decisions regarding conceptual models, treatment definition, risk adjustment strategies, and the application of statistical techniques will be explored. The student will also be expected to critically evaluate key measures to develop an overview, including measurement and analysis plans for a condition-specific outcome related to their phenomenon of interest. At least one controversy attendant to each generic outcome will be debated in class. Prerequisite: completion of Research Design and Statistics I. [3] FALL

### **NRSC8353 - Designing and Testing Interventions**

#### **Title**

Designing and Testing Interventions

#### **Catalog Description**

Analysis of methodological, ethical, and practical issues related to the design and implementation of theory-based intervention studies. Students conduct a critical analysis of existing and emerging interventions or consider a novel hypothetical intervention related to their chosen field of study and write an intervention research proposal. Prerequisites: NRSC 8308; NRSC 8313; NRSC 8352; or with permission from instructor(s). [2] FALL

### **NRSC8360 - Advanced Seminar in Statistical Methods**

#### **Title**

Advanced Seminar in Statistical Methods

#### **Catalog Description**

Special topics in advanced statistical methods that are not included in the NRSC8307 and NRSC8308 Statistical Methods course sequence. Known topics include the generalized linear modeling framework incorporating logistic, Poisson, and multi-level models, as well as approaches to assessing mediation effects. Other topics change to reflect the needs and interests of the student cohort. Published research is used to further develop the student's ability to evaluate the appropriateness and rigor of the written presentations of results from the approaches being studied. Prerequisite: completion of NRSC8307 and NRSC8308 [2] SPRING

### **NRSC8368 - Social Determinants of Health**

#### **Title**

Social Determinants of Health

#### **Catalog Description**

This course offers an overview of how conditions in places people live, learn, work and play affect their health and quality of life. The course will review Social Determinants of Health (SDOH) frameworks and students will learn to recognize multiple levels of non-medical factors that influence health outcomes. A series of lectures will offer insight into how structural, social and policy factors impact care of individuals in Nashville, and around the world. Students will reflect on how SDOH relate to their populations and phenomena of interest through classroom discussions and written assignments. Prerequisite: Enrollment in the PhD program or consent of faculty. [2] FALL

### **NRSC8380 - Knowledge Synthesis In Nursing Science**

#### **Title**

Knowledge Synthesis In Nursing Science

#### **Catalog Description**

This course provides a critical appraisal of the theoretical and empirical basis of nursing science. Theories and research generated to study phenomena related to nursing are evaluated and synthesized. Strategies for synthesizing extant knowledge in nursing are discussed. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [3] SPRING

## **NRSC8382 - Introduction to Health Services Research**

### **Title**

Introduction to Health Services Research

### **Catalog Description**

This course assists the student in acquiring skills for health services research (HSR). The course addresses common outcomes of HSR, as well as the knowledge and skills needed to evaluate the effectiveness of health service interventions within clinical settings, organizations and systems. The student will develop expertise in the design, analysis, and execution of core HSR methodologies from the perspective of safety and quality. The complex nature of health service interventions is emphasized within the context of implementation science. Strategies of attending to the execution and analysis of multilevel, multi-organizational studies will be addressed. Prerequisite: completion of Research Design, and Statistics I and II. [2] SPRING

## **NRSC8390 - Independent Study In Nursing Science**

### **Title**

Independent Study In Nursing Science

### **Catalog Description**

Individualized study and reading in areas of mutual interest to the student and faculty member. Prerequisite: consent of instructor. [Variable credit: 1-3]

## **NRSC8394 - Qualitative and Mixed Methods Research**

### **Title**

Qualitative and Mixed Methods Research

### **Catalog Description**

This course is designed to provide an introduction to and critical analysis of qualitative and mixed methods research in the development of nursing and health science. The course includes epistemology and philosophical assumptions of qualitative and mixed methods research; differentiation among types of qualitative and mixed methods study designs; issues in the research planning process related to qualitative and mixed methods research; rigor and assessment of quality; and methods for data collection and analysis. The course attends to ethical issues with an emphasis on cultural variations, diverse populations, and potential for describing disparities. [3]

## **NRSC8395 - Research Practicum**

### **Title**

Research Practicum

### **Catalog Description**

This course provides students with exposure to and involvement in the research process. Learning activities are based on student need and interest and determined according to best fit with available faculty research programs. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [Variable credit: 1-3]

## **NRSC8999 - Non-Candidate Research**

### **Title**

Non-Candidate Research

### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [Variable credit: 0-6]

## **NRSC9999 - Ph.D. Dissertation Research**

### **Title**

Ph.D. Dissertation Research

### **Catalog Description**

Prerequisite: Enrollment in the Ph.D. program and consent of faculty. [Variable credit: 0-6]

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## **Pharmacology (GS)**

### **PHAR-GS8310 - Pharmacology Journal Club**

#### **Title**

Pharmacology Journal Club

#### **Catalog Description**

Students make oral presentations of recent, high-impact publications in their field, with mandatory attendance of all students in the first three years in the Pharmacology Program. The course meets every week for one hour with one student presenting at each session. [0]

### **PHAR-GS8311 - Pharmacology Seminar**

#### **Title**

Pharmacology Seminar

#### **Catalog Description**

Students attend Pharmacology Seminars presented by nationally and internationally established investigators, interspersed with presentations by their peers. Pharmacology Seminar attendance is mandatory for all Pharmacology students, unless with special exemption from the DGS. The course meets every week for one hour.

### **PHAR-GS8320 - Fundamentals of Pharmacology and Drug Discovery**

#### **Title**

Fundamentals of Pharmacology and Drug Discovery

#### **Catalog Description**

This course is divided into three five- week modules. The first focuses on fundamentals aspects of pharmacological targets: receptor theory, enzyme kinetics, and cell signaling pathways. The second focuses on quantitative modeling of drug absorption, distribution, metabolism, and elimination. The third focuses on key aspects of drug discovery including target selection and validation, identification of early drug leads, optimization of those leads into compounds suitable for clinical development, transitioning from discovery to the early clinical development phase, and medical and marketing consideration that impact progress of a drug discovery program. The course will be taught by a team of faculty members with considerable real- world experience applying these concepts to drug discovery. In addition to guided readings and lectures, students will participate in weekly journal article discussions and active learning exercises designed to enhance students understanding of recent developments and application of fundamental concepts. May be repeated for credit if there is no duplication of topic. FALL [2 per module] Davies, Jones, Niswender, Kramlinger.

## **PHAR-GS8322 - Scientific Communications I**

### **Title**

Scientific Communications I

### **Catalog Description**

This interactive course gives students experience preparing and delivering scientific presentations that effectively communicate scientific research. In the course, students will prepare and present a 10-minute journal club, a 10-minute specific aims talk for the Pharmacology Retreat, and a 15-minute presentation of their scientific research for a lay audience. Following the course, the student will also be required to present a 30-min Journal Club to the Pharmacology Department during the spring semester. As preparation for their retreat talk, students will also write a draft Specific Aims page and a 2-page Background and Significance section that will be further developed into a full fellowship proposal during the Spring Scientific Communication II course.

Prerequisite: Enrollment in the Pharmacology Ph.D. program or consent of course directors. FALL [2] Davies

## **PHAR-GS8323 - Scientific Communication Skills II**

### **Title**

Scientific Communication Skills II

### **Catalog Description**

This course will leverage the writing assignments of the fall Scientific Communications course (8322) to accelerate preparation of a draft NRSA fellowship (or equivalent such as AHA) application. During the fall course, a draft Specific Aims page is written and critiqued. In this spring course, students will write the next two sections of their application and have it peer-reviewed. These writing assignments are intended to be self-guided with significant support by the student's mentor. The applications will subsequently be submitted for funding to the proper agency. Pre-requisite: Completion of PHAR-GS 8322 and Enrollment in the Ph.D. program. SPRING. Davies and faculty [2]

## **PHAR-GS8328 - Experimental Design and Statistical Methodology, and Responsible Conduct**

### **Title**

Experimental Design and Statistical Methodology, and Responsible Conduct

### **Catalog Description**

This course provides the fundamentals necessary to conceptualize all components that lead to responsible research approaches, including methodical experimental design, analytical assessment of the literature, and proper interpretation of data. Students learn how to design experiments with rigorous and reproducible results and how to appropriately develop experimental models. Topics include research integrity, bias, scientific transparency, data- and material sharing, proper record maintenance, accurate data presentation, and statistical analysis. SPRING [2] Konradi

## **PHAR-GS8338 - Principles of Pharmacology in Neurobiological Research**

### **Title**

Principles of Pharmacology in Neurobiological Research

### **Catalog Description**

Principles of Pharmacology in Neurobiological Research. Most biological research depends on principles of pharmacology. Neuroscience is no exception. This course will focus on the application of fundamental principles in pharmacology to understanding the brain and behavior in animal models and how this relates to observations in humans. In the first part of the course we will discuss traditional and modern tools used to answer questions about the neural control of behavior, while in the second part of the course we will examine the challenges of applying pharmacological principles to the multi-dimensional features of human mental disorders. The course will incorporate a historical and modern perspective, highlighting neuroscience's roots in pharmacology and the future of applied neuropharmacology. SPRING [3] Konradi



## **PHAR-GS8345 - Fundamentals of Neuroscience I**

### **Title**

Fundamentals of Neuroscience I

### **Catalog Description**

This course can be taken as an elective for graduate students in Pharmacology. It emphasizes the cellular and molecular aspects of neuroscience. The goal is for students to learn the general organization of the nervous system and its circuitry and understand the fundamental molecular and cellular bases underlying its development and function in normal and pathological conditions. In addition, the students learn how the cellular systems in the brain relate to the major branches of cognitive neuroscience. There are 3 themes that will be woven into the course to provide a continuum from molecules to cognition and disease: sensory systems, motor systems and memory. This course combines faculty lecture with discussion of original articles with an emphasis on fundamental concepts and the elucidation of important research paradigms in the discipline. Prerequisite: Undergraduate coursework in cell biology or biochemistry or permission of the course directors. SPRING [4].

## **PHAR-GS8350 - Independent Study**

### **Title**

Independent Study

### **Catalog Description**

Qualified students work with individual staff members in areas not covered in other available courses. Prerequisite: approval of staff member and department chair. FALL, SPRING, SUMMER. [1-2,] Staff.

## **PHAR-GS8360 - Current Issues In Pharmacology**

### **Title**

Current Issues In Pharmacology

### **Catalog Description**

Presentation of current advances, paradigm shifts, and problems in pharmacology with an emphasis on experimental approaches and their interpretation. Prerequisite: consent of instructor. SPRING. [Variable credit: 1-3] Staff.

## **PHAR-GS8999 - Non-Candidate Research**

### **Title**

Non-Candidate Research

### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

## **PHAR-GS9999 - Ph.D. Dissertation Research**

### **Title**

Ph.D. Dissertation Research

### **Catalog Description**

[0-12]

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## **Philosophy**

**PHIL5665 - Racial Justice Lab**

**Title**

Racial Justice Lab

**Catalog Description**

Application of philosophical race theory to concrete problems of racial justice. Collaborative, problem-centered exercise culminating in student-designed projects. Themes vary by semester. [3]

**PHIL5900 - Figures in Philosophy**

**Title**

Figures in Philosophy

**Catalog Description**

[3]

**PHIL5903 - Kant's Theoretical Philosophy**

**Title**

Kant's Theoretical Philosophy

**Catalog Description**

Immanuel Kant's 1781/1787 Critique of Pure Reason in context of his earlier philosophy and broader system of philosophy. [3]

**PHIL5905 - History of Normative Ethics**

**Title**

History of Normative Ethics

**Catalog Description**

Normative ethics in Western philosophy, including eudaimonism, virtue ethics, deontology, utilitarianism, and care ethics. Historical texts and contemporary applications. [3]

**PHIL5910 - History of Philosophy**

**Title**

History of Philosophy

**Catalog Description**

[3]

**PHIL5920 - Topics in Philosophy**

**Title**

Topics in Philosophy

**Catalog Description**

[3]

**PHIL5922 - Democracy****Title**

Democracy

**Catalog Description**

Democratic government: duty to vote, alternatives to full suffrage, the epistemic dimension of democratic authority, and various cognitive dysfunctions that democracy encourages. Readings from contemporary journal literature. [3]

**PHIL7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-12]

**PHIL8000 - Teaching and Research Methods****Title**

Teaching and Research Methods

**Catalog Description**

Survey of methods of research in philosophy and examination and discussion of teaching methods. Required of all first-year graduate students. [2]

**PHIL8001 - Philosophical Readings in French****Title**

Philosophical Readings in French

**Catalog Description**

Selected major philosophical works or a selected bibliography about a major philosophical problem, read in French. A translation examination and appropriate reports. Prerequisite: department approval. [3]

**PHIL8002 - Philosophical Readings in German****Title**

Philosophical Readings in German

**Catalog Description**

Selected major philosophical works or a selected bibliography on a major philosophical problem. A translation examination and appropriate reports. Prerequisite: department approval. [3]

**PHIL8003 - Philosophical Readings in Classical Languages (Latin or Greek)****Title**

Philosophical Readings in Classical Languages (Latin or Greek)

**Catalog Description**

Reading in Latin or Greek of selected major philosophical works or a selected bibliography on a major philosophical problem. A translation examination and appropriate reports. Prerequisite: department approval. [3]

**PHIL8050 - Readings in Philosophy****Title**

Readings in Philosophy

**Catalog Description**

Selected major philosophical works or a selected bibliography about a major philosophical problem. Appropriate reports and examination. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PHIL8999 - Non-candidate Research****Title**

Non-candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**PHIL9000 - Figures in Philosophy****Title**

Figures in Philosophy

**Catalog Description**

Survey of figures in the history of philosophy. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PHIL9010 - History of Philosophy****Title**

History of Philosophy

**Catalog Description**

Survey of figures and/or topics in history of philosophy. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PHIL9020 - Topics in Philosophy****Title**

Topics in Philosophy

**Catalog Description**

Survey of topics in philosophy. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PHIL9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

# Physics

## **PHYS5200 - Statistical Physics**

### **Title**

Statistical Physics

### **Catalog Description**

Temperature, work, heat, and the first law of thermodynamics. Entropy and the second law of thermodynamics. Kinetic theory of gases with applications to ideal gases and electromagnetic radiation. Serves as repeat credit for students who have completed 5207. No credit for students who have earned credit for 3200 or 3207. Prerequisite or corequisite: 5270 or 5275. [3]

## **PHYS5210 - Classical and Modern Optics**

### **Title**

Classical and Modern Optics

### **Catalog Description**

(Also listed as PHYS 2210) Geometrical optics, including reflection, refraction, ray tracing, aberrations, and interference. Physical optics, including wave theory, absorption, dispersion, diffraction, and polarization. Properties of light from lasers and synchrotron sources. Photodetectors and optical technology. No credit for students who have earned credit for 2210. [3] (MNS)

## **PHYS5237 - Computational Physics**

### **Title**

Computational Physics

### **Catalog Description**

(Also listed as PHYS 2237) Topics in modern physics analyzed exclusively with computer programs. Three-body solar system orbits. Random walk diffusion and entropy growth. Magnetism in the second order using model, non-equilibrium molecular dynamics. Solutions to the Schrödinger equation with numerical methods. No credit for students who have earned credit for 2237. [3]

## **PHYS5250 - Concepts and Applications of Quantum Physics**

### **Title**

Concepts and Applications of Quantum Physics

### **Catalog Description**

(Also listed as PHYS 2250) Atomic and molecular structure, interaction of light with atoms and molecules, and spectroscopy. One three-hour laboratory per week. No credit for students who have earned credit for 2250 or 2250W. [4] (MNS)

## **PHYS5260 - Modern Physics**

### **Title**

Modern Physics

### **Catalog Description**

(Also listed as PHYS 2260) Condensed-matter physics, biophysics, special theory of relativity, and nuclear and particle physics. One three-hour laboratory per week. No credit for students who have earned credit for 2260 or 2260W. [4]

## **PHYS5290 - Electricity, Magnetism, and Electrodynamics I**

### **Title**

Electricity, Magnetism, and Electrodynamics I

### **Catalog Description**

(Also listed as PHYS 2290) Electrostatic fields and potentials. Gauss's law. Electrical properties of insulators, semiconductors, and metals. The Lorentz force. Magnetic fields and forces. Electromagnetic induction, Maxwell's equations, and electromagnetic waves. No credit for students who have earned credit for 2290. [3]

## **PHYS5291 - Electricity, Magnetism, and Electrodynamics II**

### **Title**

Electricity, Magnetism, and Electrodynamics II

### **Catalog Description**

(Also listed as PHYS 2291) Continuation of 229a. Electromagnetic waves in dielectrics and conductors. Electromagnetic radiation in waveguide structures. Relativistic electrodynamics. Magnetism as a relativistic phenomenon. No credit for students who have earned credit for 2291. [3]

## **PHYS5640 - Physics of Condensed Matter**

### **Title**

Physics of Condensed Matter

### **Catalog Description**

(Also listed as PHYS 3640) Crystal structure and diffraction. Phonons and lattice vibrations. Free-electron theory of metals. Elementary band theory of solids. Semiconductors. Optical properties of insulators. Applications to solid-state devices, magnetism, and superconductivity. No credit for students who have earned credit for 3640. [3]

## **PHYS5651 - Advanced Quantum Mechanics I**

### **Title**

Advanced Quantum Mechanics I

### **Catalog Description**

(Also listed as PHYS 3651) Wave-particle duality, indeterminacy, superposition, the Schrödinger equation, angular momentum, the hydrogen atom, and spin and indistinguishability. No credit for students who have earned credit for 3651. [3]

## **PHYS5652 - Advanced Quantum Mechanics II**

### **Title**

Advanced Quantum Mechanics II

### **Catalog Description**

(Also listed as PHYS 3652) Time-independent and time-dependent perturbation theory, matrix theory, scattering, applications to atomic physics, condensed matter physics, and astrophysics. No credit for students who have earned credit for 3652. [3]

**PHYS5660 - Introduction to Particle Physics****Title**

Introduction to Particle Physics

**Catalog Description**

(Also listed as PHYS 3660) Weak, strong, and electromagnetic forces as evidenced by the interactions of elementary particles. Classification of particles and experimental techniques. No credit for students who have earned credit for 3660. [3]

**PHYS5890 - Selected Topics****Title**

Selected Topics

**Catalog Description**

(Also listed as PHYS 3890) No credit for students who have earned credit for 3890. [1-3] (No AXLE credit)

**PHYS7007 - Radiation Dose Assessment****Title**

Radiation Dose Assessment

**Catalog Description**

Advanced physics of radiation interactions, shielding, and dosimetry. Gamma ray and neutron shielding; internal and external dosimetry methods and models; radiation protection regulations; environmental monitoring for radioactive materials; and response to radiation accidents and emergencies. Use of specialized computer programs. Prerequisite: 3125. [3]

**PHYS7125 - Health Physics****Title**

Health Physics

**Catalog Description**

(Also listed as PHYS 3125) Theory and instrumentation in health physics and radiological physics. Radiation shielding design, methods of external and internal dosimetry, and radiation regulatory issues. No credit for students who have earned credit for 3125. [3]

**PHYS7645 - Radiation Detectors and Measurements****Title**

Radiation Detectors and Measurements

**Catalog Description**

(Also listed as PHYS 3645) Basic physics principles and applications of radiation detecting instruments, with laboratory exercises. Techniques and instrumentation for nuclear radiation detection and measurements as they relate to health physics (radiation safety) and nuclear physics. No credit for students who have earned credit for 3645. [4]

**PHYS7999 - Master's Thesis Research**

**Title**

Master's Thesis Research

**Catalog Description**

[0-13]

**PHYS8000 - Seminar**

**Title**

Seminar

**Catalog Description**

[1]

**PHYS8001 - Physics Colloquium**

**Title**

Physics Colloquium

**Catalog Description**

Weekly colloquium attendance and mandatory participation in online discussion forum. Required evaluation of presentations based on content, visual aids, and delivery. Offered on satisfactory/unsatisfactory basis. [0]

**PHYS8002 - Learning to Teach, Teaching to Learn**

**Title**

Learning to Teach, Teaching to Learn

**Catalog Description**

Directed readings and discussion of topics in the teaching of science and engineering. Practical application of best teaching practices will be emphasized. Intended primarily for first-time teaching assistants and first-year graduate students. [1]

**PHYS8003 - Teaching Practicum**

**Title**

Teaching Practicum

**Catalog Description**

Discussion of best teaching practices in weekly meeting with instructor. Application of teaching strategies via teaching undergraduate lab or leading homework help-desk sessions. Offered on satisfactory/unsatisfactory basis. [0-1]

**PHYS8004 - Fisk-Vanderbilt Bridge Program Seminar**

**Title**

Fisk-Vanderbilt Bridge Program Seminar

**Catalog Description**

Attendance and participation in monthly Bridge seminar. Engagement in academic and professional development workshop activities. [0]



## **PHYS8005 - Mathematical Methods for Physicists**

### **Title**

Mathematical Methods for Physicists

### **Catalog Description**

Linear spaces and operators; matrix algebra; differential equations; Green's function; and complex analysis. May include variational calculus; perturbation methods; group theory. [3]

## **PHYS8010 - Particle and Continuum Mechanics**

### **Title**

Particle and Continuum Mechanics

### **Catalog Description**

Least action principle, Lagrange formalism, conservation laws, two-body problem, small-amplitude vibrations, non-inertial reference frames, canonical formalism, rigid body motion, continuous media, and field theory. Includes programming on scientific work stations. Prerequisite or corequisite: 8005. [3]

## **PHYS8020 - Advanced Electrodynamics**

### **Title**

Advanced Electrodynamics

### **Catalog Description**

Electrostatics, potentials, boundary value problems, multipole moments, polarization, magnetostatics, Maxwell's equations, electromagnetic wave propagation, dissipative and conductive media. Prerequisite or corequisite: 8005. [3]

## **PHYS8021 - Advanced Electrodynamics**

### **Title**

Advanced Electrodynamics

### **Catalog Description**

Continuation of 8020. Covariant formulation, least-action principle and Lagrange density, energy momentum tensor, charges in external fields, radiation from accelerated charges, multipole radiation. Prerequisite: 8020. [3]

## **PHYS8030 - Quantum Mechanics**

### **Title**

Quantum Mechanics

### **Catalog Description**

Underlying assumptions. Schrodinger equation: interpretation, discrete and continuous basis, change of basis. One-dimensional examples: square potential, harmonic oscillator. Uncertainty relations, symmetries and their implications, angular momentum, hydrogen atom, spin, systems with N-degrees of freedom; time independent perturbation theory, Fermi's golden rule. Corequisite: 8005. [3]

## **PHYS8031 - Quantum Mechanics**

### **Title**

Quantum Mechanics

### **Catalog Description**

Continuation of Phys 8030. Variational method, degenerate second order perturbation theory. Brief introduction to group theory with rotation group and Lorentz group as examples, addition of angular momentum, Wigner-Ekhardt theorem, derivation of covariant spin-half wave functions. Potential scattering theory: angular momentum decomposition, T-matrix, S-matrix, Lippman-Schwinger equation, scattering by two potentials, local and separable potentials. Dirac equation: current conservation; completeness; parity, time reversal, and charge conjugation symmetries; co-variant solution of the hydrogen atom; Feynman propagator. Prerequisite: 8030. [3]

## **PHYS8040 - Statistical Mechanics**

### **Title**

Statistical Mechanics

### **Catalog Description**

Phase space, entropy and reversibility; ensemble theory; Fermi and Bose Statistics; systems of interacting particles; equation of state, critical phenomena, and phase transitions; pairing and superfluidity. [3]

## **PHYS8100 - Selected Topics in Theoretical Physics**

### **Title**

Selected Topics in Theoretical Physics

### **Catalog Description**

Topics such as Lie groups and symmetry principles in quantum mechanics, quantum electrodynamics of strong field, phenomenological modes of nuclear structure. Prerequisite: consent of instructor. [3]

## **PHYS8105 - Special Topics in Experimental Physics**

### **Title**

Special Topics in Experimental Physics

### **Catalog Description**

Current topics in experimental physics relevant to research areas in the department, such as biological, condensed- matter, elementary-particle, nuclear, and optical physics, astronomy, astrophysics and cosmology. [Variable credit: 1-3]

## **PHYS8111 - Professional Scientific Writing**

### **Title**

Professional Scientific Writing

### **Catalog Description**

Preparing abstracts, journal articles, grant proposals, and fellowship applications. Communicating effectively by writing from the readers' perspective. Designing clear and information-rich figures. [3]

## **PHYS8120 - Biomolecular Physics**

### **Title**

Biomolecular Physics

### **Catalog Description**

Physical principles applied to the structure and dynamics of biological molecules on the nanometer scale. Emphasis on the random Brownian motion that dominates at all length scales, and how bimolecular structures move, function, and interact amid chaotic thermal fluctuations. Selected measurement techniques. [3]

## **PHYS8122 - Physics of Living Systems**

### **Title**

Physics of Living Systems

### **Catalog Description**

Physical principles applied to biological phenomena. Development of physical models of biological systems on scales ranging from molecules to organisms. Biological applications of mechanics, thermodynamics, and dynamical systems. [3]

## **PHYS8124 - Physical Measurements on Biological Systems**

### **Title**

Physical Measurements on Biological Systems

### **Catalog Description**

(Also listed as Biomedical Engineering 7425) A survey of the state of the art in quantitative physical measurement techniques applied to cellular or molecular physiology. Topics include the basis for generation, measurement, and control of the transmembrane potential; electrochemical instrumentation; optical spectroscopy and imaging; X-ray diffraction for determination of macromolecular structure; magnetic resonance spectroscopy and imaging. One lecture and one recitation. [3]

## **PHYS8126 - Theoretical and Experimental Systems Biology**

### **Title**

Theoretical and Experimental Systems Biology

### **Catalog Description**

Introduction to systems biology from the perspective of the emergence of complexity in toy models. Simple biological subsystems, their reductionist and equivalent models, and measurements required to specify model architecture and parameters. Multiple interconnected organs-on-chips as dynamic biological systems that can model organismal biology. [3]

## **PHYS8128 - Biophysical Electrodynamics**

### **Title**

Biophysical Electrodynamics

### **Catalog Description**

The physics of bioelectric phenomena: the mechanisms that lead to the transmembrane resting and action potentials in nerve and muscle cells, the differential equations describing propagation of the nerve action potential, and the relationship between the transmembrane and extracellular potentials in nerve and cardiac muscle. [3]

**PHYS8140 - Nuclear Theory****Title**

Nuclear Theory

**Catalog Description**

Basic experimental facts and phenomenological models (shell model and collective model). Nucleon-nucleon interaction, mean-fields theories of nuclear structure (Hartree-Fock, BSC pairing, HFB, RPA, and QRPA). Ab-initio calculations for light nuclei. Time-dependent Hartree-Fock calculations of heavy-ion reactions. Prerequisite or co-requisite 8030. [3]

**PHYS8142 - Relativistic Heavy Ion Physics****Title**

Relativistic Heavy Ion Physics

**Catalog Description**

Basic experimental facts and phenomenological models of ultra-relativistic heavy-ion collisions. Quark-gluon plasma formation, signatures, and properties. Thermodynamics and hydrodynamical evolution of nuclear matter in extreme conditions. Prerequisite or corequisite: 8030, 8040. [3]

**PHYS8144 - Experimental Nuclear Physics****Title**

Experimental Nuclear Physics

**Catalog Description**

Interactions of charged particles and photons in matter, coordinate transformations, statistics of nuclear processes, radiation detectors and analyzers, and selected topics in the design and application to experiments of particle accelerators and instrumentation used in nuclear and high energy physics. [3]

**PHYS8150 - Electromagnetic Spectroscopy****Title**

Electromagnetic Spectroscopy

**Catalog Description**

Interaction of electromagnetic radiation with matter as a function of photon energy and flux. Mechanisms of absorption, emission, and scattering of light within the visible, infrared, ultraviolet, and x-ray wavelength regimes. Experimental and computational techniques and instrumentation for assessing and analyzing spectroscopic information. Prerequisite: 8030. [3]

**PHYS8152 - Quantum Mechanics of Solids****Title**

Quantum Mechanics of Solids

**Catalog Description**

Free-electron theory of metals; elementary band theory of solids; quantum theory of the harmonic crystal; elementary excitations; optical properties of materials; electronic basis of magnetic interactions; density-functional theory; relativistic band structure; electronic localization and amorphous solids; two-dimensional phase transitions and superlattices. Consent of instructor required. [3]

## **PHYS8154 - Nanoscale Condensed Matter**

### **Title**

Nanoscale Condensed Matter

### **Catalog Description**

Evolution of elementary excitations; optical, magnetic, electronic, and mechanical characteristics of matter at nanometer length scales. Effects of one, two, and three dimensional electron confinement. Novel single-particle and collective properties of nanometer-size objects, including optical, magnetic, thermal, and transport phenomena. Prerequisite: 8030. [3]

## **PHYS8156 - Surface Structure and Dynamics**

### **Title**

Surface Structure and Dynamics

### **Catalog Description**

Geometrical and electronic structure of surfaces, including surface reconstruction, density of states, and effects of adsorbates, impurities, and electronic defects. Prerequisite: 8030-8031. [3]

## **PHYS8158 - Interactions of Photons with Atoms, Molecules, and Solids**

### **Title**

Interactions of Photons with Atoms, Molecules, and Solids

### **Catalog Description**

Macroscopic optical properties of solids. Lorentz model of optical excitation, radiative and non-radiative relaxation. Coherence and dephasing in two-level systems. Interband transitions and luminescence. Optical properties of quantum-confined systems. Excitons, phonons, plasmons, and polaritons. Lasers, Raman and Brillouin scattering, nonlinear optical phenomenology. Prerequisite: 5651, 5640 or CHEM 5360. [3]

## **PHYS8159 - Experimental Nanoscale Fabrication and Characterization**

### **Title**

Experimental Nanoscale Fabrication and Characterization

### **Catalog Description**

Laboratory introduction to nanofabrication and characterization. Preparation for independent and original research in nanotechnology and nanoscience. Review of nanomaterials, nanofabrication, characterization, nanoelectronics, and photonics. [3]

## **PHYS8160 - General Relativity and Cosmology**

### **Title**

General Relativity and Cosmology

### **Catalog Description**

Einstein's geometric theory of gravity in terms of tensor analysis and differential geometry. Einstein's field equations are derived and solutions are discussed. Applications of general relativity are explored, including those to very strong gravitational fields, gravitational collapse, neutron stars, black holes, and quantum gravity. Topics in cosmology will include red shifts and cosmic distance relations, big bang cosmology, primordial nucleosynthesis, the very early universe and inflationary cosmologies. Prerequisite: consent of instructor. [3]

## **PHYS8161 - General Relativity and Cosmology**

### **Title**

General Relativity and Cosmology

### **Catalog Description**

Continuation of 8160. Einstein's geometric theory of gravity in terms of tensor analysis and differential geometry. Einstein's field equations are derived and solutions are discussed. Applications of general relativity are explored, including those to very strong gravitational fields, gravitational collapse, neutron stars, black holes, and quantum gravity. Topics in cosmology will include red shifts and cosmic distance relations, big bang cosmology, primordial nucleosynthesis, the very early universe and inflationary cosmologies. Prerequisite: consent of instructor. [3]

## **PHYS8164 - Many-Particle Quantum Theory**

### **Title**

Many-Particle Quantum Theory

### **Catalog Description**

Nonrelativistic theory of atoms, solids, and nuclei; operators in second quantization, fermions and bosons, pair correlation function, interacting electron gas (metal), propagators, Wick's theorem and Feynman diagrams, Hartree-Fock theory, shell model, pairing forces in nuclei, and superconductivity. Prerequisite: 8031. [3]

## **PHYS8170 - Quantum Field Theory**

### **Title**

Quantum Field Theory

### **Catalog Description**

Relativistic quantum mechanics, canonical and path-integral field quantization, relativistic scattering theory, perturbation expansions; Feynman diagrams and radiative corrections, renormalization and regularization, with applications to quantum electrodynamics and non Abelian gauge theories. Prerequisite: 8010, 8020, 8030, and 8031. Corequisite: 8021. [3]

## **PHYS8171 - Quantum Field Theory**

### **Title**

Quantum Field Theory

### **Catalog Description**

Relativistic quantum mechanics, canonical and path-integral field quantization, relativistic scattering theory, perturbation expansions; Feynman diagrams and radiative corrections, renormalization and regularization, with applications to quantum electrodynamics and non Abelian gauge theories. Prerequisite: 8170. [3]

## **PHYS8189 - Particle Physics**

### **Title**

Particle Physics

### **Catalog Description**

The standard model of particle physics. Space-Time Symmetries, The Quark Model, Feynman Diagrams, Accelerators and Detectors, Electro-Weak Interaction, Gauge Theories, Spontaneous Symmetry Breaking, The Higgs Boson, The W and Z Bosons, Quark Mixing Angles and Weak Decays, Neutrino Masses and Mixings.

**PHYS8190 - Independent Study****Title**

Independent Study

**Catalog Description**

May be repeated for credit more than once, but students may earn only up to 3 credits per semester of enrollment. [1-3]

**PHYS8999 - Non-candidate Research****Title**

Non-candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-13]

**PHYS9995 - Half-time Ph.D. Dissertation Research****Title**

Half-time Ph.D. Dissertation Research

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

**PHYS9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-13]

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## Political Science

**PSCI5202 - Ancient Political Thought****Title**

Ancient Political Thought

**Catalog Description**

(Also listed as PSCI 2202) Greek and Roman political traditions. Plato, Aristotle, Cicero, and early Christian thinkers. Questions of justice, equality, democracy, and political knowledge. No credit for students who have earned credit for 2202. [3]

**PSCI5203 - History of Modern Political Philosophy****Title**

History of Modern Political Philosophy

**Catalog Description**

(Also listed as PSCI 2203) Intensive analysis of the principal political philosophers in the modern tradition. No credit for students who have earned credit for 2203. [3]

**PSCI5204 - American Political Thought****Title**

American Political Thought

**Catalog Description**

(Also listed as PSCI 2204) An analytical study of American political theories and their impact upon our political institutions. Prerequisite or corequisite: 100, 101, 102, 103, or 150. [3] (US)

**PSCI5205 - Contemporary Political Theory****Title**

Contemporary Political Theory

**Catalog Description**

(Also listed as PSCI 2205) Debates in contemporary political thought. Justice, democracy, freedom, identity, and individualism. Includes emerging contemporary theories. No credit for students who have earned credit for 2205. [3]

**PSCI5207 - Liberalism and Its Critics****Title**

Liberalism and Its Critics

**Catalog Description**

(Also listed as PSCI 2207) The liberal tradition in political theory and its major challengers. Critical debates surrounding the relationship between individuals and political community, rights, freedom and equality. No credit for students who have completed 2207 or 2207W. [3]

**PSCI5208 - Law, Politics, and Justice****Title**

Law, Politics, and Justice

**Catalog Description**

(Also listed as PSCI 2208) Contemporary and classical theories of law and society: rights theories, gender and the law; law and transitions to democracy; law between nations. No credit for students who have earned credit for 2208. [3]

**PSCI5209 - Issues in Political Theory****Title**

Issues in Political Theory

**Catalog Description**

(Also listed as PSCI 2209) Topics vary from semester to semester. May be repeated once if there is no overlap with previous offerings. No credit for students who have earned credit for 2209. [3]



**PSCI5210 - West European Politics****Title**

West European Politics

**Catalog Description**

(Also listed as PSCI 2210) Analysis of political development, social forces, institutions, and public policy in Great Britain, France, Germany, Italy, and Sweden. No credit for students who have earned credit for 2210. [3]

**PSCI5213 - Democratization and Political Development****Title**

Democratization and Political Development

**Catalog Description**

(Also listed as PSCI 2213) Comparative study of political development, with a focus on institutions. The effect of political choices about voting systems, executive and legislative powers, cabinet formation, and other institutions on political competition, parties and government stability. Cases from established democracies and countries undergoing democratization. No credit for students who have earned credit for 2213 or 8317. [3]

**PSCI5215 - Change in Developing Countries****Title**

Change in Developing Countries

**Catalog Description**

(Also listed as PSCI 2215) Comparative study of political and economic change in developing countries. Political implications of ethnicity, economic dependency, and environmental degradation. No credit for students who have earned credit for 2215. [3]

**PSCI5216 - The Chinese Political System****Title**

The Chinese Political System

**Catalog Description**

(Also listed as PSCI 2216) Governmental institutions and political processes in the People's Republic of China with emphasis upon the interaction of traditional and revolutionary elements. Some attention to Taiwan since 1950 and to the overseas Chinese as parts of the Chinese political universe. No credit for students who have earned credit for 2216. [3]

**PSCI5219 - Politics of Mexico****Title**

Politics of Mexico

**Catalog Description**

(Also listed as PSCI 2219) A survey of contemporary Mexican politics from a comparative perspective. Interaction of economic, social, and political forces that led to the demise of one of the world's most durable one-party political regimes and the prolonged transition to democracy. No credit for students who have earned credit for 2219. [3]

**PSCI5220 - Crisis Diplomacy****Title**

Crisis Diplomacy

**Catalog Description**

(Also listed as PSCI 2220) Foreign policy decision making and strategy. Emphasis on differences between crises that lead to war and those that do not. Foreign relations of Britain, France, Germany, Russia, and Japan. No credit for students who have earned credit for 2220. [3]

**PSCI5221 - Causes of War****Title**

Causes of War

**Catalog Description**

(Also listed as PSCI 2221) Scientific study of the onset of expansion and consequences of war; conditions of peace, emphasizing alliances, arms races, and crisis escalation. No credit for students who have earned credit for 2221. [3]

**PSCI5222 - American Foreign Policy****Title**

American Foreign Policy

**Catalog Description**

(Also listed as PSCI 2222) Critical analysis of major international and domestic factors shaping U.S. foreign relations as reflected in selected twentieth- and twenty-first-century experiences. No credit for students who have earned credit for 2222. [3]

**PSCI5224 - Theories of World Politics****Title**

Theories of World Politics

**Catalog Description**

(Also listed as PSCI 2224) Analysis of major theories of the basic factors underlying global relations. No credit for students who have earned credit for 2224. [3] (SBS)

**PSCI5226 - International Law and Organization****Title**

International Law and Organization

**Catalog Description**

(Also listed as PSCI 2226) The role of international law and international organizations in the contemporary global political system. Focus on the evolution and impact of international law, the United Nations, the International Monetary Fund (IMF), and selected regional organizations. No credit for students who have earned credit for 2226. [3]

**PSCI5240 - Political Parties****Title**

Political Parties

**Catalog Description**

(Also listed as PSCI 2240) Theories of party formation, organization, and behavior. Historical development of party systems. Criteria for the comparative evaluation of party systems. Parties as instruments of citizen control. Implications for electoral outcomes, coalition formation, legislative decision making, and public policy. No credit for students who have earned credit for 2240. [3]

**PSCI5243 - Political Campaigns and the Electoral Process****Title**

Political Campaigns and the Electoral Process

**Catalog Description**

(Also listed as PSCI 2243) Theories of representation and democratic accountability; electoral strategies and tactics, including political polling and analysis. No credit for students who have earned credit for 2243. [3]

**PSCI5245 - The American Presidency****Title**

The American Presidency

**Catalog Description**

(Also listed as PSCI 2245) Constitutional, historical, and political aspects. Attention to electing and nominating president, presidential leadership and personality, governing, and relations with Congress and the public. No credit for students who have earned credit for 2245. [3]

**PSCI5255 - Public Policy Problems****Title**

Public Policy Problems

**Catalog Description**

(Also listed as PSCI 2255) Specific problems of public policies and their relations to political and institutional structures. Particular policy problems vary from semester to semester. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 2255. [3]

**PSCI5259 - Political Strategy and Game Theory****Title**

Political Strategy and Game Theory

**Catalog Description**

(Also listed as PSCI 2259) Campaigns and elections, legislative politics, political bargaining, and political organization. Applications of decision and game theory. Models of complete and perfect information, and games of incomplete information. No credit for students who have earned credit for 2259 or 8359. [3]

**PSCI5262 - The Judicial Process****Title**

The Judicial Process

**Catalog Description**

(Also listed as PSCI 2262) Functioning of the judiciary in the American political process; operation and powers of the courts; non-legal aspects of the judicial process; political role and effects of judicial decisions. No credit for students who have earned credit for 2262. [3]

**PSCI5263 - Religion and Politics****Title**

Religion and Politics

**Catalog Description**

(Also listed as PSCI 2263) Religion in democratic societies. Abortion, gay marriage, faith-based initiatives, and the Pledge of Allegiance. Historical works and contemporary contributions to debates. No credit for students who have earned credit for 2263. [3]

**PSCI5267 - Voting and Political Representation in America****Title**

Voting and Political Representation in America

**Catalog Description**

(Also listed as PSCI 2267) The history of voting rights and the efficacy of representation in the American political system. Political participation, voting rights, felony disenfranchisement, redistricting, and alternative electoral systems. No credit for students who have earned credit for 2267. [3]

**PSCI5270 - Conducting Political Research****Title**

Conducting Political Research

**Catalog Description**

(Also listed as PSCI 2270) Research sources, designs, and methods used by political scientists. Locating and accessing data, the logic of causal inferences, and basic data presentation and analysis. No credit for students who have earned credit for 2270. [3]

**PSCI6211 - The European Union****Title**

The European Union

**Catalog Description**

(Also listed as PSCI 3211) Political and economic integration. Origins, institutions, decision processes, policies, achievements, and prospects of the European integration movement. No credit for students who have earned credit for 3211. [3]

**PSCI6217 - Latin American Politics****Title**

Latin American Politics

**Catalog Description**

(Also listed as PSCI 3217) Cross-national analysis of political institutions, cultures, and processes of change in Latin America. No credit for students who have earned credit fro 3217. [3]

**PSCI6228 - International Politics of Latin America****Title**

International Politics of Latin America

**Catalog Description**

(Also listed as PSCI 3228) Examination of Latin America's role in the international and inter-American system. Special attention to the international response to revolutionary change in the area, and to the region's major actors and their changing relationship with the United States, with other major powers, and with other actors such as multinational corporations and international financial institutions. No credit for students who have earned credit for 3228. [3]

**PSCI6229 - Strategy and International Politics****Title**

Strategy and International Politics

**Catalog Description**

(Also listed as PSCI 3229) Strategic behavior and strategic choices arising from interactive decision making within the context of international politics. General principles of strategy. In-class experiments and game playing. No credit for students who have earned credit for 3229. [3]

**PSCI6241 - American Public Opinion and Voting Behavior****Title**

American Public Opinion and Voting Behavior

**Catalog Description**

(Also listed as PSCI 3241) The development and dynamics of political opinion and its effects on voting and public policy. Models of political behavior. No credit for students who have earned credit for 3241. [3]

**PSCI6244 - The Legislative Process****Title**

The Legislative Process

**Catalog Description**

(Also listed as PSCI 3244) Legislative organization and processes in the U.S. Congress. Attention to parties, elections, institutional structure, interest groups, and other branches of government as they relate to the legislative process. No credit for students who have earned credit for 3244. [3]

**PSCI6247 - American Political Culture****Title**

American Political Culture

**Catalog Description**

(Also listed as PSCI 3247) Content, historical development, and political consequences of the American public's deeply rooted values concerning how the political system ought to work and the ends it ought to serve. Attention to regional variation. No credit for students who have earned credit for 3247. [3]

**PSCI6253 - Ethics and Public Policy****Title**

Ethics and Public Policy

**Catalog Description**

(Also listed as PSCI 3253) Political and moral values in assessing policy-making, public policies and processes, and policy impacts. No credit for students who have earned credit for 3253. [3]

**PSCI6260 - Introduction to American Law****Title**

Introduction to American Law

**Catalog Description**

(Also listed as PSCI 3260) Law as a component of public policy and the political system; the elements and rationale of private law. No credit for students who have earned credit for 3260. [3]

**PSCI6265 - Constitutional Law: Powers and Structures of Government****Title**

Constitutional Law: Powers and Structures of Government

**Catalog Description**

(Also listed as PSCI 2265) U.S. constitutional system and fundamental principles of constitutional interpretation. Judicial development of principles of distribution and scope of governmental powers. Case method. No credit for students who have earned credit for 2265. [3]

**PSCI6266 - Constitutional Law: Civil Liberties and Rights****Title**

Constitutional Law: Civil Liberties and Rights

**Catalog Description**

(Also listed as PSCI 2266) Supreme Court's interpretation of the Bill of Rights and the Fourteenth Amendment. Case method. No credit for students who have earned credit for 2266. [3]

**PSCI6891 - Topics in Contemporary Politics****Title**

Topics in Contemporary Politics

**Catalog Description**

(Also listed as PSCI 3891) Political, governmental, and policy issues. May be repeated for credit when topics vary. No more than three hours may be counted toward the major. No credit for students who have earned credit for 3891. [1-3] (No AXLE credit)

**PSCI7238 - Comparative Political Parties****Title**

Comparative Political Parties

**Catalog Description**

(Also listed as PSCI 4238) Political parties and their role in the democratic process of modern liberal western democracies, focusing on party systems and party organizations. No credit for students who have earned credit for 4238. [3]

**PSCI7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-12]

**PSCI8211 - Terrorism****Title**

Terrorism

**Catalog Description**

Terror and insurgency through a scientific lens. Why political violence occurs; its participants, terror and insurgent groups' organization and operations. Best practices for counterinsurgency. [3]

**PSCI8221 - American Political Institutions: Bureaucracy****Title**

American Political Institutions: Bureaucracy

**Catalog Description**

Approaches for studying the U.S. bureaucracy. Key works. People, organizations, external influences, and processes that shape and implement policy administratively. Serves as repeat credit for students who completed 8370 section 03 offered Spring 2022. [3]

**PSCI8300 - Political Theory****Title**

Political Theory

**Catalog Description**

Basic course in political theory. Surveys major texts in political theory, as well as central concepts and debates in the current literature. [3]

**PSCI8301 - Human Rights****Title**

Human Rights

**Catalog Description**

Provides a historical and contemporary context for reflection on the meaning of human rights. Focus on the theory of human rights. [3]

**PSCI8302 - Democratic Theory****Title**

Democratic Theory

**Catalog Description**

Growth of democratic theory in political philosophy and historical application. Connections between democratic theory and political institutions. [3]

**PSCI8304 - Identity Politics: From Democracy to Conflict****Title**

Identity Politics: From Democracy to Conflict

**Catalog Description**

Economic, social, and psychological theories of identity. Studies of ethnic, partisan, class and religious identities. Identity's impact on policy, patronage, collective action, and conflict. [3]

**PSCI8305 - Feminist Social and Political Thought****Title**

Feminist Social and Political Thought

**Catalog Description**

Feminist political theorists, both as critics of the history of political thought and as authors of contemporary social and political theory. [3]

**PSCI8307 - The Politics of Gender****Title**

The Politics of Gender

**Catalog Description**

Gender and politics. Women's political representation. Gender gaps in political behavior. Not open to students who have earned credit for 8370 section 01 offered spring 2018. [3]

**PSCI8308 - Studies in Historical Political Thought****Title**

Studies in Historical Political Thought

**Catalog Description**

Major texts and themes focusing on a single thinker, a school of thought, or a theme. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSCI8309 - Research in Political Theory****Title**

Research in Political Theory

**Catalog Description**

Supervised individual research and reading on selected topics in political theory. [3]



**PSCI8310 - Studies in Comparative Analysis**

**Title**

Studies in Comparative Analysis

**Catalog Description**

A survey of important literature and concepts in the field of comparative politics. Core class for the subfield. May be taken more than once if there is no duplication in topic. [3]

**PSCI8311 - Regional and International Dimensions of European Integration**

**Title**

Regional and International Dimensions of European Integration

**Catalog Description**

Theories of political and economic integration; key actors in the European Union (including national and subnational governments, EU institutions, interest groups, and citizens); principal EU policy arenas and issues (including economic and monetary union, the single market, the common agricultural policy, regional policies, joint foreign and security policies). [3]

**PSCI8313 - Comparative Authoritarianism**

**Title**

Comparative Authoritarianism

**Catalog Description**

Politics of autocracy, including regime survival, institutional choice, repressive strategy, and transition potential. Diversity of autocratic strategy. [3]

**PSCI8314 - Comparative Political Parties**

**Title**

Comparative Political Parties

**Catalog Description**

Origin of political parties, party organizations and ideologies, party systems, democratic representation. [3]

**PSCI8315 - Research in Latin American Politics**

**Title**

Research in Latin American Politics

**Catalog Description**

Recurring and novel topics in Latin American politics, such as the relation between economic growth and political regimes, the role of the Church, human rights, and U.S. foreign policy. Particular issues vary from semester to semester. [3]

**PSCI8317 - The Political Economy of Development****Title**

The Political Economy of Development

**Catalog Description**

The causes of international and national inequalities in the distribution of wealth. Factors related to economic development and tied to domestic and international income distribution, such as geography, natural resources, culture, democracy, and dependency. Examples from throughout the world, especially Asia and Latin America. [3]

**PSCI8319 - Research in Comparative Analysis****Title**

Research in Comparative Analysis

**Catalog Description**

Supervised individual research and reading on selected topics in comparative politics. [3]

**PSCI8320 - Political Economy of Conflict****Title**

Political Economy of Conflict

**Catalog Description**

Surveys research on interstate and intrastate conflict, political violence, and war. Theories of conflict and war, microfoundations and economic dimensions of political violence, and political and economic implications of conflict. [3]

**PSCI8321 - International Conflict: Theories and Methods****Title**

International Conflict: Theories and Methods

**Catalog Description**

Analysis of international conflict and war. [3]

**PSCI8324 - Political Violence****Title**

Political Violence

**Catalog Description**

Use and organization of violence against political actors. Violence against civilians, perpetrators of violence, riots, genocide, and effects of violence. Focus on civil conflict and violence. Not open to students who have completed 8370 section 09 offered fall 2018. [3]

**PSCI8327 - International Political Economy****Title**

International Political Economy

**Catalog Description**

Survey of major issues involving the interaction of political and economic forces at the global level. Particular attention to theories of interdependence and imperialism, the position of developing countries in the international system, multinational corporations, and the economic origins of war. [3]

**PSCI8328 - Ideas and International Security****Title**

Ideas and International Security

**Catalog Description**

Role of collectively-held meanings and shared ideas (identity, norms, beliefs, values) in national security and political behavior. Texts from political science, economics, philosophy, military strategy and history, and sociology. Real world applications include perceptions of war and war outcomes, security strategy formulation, and impact of identity on international relations. [3]

**PSCI8329 - Research in International Politics****Title**

Research in International Politics

**Catalog Description**

Supervised individual research and reading on selected topics in international politics. [3]

**PSCI8330 - Studies in American Politics****Title**

Studies in American Politics

**Catalog Description**

A survey of important literature and concepts in the field of American politics. [3]

**PSCI8331 - Party Politics****Title**

Party Politics

**Catalog Description**

Structure and functions of political parties; theories of partisan change, party formation, and party organization. Influence on rules and the behavior of politicians on party policies. [3]

**PSCI8332 - Electoral Behavior and Public Opinion****Title**

Electoral Behavior and Public Opinion

**Catalog Description**

Theories of voting and behavior of candidates in American elections; models of electoral change; the development and dynamics of public opinion. Effects of elections and public opinion on policy and governmental action. [3]

**PSCI8333 - Political Culture, Opinion, and Behavior****Title**

Political Culture, Opinion, and Behavior

**Catalog Description**

Politics as a contest of meaning; how issues, structures, and events are signified; the patterns and distributions of core beliefs as the foundation of individual and collective political behavior and institutional politics. [3]

**PSCI8334 - Political Psychology****Title**

Political Psychology

**Catalog Description**

The psychological roots of individual choice and judgment in politics. Cognitive and affective theories of political decision-making. Survey responses, political identity, and explicit or implicit attitudes. [3]

**PSCI8335 - Politics of American Legislation****Title**

Politics of American Legislation

**Catalog Description**

The structure and function of American legislative institutions, especially Congress, and their relation to the wider setting. [3]

**PSCI8336 - American Political Institutions****Title**

American Political Institutions

**Catalog Description**

Origins, development, and operation of institutions in American politics. Executive, legislative, and judicial branches and inter-branch relations. Rational choice, historical, sociological, and political science theories. [3]

**PSCI8337 - American Political Behavior****Title**

American Political Behavior

**Catalog Description**

The origins and dynamics of mass political attitudes and actions. Study of political socialization, information, participation, and choice. Economic, psychological, sociological, and political science theories. [3]

**PSCI8338 - Comparative Representations and Accountability****Title**

Comparative Representations and Accountability

**Catalog Description**

Political representation and democratic accountability in advanced industrial societies and in developing democracies. [3]

**PSCI8339 - Research in American Politics****Title**

Research in American Politics

**Catalog Description**

Supervised individual research and reading on selected topics in American politics. [3]

**PSCI8340 - Gender, Institutions, Behavior****Title**

Gender, Institutions, Behavior

**Catalog Description**

Empirical research on gender, political institutions, elite and citizen behaviors. [3]

**PSCI8341 - Comparative Political Behavior****Title**

Comparative Political Behavior

**Catalog Description**

How citizens approach politics around the world; what shapes attitudes about politicians and political issues; why some citizens participate in politics and others do not. [3]

**PSCI8342 - Race and Racism in American Politics****Title**

Race and Racism in American Politics

**Catalog Description**

Political construction of race in the United States. Racial animus in policy making, group-identity politics, and racial connections to wealth distribution and political power. No credit for students who earned credit for 8370 section 1 in Spring 2017. [3]

**PSCI8355 - Research Design****Title**

Research Design

**Catalog Description**

Introduction to Analysis of Tables, Measures of Association, OLS regression. Coverage of research design. Experimental design, survey research, elite interviewing, in-depth interviewing, aggregate data, field research, content analysis, case studies, and small-n analysis. Emphasis on concept formation and measurement. [3]

**PSCI8356 - Statistics for Political Research I****Title**

Statistics for Political Research I

**Catalog Description**

Introduction to statistical analysis with applications in political science, statistical distributions, statistical inference, bivariate and multiple regression, logit, and probit. [3]

**PSCI8357 - Statistics for Political Research II****Title**

Statistics for Political Research II

**Catalog Description**

Advanced topics in statistical analysis with research applications in maximum likelihood estimation, logit and probit analysis, simultaneous equation models, generalized least squares, and introductory time series concepts. [3]

**PSCI8358 - Topics in Political Methodology**

**Title**

Topics in Political Methodology

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSCI8359 - Introduction to Formal Theory and Modeling**

**Title**

Introduction to Formal Theory and Modeling

**Catalog Description**

Social choice and game theory. Instability and disequilibria of group decisions under different decision-making rules. Theoretical model building as a way to generate hypotheses. Rules in decision making, manipulability of outcomes, bargaining strategies and the evolution of cooperation. [3]

**PSCI8360 - Topics in Formal Theory and Modeling**

**Title**

Topics in Formal Theory and Modeling

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSCI8361 - Writing Proposals and Securing Grants in the Empirical Social Sciences**

**Title**

Writing Proposals and Securing Grants in the Empirical Social Sciences

**Catalog Description**

[3]

**PSCI8362 - Data Collection Methods**

**Title**

Data Collection Methods

**Catalog Description**

Data collection methods to build theory and investigate theory empirically. Creating a pre-analysis plan. Practical skills to undertake surveys, focus groups, semi-structured interviews, archival or web data collection, and behavioral tasks. Role of experimental intervention. Ethics on working with human subjects. Access and collaboration with NGOs and policymakers. Logistics such as timelines, budgets, grant proposals, data management, and incentivizing or managing employees. [3]

**PSCI8363 - Survey Research Methods**

**Title**

Survey Research Methods

**Catalog Description**

Questionnaire design, sampling, data analysis, longitudinal surveys, and experimental techniques. No credit for students who have earned credit for 8370 section 08 offered spring 2017. [3]

**PSCI8364 - Formal Political Theory II: Advanced Modeling and Applications**

**Title**

Formal Political Theory II: Advanced Modeling and Applications

**Catalog Description**

Advanced game theory and formal modeling with applications in political science. Not open to students who have earned credit for 8360 offered spring 2019. [3]

**PSCI8365 - Topics in Network Analysis**

**Title**

Topics in Network Analysis

**Catalog Description**

Methods for studying role of social networks in political behavior. Applications to international relations, comparative politics, and American politics. Overview includes survey methods, statistical methodology, experiments, agent-based models, and game theory. Prerequisite: 8356 and 8359. [3]

**PSCI8366 - Field Experimental Methodology**

**Title**

Field Experimental Methodology

**Catalog Description**

Applied methodology for conducting field experiments, also called randomized controlled trials, in the social sciences. Includes practical training on policy experiments; partnering with implementing policy partners and donors to test policy. [3]

**PSCI8367 - Formal Models of International Relations**

**Title**

Formal Models of International Relations

**Catalog Description**

Crisis bargaining. Signaling, reputation, and audience costs. Contests and costly competition. Public goods provision and international institutions. Prerequisite: 5259. [3]

**PSCI8370 - Topics in Political Science**

**Title**

Topics in Political Science

**Catalog Description**

An inquiry into selected topics. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSCI8383 - Grounded & Engaged Approaches to Political Theory and Philosophy**

**Title**

Grounded & Engaged Approaches to Political Theory and Philosophy

**Catalog Description**

Grounded/engaged normative theory from lived experience and other political data. Wide variety of grounded or engaged research methods: historically contextual approaches to political problems, interpretive methods, qualitative interviews, ethnographic research, discourse analysis, etc. [3]

**PSCI8398 - Dissertation Seminar**

**Title**

Dissertation Seminar

**Catalog Description**

Focus on developing the theoretical, empirical, and normative aspects of each student's dissertation research. [3]

**PSCI8901 - Independent Study**

**Title**

Independent Study

**Catalog Description**

[Variable credit: 1-3 each semester]

**PSCI8902 - Independent Study**

**Title**

Independent Study

**Catalog Description**

[Variable credit: 1-3 each semester]

**PSCI8999 - Non-candidate Research**

**Title**

Non-candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**PSCI9995 - Half-time Ph.D. Dissertation Research**

**Title**

Half-time Ph.D. Dissertation Research

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]



**PSCI9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Portuguese

**PORT5203 - Intermediate Portuguese****Title**

Intermediate Portuguese

**Catalog Description**

(Also listed as PORT 2203) Review of Portuguese grammar with emphasis on conversation, composition, and reading of modern Portuguese literary texts. No credit for students who have earned credit for a higher level Portuguese language course. No credit for students who have earned credit for 2203. [3]

**PORT5205 - Portuguese and Global Health****Title**

Portuguese and Global Health

**Catalog Description**

Speaking, reading, and writing; advanced grammar. Health in Brazil and Lusophone Africa, through literary texts, films, articles, and public health publications. Virtual language-learning partnerships with medical students in Lusophone Africa. Prerequisite: 5203. [3]

**PORT5301 - Portuguese through the Arts****Title**

Portuguese through the Arts

**Catalog Description**

Writing and presentation skills in Portuguese through encounters with the arts. Visual, performing, and literary arts from Brazil, Portugal, and Lusophone Africa. [3]

**PORT5302 - Brazilian Pop Culture****Title**

Brazilian Pop Culture

**Catalog Description**

(Also listed as PORT 3302) Development of written and oral communication skills through the study of Brazilian popular culture. Movies, music, television, and magazines. No credit for students who have earned credit for 3302. [3]

**PORT5303 - Introduction to Luso-Brazilian Literature**

**Title**

Introduction to Luso-Brazilian Literature

**Catalog Description**

(Also listed as PORT 3303) Critical readings and methods of literary analysis. Masterpieces from Portugal and Brazil from all genres in several periods. Conversation and writing. No credit for students who have earned credit for 3303. [3]

**PORT5350 - Portraits of Brazil: Culture, Society and the Arts**

**Title**

Portraits of Brazil: Culture, Society and the Arts

**Catalog Description**

Themes in Brazilian culture and society. Literature, theater, popular music, media, and key essays by Brazilian intellectuals. Taught in Portuguese. Serves as repeat credit for PORT 4350. [3]

**PORT5420 - Brazilian Literature through the Nineteenth Century**

**Title**

Brazilian Literature through the Nineteenth Century

**Catalog Description**

(Also listed as PORT 4420) Main literary trends, principal writers and works of Brazilian literature, from colonial beginnings through the nineteenth century. Study of the works of Gregório de Matos, Gonçalves Dias, Alencar, Machado de Assis, and Euclides da Cunha. No credit for students who have earned credit for 4420. [3]

**PORT5425 - Modern Brazilian Literature**

**Title**

Modern Brazilian Literature

**Catalog Description**

(Also listed as PORT 4425) Brazilian literature from the Semana de Arte Moderna to the present. Modernist and neo-Modernist movements. No credit for students who have earned credit for 4425. [3]

**PORT5892 - Special Topics in Portuguese Language, Literature, or Civilization**

**Title**

Special Topics in Portuguese Language, Literature, or Civilization

**Catalog Description**

(Also listed as PORT 3892) May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3892. [3] (No AXLE credit)

**PORT5900 - Brazilian Civilization through English Language Material**

**Title**

Brazilian Civilization through English Language Material

**Catalog Description**

(Also listed as PORT 2900) The cultural heritage of Brazil from its earliest days to the present. National identity, race relations, and Brazil's emergence as a major force in the Americas and beyond. Taught in English. No credit for graduate students in Spanish and Portuguese. No credit for students who have earned credit for 2900. [3]

**PORT6010 - Literary Analysis and Theory**

**Title**

Literary Analysis and Theory

**Catalog Description**

(Also listed as Spanish 6010) Methods of literary analysis for the teaching of literature. The systematic application of contemporary theories - structuralist and poststructuralist - in the analysis of poetry and narrative. [3]

**PORT6020 - Ibero-Romance Philology**

**Title**

Ibero-Romance Philology

**Catalog Description**

(Also listed as Spanish 6020) Study of the evolution of the languages and dialects of the Iberian Peninsula. Analysis of selected linguistic developments and readings from medieval texts. [3]

**PORT6030 - Foreign Language Learning and Teaching**

**Title**

Foreign Language Learning and Teaching

**Catalog Description**

(Also listed as Spanish 6030) Principles and practices of teaching a second language with concentration on recent interactive and communicative models of foreign language instruction. Classroom observations, journal writing, development of materials, and a small action research project are expected. Required of all entering teaching assistants. [3]

**PORT7050 - Introduction to Latin American Colonial Studies**

**Title**

Introduction to Latin American Colonial Studies

**Catalog Description**

(Also listed as Spanish 7050) Provides a panoramic introduction to the canonical works of the colonial period from "discovery" to "independence," as well as an overview of the theoretical debates in colonial studies within the Latin American context. Topics include the construction and reshaping of identities and otherness through various stages of Latin American cultural history, the emergence of what has been called the American consciousness during the "New World Baroque," and the discourses of "independence" and early nation building. [3]

**PORT7070 - Spanish American and Brazilian Literature I****Title**

Spanish American and Brazilian Literature I

**Catalog Description**

(Also listed as Spanish 7070) Literature in a comparative perspective: from the conquests to the end of the nineteenth century. Authors may include Sor Juana, Matos, Alencar, Assis, and Carrasquilla. [3]

**PORT7071 - Spanish American and Brazilian Literature II****Title**

Spanish American and Brazilian Literature II

**Catalog Description**

Literature in a comparative perspective: twentieth century to the present. Texts may include: Os Sertões, La Guerra del Fin del Mundo, Ficciones, Perto do Coração Selvagem, and Água Viva. [3]

**PORT8200 - Seminar: Studies in Colonial Literature****Title**

Seminar: Studies in Colonial Literature

**Catalog Description**

(Also listed as Spanish 8200) May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PORT8210 - Seminar: Hispanic American Essay****Title**

Seminar: Hispanic American Essay

**Catalog Description**

(Also listed as Spanish 8210) May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PORT8400 - Seminar: Studies in Inter-American Literature****Title**

Seminar: Studies in Inter-American Literature

**Catalog Description**

(Also listed as Spanish 8400) Comparative approaches to literary texts from such New World cultures as Brazil, Spanish America, the United States, the Caribbean, and Canada (both its French and English traditions). Fluency in Spanish and/or Portuguese required; reading competency in English and French. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PORT8999 - Non-candidate Research****Title**

Non-candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**PORT9300 - Comparative Methodology**

**Title**

Comparative Methodology

**Catalog Description**

(Also listed as Spanish 9300) Comparative methodology of the literatures of the Spanish and Portuguese speaking world; emphasis on issues of theme, genre, period and movement, translation, and the relationship of literary scholarship to other humanistic endeavors, such as music, film, philosophy, painting, and the plastic arts. [3]

**PORT9520 - Seminar: Studies in Contemporary Literature of the Portuguese-Speaking World**

**Title**

Seminar: Studies in Contemporary Literature of the Portuguese-Speaking World

**Catalog Description**

Variable topics to be announced. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PORT9660 - Special Studies in Portuguese Literature**

**Title**

Special Studies in Portuguese Literature

**Catalog Description**

[Variable credit: 1-6]

**PORT9670 - Special Studies in Brazilian Literature**

**Title**

Special Studies in Brazilian Literature

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 6 credits per semester of enrollment. [1-6]

**PORT9995 - Half-time Ph.D. Dissertation Research**

**Title**

Half-time Ph.D. Dissertation Research

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

**PORT9999 - Ph.D. Dissertation Research**

**Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

# Psychology (AS)

## **PSY5780 - The Visual System**

### **Title**

The Visual System

### **Catalog Description**

(Also listed as Cell and Developmental Biology 8347 and Neuroscience 8347) An interdisciplinary approach to how humans see and interpret their visual environment. Topics include the structure of the eye and brain (including optics), the physiology of individual cells and groups of cells, machine vision and models of visual function, visual attention, and mechanisms of complex visual perception. Lectures by faculty from Psychology, Engineering, and Cell and Developmental Biology. Graduate students attend one hour discussion section per week, in addition to lecture, and turn in a more extensive paper than undergraduates. [3]

## **PSY6104 - Quantitative Methods and Experimental Design**

### **Title**

Quantitative Methods and Experimental Design

### **Catalog Description**

Principles and methods for the design and analysis of experiments and for the investigation of individual differences. Principles of experimental design and descriptive and inferential statistics. [3]

## **PSY6218 - Computational Cognitive Modeling**

### **Title**

Computational Cognitive Modeling

### **Catalog Description**

Computational modeling of human perception and cognition. Model implementation, parameter estimation, statistical model evaluation; developing and testing new models; stochastic processes, simulation and Monte Carlo methods, high-performance computing. [3]

## **PSY6219 - Scientific Computing for Psychological and Brain Science**

### **Title**

Scientific Computing for Psychological and Brain Science

### **Catalog Description**

Computer programming, scientific computing methods, and high performance computing applied to psychological and brain sciences problems, such as experimental control, data analysis and visualization, image and signal processing, optimization, and simulation. Familiarity with computer programming is assumed. Not open to students who have completed 8219. [3]

## **PSY6220 - Bayesian Modeling with Python**

### **Title**

Bayesian Modeling with Python

### **Catalog Description**

Statistical and cognitive modeling. Models of memory, psychophysics, categorization, and decision-making. Probabilistic programming in Python. Bayesian parameter estimation and model comparison. [3]

**PSY6300 - Research Seminar**

**Title**

Research Seminar

**Catalog Description**

[Variable credit: 1-4]

**PSY6370 - Independent Study**

**Title**

Independent Study

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. [1-6]

**PSY6775 - Models of Human Memory**

**Title**

Models of Human Memory

**Catalog Description**

Mathematical and computational models of the cognitive processes underlying human memory. Attribute-based models, instance theories, neural network models, retrieved-context models, executive function and working memory models. Methods of fitting models to empirical data. [3]

**PSY6890 - Special Topics in Perception**

**Title**

Special Topics in Perception

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSY6891 - Special Topics in Cognitive Psychology**

**Title**

Special Topics in Cognitive Psychology

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSY6892 - Special Topics in Neuroscience**

**Title**

Special Topics in Neuroscience

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSY6893 - Special Topics in Clinical Psychology**

**Title**

Special Topics in Clinical Psychology

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSY6894 - Special Topics in Social Psychology**

**Title**

Special Topics in Social Psychology

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSY6895 - Special Topics in Cognitive Neuroscience**

**Title**

Special Topics in Cognitive Neuroscience

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSY7031 - Advanced Investigational Techniques**

**Title**

Advanced Investigational Techniques

**Catalog Description**

A non-thesis research project. [0-6]

**PSY7032 - Advanced Investigational Techniques**

**Title**

Advanced Investigational Techniques

**Catalog Description**

A non-thesis research project. [0-6]

**PSY7033 - Second-Year Research**

**Title**

Second-Year Research

**Catalog Description**

Second-year research project in psychological sciences. May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 12 credits per semester of enrollment. [0-12]



## **PSY7034 - Advanced Research in Psychological Sciences**

### **Title**

Advanced Research in Psychological Sciences

### **Catalog Description**

Advanced research project in psychological sciences leading to the dissertation proposal. May be repeated for credit. [0-12]

## **PSY7999 - Master's Thesis Research**

### **Title**

Master's Thesis Research

### **Catalog Description**

[0-12]

## **PSY8120 - Categorical Data Analysis**

### **Title**

Categorical Data Analysis

### **Catalog Description**

Analysis of categorical data. Statistical analysis of binary, nominal, ordinal, and count data from the perspective of generalized linear models. Logistic and Poisson regression models. Population-averaged and subject-specific approaches to repeated measures. Prerequisite: 6104, 8310, or equivalents. [3]

## **PSY8216 - Brain Imaging Methods**

### **Title**

Brain Imaging Methods

### **Catalog Description**

Principles and methods used in human neuroimaging, with emphasis on functional magnetic resonance imaging (fMRI). [3]

## **PSY8218 - Computational Modeling**

### **Title**

Computational Modeling

### **Catalog Description**

Developing and testing computational models of human cognition and brain function. How to implement models, recognize good modeling, fit models to data, evaluate models, contrast competing models, develop and test new models. Discussion of Monte Carlo simulations, statistical numeric methods, and high-performance computing. [3]

## **PSY8305 - Linear and Nonlinear Mixed Effects Models**

### **Title**

Linear and Nonlinear Mixed Effects Models

### **Catalog Description**

The analysis of data from hierarchical and multilevel designs. Theory and computational methods, specification and testing of fixed effects, random effects and residuals, assessment of fit, graphical examination, applications to repeated measures data, and missing data models. Prerequisite: 6401 or equivalent. [3]

**PSY8310 - Research Methods in Clinical Psychology**

**Title**

Research Methods in Clinical Psychology

**Catalog Description**

Major methodological and quantitative issues in clinical psychology, including statistical significance testing and its alternatives; threats to internal and external validity; psychometric theory; quantitative approaches to classification; behavioral, genetic, and psychophysiological methods; animal models; analysis of change, mediation, and moderation. [3]

**PSY8312 - Psychological Assessment**

**Title**

Psychological Assessment

**Catalog Description**

Major techniques of psychological assessment, with an emphasis on the rationale, administration, and interpretation of measures assessing personality and psychopathology. [3]

**PSY8315 - Theories of Psychotherapy**

**Title**

Theories of Psychotherapy

**Catalog Description**

Advanced study on the major principles, concepts, techniques, and issues relevant to the theory and practice of psychotherapy. Experience in supervised clinical settings or observation of clinical sessions is provided to further understanding of psychotherapeutic processes. [3]

**PSY8323 - Practicum in Psychological Assessment**

**Title**

Practicum in Psychological Assessment

**Catalog Description**

[Variable credit: 1-5 each semester]

**PSY8324 - Practicum in Psychotherapy**

**Title**

Practicum in Psychotherapy

**Catalog Description**

[Variable credit: 1-5 each semester]

**PSY8325 - Advanced Standing in Psychological Assessment**

**Title**

Advanced Standing in Psychological Assessment

**Catalog Description**

[Variable credit: 1-5 each semester]

**PSY8326 - Advanced Standing in Psychotherapy**

**Title**

Advanced Standing in Psychotherapy

**Catalog Description**

[Variable credit: 1-5 each semester]

**PSY8352 - Advanced Topics in Clinical Psychology**

**Title**

Advanced Topics in Clinical Psychology

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSY8353 - Professional Ethics in Clinical Psychology**

**Title**

Professional Ethics in Clinical Psychology

**Catalog Description**

Issues and practical applications of ethical principles in clinical and research settings. Cultural context for clinical and ethical issues. [3]

**PSY8354 - Clinical Neuropsychology**

**Title**

Clinical Neuropsychology

**Catalog Description**

Cognitive and behavioral disorders associated with brain injury and disease. Methods of neuropsychological assessment. Prerequisite: PSY-GS 8300 or permission of instructor. [3]

**PSY8355 - Diversity and Differentness**

**Title**

Diversity and Differentness

**Catalog Description**

Theory, issues, and practical application of cultural sensitivity and competency in research and clinical settings. [1-3]

**PSY8360 - Seminar in Clinical Science**

**Title**

Seminar in Clinical Science

**Catalog Description**

Integration of the subareas of clinical science. Includes history and systems of psychology as related to clinical science, ethical issues, and problems encountered in professional psychology. May be repeated for credit more than once if there is no duplication in topic. Students may earn only up to 2 credits per semester of enrollment. [0-2]

**PSY8398 - Internship****Title**

Internship

**Catalog Description**

[0]

**PSY8505 - Judgment and Decision-Making****Title**

Judgment and Decision-Making

**Catalog Description**

Historical origins and development of human judgment and decision-making as a specialty within cognitive psychology. Expected utility theory; heuristics and biases; decision-making in clinical psychology; neurobiology of decision-making; neuroeconomics. No credit for students who have earned credit for 8551 section 01 in spring 2016. [3]

**PSY8507 - Computational Neuroscience of Human Vision****Title**

Computational Neuroscience of Human Vision

**Catalog Description**

Neurocomputational modeling and deep learning have transformed our understanding of how the brain encodes sensory information to infer the presence of surfaces, shapes and objects in complex scenes. This seminar will discuss key literature, computational models and deep neural networks, and provide computational assignments for students to gain experience. [3]

**PSY8543 - Advanced Topics in Perception****Title**

Advanced Topics in Perception

**Catalog Description**

In-depth discussion and exploration of a specialized topic in Perception. The topic can cover any and all aspects of perception, from the molecular neurobiology of retinal processing to the phenomenology of consciousness, and can emphasize particular methodological approaches (e.g. single-cell recording, neuroimaging). May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSY8551 - Advanced Topics in Cognitive Psychology****Title**

Advanced Topics in Cognitive Psychology

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSY8557 - Seminar in Cognition and Cognitive Neuroscience**

**Title**

Seminar in Cognition and Cognitive Neuroscience

**Catalog Description**

Integration of the subareas of cognitive science. May be repeated for credit more than once if there is no duplication in topic. Students may earn only up to 2 credits per semester of enrollment. [0-2]

**PSY8744 - Advanced Topics in Neuroscience**

**Title**

Advanced Topics in Neuroscience

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSY8750 - Scientific Writing in Psychology and Neuroscience**

**Title**

Scientific Writing in Psychology and Neuroscience

**Catalog Description**

Journal articles, grants, scientific papers, press releases, and dissertations. Revising and editing. [3]

**PSY8758 - Seminar in Neuroscience**

**Title**

Seminar in Neuroscience

**Catalog Description**

Integration of the subareas of neuroscience. May be repeated for credit more than once if there is no duplication in topic. Students may earn only up to 2 credits per semester of enrollment. [0-2]

**PSY8901 - Teaching Practicum**

**Title**

Teaching Practicum

**Catalog Description**

Discussion of teaching practices in weekly meeting with instructor. Application of teaching strategies through hands-on experience with undergraduates. [0-1]

**PSY8906 - Evolutionary Psychology**

**Title**

Evolutionary Psychology

**Catalog Description**

Interdisciplinary analysis of the origins of mind, with particular emphasis on the mind/brain as a product of biological evolution. [3]

**PSY8942 - Seminar: Social  
Title**

Seminar: Social

**Catalog Description**

In-depth investigation of a specialized topic in Social Psychology. The topic might cover any and all aspects of social psychology, emphasize intra-personal and/or extra-personal perspectives, and focus on theoretical and/or experimental approaches. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**PSY8999 - Non-candidate Research  
Title**

Non-candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**PSY9999 - Ph.D. Dissertation Research  
Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## **Psychology and Human Development (GS)**

**PSY-GS7951 - Research Practicum in Cognitive Psychology In Context I  
Title**

Research Practicum in Cognitive Psychology In Context I

**Catalog Description**

A mentored research experience, designed to introduce students to topics relevant to major aspects of conducting research and to prepare students for research-oriented careers in cognitive psychology in everyday contexts. Students are matched with a research mentor, according to their professional goals and research interests, and placed in the corresponding lab. Additionally, all students meet once a week as a class. Students work alongside principal investigators, professors, researchers, and doctoral students, gaining experience in the work of the lab and furthering their own research interests and agenda in preparation for graduate school or industry careers that require knowledge of the science of cognitive psychology. Lab opportunities may include conference presentations, authorship on manuscripts or other publications, experience with grant writing, and involvement in study design and implementation, depending on the specifics of the lab. This course will also consider topics related to ethics, responsible conduct of research and career options. May be repeated for credit. [3]

## **PSY-GS7952 - Research Practicum in Cognitive Psychology In Context II**

### **Title**

Research Practicum in Cognitive Psychology In Context II

### **Catalog Description**

A mentored research experience, designed to for students to go more in depth into the topics related to research-oriented careers in cognitive psychology in everyday contexts. All students meet once a week as a class. Students continue working with a research mentor that they had been placed with as part of Research Practicum in Cognitive Studies-1. Students continue furthering their own research interests and agenda in preparation for graduate school or industry careers that require knowledge of the science of cognitive psychology. Lab opportunities may include conference presentations, authorship on manuscripts or other publications, experience with grant writing, and involvement in study design and implementation, depending on the specifics of the lab. This course will also go deeper in topics related to ethics, responsible conduct of research and career options. May be repeated for credit. [3]

## **PSY-GS7999 - Master's Thesis Research**

### **Title**

Master's Thesis Research

### **Catalog Description**

Open only to candidates for the Master of Science degree engaged in thesis research and writing. Consent of major professor required. [Variable credit: 0-6]

## **PSY-GS8100 - Behavioral Pediatrics and Child Health Psychology**

### **Title**

Behavioral Pediatrics and Child Health Psychology

### **Catalog Description**

Behavioral pediatrics and child health psychology for advanced predoctoral and postdoctoral trainees. Topics include the scope and definition of behavioral pediatrics, measurement of child behavior, children's health beliefs and understanding of illness, theories of psychosomatic illness, immunologic and endocrinologic aspects of stress, compliance, psychological effects of physical illness, families' responses to stress, and psychological intervention strategies. [3]

## **PSY-GS8120 - Psychological Intervention with Children**

### **Title**

Psychological Intervention with Children

### **Catalog Description**

Various intervention approaches with children, including parent training, behavior therapy, group therapy, psychopharmacological intervention, individual psychotherapy, cognitive behavioral intervention, psychoanalytic play therapy, and residential treatment. [3]

## **PSY-GS8200 - Psychopathology**

### **Title**

Psychopathology

### **Catalog Description**

Focuses on descriptive, epidemiological, and casual psychopathology research, with an emphasis on developmental and cultural influences. The course goal is to increase students' ability to think creatively and critically about psychopathology research and to conduct their own psychopathology-related research. Prerequisite: Consent of instructor [3]

**PSY-GS8300 - Psychological Assessment****Title**

Psychological Assessment

**Catalog Description**

A general introduction to clinical assessment, with a particular emphasis on children. The major purpose is to familiarize students with the theoretical issues and psychometric properties of several different methods of assessment including objective and projective personality measures, behavior checklists, behavioral observation, and clinical interviews. Required before taking practica. Prerequisite: consent of instructor. [3]

**PSY-GS8310 - Research Methods in Clinical Psychology****Title**

Research Methods in Clinical Psychology

**Catalog Description**

Major methodological and quantitative issues in clinical psychology, including statistical significance testing and its alternatives; threats to internal and external validity; psychometric theory; quantitative approaches to classification; behavioral, genetic, and psychophysiological methods; animal models; analysis of change, mediation, and moderation. [3]

**PSY-GS8350 - Individual Differences****Title**

Individual Differences

**Catalog Description**

Focuses on traditional concepts and findings in the area of individual differences broadly defined. The psychological content will primarily involve abilities, interests, and personality; methodological issues encountered in assessing these attributes will be stressed throughout; and particular attention will be devoted to how these concepts can enhance research programs in both applied and theoretical areas. The specific variables discussed within each domain will be restricted to those that have empirically "panned out" (viz., variables that are reliable and related to meaningful behaviors and outcomes that psychologists are interested in predicting and better understanding), rather than theoretical constructs and measures whose external validity is unknown. [3]

**PSY-GS8360 - Human Cognition****Title**

Human Cognition

**Catalog Description**

Current research and theory in cognitive psychology. Emphasis on memory, perception, and language. Some applications of cognitive theories are explored. [3]

**PSY-GS8400 - Developmental Psychology****Title**

Developmental Psychology

**Catalog Description**

Central issues, theories, and methods. [3]



**PSY-GS8410 - Advanced Seminar in Educational Psychology**

**Title**

Advanced Seminar in Educational Psychology

**Catalog Description**

May be repeated with change of topic. [Variable credit: 1-3]

**PSY-GS8420 - Advanced Seminar in Clinical Psychology**

**Title**

Advanced Seminar in Clinical Psychology

**Catalog Description**

May be repeated with change of topic. [3]

**PSY-GS8430 - Advanced Seminar: Cognitive Studies**

**Title**

Advanced Seminar: Cognitive Studies

**Catalog Description**

Special topics in cognitive studies. May be repeated with change of topic. [3]

**PSY-GS8440 - Seminar in Behavioral Biology**

**Title**

Seminar in Behavioral Biology

**Catalog Description**

Selected topics in behavioral biology-e.g., ethology. Content varies according to student needs and interests. May be repeated. [3]

**PSY-GS8450 - Seminar in Cognitive Development**

**Title**

Seminar in Cognitive Development

**Catalog Description**

Major theoretical and conceptual issues in cognitive development. Emphasis in current research topics like memory development, reading, conceptual development, semantic development, problem solving, and reasoning. Recommended background: 352P and/or 8400 [3]

**PSY-GS8460 - Advanced Seminar in Developmental Psychology**

**Title**

Advanced Seminar in Developmental Psychology

**Catalog Description**

May be repeated with a change of topic. [3]

## **PSY-GS8470 - Cognitive Science to the Classroom**

### **Title**

Cognitive Science to the Classroom

### **Catalog Description**

This course focuses on the interplay between basic research in cognitive science and educational innovation. There is a major push to design learning environments that are based on cognitive science research and theory and to rigorously evaluate these environments. How do we go about doing this? We will use a case study approach of successful educational innovations, the basic research behind them, and their impact on basic research in turn. This will allow us to develop a framework for developing and evaluating educational innovations. [3]

## **PSY-GS8480 - Educational Neuroscience**

### **Title**

Educational Neuroscience

### **Catalog Description**

Seminar that examines the interdisciplinary intersection between cognitive neuroscience investigations of the development of brain structure and function and studies of cognitive development relevant to education. Topics including the emerging theoretical and empirical contribution of neuroscience approaches to understanding the typical and atypical development of domain specific academic skills such as reading and mathematics, as well as the neural basis of domain general processes crucial for educational success such as working memory, motivation, attention, and social cognition. [3]

## **PSY-GS8500 - Special Topics in Psychology**

### **Title**

Special Topics in Psychology

### **Catalog Description**

May be repeated with change of topic. [1-3]

## **PSY-GS8550 - Neuroscience of Cognition & Behavior**

### **Title**

Neuroscience of Cognition & Behavior

### **Catalog Description**

The purpose of this course is to introduce students to cognitive and behavioral neuroscience. Through this course students will develop an understanding of brain function and how it supports cognition and behavior, as well as the maturational and environmental factors that influence brain development. The course will focus on functional magnetic resonance imaging (fMRI) as the principal neuroimaging method and address issues such as where does fMRI signal come from and how can we interpret it in the context of cognition and behavior. A key goal of the course is for students to become more informed consumers of neuroscience research.[3]

## **PSY-GS8600 - Seminar in Social and Personality Development**

### **Title**

Seminar in Social and Personality Development

### **Catalog Description**

Development of personality and social processes, with emphasis on methods of inquiry. Trait theory, socialization processes, origins of gender differences, cultural differences in childbearing practices, experimental and observational methods in developmental research, and development of motivational systems. [3]

## **PSY-GS8690 - Cognitive Science of Learning and Development Research Forum**

### **Title**

Cognitive Science of Learning and Development Research Forum

### **Catalog Description**

The Cognitive Science of Learning and Development Research Forum serves as a venue for delivering and hosting research presentations relevant to cognitive science, learning and development hosted by graduate students and faculty within the Psychological Sciences program, as well as researchers from other departments and Universities. May be repeated for credit. This is a 1 credit year-long course. Students register for 0 credit hours in the Fall and 1 credit hour in the Spring.

## **PSY-GS8751 - Exploratory Data Analysis**

### **Title**

Exploratory Data Analysis

### **Catalog Description**

Exploratory Data Analysis (EDA) is a modern statistical paradigm developed by John Turkey in the 1970's. EDA emphasizes fitting mathematical models to data as preliminary to the traditional hypothesis testing approach used in confirmatory analyses. Hallmarks of EDA include graphical methods, residual analysis, robust/resistant statistical methods, and data re-expression/transformation. But EDA is actually a whole philosophy of data analysis, and includes treatment of ethics and propriety in research. In this class we study EDA, as it has developed over the past four decades. We also do a great deal of EDA. An "EDA Portfolio" is developed by each student of different data analysis and graphical analysis projects. Included within the course is treatment of "big data" and data mining approaches, and also discussion of the current "replication crisis" and its emphasis on Questionable Research Practices (QRP's); EDA provides a certain type of prescriptive treatment of QRP's. Prerequisites: PSY-GS 8861 and PSY-GS 8870 or equivalent. [3]

## **PSY-GS8810 - Methods of Psychological Research**

### **Title**

Methods of Psychological Research

### **Catalog Description**

Methods for collecting and analyzing empirical information about behavior. Serves as a base upon which to build research competence through more advanced courses and research apprenticeships. [3]

## **PSY-GS8815 - Advanced Research Methods in Developmental Psychology**

### **Title**

Advanced Research Methods in Developmental Psychology

### **Catalog Description**

Major empirical approaches to the study of development. Emphasis on human behavioral development, although elements from comparative psychology and biomedical sciences included. [3] (Offered by independent study)

**PSY-GS8820 - Program Evaluation****Title**

Program Evaluation

**Catalog Description**

The evaluation of social programs. The design of evaluations to produce both theoretically meaningful and practical information about the program and its effectiveness. Such topics as needs assessment, monitoring, impact assessment, and cost/effectiveness evaluations. Covers programs in education, health, and human services. [3]

**PSY-GS8850 - Advanced Seminar in Measurement, Statistics, and Evaluation****Title**

Advanced Seminar in Measurement, Statistics, and Evaluation

**Catalog Description**

Special topics in measurement, statistics, and program evaluation. May be repeated with change of topic. Prerequisite: consent of instructor. [3]

**PSY-GS8855 - Quantitative Methods Forum****Title**

Quantitative Methods Forum

**Catalog Description**

The Forum serves as a venue for delivering and hosting methodological research presentations by graduate students and faculty within the Quantitative Methods program, as well as researchers from other departments. Periodically, the Forum will also provide workshops on methodological topics, feature panels on professional development topics, and host invited talks by visiting scholars. May be repeated for credit. [0-1]

**PSY-GS8858 - Introduction to Statistical Inference****Title**

Introduction to Statistical Inference

**Catalog Description**

Introduction to statistical methods for graduate students in education and psychology with minimal undergraduate statistical background. The course will present descriptive and inferential methods for assessing distributional shape, central tendency, variability, and association. An introduction to statistical computing with popular general purpose statistical computer programs will be provided. [3]

**PSY-GS8861 - Statistical Inference****Title**

Statistical Inference

**Catalog Description**

Introductory course designed to familiarize doctoral students with the principles and procedures of statistical inference and to prepare them for more advanced work in research design and analysis. [3]

## **PSY-GS8864 - Analysis and Design of Experiment**

### **Title**

Analysis and Design of Experiment

### **Catalog Description**

This course covers a variety of analysis of variance (ANOVA) techniques for analysis of experimental data. Topics are between-subject one-way and two-way ANOVA, within-subject ANOVA, and ANOVA with both within- and between-subject factors. Coverage of each variant includes concepts in experimental design, statistical model and assumptions, statistical tests of the overall effect and contrasts, effect size and power/sample size calculations, multiple comparison techniques, software specification and interpretation. R is the primary statistical computing platform, but SPSS will also be covered. Prerequisite: 8861 or equivalent. [3]

## **PSY-GS8867 - Multivariate Statistics for Data Science**

### **Title**

Multivariate Statistics for Data Science

### **Catalog Description**

This course covers several multivariate statistical topics used in data science: principal component analysis, rotation, canonical correlations, multidimensional scaling, correspondence analysis, and hierarchical clustering. Matrix algebra and basics about multivariate data will be taught at the beginning. The course has both theoretical and applied components. R will be used as the primary computing tool. Prerequisite: PSY-GS 8861 or equivalent [3]

## **PSY-GS8870 - Correlation and Regression**

### **Title**

Correlation and Regression

### **Catalog Description**

Fundamental concepts in bivariate and multiple regression and correlation techniques. Emphasizes the theory and assumptions underlying OLS and logistic regression, computational procedures, and interpretation of results. Specific applications include: (1) coverage of the full range of correlation indices; (2) a range of regression strategies (e.g., reduced-form regression, path analysis, ordered and unordered step-wise inclusion); (3) statistical power; (4) regression diagnostics; (5) nonlinear regression and linearizing transformations; (6) testing interactions; and (7) conditions for causal analysis and analysis of change. [3]

## **PSY-GS8873 - Structural Equation Modeling**

### **Title**

Structural Equation Modeling

### **Catalog Description**

This course introduces the basic principles of path analysis, confirmatory factor analysis, and latent variable structural modeling, which constitute a powerful set of statistical tools for examining correlational, observational, and even experimental data in the social sciences. Computer techniques for conducting these analyses will also be taught: the LISREL program in particular, but AMOS will also be introduced. [3]

## **PSY-GS8875 - Behavioral Data Science**

### **Title**

Behavioral Data Science

### **Catalog Description**

Application-focused data science for social scientists. Emphasis on open science and reproducible code, effective data management and visualization, application of machine learning and predictive modeling (e.g., classification, regression, regularization, neural networks), unsupervised learning (e.g., k-means clustering, exploratory graph analysis), and cross-validation for generalizability. Experience with R is helpful but not necessary. [3]

## **PSY-GS8876 - Psychological Measurement**

### **Title**

Psychological Measurement

### **Catalog Description**

Fundamental concepts, methods, and principles of psychological measurement. Particular attention will be devoted to reliability and validity issues underlying psychometric theory, and how psychometric theory relates to the assessment of individual differences or human variation more generally. Topics will include multiple regression, factor analysis, and item response theory. [3]

## **PSY-GS8878 - Statistical Consulting Integrating AI**

### **Title**

Statistical Consulting Integrating AI

### **Catalog Description**

The objective of this course is to prepare students for providing statistical consulting in collaborative applied research settings. Statistical consulting skills are increasingly vital for research and analytic jobs in industry, education, medicine, and academia. Yet a variety of data analysis experiences beyond formal methodological coursework are needed to hone statistical consulting skills. Students work in a mentored environment on statistical and theoretical problems confronted by applied researchers in real data analysis settings within the social sciences and education. Students work in small groups or individually on consulting projects and also have opportunities for providing constructive feedback on others' projects. Throughout, students will critically consider the role of artificial intelligence (AI), specifically large language models, and to aid in statistical consulting and problem solving. Students will practice using AI to augment consulting deliverables and will critically evaluate the utility of AI for these purposes. This course will synthesize and further develop students' understanding of how to translate subject-matter questions into statistical language, select an appropriate statistical method, research and develop workable solutions to new problems, write an analysis plan, and effectively communicate results through oral and written reports, and thoughtfully use emerging technology to solve complex statistical inquiries. This course will not only focus on the content of statistical consulting but also on the process - covering how to communicate effectively, professionally, and ethically with clients about expectations, responsibilities, hypotheses, analyses, and results. Permission of Instructor required. [3]

## **PSY-GS8879 - Factor Analysis**

### **Title**

Factor Analysis

### **Catalog Description**

This course covers primarily Exploratory Factor Analysis (EFA), which is extensively used in psychology, education, medicine, and management. The course covers the theory behind factor analysis, hands-on application to data, exposure to uses of factor analysis in the applied literature, and instruction in popular EFA software. Key topics include model specification, fit and evaluation, rotation methods, questionnaire development, sample size and power issues, and extensions to confirmatory factor models. [3]

## **PSY-GS8880 - Introduction to Item Response Theory**

### **Title**

Introduction to Item Response Theory

### **Catalog Description**

In this course, students are introduced to the basic concepts of educational and psychological measurement, classical test theory (CTT), and item response theory (IRT). These concepts will be taught with the practice by illustrating the construction of instruments using the 'Four Building Blocks' approach (Wilson, 2005) and investigating their measurement properties (e.g., validity and reliability). This class will present both the 'how to' and the 'why' of IRT. The primary objective of the course is to sharpen the skill, sophistication, and intuition of the student in the interpretation of educational and psychological test data, and in the construction and use of tests as instruments of educational and psychological theory and as tools in the practical problems of selection, evaluation, and guidance in the light of IRT. [3]

## **PSY-GS8881 - Item Response Theory II**

### **Title**

Item Response Theory II

### **Catalog Description**

Item Response Theory (IRT) II covers IRT models commonly used in education and psychology and their parameter estimation techniques using currently available software. This course will focus on developing a conceptual understanding of the mathematical concepts underlying the IRT models in so far as this is necessary for appropriate use of IRT models. In addition, the class covers topics in applications of IRT including equating/linking (as preliminary procedures for complex IRT models) and differential item functioning (DIF) analysis. [3]

## **PSY-GS8882 - Multilevel Modeling**

### **Title**

Multilevel Modeling

### **Catalog Description**

This course covers multilevel (or hierarchical linear) modeling, which is used extensively in psychology, education, sociology, and medical research. The course covers the theory behind multilevel modeling, hands-on application to data, exposure to uses of multilevel modeling in the applied literature, and instruction in popular multilevel modeling software. Key topics include random effects ANOVA, random slopes, cross-level interactions, multivariate and multi-group models, centering, growth models, discrete outcomes, and dealing with cross-classified data. [3]

## **PSY-GS8885 - Applied Latent Class and Mixture Modeling**

### **Title**

Applied Latent Class and Mixture Modeling

### **Catalog Description**

Often social science and educational researchers hypothesize that there are unobserved groups--or latent classes--of persons who show different behavioral patterns, or different patterns of change over time. This course covers mixture modeling, a statistical approach that allows assessment of the number and size of classes, as well as class homogeneity or heterogeneity. Longitudinal mixture models are also covered, which allow classes to transition between states at different rates and/or have different functional forms of change. [3]

### **PSY-GS8888 - Latent Growth Curve Modeling**

#### **Title**

Latent Growth Curve Modeling

#### **Catalog Description**

The analysis of longitudinal data (repeated measurements on the same people over time) is central for evaluating many theories in social science and educational research. This applied course will focus on one flexible and powerful approach for analyzing within-individual change over time, and between-individual differences in change: the latent growth curve model. Emphasis will be placed on attaining a solid understanding of the statistical model, applications to real data, and interpretation of results. [3]

### **PSY-GS8999 - Non-Candidate Research**

#### **Title**

Non-Candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

### **PSY-GS9950 - Clinical Applications and Practicum I**

#### **Title**

Clinical Applications and Practicum I

#### **Catalog Description**

This two-semester sequence is required for doctoral students in clinical psychology. The sequence involves applications of theoretical principles of behavior change in clinical settings. Didactic meetings will integrate the empirical and theoretical literatures with problems in clinical application. Students will participate in clinical practice (assessment and intervention) under program faculty supervision. Prerequisite: psychopathology, clinical assessment, and intervention, as well as consent of instructor. [0-3]

### **PSY-GS9951 - Clinical Applications and Practicum II**

#### **Title**

Clinical Applications and Practicum II

#### **Catalog Description**

This two-semester sequence is required for doctoral students in clinical psychology. The sequence involves advanced application of theoretical principles of behavior change in clinical settings. Students will participate in clinical practice (assessment and intervention) under the joint supervision of program faculty and adjunct faculty in community settings. Prerequisite: 9950 [1-3]

### **PSY-GS9960 - Readings and Research in Psychology**

#### **Title**

Readings and Research in Psychology

#### **Catalog Description**

Individual programs of reading or empirical research in psychology. Prerequisite: consent of faculty supervisor. May be repeated. [Variable credit: 1-3]



**PSY-GS9980 - Clinical Psychology Internship****Title**

Clinical Psychology Internship

**Catalog Description**

Required of all Ph.D. students in the clinical program. Specialty rotations, generalized training, didactic instruction, and supervised research are offered during one full year of clinical experience in an academic clinical setting or similar internship facility accredited by the American Psychological Association (APA). Credit hours: students register for zero hours to reflect full-time involvement in supervised clinical psychology internship. Grading is on a Pass/Fail basis. [0]

**PSY-GS9995 - Half-Time Ph.D. Dissertation Research****Title**

Half-Time Ph.D. Dissertation Research

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0].

**PSY-GS9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Religion

**REL5000 - GDR Teaching Assistantship/Teaching Associate Practicum****Title**

GDR Teaching Assistantship/Teaching Associate Practicum

**Catalog Description**

Designed as a mentoring activity, which begins with a written strategy mutually agreed to by the student and faculty member outlining expectations and goals for the semester (MA/PhD). Prerequisite: REL 8004.0 I Practicum in the Teaching of Religion and/or REL 8900.0 I Study of Religion; [0] credit hours; offered Fall, Spring, Summer

**REL5101 - Elementary Biblical Hebrew, Part I****Title**

Elementary Biblical Hebrew, Part I

**Catalog Description**

This is the first course in a two-semester sequence leading to a reading knowledge of the Hebrew Bible; concentration is on the basic elements and grammatical study of the language, leading students to begin reading from the original texts. [3] Staff.

**REL5102 - Elementary Biblical Hebrew, Part II****Title**

Elementary Biblical Hebrew, Part II

**Catalog Description**

This is the second course in a two-semester sequence leading to a reading knowledge of the Hebrew Bible; concentration is on the basic elements and grammatical study of the language, leading students to begin reading from the original texts. [3] Staff.

**REL5103 - Beginning Greek I****Title**

Beginning Greek I

**Catalog Description**

Elements of ancient Greek. Reading of simplified texts from authors of the Classical, Hellenistic, and Imperial period, including religious scripture and related genres. [3]

**REL5104 - Beginning Greek II****Title**

Beginning Greek II

**Catalog Description**

This is the second course in a two-semester sequence of study leading to a knowledge of the New Testament. [3] Staff.

**REL5105 - Intermediate Greek I****Title**

Intermediate Greek I

**Catalog Description**

Classical and Koinv© Greek. Review of Greek grammar and readings from classical and biblical texts. Open for credit to M.A. students only. [3] Gaca.

**REL5106 - Elementary Modern Hebrew I****Title**

Elementary Modern Hebrew I

**Catalog Description**

Introduction to alphabet, the basics of grammar, and elementary conversation. [3] Staff.

**REL5107 - Elementary Modern Hebrew II****Title**

Elementary Modern Hebrew II

**Catalog Description**

Emphasis on conversation and grammar. [3] Staff.

**REL5108 - Intermediate Modern Hebrew I****Title**

Intermediate Modern Hebrew I

**Catalog Description**

Modern Hebrew reading, conversation, and advanced grammar. Spring: greater emphasis on reading and writing. Prerequisite: one year of Modern Hebrew or its equivalent. [3] Staff.

**REL5109 - Intermediate Modern Hebrew II****Title**

Intermediate Modern Hebrew II

**Catalog Description**

Modern Hebrew reading, conversation, and advanced grammar. Spring: greater emphasis on reading and writing. Prerequisite: one year of Modern Hebrew or its equivalent. [3] Staff.

**REL5111 - Beginning Latin I****Title**

Beginning Latin I

**Catalog Description**

Designed to enable the student to understand elementary Latin, whether written or oral. Some practice in speaking and writing in Latin. FALL. [3]

**REL5120 - Intermediate Biblical Hebrew****Title**

Intermediate Biblical Hebrew

**Catalog Description**

Designed for students who have completed an elementary course in Hebrew and need more work in the areas of grammar, syntax, and reading of Hebrew texts. [3]

**REL5125 - Ugaritic****Title**

Ugaritic

**Catalog Description**

Elements of Ugaritic grammar, with reading in selected texts. Prerequisite: Elementary Biblical Hebrew. [3]

**REL5126 - Arabic of the Qur'an and Other Classical Texts****Title**

Arabic of the Qur'an and Other Classical Texts

**Catalog Description**

Syntactical and morphological features of classical Arabic. Differences and similarities with modern standard Arabic in vocabulary usage, semantic extensions, and context; vocabulary borrowing. Texts drawn from the Qur'an, Hadith, and Sira (biographical) literature. [3]

## **REL5247 - Religion in the Global Context**

### **Title**

Religion in the Global Context

### **Catalog Description**

This course explores the evolving relationships of religious traditions in the context of globalization. Religion, both theoretically and in practice, is a "global" phenomenon, and the world's religions are now recognized as major players in an increasingly interconnected world. This course, thus takes globalization as its orienting theory or description of social reality, and examines the role and place of religion in that context. What is globalization, and what is religion's relationship to it? How have religious traditions furthered globalization? How have they resisted it? What has globalization meant for religious identity and practice? What does it mean to be religious in the context of globalization? Over the course of the semester, we will: 1) study the key aspects of globalization as a social process; 2) examine the global religious landscape, and 3) identify and research key trends of religion in this context. 4) Finally, we will consider issues of global concern for religions: global health, poverty, and issues of gender and sexuality. [3] Mr. Reside

## **REL5270 - Jewish Storytelling**

### **Title**

Jewish Storytelling

### **Catalog Description**

Twentieth-century short fiction and narrative traditions. The transition from religious to secular cultural forms. Immigration and ethnic literary forms. All works are in English or English translation from Yiddish, Hebrew, and Russian. [3]

## **REL5279 - The Sacred and the Secular**

### **Title**

The Sacred and the Secular

### **Catalog Description**

Ethnographies of ritual and religious life. Politics of secularism and religious revival. Issues in anthropology, literature, and philosophy. Christianity, Hinduism, Islam, and Native American Religions. [3] Fall. Taneja.

## **REL5353 - Baptist History And Polity**

### **Title**

Baptist History And Polity

### **Catalog Description**

Investigates the origins, development, and theological positions throughout the history of the Baptist tradition and examines current trends in the tradition's polity. [3] Byrd.

## **REL5356 - Episcopal Liturgy: The Book of Common Prayer and Its Resources**

### **Title**

Episcopal Liturgy: The Book of Common Prayer and Its Resources

### **Catalog Description**

This seminar course will explore diverse topics in liturgical theology, including history, specific liturgical traditions (both denominational and cultural), pedagogy, ritual studies, feminist and gender studies, multicultural worship and inculturation, ecumenics and liturgical renewal, liturgical language, the arts, ethics, pastoral care, and contemporary liturgical theology. It will also look at different methodologies employed for the use of liturgical studies, especially in the study of historical texts. This course is designed for those students who want an in depth look at liturgical theology, particularly doctoral students preparing for their comprehensive exams in this area. [3]

**REL5412 - Survey of Christian Congregational Song**  
**Title**

Survey of Christian Congregational Song

**Catalog Description**

This course will survey the various styles of congregational song that have been used in Christian worship from the beginnings of Christianity to the present day. By analyzing the texts and music of congregational songs from a global and ecumenical perspective, the goal is to prepare students for the variety of settings in which they will be charged to choose congregational songs for their specific contexts (whether inside or outside the church walls). Particular attention will be given to congregational songs from the 21st century and how they address topics including violence, poverty, immigration, and natural disasters, as well as justice issues of race, class, ethnicity, ability, sex, gender identity, and sexual orientation. [3] Ms. Budwey

**REL5432 - Women and Religion**  
**Title**

Women and Religion

**Catalog Description**

This course will explore the ways that femaleness and woman-gendered identities configure religious consciousness and performance across cultures and chronologies. Through an examination of women's sacred productions and roles in Native American, West African, Hindu, Muslim, Christian, Vodou, and other religious traditions, we will interrogate how religion shapes gender identity, and conversely, how woman-gendered identity informs religiosity. Finally, the course will analyze woman-centered movements, such as feminism and womanism, in light of religious women's experiences and seek new ways to categorize these experiences. [3]

**REL5458 - The Golden Age of Islam**  
**Title**

The Golden Age of Islam

**Catalog Description**

The history and origins of Islam are topics of increasing public interest and concern. Many have heard of Islam's Golden Age, the brilliant works of art and architecture, the medical and astronomical discoveries, the advances in literature, philosophy, and history writing, the spiritual subtleties of Sufism. Students wonder how the flowering of Islam led to today's rivalry between Shi'ites and Sunnis, or how the fierce partisanship of militants and extremists colored or pushed aside the cosmopolitan openness of an earlier age. This course aims to open up a richer, fuller appreciation of Islamic civilization than will be seen in the daily news feeds. It will provide the background needed to appreciate the rich diversity of Islamic culture and history indispensable for an informed encounter with our present world. Illustrated lectures, discussions, distinguished visiting speakers, and key artifacts will be part of the course experience. [3]

**REL5459 - Buddhist Traditions**  
**Title**

Buddhist Traditions

**Catalog Description**

Historical and thematic survey of foundational, Mahayana, and esoteric Buddhist traditions. Mythology, doctrine, meditation, devotional practices, and institutions. Contemporary case studies from Asia and North America. [3]

**REL5460 - East Asian Buddhism****Title**

East Asian Buddhism

**Catalog Description**

East Asian Buddhism is a vast subject. Many scholars have spent their entire careers working in just a corner of it. Rather than attempting a comprehensive survey, this course focuses on aspects of East Asian Buddhism carefully chosen to illuminate the powerful, variegated, long-lasting religion it was and still is. Readings include the Lotus Sutra and the famous Zen text known as the Platform Sutra. [3] Mr. Company

**REL5466 - Through the Eyes of the Other: A History of Muslim-Christian Relations****Title**

Through the Eyes of the Other: A History of Muslim-Christian Relations

**Catalog Description**

Charting the trajectory of mutual discovery through the following criteria: (1) official religious and political texts that delineate the contours of each religion vis-à-vis the other; (2) histories and narrative of significant episodic moments of rupture in the relationship between Islam and Christianity; (3) travelogues written from the Muslim and Christian vantage points to describe the other, and in so doing deepening the process of self-discovery and/or defending the salutariness of their own religion. [3] Mr. P. Lim and Mr. R. McGregor

**REL5475 - Daoist Tradition****Title**

Daoist Tradition

**Catalog Description**

Historical and thematic survey of the Daoist tradition in China. Philosophical classics and religious scriptures, as well as social history are covered. Daoism today. [3] Mr. Company

**REL5477 - Religion and Climate Change****Title**

Religion and Climate Change

**Catalog Description**

Role of religion in climate change and as response to planetary catastrophe. Religious and literary texts. Historical, philosophical, and anthropological work. [3] Mr. Taneja

## **REL5478 - Approaches to the Academic Study of Religion**

### **Title**

Approaches to the Academic Study of Religion

### **Catalog Description**

Religious beliefs are beliefs about the sacred, and our ways of approaching and relating to the sacred. The conflicts of the contemporary world have proved that the sacred, whether as absence or as presence, still has a powerful hold on our imaginations, and on our ways of being and acting in a world which was previously seen as becoming rapidly and dominantly secular. But what is the sacred? And where is the sacred found? Is it transcendent, beyond and outside this world, or immanent, present within it? What are the consequences of believing in the sacred to be one or the other? Is the sacred unchanging, or shaped by history? What is the relation of the sacred to human behavior – to rituals, to ethics, to everyday life? What is the relation of the sacred to nature, a question of utmost importance in an era of increasing global warming and ever-diminishing natural resources. What is the relation of the sacred to the political ideologies and practices of secularism? What is the relation of the sacred to the “disenchanted” secular worldview? In this course, we will explore the above questions by studying a range of theoretical approaches to secularism and the secular, and various classic and recent ethnographies about the sacred and its relation to materiality, history and to everyday life in many parts of the world. [3] Mr. Taneja

## **REL5492 - Dante and Theology**

### **Title**

Dante and Theology

### **Catalog Description**

Dante's poetic, philosophical, critical, and political work will be considered especially from the standpoint of the theological vision it promulgates and of the possibilities for aesthetic theology that it discloses. The course serves also as an introduction to Literature and Religion. The emphasis will be placed on Dante's *Paradiso* but also on the pertinence of his pre-modern theological ideas and passions as developed in *Convivio*, *De monarchia*, and *De vulgari eloquentia* for our contemporary and postmodern world. Dante's theology will be developed in its own context by comparison especially with Thomas Aquinas, Bonaventure, Meister Eckhart, and Duns Scotus, the last being his exact contemporary. Dante's own pioneering of a modern approach to theology in the context of an incipient secular world will be brought out, but also the implications of his expressly imperialist political theology for our global age and the tension between claims of universal truth and of negative theology. We will scrutinize, for example, issues of Transgression and Transcendence, or What Makes Religion Radical. [3] Mr. Franke

## **REL6013 - Warrior Chants and Unquiet Spirits**

### **Title**

Warrior Chants and Unquiet Spirits

### **Catalog Description**

A focus upon the Christian protest tradition, in historical and contemporary contexts, through the autobiographies of men and women who have used their voices and actions to address and to make significant differences in church and society. Analysis of personal descriptions and basic commitments for social justice form the framework for integrating spirituality with social witness. We study the relationship of the work of such movements within and beyond church structures. [3]

## **REL6080 - Womanist Thought in Religion and Psychology**

### **Title**

Womanist Thought in Religion and Psychology

### **Catalog Description**

This seminar course will introduce students to, and deepen their engagement with, womanists' thought, and the methods, aims, approaches, and sources of womanist scholarship in religion and psychology. Womanist scholars situate black women's experience as the epistemological starting place for reflection, theory building and praxis; therefore, a primary presupposition of this course is that black women's particularity, and the challenges their experiences pose for existing perspectives, is integral to womanist approaches to psychology and religion and is the privileged source of knowledge building in this class. Fall. [3] Sheppard.

## **REL6087 - Psychology and Religion in Butch, Femme, and Queer Women's Ethnographies and Narratives**

### **Title**

Psychology and Religion in Butch, Femme, and Queer Women's Ethnographies and Narratives

### **Catalog Description**

This course is concerned with identity/identities, the formation of subjectivities in the midst of highly defined spaces as well as broader self-defined inclusive spaces. Questions related to religion, psychology, and culture will guide us as will questions such as what/who is a woman, what is butch-femme, and queer. All will be subjected to the contribution, challenge, and critique of lived experience. Pre-requisites: Graduate student in Religion or advanced DIV student. [3]

## **REL6177 - Song of Songs**

### **Title**

Song of Songs

### **Catalog Description**

The Song of Songs text, analysis of the literature, study of the religious significance and social background of the book, and its place in the theology of the Hebrew Bible. Prerequisite: knowledge of biblical Hebrew. [3]

## **REL6500 - The Hebrew Bible**

### **Title**

The Hebrew Bible

### **Catalog Description**

The life and thought of ancient Israel, with emphasis on the community's understanding of itself and of its role in history, are addressed in this course; concentration is upon both the problems of historical and literary interpretations and the Israelites' religious practices and faith. Not available for Ph.D. credit in biblical studies. [3]

## **REL6501 - Literary Analysis of the Hebrew Bible**

### **Title**

Literary Analysis of the Hebrew Bible

### **Catalog Description**

This course focuses on narrative criticism of the Hebrew Bible, comparing it to similar methodologies (poetics, rhetorical criticism, etc.) and contrasting it with other forms of exegesis (historical criticism, deconstruction, etc.). Students will study key literary terms and discuss the elements that work together to form a story. The class will consider the narrator's voice in relation to the text and the reader, examining narrative omniscience, key type scenes, and themes in the Hebrew Bible and ancient Near Eastern literature. [3]



## **REL6502 - Leadership in Hebrew Bible**

### **Title**

Leadership in Hebrew Bible

### **Catalog Description**

Using Jotham's fable (Judges 9) as a paradigm for leadership, this course examines various types of leaders in the Hebrew Bible and ancient Near East. Employing folkloristics, socio-historical criticism, and other methodologies, students will study the roles of kings, queens, priests, prophets, prophetesses, and other leaders in the ancient world. As students compare and contrast the ideologies and imagery associated with different types of authority, the class invites them to explore practical applications in their own vocations. [3]

## **REL6503 - History Of Ancient Israel**

### **Title**

History Of Ancient Israel

### **Catalog Description**

Examination of the major areas of debate in the reconstruction of the history of ancient Israel and analysis of the important extra-biblical sources that have contributed to the scholarship on ancient Israel's history. The course will also address the roles that ancient Israel's Near Eastern neighbors played in the development of ancient Israel's history. [3] Azzoni.

## **REL6504 - Modern Interpreters of Ancient Israel**

### **Title**

Modern Interpreters of Ancient Israel

### **Catalog Description**

Characteristic approaches to the history and religion of ancient Israel, as seen in selected writings by prominent scholars since the Enlightenment. Attention to the presuppositions of each scholar and to the view of Israel afforded in each study. [3] Marbury

## **REL6505 - Law in the Hebrew Bible & ANE**

### **Title**

Law in the Hebrew Bible & ANE

### **Catalog Description**

The legal materials in the Pentateuch, their relation to the prophetic movement, and the role of law in ancient Israel's thought and society against the ancient Near Eastern background. [3] Ms. Azzoni

## **REL6508 - Death and Transfiguration in Pharaonic Egypt**

### **Title**

Death and Transfiguration in Pharaonic Egypt

### **Catalog Description**

This course explores the conceptual world of Ancient Egyptian mortuary religion: how the ancient Egyptians viewed death and the afterlife, prepared the body for eternity, and created lasting funerary monuments. Attention will be given to how these concepts are evoked in Ancient Israel, and how they are presented today through museum exhibitions and in popular culture.

**REL6509 - Exegesis Seminar****Title**

Exegesis Seminar

**Catalog Description**

Study of the principles, methods, and tools used in the critical study of the Hebrew Bible, including textual, historical-critical, ideological, literary, and other exegetical methods. [3] Seow

**REL6510 - Empire and Canon****Title**

Empire and Canon

**Catalog Description**

Arguably, two eras of imperial domination, the Persian and Hellenistic periods, are the most literarily active in the formation of the Hebrew Bible. This advanced-level seminar looks at the Persian imperial context as the social world from which much of the Hebrew Bible emerged. Its seminal question, "How much did Persian imperial policy shape the writings of the early Second Temple priesthood?" will guide both the discussions and the readings. With this in mind, the course examines struggles between the priesthood, imperial authorities, and the Jerusalem populace and raises questions about specific biblical texts which may provide insights into these relationships. [3] Mr. Marbury

**REL6511 - Book Of Genesis****Title**

Book Of Genesis

**Catalog Description**

Book of Genesis, concentrating on the definition of its major themes and purposes. Hebrew language not required. [3] Mr. Seow

**REL6514 - The Exodus in African American Biblical Interpretation****Title**

The Exodus in African American Biblical Interpretation

**Catalog Description**

This seminar surveys the politics of African American biblical interpretation and the Book of Exodus in the 19th and 20th centuries. The seminar will rely entirely upon primary source materials. [3]

**REL6515 - The Book of Deuteronomy****Title**

The Book of Deuteronomy

**Catalog Description**

An exegesis class on the Book of Deuteronomy, concentrating on defining the book's major themes and purposes as well as examining the book's poetry.

**REL6516 - The Book of Numbers****Title**

The Book of Numbers

**REL6518 - Book Of Job****Title**

Book Of Job

**Catalog Description**

A study of the book of Job, attending to its literary features, religious themes, internal disputes regarding theodicy, and its relation to other texts from the region. [3] Seow.

**REL6519 - Book of Qoheleth****Title**

Book of Qoheleth

**Catalog Description**

Israelite skepticism, with emphasis on the literary form, thematic coherence, and religious viewpoint of Job and Qoheleth, interpreted within the broad spectrum of Israelite wisdom and consideration of Greek influence. [3]

**REL6520 - Book Of Daniel****Title**

Book Of Daniel

**Catalog Description**

An in-depth analysis of the Book of Daniel, with particular attention to the text's historical background and literary form. The place of the Book of Daniel within Prophetic and Apocalyptic literature will also be explored. [3] Mr. Seow

**REL6522 - Sexuality in the Hebrew Bible and ANE****Title**

Sexuality in the Hebrew Bible and ANE

**Catalog Description**

Explores how various sexual practices (prostitution, homosexuality, heterosexuality, rape, sodomy, incest) are dealt with in the Hebrew Bible and in the larger context of the ANE. [3]

**REL6523 - Religions and Cultures of the Ancient Near East****Title**

Religions and Cultures of the Ancient Near East

**Catalog Description**

A consideration of the cultural and religious milieus of Egypt, Mesopotamia, Anatolia, Canaan and beyond before Alexander the Great. The goals of the course include a deeper understanding of the cultures of the area that surrounded, chronologically and geographically, the people who wrote the Hebrew Bible, and an awareness of the complex interactions and mutual influences among these cultures the world of the Bible in its ancient context. [3] Ms. Azzoni

## **REL6524 - From the Invention of Writing to Literary Classics**

### **Title**

From the Invention of Writing to Literary Classics

### **Catalog Description**

This course will begin with the invention of writing in ancient Sumer and Egypt; the development of the writing systems in Mesopotamia, Egypt, Anatolia, and the origin and development of the alphabet in the Levant and its reflexes in Greek and Latin. The course will then explore various literary classics in that cradle of world literature. [3] Mr. Seow

## **REL6525 - Ancient Goddesses**

### **Title**

Ancient Goddesses

### **Catalog Description**

This course will examine how ancient cultures (Mesopotamia, Egypt, Ancient Israel, and beyond) conceived of the feminine divine, primarily through a survey of the available literature (myths, hymns, and prayers) and iconographic evidence (statues, plaques, figurines). The roles of specific goddesses, their spheres of influence, and their place in the various pantheons will be taken into account, while also paying attention to cultic practices and religious syncretism across the cultures.

## **REL6526 - Jewish Life in Persian Egypt**

### **Title**

Jewish Life in Persian Egypt

### **Catalog Description**

The Aramaic documents from the island of Elephantine offer a unique portrayal of the life of a Jewish community in fifth-century Egypt BCE. In this seminar, students will learn to read the papyri and ostraca in the original language and script, and explore the historical, linguistic, and cultural implications of the documents in relationship with relevant Biblical material.[3]

## **REL6527 - Hellenistic Jewish Literature**

### **Title**

Hellenistic Jewish Literature

### **Catalog Description**

In the Second Temple period, Israel's ancient library of sacred texts was becoming the Bible. This period witnessed a proliferation of enormously versatile literary texts with religious themes written in the dominant languages of the time: Aramaic, Hebrew, and Greek. Those works that are left out the Hebrew Bible, but became a part of the canonical literature of the early Christian churches, we call here Apocrypha. Pseudepigrapha, conversely, is a vague term for the ancient Jewish national literature that grew around biblical figures and events but was left out of the ancient scriptural traditions. In this course we will examine most of the Apocrypha and a selection of the Pseudepigrapha, in English, and compare them with the literature of a similar genre and period, such as testaments (Testament of Abraham, The Testament of 12 Patriarchs), romances (Joseph and Aseneth), tales of adventure (Books of Tobit, Judith, Esther), letters, apocalyptic literature, historiographies (1-2 Maccabees, Josephus), and philosophical essays (Philo). In these numerous readings of the primary sources, we will also look at the main contemporary methods of interpretation: midrash and allegory. The canonical issues, the scriptural and ecclesiastical authority of the Apocrypha and Pseudepigrapha, and their use and function in the confessional and academic setting will receive due attention.

**REL6529 - Eighth-Century? Prophecy****Title**

Eighth-Century? Prophecy

**Catalog Description**

A study of the prophetic literature against its ancient Near Eastern background; emphasis placed on the eighth-century B.C.E. prophets and on the contemporary significance of their message. [3] Marbury

**REL6532 - Marriage in the Beginning****Title**

Marriage in the Beginning

**Catalog Description**

An examination of different aspects (religious, legal, socio-economic) of marriage, through a survey of ancient Sumerian, Assyrian, Babylonian, Egyptian sources and the relevant sections of the Hebrew Bible. The variety of literary and historical texts will reveal a complex picture of how this institution developed at the very beginning of recorded history. [3]

**REL6533 - The Book of Psalms****Title**

The Book of Psalms

**Catalog Description**

A study of the Book of Psalms, including an analysis of the types and settings in the life of Israel, a discussion of the religion of the poems and their poetic form, and a survey of modern scholarship in the area. [3]

**REL6534 - Job, Literature, and Visual Arts****Title**

Job, Literature, and Visual Arts

**Catalog Description**

After an orientation of the book of Job as a literary work of art, the course will consider the reception of the story in literature. Lectures will include broad surveys of literature from various periods, cultures, and genres. Students will have opportunities to explore topics that are commensurate with their interests and areas of study, including English literature (or French, German, Spanish, Japanese), Jewish studies, theatre, and music. [3] Mr. Seow

**REL6535 - Hebrew Poetry****Title**

Hebrew Poetry

**Catalog Description**

This course explores the nature and modes of poetry in the Hebrew Bible in various genres through lectures, secondary literature, and close reading of selected poems. Prerequisite: knowledge of Biblical Hebrew. [3] Mr. Seow

**REL6536 - The Book of Judges****Title**

The Book of Judges

**Catalog Description**

Critical exegesis of major sections of the Book of Judges, with evaluation of its historical, historiographic, and literary contents. [3] Mr. Seow

**REL6543 - Religion, Ecology, and Power in Africa****Title**

Religion, Ecology, and Power in Africa

**Catalog Description**

As people increasingly worry over the environmental challenges that the world faces, this course will guide students through an exploration of the interwoven destinies of human beings, animals, and land across Sub-Saharan Africa. To begin, we shall consider how ideas about the divine origin and development of the earth and its peoples have influenced African social structure, ethnically-based occupations, and stewardship over the environment. From here students will examine further how power relations in pre-colonial Africa through the present-day have determined human-earth relations and how resources are cared for and consumed. We also shall discuss and debate the role of ritual in addressing environmental problems alongside ongoing issues regarding the management and ownership of African resources. [3]

**REL6546 - Secularism****Title**

Secularism

**Catalog Description**

As a cultural phenomenon commonly associated with the contemporary world, especially the modern Western world, secularism is not mere atheism or anti-religion. Rather, it advocates or assumes a separation of government, education, and other social institutions from religious authority. The course aims to survey the complexities of secularism from a variety of angles: history, geographical variations, philosophy, religion, ethics, law, sociology, economics, psychology, education, literature and art. Prerequisite: Prior coursework in the humanities and social sciences. SPRING. [3]

**REL6548 - Middle Egyptian Hieroglyphs****Title**

Middle Egyptian Hieroglyphs

**Catalog Description**

Ancient Egyptian culture has captivated western societies for centuries, and the hieroglyphic writing system is particularly fascinating. In this class, we will focus on Middle Egyptian, the "classical" language of Pharaonic Egypt. You will acquire a solid grounding in Middle Egyptian grammar and be able to sample hieroglyphic texts that were written during four millennia. Additionally, you will gain valuable insights into ancient Egypt culture. [3] Ms. Azzoni

**REL6550 - Akkadian I****Title**

Akkadian I

**Catalog Description**

Elements of Akkadian (Assyro-Babylonian) grammar, with reading in selected texts. Consent of the instructor required. [3] Ms. Azzoni

**REL6551 - Akkadian II****Title**

Akkadian II

**Catalog Description**

Reading in selected historical, mythical, legal, and epistolary texts. Consent of the instructor required. [3] Ms. Azzoni

**REL6552 - Introduction to Classical Syriac****Title**

Introduction to Classical Syriac

**Catalog Description**

Classical Syriac (also called "literary" Syriac --ktabanaya) is a dialect of Aramaic that flourished for over a millennium in the Middle East and Asia. Today, perhaps more than ten thousand manuscripts written in Classical Syriac survive; many are unique sources for the history of Judaism, Christianity, and Islam. Reading classical Syriac literature is thus of interest to a variety of scholars including ancient and medieval historians, classicists, scholars of religious studies, biblical scholars, and comparative linguists. In this course students will learn the basic structure of Classical Syriac grammar and learn to read simple texts from the Syriac translations of Christian and Jewish scriptures. [3] Mr. Michelson

**REL6553 - Historical Hebrew Grammar****Title**

Historical Hebrew Grammar

**Catalog Description**

The course will offer a diachronic overview of the Hebrew Language, tracing its origin in connection and comparison with other Semitic languages, particularly within the Northwest Semitic subgroup. Different theoretical models will be discussed, and comparative Semitics data will be offered to examine linguistic features, with specific focus on phonology, morphology, and the lexicon. [3]

**REL6554 - Readings in Reception Theory****Title**

Readings in Reception Theory

**Catalog Description**

A directed reading course in reception theory. [1] Mr. Seow

**REL6555 - Consequences of Scripture****Title**

Consequences of Scripture

**Catalog Description**

This course considers the "history of consequences" (variously called "history of interpretation," "history of reception," and "history of effects") of the Hebrew Bible/Old Testament, as evident in Jewish, Christian, and Islamic commentaries, theological writings, literature, liturgy, music, and visual arts. [3] Mr. Seow

**REL6566 - The Targums****Title**

The Targums

**Catalog Description**

An introduction to the Jewish Aramaic translations and interpretations of the Hebrew Bible; the course will aim at familiarizing the students with Jewish Literary Aramaic as reflected by the various Targums; examines different translations of the same biblical passages and different interpretative approaches. [3]

**REL6571 - African American Biblical Hermeneutics****Title**

African American Biblical Hermeneutics

**Catalog Description**

Surveys the field of discourse in African American biblical scholarship from its beginnings through the twenty-first century; students will analyze the work of the most prominent hermeneutics; discussions will emphasize the social and ideological currents that have contributed to the development of African American biblical hermeneutics as resistance discourse. [3] Marbury.

**REL6575 - Old Testament Theologies****Title**

Old Testament Theologies

**Catalog Description**

Traces Old Testament Theology in modern biblical criticism from the late 18th century through the mid 20th century. The class will turn to primary sources to engage both the major expressions and major critiques of the enterprise. [3]

**REL6580 - North-West Semitic Epigraphy****Title**

North-West Semitic Epigraphy

**Catalog Description**

Participants in this course will read from Hebrew, Aramaic, Phoenician, and Moabite texts, and emphasis will be placed upon relevant grammatical analyses. Prior to enrolling in this language course, students must demonstrate a proficient knowledge of Hebrew. [3] Azzoni.

**REL6600 - The New Testament****Title**

The New Testament

**Catalog Description**

How the New Testament shows the main characteristics of early Christianity as compared and contrasted with early Judaism and with Hellenistic religions. Religious authority in early Christian communities and the types of faith and ethics found within the New Testament traditions. [3]



## **REL6602 - The Gospels**

### **Title**

The Gospels

### **Catalog Description**

This course serves as a graduate level introduction to the contemporary interpretations of the Gospels in the New Testament and related documents. It will address the Greco-Roman and Jewish milieu of the Gospels, the methodological development of the Gospel scholarship, and the distinctiveness of each Gospel with regard to literary style, Christology, discipleship, and community concerns. It will also highlight the importance of ethical interpretation of the Gospels that will promote justice and mercy in today's world. [3] Ms. Quigley

## **REL6603 - The Gospel of Mark**

### **Title**

The Gospel of Mark

### **Catalog Description**

This course addresses various theories concerning Mark's historical context, narrative art, Christology, depiction of the disciples, political views, and presentations of gender, ethnicity, and social status. Students taking this course will consider the Gospel in its Roman imperial context, economics (e.g., money and trade, rich and poor), social groups (e.g., slaves, military, government officials, religious leaders, patrons and clients, beggars, women and children, families), Christology, and ecclesiology. Discussion will attend both to what the text might have meant in its first-century context and what it might mean for how it has been used by readers today. [3] Levine

## **REL6604 - The Gospel of John**

### **Title**

The Gospel of John

### **Catalog Description**

This course addresses various theories concerning John's historical context, narrative art, Christology, depiction of disciples, dualistic language and depictions of those outside the circle of Jesus-believers (e.g., "the world" "the Jews"), presentations of gender, ethnicity, and social status; eschatology (futurist, realized), and use/misuse within Christian teaching and preaching. [3] Levine

## **REL6605 - Readings in Greek: The Gospel of John**

### **Title**

Readings in Greek: The Gospel of John

### **Catalog Description**

This upper-level course focuses on the Greek text of the Fourth Gospel. Along with exegetical questions prompted by thesaurus of biblical approaches, attention will be focused on the style, nuances, and intertextual echoes of John's narrative. The pre-requisite for enrolling in the course is successful completion of course work in the Greek language. [3] Levine

## **REL6607 - Acts Of The Apostles**

### **Title**

Acts Of The Apostles

### **Catalog Description**

Exegesis of selected passages from Acts 1-15 with foci on various methodological perspectives. Greek required. [3] Levine.

## **REL6608 - Jewish/Christian Relations**

### **Title**

Jewish/Christian Relations

### **Catalog Description**

This course offers a brief history of relations between Christians and Jews and invites participants into critical engagement with present practices in light of that history. [3] Ms. Levine and Mr. Lim

## **REL6609 - Feminist Interpretations Of Scripture**

### **Title**

Feminist Interpretations Of Scripture

### **Catalog Description**

Examination of the representations of women, religious and ethnic "others," and sexuality in biblical and contemporary noncanonical (ANE, Pseudepigrapha, Gnosticism) texts, utilizing various approaches (literary, historical, anthropological, ideological, Womanist, Mujerista). [3] Levine.

## **REL6610 - The Pauline Interpretation Of Christianity**

### **Title**

The Pauline Interpretation Of Christianity

### **Catalog Description**

Pauline Christianity and its place in the early church, using the letters of Paul, the deutero-Pauline letters, and the portrait of Paul in Acts. Attention to the problems of method. Greek not required. [3] Patte.

## **REL6611 - Global Interpretations of Christian Scriptures**

### **Title**

Global Interpretations of Christian Scriptures

### **Catalog Description**

This course will compare the interpretations of biblical texts by Christians in Africa, Asia, Latin America, and Oceania-where at present two-thirds of the readers of the Bible are-with those by Orthodox Christians in Eastern Europe and the Middle East, and by Catholic and Protestant Christians in Western Europe and North America.

## **REL6612 - Semiotics and Biblical Studies**

### **Title**

Semiotics and Biblical Studies

### **Catalog Description**

Why are several, different, and often opposed interpretations of the same biblical text equally legitimate and plausible? (This is the question raised by Ricoeur in *The Conflict of Interpretations*, and by Fish in *Is There a Text in This Class?*, and also raised by the shelves of diverging scholarly commentaries on the same biblical book.) Thus, why do interpreters of the Bible have the moral responsibility of choosing among these legitimate and plausible interpretations one which "does no harm" and to take the risk of choosing an interpretation which will be helpful, liberating, and constructive by challenging systemic evil? Semiotic theories address these questions by providing theories of the way meaning is produced through the interaction of texts, intertexts, contexts, and readers. Most helpful in biblical studies are the semiotic theories of Umberto Eco (*A Theory of Semiotics and The Role of the Reader*), A.-J. Greimas (*Semiotics and Language*), who opens the possibility to account for *The Religious Dimensions of Biblical Texts*), and their applications in biblical studies by Mieke Bal, in *Narratology: Introduction to the Theory of Narrative; On Meaning-Making: Essays in Semiotics*; and her spectacular study of Judges 4 and 5, *Murder and Difference: Gender, Genre, and Scholarship on Sisera's Death*; and *Loving Yusuf: Conceptual Travels from Present to Past*, in which she reads biblical texts together with modern literature, feminist issues, visual art, and other religious texts (in the latter case, the Qur'an). [3]

**REL6614 - The Parables of Jesus****Title**

The Parables of Jesus

**Catalog Description**

Examining the nature of parable as form, the history of the interpretation of parables, the study of parables in the setting of the ministry of Jesus and the theology of the Evangelists, and literary criticism and the interpretation of parables. [3] Levine

**REL6616 - Greek Readings: The Gospel of Matthew****Title**

Greek Readings: The Gospel of Matthew

**Catalog Description**

Through analytical approaches such as historical-critical, literary, sociological, and ideological, students will reconstruct Matthew's audience, both actual and ideal, and explore the topics of Christology, ecclesiology, debates with the synagogue, politics, and artistry of composition. [3] Levine.

**REL6617 - Gospel According to Luke****Title**

Gospel According to Luke

**Catalog Description**

Exploration of Luke's compositional techniques, possible sources, Christology, community formation, and ethics, utilizing a variety of approaches (socio-historical, literary, ideological, feminist). Knowledge of Greek required. [3] Levine

**REL6618 - Christian-Jewish Relations in Medieval and Early Modern Europe****Title**

Christian-Jewish Relations in Medieval and Early Modern Europe

**Catalog Description**

Political and cultural history from the medieval persecutions to the expansion of legal toleration in the Enlightenment; close consideration of legal toleration, banishments, re-admissions, and the impact of Christian reform movements. [3] Mr. Price.

**REL6619 - Early Christian Writers****Title**

Early Christian Writers

**Catalog Description**

Writings of Greek Christians, from the New Testament to critical works and letters by the Cappadocian fathers. Historical and intellectual context. Rhetoric and style. The Roman East. [3]

## **REL6621 - Economic Justice in the New Testament**

### **Title**

Economic Justice in the New Testament

### **Catalog Description**

This course examines the complex ways in which the New Testament is and has been used both for economic exploitation and to help inspire communities to economic justice. Students will learn about the historical context of biblical texts related to economic themes related to land, poverty, and charity. We will also consider a variety of contemporary economic justice issues, including debt jubilees, the bail abolition movement, neo-monastic movements, credit unions, and divestment movements as sites where contemporary Christian communities organize to reduce economic exploitation and economic inequality and to bring about more just economic systems. How can ethical and contextual biblical interpretation inform action for economic justice? [3]

## **REL6641 - New Testament Studies: Ethos and Locus, Methods and Theories**

### **Title**

New Testament Studies: Ethos and Locus, Methods and Theories

### **Catalog Description**

Current methods of New Testament analysis, including textual, source, form, redaction, sociological, semiotic, and literary criticisms. [3]

## **REL6642 - New Testament Studies II: Ideological & Cultural Criticisms**

### **Title**

New Testament Studies II: Ideological & Cultural Criticisms

### **Catalog Description**

This course constitutes the second part of a two-part introduction to New Testament Studies as presently conceived and practiced. It is an advanced course, presupposing previous and substantial work in the field and designed primarily for students in the Graduate Department of Religion. The course is also open to advanced students in either the M.Div. or the M.T.S. degree program, although with permission of the instructor required. Contemporary biblical criticism may be approached in terms of five interpretive paradigms, each with its own distinctive though complex mode of discourse: historical criticism; literary criticism; sociocultural criticism; ideological criticism; cultural criticism. This second part will examine the role and future of biblical criticism in general as well as the methods and theories at work in the paradigms of ideological and cultural criticism. Its goal is to provide a comprehensive, critical picture of the discipline in terms of differential formations and relations of power as well as of different traditions of reading. The course will encompass three major components. First, a general introduction to the history of the discipline from the 1970s through today, with a focus on the questions raised by ideological and cultural criticisms. Second, sustained analysis of various ideological approaches (feminist and materialist criticisms, ethnic-racial and queer criticisms, postcolonial criticism, disability and ecological criticism) as well as focused consideration of cultural criticism, problematics, trajectories, critiques, interdisciplinary conversations. Finally, a brief view at both the role and the future of biblical criticism.[3]

## **REL6643 - Materialist Biblical Criticism**

### **Title**

Materialist Biblical Criticism

### **Catalog Description**

Focuses on the question of political economy and the resultant constructions and relations of social class, an angle of vision closely associated with the liberation criticism of the 1970s and beyond but also with roots in earlier Marxist approaches to the Bible; the course deals with the juncture between economic studies and biblical criticism, both with regard to the texts and contexts of early Christianity and the interpretations/interpreters of such texts and contexts in modernity and postmodernity; course will consider a study of political economy, approaches to the political economy of the Roman Empire, and the trajectory of materialist criticism. [3] Mr. Segovia.

**REL6644 - Racial-Ethnic Biblical Criticism****Title**

Racial-Ethnic Biblical Criticism

**Catalog Description**

Students participating in this seminar will analyze the juncture between Early Christian Studies and Racial-Ethnic Studies with a focus on the problems of race and ethnicity in biblical texts and contexts as well as in modern and postmodern interpretations and interpreters. The grounding phenomenon of migration; representations of Self and Others, signification of race and ethnicity, approaches to race and ethnicity in the Roman Empire; approaches to race and ethnicity in early Christian texts and contexts are among the topics students will explore. [3] Mr. Segovia

**REL6645 - Political Biblical Criticism****Title**

Political Biblical Criticism

**Catalog Description**

Analysis of the tradition of social criticism in general and the model of political criticism in the field of Biblical criticism in particular; a focus on how critics invoke and deploy Biblical texts and contexts with regard to major crises of our days. [3] Mr. Segovia

**REL6646 - Biblical Interpretation and Postcolonialism****Title**

Biblical Interpretation and Postcolonialism

**Catalog Description**

Analysis of the juncture between Early Christian Studies and Postcolonial Studies, with a focus on geopolitics and imperial-colonial formations and relations, in biblical texts and contexts as well as in modern-postmodern interpretations and contexts. [3] Mr. Segovia

**REL6648 - Imperial Biblical Criticism****Title**

Imperial Biblical Criticism

**Catalog Description**

This course addresses the problematic of geopolitics-the differential formations and relations of power revolving around the axis of imperial-colonial frameworks-and the tradition of imperial biblical criticism. As such, the course deals with the juncture between Early Christian Studies and Empire Studies. Its focus is twofold: the world of production-the texts and contexts of early Christianity; and the world of reception-the texts and contexts of geopolitical interpretations and interpreters of early Christianity. Topics to be addressed include: (1) the tradition of Empire Studies as a field of studies; (2) the analysis of the imperial-colonial framework of Rome, including its religious-theological dimensions; (3) overview of geopolitical approaches to the texts and contexts of the New Testament; and (4) the significance and relevance of such study in our contemporary social-cultural world, especially our religious-theological world. [3] Mr. Segovia

## **REL6700 - History of Global Christianities I**

### **Title**

History of Global Christianities I

### **Catalog Description**

This course surveys key themes in the origins, spread, and diversity of the various movements that identified themselves as "Christian" from the second century of the current era to year 1700. Students will be introduced to selected cultural, social, political, religious, and intellectual contexts in which Christian communities formed in the Middle East, Africa, Europe, Asia, and the Americas. Throughout the course, students will learn and apply historical methods of inquiry. The primary purpose of the course is for students to use primary sources to investigate questions of doctrine and practice, religion and politics, the creation of institutions, and varieties of Christian experience and identity. These questions are examined within a wider context of pre-modern to early modern global history. Special attention will be given to recovering voices and perspectives lost or muted in the sources. This is the first of the two-course sequence in History of Global Christianities. The course focuses especially on two formative periods: Christian formation in Late Antiquity and again surrounding the reformations beginning in the 1500s. [3]

## **REL6701 - Introduction to Christian Worship**

### **Title**

Introduction to Christian Worship

### **Catalog Description**

This course will examine the history, theology, and practices of Christian worship from global and ecumenical perspectives with the goal of preparing students for ministry (broadly defined), including the planning of worship, occasional services, and other rituals. Particular attention will be paid to helping students think critically as practical and pastoral theologians as they design and lead worship in their specific contexts while also being attentive to how justice issues such as race, class, ethnicity, ability, sex, gender identity, and sexual orientation affect and are affected by worship. [3] Ms. Budwey

## **REL6706 - The History of Monasticism**

### **Title**

The History of Monasticism

### **Catalog Description**

This course examines the rise of Christian asceticism in Late Antiquity. Students will study the specific historical and geographic contexts of the development of monasticism in Syria, Egypt, and its spread across the Mediterranean and beyond. The course will be primarily focused on interpreting the large body of ascetic literature which developed from the fourth through sixth centuries. Students will read various genres and monastic theologians including the sayings of the Desert Fathers and Mothers, Athanasius' Life of Anthony, Gerontius' Life of Melania the Younger, the works of Evagrius Ponticus, Isaac of Nineveh, Philoxenos of Mabbug and others. The course will also examine the legacy of desert spirituality for later Christian traditions and for contemporary theology and monastic practice (such as in the work of Roberta Bondi or Thomas Merton) [3] Mr. Michelson

## **REL6708 - History of Global Christianities II**

### **Title**

History of Global Christianities II

### **Catalog Description**

This course aims to acquaint divinity students with the history of the North American religious cultures and those of the global South as recipients and participants in a broader movement of Christianities in time and across space. Key moments to be explored include colonialism, slavery, interchristian rivalry, evangelicalism, participation in democratic, reform, and military institutions, and the world missionary movements - old and new. The term begins with the transmission of European and African peoples and religious traditions to the Western hemisphere in contact and interaction with indigenous peoples. Key moments to be explored include colonialism, slavery, interchristian rivalry, evangelicalism, participation in democratic, reform, and military institutions, and the world missionary movements - old and new. The second half of the semester moves with much of the modern Christian population to the so-called global South. Growth of 19th century colonial mission field and earlier Christian churches will be tracked in Africa, Asia, and Latin America. The growth of worldwide Pentecostalism and indigenous churches will figure strongly, along with the Western Christian traditions of Roman Catholicism and Protestantism but also to Eastern Christian churches and the global Christian communities of the modern era. Throughout the semester students will explore the distinctions of East or West, North or South, national or transnational, marginalized or majority, lay or clerical, as well as the dynamics of gender, race, class, sexuality which have influenced variegated Christianities around the globe. [3]

## **REL6709 - Religion, Culture, Politics in Post Reformation England**

### **Title**

Religion, Culture, Politics in Post Reformation England

### **Catalog Description**

The course will examine the interaction between religious change and politics in the period after the reformation. The focus will be on the Elizabethan and early Stuart periods. Emphasis will be given to questions of "political culture"; the ways in which the peculiar exigencies of the Elizabethan regime, in Collinson's phrase "the Elizabethan exclusion crisis", led to various experiments in the ways in which politics was conducted. Central here will be the notion of the monarchical republic of Elizabeth 1 and the politics of popularity and the various monarchical reactions thereby provoked. The doings of both catholics and puritans will be examined and a wide range of primary sources will be consulted. Various literary texts will also be used.

## **REL6710 - History of Anti-Trinitarian Theology**

### **Title**

History of Anti-Trinitarian Theology

## **REL6711 - Theodicy: God and Human Suffering in Historical Perspectives**

### **Title**

Theodicy: God and Human Suffering in Historical Perspectives

### **Catalog Description**

The story of Christianity has the notion of God who suffers with and in our place at its crux. This course surveys the variegated histories of Christian attitudes toward and responses to evil and suffering: both individually, ecclesially, both in its theology and praxis. Readings will range from Dorothy Day to Irenaeus of Lyons, from Toni Morrison to Shusaku Endo, from Karl Barth to Hannah Arendt. Particular attention will be given to the contemporary issue of human trafficking and global economic disparity and its global impact. [3]

## **REL6713 - Seminar in Late Antiquity**

### **Title**

Seminar in Late Antiquity

### **Catalog Description**

This course is a survey of the scholarly literature on the transformation of the Roman world (its state apparatus, society, and culture) from the third through seventh centuries of the current era. We will study the end of the classical world and the origins of Byzantium, the Islamic world, and the medieval West. This class will review historiography on the questions of the fall of Rome and the birth of the heirs to Roman civilization. The course will present key themes for analysis of late Roman society such as wealth and poverty, the crisis of the third century, Roman imperial ideology, gender roles and family structures, the rise of Christianity, the geographic divisions of the Empire, and the last great war of antiquity. Particular attention will be paid to religious practices, communities, and institutions in the later Roman world. Students will gain an overview of scholarly literature on Greek and Roman religious institutions, Jewish, Christian, Manichean, and Muslim communities and a wide range of religious practices. Together, we will traverse recent scholarship concerning a variety of evidence including geography, material evidence, and primary source texts. Students will be encouraged to formulate their own positions with regard to current scholarly debate on the following questions: How did the Roman world change in late antiquity? Why did these changes develop and what alternative trajectories existed? [3] Mr. Michelson

## **REL6715 - Images of Mary in Christian Thought and Practice**

### **Title**

Images of Mary in Christian Thought and Practice

### **Catalog Description**

The first half of this course will survey the history of Marian theology and devotion from an ecumenical perspective in order to lay the foundation for the second half of the course, which will focus on engaging with diverse contemporary perspectives (Feminist, Latinx, Black, Womanist, Asian, Queer, ecumenical, and interreligious) on Mary. Particular attention will be paid to how the arts--music, literature, and the visual arts--have been and are being used to both reinforce oppressive views of Mary as well as create new and liberating views of Mary. [3]

## **REL6722 - History of Syriac Christianity**

### **Title**

History of Syriac Christianity

### **Catalog Description**

This course is a seminar on Syriac Christian traditions. Syriac is a dialect of Aramaic which was influential in the spread of Christianity across the Middle East and Asia. By the time of the rise of Islam, Syriac-speaking Christian communities could be found in what today would be a region stretching from modern day Lebanon across Iraq and the Persian Gulf on to India, Central Asia, and China. In the Middle Ages, Syriac culture and literature flourished as a cultural bridge between the Byzantine Empire and the Islamic states of the Middle East. In the modern era, Syriac communities have continued to persist to the present as minorities in the Middle East and India and in a global diaspora. This course surveys the history of these communities, the theological literature that they produced, and historiographical debates about their origins and development. [3] Mr. Michelson



### **REL6723 - History of Early Christian Poetry**

#### **Title**

History of Early Christian Poetry

#### **Catalog Description**

This course explores the writing and reception of Christian verse from Late Antiquity and the early Middle Ages. Students will study the specific historical, cultural, and geographic contexts for the development of early Christian poetry (roughly from the New Testament era to the 9th century). The course will examine a variety of genres including classical Greek and Roman styles (e.g. epic poetry, elegiac couplets, epigrams, and Virgilian imitations) and emerging early Christian forms (e.g. translations of Biblical psalms and verse, hymns, poetic sermons and Biblical interpretations, liturgical texts, and verses in praise of Christians saints). All readings will be done in English translations of texts from variety of the linguistic traditions including Syriac, Greek, Latin, Armenian, and Old English. Readings will include the work of Ephrem the Syrian, Proba, Gregory of Nazianzus, Basil of Caesarea, Prudentius, Romanos, Rade Gund, Kassia and anonymous texts including the Dream of the Rood. Students will also examine the impact of early Christian poetry on later Christian imagination including its influence on later authors and musicians such as in the work of J.M. Neale, Christina Rossetti, and John Tavener. Lastly, students will have the opportunity to add their own voices to the long legacy of Early Christian verse through interpretation, composition, or other engagement with the tradition. [3] Mr. Michelson

### **REL6729 - The Historiography Of American Religion**

#### **Title**

The Historiography Of American Religion

#### **Catalog Description**

This course focuses on the major important interpretive accounts of the history of American Religion. The course is designed especially for graduate students who intend to specialize within, or take a doctoral exam on, the field of American religious and church history, key problems and significant monographs in the field. [3] Hudnut-Beumler, Byrd

### **REL6730 - The History Of Religion In America**

#### **Title**

The History Of Religion In America

#### **Catalog Description**

The history of the religions in America beginning with colonial religious experiments in the New World. Examines American "church history" as well as the influence of non-Christian religions in American culture. [3] Dickerson.

### **REL6731 - Religion And War In American History**

#### **Title**

Religion And War In American History

#### **Catalog Description**

An examination of complex interactions between religion and war in American history. Considers the various functions of religion in social and political crises, contrasting theological interpretations of violence, and the religious construction of national identity through warfare. [3] Byrd.

## **REL6732 - Theology in America 1630-1865**

### **Title**

Theology in America 1630-1865

### **Catalog Description**

Theology in America from the arrival of the Puritans through the Revolutionary period was a complex mixture of academic doctrines and popular beliefs. The scope of theological ideas extended beyond religious institutions to influence cultural patterns and social issues such as war, slavery, religious persecution, and the nature of citizenship. This intermediate-level seminar examines various theologies in America, including an examination of key theologians (broadly considered) and important themes and traditions, including the Reformed Tradition, Antinomianism, political theologies, revivalism, and Deism. [3] Byrd.

## **REL6733 - Seminar: American Revivals**

### **Title**

Seminar: American Revivals

### **Catalog Description**

This course examines selected revivals in American Christianity from the colonial period through the twentieth century. We will focus on the varieties of revival practice, including the ways in which revivals have interacted with views of ministerial authority, doctrine, the body in worship, social reform, and church architecture. Primary and secondary resources will include texts and audio-visual representations of revival experience.

## **REL6734 - American Apocalyptic Thought and Movements**

### **Title**

American Apocalyptic Thought and Movements

### **Catalog Description**

This course explores apocalyptic and millennial ideas and movements in North America from the colonial period to the present. The primary focus will be on apocalyptic themes in relation to social and political crises in the history of the United States. Particular attention will be given to apocalyptic images and ideas in popular culture.

## **REL6736 - America's Bibles**

### **Title**

America's Bibles

### **Catalog Description**

This course asks why and to what ends have Americans produced so many kinds of Bibles; not just different translations, but different versions of the same translation? Students will examine that history of Bible creation to understand better what it tells us about particular religious communities and American religion generally. In doing so, students will consider the broad themes of American religious history, such as race, gender, nationalism, millennialism, and science and will use such theories as narrative criticism and material Christianity. Most broadly this course invites students to consider the significance of the Christian Bible to the creation and display of a variety of religious and no-so-religious meanings throughout U.S. history. Thus, students will study the Bible as both a sacred text for some and an unavoidable cultural object for all Americans. [3] Mr. Byrd.

## **REL6737 - Religion and the Founding of the United States**

### **Title**

Religion and the Founding of the United States

### **Catalog Description**

Was the United States founded as a Christian nation? This question has never been more urgent than it is today. Opposing views on this question have clashed, and questions about religion and national identity continue to circulate. This course examines this and other questions as it explores the place of religion in the revolutionary era and the early republic of the U.S. The course will engage various important themes, including: the place of religion in debates over slavery, abolition, and revolutionary ideas of liberty; revolutionary-era women's leadership (including preaching); the influence of religious activism and ideas on political views; religion and violence; just war theory and pacifism; religious views of the founders; religion and the Constitution and its ratification; Deism; the Enlightenment; and the influence of the Bible on the American Revolution and the nation's founding. [3] Mr. Byrd

## **REL6738 - Jesus In Modern America**

### **Title**

Jesus In Modern America

### **Catalog Description**

The period from 1880 to 2000 featured a high level of American cultural interest in Jesus of Nazareth. More books were produced on Jesus during this period than on any other biblical figure. Through various modes of cultural production—plays, novels, movies, biblical commentaries, theologies, and moral essays—Americans depicted Jesus to meet their needs and conceptions of who this man was and what he represented for their congregations. Students will examine a wide range of "American Jesuses." [3] Hudnut-Beumler.

## **REL6739 - American Religious Intolerance**

### **Title**

American Religious Intolerance

### **Catalog Description**

This course studies the art of religious defamation as evidenced by 19th and 20th century exposés and memoirs. The following questions guide our study: what are the enduring anxieties that beget and tropes that express religious prejudice; what do they tell us about American society and culture; and how may these anxieties and prejudices be recognized in contemporary culture and ourselves. Memoirs and exposés comprise the focus of course readings, while secondary literature provides the context and theoretical frame for our study of intolerance more generally. This term, anti-Catholicism and anti-Mormonism will provide our chief case studies, but the assignment structure and some reading assignments encourage application to other groups. Class discussion will be oriented to identifying the manner in which past and present religious prejudices continually inform one another, both sustaining and imaginatively reshaping meanings to fit instant anxieties and disparate religious groups. At the end of the course, students will better understand the history of religious intolerance in America; recognize the enduring tropes of religious intolerance; be able to critically engage such tropes as applied to different religions; and be more adept in identifying their own prejudices. Grades will be based on contribution to seminar discussions and completion of a research paper. [3]

## **REL6741 - Contemporary Issues in American Religion**

### **Title**

Contemporary Issues in American Religion

### **Catalog Description**

This course invites students to reflect upon our inheritance from the late twentieth century. We will not march through the years but will consider important themes, key developments, pivotal moments, and still significant writings in order to understand better our contemporary situation. Specifically, we will study how religion has and is responding to recent social crises and cultural developments. Three themes will frame our subject. We will look at the state of organized religion, as well as consider what it means to be "spiritual not religious." Second, by examining civil rights and wrongs, including but not limited to race, we will attempt to better understand the diverse political strategies employed by religious people. Finally, not just the public, but also the private sphere deserves attention. We will look at religious interests in the sexual revolutions (broadly construed) of the last few decades. This allows us to consider, among other things, the continuing challenge science poses to religious values and worldviews. Certainly, other topical frameworks could be developed and additional sub-topics explored. The reading done for the paper assignments will facilitate your working on topics of particular interest or delving more deeply on ones listed here. Moreover, there will be room on the syllabus for the class to suggest additional themes. A book review, two short papers, and an even shorter class presentation will be required. [3]

## **REL6744 - The Evangelical Protestant Movement In America**

### **Title**

The Evangelical Protestant Movement In America

### **Catalog Description**

An examination of evangelical traditions from the colonial period to their present manifestations in twentieth century America, with some attention to the European background. Special attention is devoted to debates concerning the authority and inerrancy of scripture, theology, church-state relations, the role of the Christian in society, education, the relationship between science and religion, the church and racism, the moral character of America, and other areas of cultural cleavage. Cultural conflict or "wars of faith" between conservative black and white Christians studied in terms of their historical significance and political implications. [3] Baldwin.

## **REL6745 - Evangelicalism, Pentecostalism, and the Shape of World Christianity**

### **Title**

Evangelicalism, Pentecostalism, and the Shape of World Christianity

## **REL6746 - Material History In American Religion**

### **Title**

Material History In American Religion

### **Catalog Description**

Enables students to become familiar with the use of non-textual sources to help recover the historical record, and aid in the interpretation, of people and movements in American religious history. The first half of the seminar will consist of analysis of exemplary techniques for reading the material culture and evidence of the religious past. The second half will consist of hands-on fieldwork and interpretation of aspects of American religion such as dress, architecture, food ways, rituals, money practices, visual imagery, music, and the use of time. [3] Hudnut-Beumler.

## **REL6748 - History of Religion in the American South**

### **Title**

History of Religion in the American South

### **Catalog Description**

This seminar examines the religious history of the American South from colonization to the present with an emphasis on racial, regional, and gendered aspects of the history. Readings will focus on the interpretation of religion in the South by diverse contemporary historians. Topics include: slave religion, "lost cause" religion, Jewish life in the South, the freedom movement, gospel and blues music, megachurches and the prosperity gospel. [3] Mr. Hudnut-Beumler

## **REL6749 - Race and Religion in America**

### **Title**

Race and Religion in America

### **Catalog Description**

Race and Religion in America explores the historical conflicts and critical questions that emerge at the intersection of race, religion, and nationalism - offering a space for students interested in American history, American religious history, and race in the Americas to consider how American identities have been constituted through subjugation, negations, and intersections. By combining two critical topics in American history, the course illuminates the racialized religious myths, symbols, and images encapsulated within the concept of the American. [3] Ms. Wells-Oghohomeh.

## **REL6750 - Evangelicalism and Politics in the United States**

### **Title**

Evangelicalism and Politics in the United States

### **Catalog Description**

Evangelicalism is influential, not only as a religious movement, but also as a political force in the United States. This course examines the history of evangelicals in the United States from the eighteenth century to the present, focusing on their social and political activism. Numerous scholars have examined evangelicalism's diverse social and political influence on a variety of issues. Most recently, however, politicians and the news media in the United States often have more narrowly defined evangelicalism as a conservative Christian movement comprised of whites who overwhelmingly support the Republican party. How did this understanding develop and why? How accurate is this view in accounting for the complexities of evangelicalism? Also, how do we evaluate the moral claims many evangelicals have made in relation to their political loyalties and activism? This course addresses these and other questions from a historical perspective. [3] Mr. Byrd

## **REL6751 - The Faith of Frederick Douglas**

### **Title**

The Faith of Frederick Douglas

### **Catalog Description**

An examination of the life, writings, and legacy of Frederick Douglass, focusing on his religious biography and his engagements with religious groups and ideas. The course takes a chronological approach, focusing mainly on primary sources - the writings of Douglass, including famous publications and speeches and lesser-known works - but also introduces various interpretations of Douglass from the nineteenth century to the present. [3] Mr. Byrd

## **REL6760 - Black Churches and the Quest for Economic Justice**

### **Title**

Black Churches and the Quest for Economic Justice

### **Catalog Description**

The efforts of Black women, men, and children to realize justice from their status of being historically oppressed and economically exploited status within U.S. society has contributed greatly to the expansion and evolution of movements to both civil society and political economy in order to include countless other disadvantaged groups - women, immigrants, LGBTQ people, the disabled and the working poor to name a few. Towards this end, the course seeks to help students comprehend diverse visions of human freedom, justice, equality, and dignity predicated upon the intersectional viewpoints of those individuals and communities who have been largely exploited and excluded by the Church, the State, and the Market in the hopes of fomenting the societal transformation necessary to make them the beneficiaries of new laws, sociocultural norms, political rights, religious values, and economic relations. [3] Mr. Floyd-Thomas

## **REL6762 - Religions of the African Diaspora**

### **Title**

Religions of the African Diaspora

### **Catalog Description**

This course is a survey of the religious traditions of people of African descent by exploring the historic and phenomenological connections among diverse religious beliefs, values, rituals, institutions, and worldviews throughout the African Diaspora. Using several methodological and theoretical approaches, the course will explore various forms of experiences and practices that provide a deep understanding and appreciation of the sacred meaning of human existence (myth, doctrine, prayers, rituals, institutions, and symbols) drawn from African-derived faith communities dispersed across the Atlantic World such as indigenous African religions, Christianity, Judaism, Islam, Vodoun, Santería, alternative religious movements, and humanism amongst others.

## **REL6763 - Religion, Slavery, and the American Civil War**

### **Title**

Religion, Slavery, and the American Civil War

### **Catalog Description**

This seminar examines slavery in relation to the religious history of the American Civil War. Based on reading and discussion of primary and secondary sources, the seminar will begin by assessing the development of slavery in colonial America and its relation to religious groups through the American Revolution and the early republic. The seminar will examine religious themes in the debates, protests, and revolts over slavery in the nineteenth century. In addition, the seminar will examine broadly the religious history of the Civil War and its aftermath. [3]

## **REL6764 - Slave Religion and Culture in the American South**

### **Title**

Slave Religion and Culture in the American South

### **Catalog Description**

The cosmologies, theologies, ethics, rituals, and material realities of enslaved Africans and African-Americans beginning in pre-colonial Africa and ending in the Civil War. Music, Movement, Myth, Magic, and Sexuality. [3].

## **REL6765 - Black Church Studies**

### **Title**

Black Church Studies

### **Catalog Description**

This course is an introductory exploration of the historical legacy, progressive traditions, spiritual depth, and social witness of the Black Church as it has been studied through theories and methods that make up the interdisciplinary field of Black Church Studies. Towards this end, we will take a definitive look at the various Black Church Studies sub-disciplines, namely: Black Church History; African American Biblical Hermeneutics; Black Theologies; Black Church, Culture, and Society; African American Social Ethics; African American Pastoral Care, Black Christian Education; African American Worship; and Black Preaching,. The course will also facilitate opportunities for the intellectual, professional, and inspirational development of transformational leadership for students interested in working in or in collaboration with African-American Christian churches and communities. [3] Mr. Floyd-Thomas

## **REL6766 - Black Religion in Context: Harlem**

### **Title**

Black Religion in Context: Harlem

### **Catalog Description**

This course examines the dynamic issues of racial identity and religious diversity within a specific social context. New York City's Harlem will serve as a case study to focus our religious imaginations on the issues of race, religion and social transformation in the United States. Special emphasis will be paid to the Black religious tradition in Harlem and how its religious communities are adapting to pressing social issues and other elements of change such as immigration, urbanization, poverty, and globalization. Also critical to this examination are the ways in which the Black Church tradition adapts to different cultural settings and interacts with other world religions as it attends to the religious pluralism of the twenty-first century world. The course is designed as an interdisciplinary study, and a wide range of methodologies and perspectives will be utilized to investigate these issues. [3]

## **REL6767 - Cultural Significations and Black Religion**

### **Title**

Cultural Significations and Black Religion

### **Catalog Description**

This course focuses on the origins and varieties of religious experience - scriptural interpretations, ritual practices, mythical narratives, symbolic representations, cultural artifacts, vernacular folk traditions, sociopolitical ideologies, and power dynamics - that historically have been subsumed under the heavy-laden concept of "Black religion." Utilizing the work of pioneering historian of religion Charles H. Long, considerable attention will be paid to the process of signifying as a system of general theorizing about the ways in which human beings communicate, seek, and negotiate meaning and social power in both the sacred and secular spheres. Through an interdisciplinary examination of sources drawn from across the African diaspora, this course will emphasize the study of religion in the modern world as both a mode of orientation as well as a process of meaning-making, but with the description and critical analysis of Black religious phenomena--the complex matrix of sights, sounds, movements, and other sensory stimuli--in contradistinction to the invisibility and invalidation imposed upon subjugated peoples around the world by normative Western discourses. [3]

**REL6768 - Critical Readings in African American Religion: W. E. B. Du Bois**

**Title**

Critical Readings in African American Religion: W. E. B. Du Bois

**Catalog Description**

This course is designed to survey the genealogy of African American religious thought. As an intense reading discussion of fundamental texts of W. E. B. Du Bois, the pioneering African American historian, sociologist, activist, and critical theorist, this course will focus on the relationship of his research and the study of African American religious thought in light of the historic and contemporary problems associated with race, class, and gender oppression. [3] Mr. Floyd-Thomas.

**REL6769 - The Religious Thought of Howard Thurman**

**Title**

The Religious Thought of Howard Thurman

**Catalog Description**

This course will explore the prophetic ministry of Howard Thurman (1900-1981) as a minister, scholar, poet, theologian, pastor, and mystic by focusing on key themes in Thurman's thought through an interrogation of his intellectual foundations, spiritual formation, his particular vision of justice-making, mysticism, theological praxis, homiletics, liturgy, and doxology. There will be critical insights into Thurman's intellectual and spiritual growth as well as offering a window onto the landscape of the defining issues, events, movements, institutions, and individuals that shaped his sacred worldview.

**REL6770 - Religion And The Civil Rights Movement**

**Title**

Religion And The Civil Rights Movement

**Catalog Description**

Students who enroll in this course should note that the seminar carries four semester hours. The seminar will examine the religious ideas and individuals that played pivotal roles in the civil rights movement by exploring the theological foundations of the black freedom struggle, the crucial impact of religion in debates about social change, and the participation of religious institutions and organizations in an effort to achieve racial equality. [4] Dickerson.

**REL6771 - New Religious Movements**

**Title**

New Religious Movements

**Catalog Description**

The rise and development of new religious movements in nineteenth- and twentieth-century America. Emphasizes the following themes: utopian, restorationist, and social reform movements in relation to American primitivism and political orders; the role of text and ritual in creating and maintaining religious order and community; and the problematic nature of the sociological categories "sect" and "cult." [3] Mr. J. Floyd-Thomas



## **REL6772 - Race, Religion, and Protest Music**

### **Title**

Race, Religion, and Protest Music

### **Catalog Description**

This course examines how music and other related forms of art emerge from a particular social location in order to: help define pressing social issues; galvanize mass social movements; and function as symbols of protest. Using several methodological and theoretical approaches, the course will explore a wide variety of musical genres such as the spirituals, the blues, gospel, jazz, rhythm and blues, rock and roll, folk music, soul music, punk rock, reggae, Afrobeats, and hip hop in order to determine how racial identity and religious themes have articulated themselves within protest music. Various historical and contemporary examples derived from cross-cultural perspectives will be used to illustrate the impact of race and religion on social protest music.

## **REL6773 - Reel Black Faith: Race, Religion, and Film**

### **Title**

Reel Black Faith: Race, Religion, and Film

### **Catalog Description**

This course is an examination of the religious and spiritual dimensions of films selected from across the African diaspora through from the silent film era to contemporary cinema. The emphasis of this course will focus on race, gender, class, sexuality, nationality, and other aspects of social location juxtaposed with theological concepts, spiritual concerns, religious imagery, and moral values to better understand the interplay of cinematic representation of Black religious experience. [3]

## **REL6775 - Seminar in Black Religion and Culture Studies**

### **Title**

Seminar in Black Religion and Culture Studies

### **Catalog Description**

As an emergent field, Black Cultural Studies is interdisciplinary and has greatly developed since the late 1960s from a few Black Studies programs and departments at a few notable universities, Yale leading the way in the early 1970s. The conversation has grown with the increase in student enrollments in black philosophy, black queer studies, and women's studies programs, on the one hand, and traditional theological studies, on the other. Black Religion and Culture Studies appears most appropriate as a rubric of study. It best captures the ambiguities of history, culture, and religion signified by the larger discourse on the Black Atlantic. The discourse includes not only the North American, but also Caribbean and Brazilian diaspora cultures and Black Britannia. Black Religion and Culture Studies displays a concerted methodological interest in bringing Black Culture Studies into conversation with the study of black religion as defined by Charles H. Long with a focus on the history of religions approach and phenomenological hermeneutics. [3] Mr. Anderson

**REL6777 - Black Prophetic Witness: Martin Luther King, Malcolm X, and James Baldwin**  
**Title**

Black Prophetic Witness: Martin Luther King, Malcolm X, and James Baldwin

**Catalog Description**

This course is a study of Martin, Malcolm, and Baldwin as the three distinctly Modern US prophetic voices that have not only marked the distinctive and diverse genius of the civil rights movement to which they greatly contributed but also the ways in which their writings, theologies, and activism inform the depths of theological education and religious studies for this present generation as their religious heritage, cultural context, spiritual/personal formation and global leadership have expanded and evolved to include the scholarly trajectories and political platforms of countless marginalized groups who strive to reconcile social justice with divine justice. In this class we will see how these three modern day prophets have inspired countless marginalized groups-women, immigrants, LGBTQ people, the disabled and the working poor to name a few-who found themselves the beneficiaries of new laws, social customs, and religious perspectives due to their legacy. Through an examination of their respective religious worldviews and writings, this course will compare and contrast the personal, political and religious basis of the formation of their Black prophetic discourses. [3]  
Mr. Floyd-Thomas

**REL6785 - History of Christianity in Asian American Contexts**  
**Title**

History of Christianity in Asian American Contexts

**Catalog Description**

This course charts a new pathway in the way we think about: history of Christianity in America; Asian-American identity formation, and the role of religion within it. Its trajectory transcends the existing-and both unhelpful and untrue-binaries of "progressive or evangelical" and "white or black" in the way perspectives on histories of Christianity in America are offered. Its trajectory also seeks to revise the perspectival distortion of seeing Christianity and Christian formation as exogenous or alien to the way Asian-American immigrant experiences have been studied and narrated. Students will acquire new appreciation for the complexity of the lived religion of American Christianity which includes Asian-American presence and perspectives, as well as avoidance of ethno-religious essentialism when it comes to Asian and Asian diasporic religiosity. [3]

**REL6790 - African American Methodism**  
**Title**

African American Methodism

**Catalog Description**

Examines how African Americans interpreted and implemented their understanding of Wesleyan theology and blended it with their African and African American religious sensibilities. The impact of black Methodists in both African American and majority white bodies and upon freedom movements in the United States and the world will be explored. [3]

**REL6791 - The History of the United Methodist Tradition**  
**Title**

The History of the United Methodist Tradition

**Catalog Description**

The history of United Methodism from its rise in England in the eighteenth century to the present. Forces that have shaped the movement and its impact on its own culture. Consideration of John Wesley and English Methodism (to 1790). Examination of Methodism on the American scene. [3]

## **REL6793 - Topics in Digital Humanities**

### **Title**

Topics in Digital Humanities

### **Catalog Description**

The course provides an introduction to the theory and methods of the digital humanities. This course is designed for graduate and professional students across the disciplines of the humanities. Students engage with theoretical questions concerning the application of digital methods to research in the humanities, they will be trained in practical digital research skills such as the guidelines of Text Encoding Initiative. By the conclusion of the course, students will have built a working prototype of a digital database specific to their research needs. [3] Mr. Michelson

## **REL6796 - Human Rights, Human Trafficking, and Re-making of Global Christianity**

### **Title**

Human Rights, Human Trafficking, and Re-making of Global Christianity

### **Catalog Description**

Issues surrounding human rights advocacy, especially regarding human trafficking, have become a key contemporary ethical concern. This course will offer a historical survey on the way global Christian communities-particularly the Pentecostals and evangelicals-have been evolving in its attitude toward social justice and commitment to eradication of human trafficking. A crucial interpretive key is identifying the contribution made by Christians from the Global South in resisting neocolonial encroachments from the West, and situating their biblical hermeneutical praxis of subverting trends-economic, ethical, political and cultural-that further perpetuate human rights violations and trafficking of persons. Particular attention will be given to Christian communities in Keyna, India, South Korea and the United States. [3] Mr. Lim

## **REL6797 - Colonialism, Christ, Capitalism: Reformation, Christianities, and the Advent of Modernity**

### **Title**

Colonialism, Christ, Capitalism: Reformation, Christianities, and the Advent of Modernity

### **Catalog Description**

The period popularly known as "Reformation in Europe" also overlapped with the birth and expansion of the early modern Empires: Spain, Portugal, England, France, and the Dutch Republic. This class transcends the boundaries between religious, political and economic history, with particular attention to the development of theologies of salvation among the Catholic and Protestants; articulation and defense of racial hierarchies encoded within Christian theo-grammar; and justification and promotion of capital and goods for the dual sake of Empire and Ecclesia. In so doing, the class will serve the purpose of contextualizing the currently popular concepts of colonialism, capitalism, and critique of religious nationalism. Key texts will be drawn from both Catholic and Protestant traditions, as well as from materials pertaining to the racial and religious Others from the "New World." [3] Lim

## **REL6798 - Religion and Sports in Historical Perspective**

### **Title**

Religion and Sports in Historical Perspective

### **Catalog Description**

The relationship between religions and sports has been complicated. Judging from the overtly religious elements in the ancient Greek Olympic games, one may conclude that religion and sports enjoyed a life-giving mutuality; however, judging from the languages of prohibition among the descendants of Calvinistic and Anabaptist Protestants, one may conclude that religion and sports were adversarial to each other's flourishing. This course will survey the various ways world religions, particularly ancient Greek religions, Hinduism, Islam, and Christianity have sought to articulate their perspective on sports. Attention will be given to such factors as race, gender, adolescence, and politics as well as to the phenomenon of Sports as Religion. [3]

## **REL6801 - Introduction to Christian Theology**

### **Title**

Introduction to Christian Theology

### **Catalog Description**

In this introduction to the discipline of theology, students will gain practice in reading, thinking, discussing, and writing critically and constructively about central themes, questions, and issues in Christian life, faith, and thought. Students will reflect on and with important historical and contemporary theological texts in light of past and present challenges. Themes include the nature and tasks of theology, revelation, God, human being, Christology, pneumatology, ecclesiology, and eschatology. (The prerequisites are Divinity 6500, Hebrew Bible; Divinity 6600, New Testament; Divinity 6700, History of Global Christianities, Part I; Divinity 6708, History of Global Christianities, Part II.) [3]

## **REL6803 - The Skill and Practice of Theological Conversation**

### **Title**

The Skill and Practice of Theological Conversation

### **Catalog Description**

This course is an introduction to the skills that inform theological literacy and to the critical thinking that sustains theological reflection. The primary focus will be on introducing students to the habit of theological reflection, and it presupposes very little background knowledge of Christian theology or the Christian theological tradition(s). Students will engage in short, close readings of a wide variety of primary sources, ancient and contemporary, in order to analyze the logic of theological claims, and the varying ways theological discourse addresses its ever-changing situation. Attention will be paid to the function of doctrine in theological discourse, the sources and norms employed in theological formulation, and the theologian's relationship to philosophical, cultural, and political contexts.

## **REL6805 - Christian Praxis: Liturgy and Ethics**

### **Title**

Christian Praxis: Liturgy and Ethics

### **Catalog Description**

This seminar seeks to understand the interrelated roles of sacrament, word, and ethics in the praxis of Christian faith in church and society. Methodologically focused, the course attends to history, major theologians, and current constructive proposals in the areas of early Christian sources, fundamental and political theology, and liturgical and sacramental theology. [3] B. Morrill

## **REL6807 - Suffering, Politics, and Liberation**

### **Title**

Suffering, Politics, and Liberation

### **Catalog Description**

Close reading of biographical and theological texts to explore the practical role religious faith plays in people's experiences and responses to suffering caused by systemic injustice in societies. Primarily focused on Christianity in North and South America and Europe, along with examples of indigenous American religion and Islam, study includes perspectives of women and men of a variety of races. [3] B. Morrill

## **REL6809 - Eucharistic Theology**

### **Title**

Eucharistic Theology

### **Catalog Description**

This course examines Eucharistic theology and practice as the sacramental source and summit of Christian life in community and its individual members. Study of historical and contemporary sources will encourage the development of a critical appreciation of what liturgy does, a constructive theology of the faith revealed in symbol and ritual, and why this all matters ecclesially, pastorally, and ethically. [3] Morrill

## **REL6810 - Theories Of Race, Gender, Sexuality, And Disability**

### **Title**

Theories Of Race, Gender, Sexuality, And Disability

### **Catalog Description**

Recently many subfields of religious studies, including theology, have taken up theories of race, gender, and sexuality generated by scholars in the humanities and social sciences. This course will cover important texts in the theoretical literature with an eye toward their import for constructive work in theology and other subfields. In addition to critical race theory, gender theory, and queer theory, we also will explore the emerging field of disability theory. [3] Armour.

## **REL6811 - Participation: Ritual Theory and Theology**

### **Title**

Participation: Ritual Theory and Theology

### **Catalog Description**

A reading-intensive graduate seminar studying historical and contemporary Christian theologies of participation (koinonia/communio) and a selection of current ritual theories with a view toward constructive proposals for various theological sub-disciplines. [3] Morrill

## **REL6812 - Theologies of Salvation**

### **Title**

Theologies of Salvation

### **Catalog Description**

From the origins of Christianity, salvation has been a fundamental symbol for expressing and reflecting upon experiences and proclamation of what God has done for humanity (and all creation) in the person and ongoing mission of Christ Jesus, in the power of the Spirit. This course surveys theologies of salvation-both theories and practices-through Christian history and in selected diverse contemporary contexts. [3] Morrill

## **REL6820 - God In The Western Tradition**

### **Title**

God In The Western Tradition

### **Catalog Description**

The major philosophical and theological texts of the Western tradition from Plato to the twentieth century. The changing history of the interpretation of God from Christian neoplatonism to nineteenth- and twentieth-century challenges of classical approaches. [3] DeHart.

**REL6821 - Thomas Aquinas****Title**

Thomas Aquinas

**Catalog Description**

Systematic investigation of Aquinas' major theological and philosophical assertions by considering his conception of the two disciplines and their relationships. All readings will be available in English translations. [3] DeHart.

**REL6822 - Theology In The Nineteenth Century****Title**

Theology In The Nineteenth Century

**Catalog Description**

Major movements during the nineteenth century, from Schleiermacher to Troeltsch. [3] DeHart.

**REL6823 - Kierkegaard The Theologian****Title**

Kierkegaard The Theologian

**Catalog Description**

An advanced exploration of Kierkegaard's philosophy of Christian belief, with particular attention to his analysis of faith, the relation of ethics and religion, sin and human existence, and his metaphysical and theistic assumptions. Based on close reading and classroom analysis and discussion of selected texts from the pseudonymous authorship. [3] DeHart.

**REL6824 - Theology Of Karl Barth****Title**

Theology Of Karl Barth

**Catalog Description**

An introduction to the thought of one of the most important and controversial theologians of the twentieth century. [3] DeHart.

**REL6825 - Seminar in Rahner, Schillebeeckx, and Metz****Title**

Seminar in Rahner, Schillebeeckx, and Metz

**Catalog Description**

This reading-intensive seminar provides the opportunity to study works by three of the most significant Roman Catholic theologians of the second half of the twentieth century. Study of these three authors, then, will access a certain trajectory in systematic-theological content and methods that emerged from the era of the Second Vatican Council. [3] B. Morrill

**REL6826 - St. Paul and Continental Philosophy****Title**

St. Paul and Continental Philosophy

**Catalog Description**

A number of prominent philosophers in Europe have surprisingly 'rediscovered' Jewish and Christian monotheism and eschatology, and especially the writings of Paul, as a resource for thinking in radical new ways about politics, ethics, and social agency. This course brings students into engagement with texts by these thinkers, but also with earlier texts similarly on the boundary between theology and philosophy that helped contribute to this recent development. Authors include Karl Barth, Carl Schmitt, Walter Benjamin, Jacob Taubes, Alain Badiou, Giorgio Agamben, Slavoj Zizek, and Michel de Certeau. [3] Mr. DeHart

**REL6827 - Theology of Dietrich Bonhoeffer****Title**

Theology of Dietrich Bonhoeffer

**Catalog Description**

Through close reading and discussion students will gain a sense of the development and unity of Bonhoeffer's thought, and also of the relation of that thought to his biography. They will also be encouraged to think more deeply and critically about their assumptions concerning the nature of moral and political existence in light of the God of Christian belief. [3] Mr. DeHart

**REL6840 - Seminar In Systematic Theology****Title**

Seminar In Systematic Theology

**Catalog Description**

An advanced seminar (required for doctoral students in the theology area) deals with a topic or figure of general theological importance; instructor and topics change yearly. [3]

**REL6841 - Process Theology****Title**

Process Theology

**Catalog Description**

Contributions made to Christian theology by the tradition of process thought, and the questions raised for process thought by the character of Christian theology. [3]

**REL6842 - Practical Theology****Title**

Practical Theology

**Catalog Description**

This seminar explores the development of practical theology as an academic discipline, focusing primarily on its revitalization in the last half-century, current debates, and future potential. [3]

### **REL6843 - Theology In The United Methodist Tradition**

#### **Title**

Theology In The United Methodist Tradition

#### **Catalog Description**

A survey of theological developments in the United Methodist tradition, beginning with John Wesley and the rise of the Methodist movements, and ending with current debates. This course will consider the distinct contributions of Methodist theology in the context of Christianity, other religious traditions, and the world. United Methodist doctrinal statements are explored in light of the difference they are making and have made, both locally and globally. [2] Mr. Rieger

### **REL6844 - Contemporary Theology**

#### **Title**

Contemporary Theology

#### **Catalog Description**

The major movements in Christian thought from the beginnings of dialectical theology to the present. [3]

### **REL6845 - Feminist Womanist Theology**

#### **Title**

Feminist Womanist Theology

#### **Catalog Description**

Introduce students to the classic texts and themes of feminist, womanist, and mujerista theologies as well as to current issues and important texts on the relationships among sexuality, gender, and race, the validity of "women's experiences" as sources for feminist theological reflection, and feminist critiques and reconstructions of traditional theological loci. [3] Armour.

### **REL6846 - Queer Theology**

#### **Title**

Queer Theology

#### **Catalog Description**

This course examines emergent queer theology in relationship to the theological and cultural issues (historical and contemporary) that it seeks to address.

### **REL6847 - Theology And Contemporary Continental Philosophy**

#### **Title**

Theology And Contemporary Continental Philosophy

#### **Catalog Description**

Certain continental philosophers are central to the so-called ""return of the religious"" in contemporary thought. This course will explore this development through readings in major figures in the field and in appropriations of and responses to their work by theologians.



**REL6848 - Religion, Economics and Labor****Title**

Religion, Economics and Labor

**Catalog Description**

Growing disparities between those who have to work for a living (the 99 percent) and those whose wealth and power derives from other sources affect all of us. This course is designed to engage students in explorations of how these disparities shape us all the way to the core in religion, politics, and economics, and what viable alternatives might look like. Traditions from the three Abrahamic religions, Judaism, Christianity, and Islam, will be presented in order to conceptualize justice from the perspective of the exploited and the oppressed, considering possible divine options for the margins, and how emerging movements of solidarity along the lines of class might shape deep solidarity along the lines of race, ethnicity, gender, and sexuality. This course will combine theological reflection, ethical imagination, and practical suggestions for organizing. [3] Mr. Rieger

**REL6851 - Visions of the Future****Title**

Visions of the Future

**Catalog Description**

Critical and postmodern theories in gender, colonialism, race and sexuality emphasize dystopic possibilities for the future, whereas religious traditions emphasize eutopic eschatologies. Examination of the intersection of theories and imagination on the theological question of the future. [3]

**REL6854 - Native American Philosophies and Theologies****Title**

Native American Philosophies and Theologies

**Catalog Description**

An in-depth study of key concepts and shared principles in philosophical, theological, and anthropological texts by selected Native American writers (Cordova, Waters, Bruchac, Grande, Norton-Smith); social, historical, and political contexts, and the challenges and contributions they offer to contemporary philosophical, ethical, and religious questions. [3] Ms. Schneider

**REL6855 - Theologies of Multiplicity****Title**

Theologies of Multiplicity

**Catalog Description**

Exploration of recent theological and philosophical works relating to multiplicity and relationality. Emphasis on questions of ontology and new materialisms, embodiment, liberation, poetics, and Christian ideas of incarnation. [3]

## **REL6856 - Theology Between God and the Excluded**

### **Title**

Theology Between God and the Excluded

### **Catalog Description**

Four major turns have shaped theology since the beginnings of modern theology in the eighteenth and nineteenth centuries: the turns to the self, the divine Other, the texts of the church, and to other people. This course provides a critical and constructive engagement of these turns in light of the location between God and the increasing numbers of persons excluded from the resources of life, in which religious communities find themselves today. Here, theology becomes a matter of life and death. What contributions can theological discourses make to support life? What are the potential pitfalls and challenges? What are the options for the future of theology and religion more broadly conceived? The goal is to explore and develop constructive theological paradigms and liberative practices that emerge in the creative tensions of various theologies and the multiple pressures of life. [3] Mr. Rieger.

## **REL6857 - Derrida's Death Penalty Volume II**

### **Title**

Derrida's Death Penalty Volume II

### **Catalog Description**

This seminar examines the philosophical argument against the death penalty presented in the "teaching lectures" delivered by Jacques Derrida. [3] Ms. Armour and Ms. Oliver

## **REL6858 - Theology, Religion, and Postcolonialism**

### **Title**

Theology, Religion, and Postcolonialism

### **Catalog Description**

This seminar explores postcolonial/decolonial theories and their interconnections with the study of religion and theology. The goal is to engage in critical conversations that develop religious and theological discourses in the context of particular postcolonial/decolonial struggles in global perspective. Of particular interest are constructive proposals that do not merely reproduce or copy existing theories. [3] Mr. Rieger

## **REL6859 - Theology, Visual Culture, and New Media**

### **Title**

Theology, Visual Culture, and New Media

### **Catalog Description**

In recent years, a dramatic change has occurred in our media landscape. Online social media outlets - Facebook, Twitter, Instagram and the like - are now ubiquitous. Legacy media players (newspapers, magazines, television news) have moved online as well often partnering with social media to share content and attract readers and viewers. Faith communities are part of this shift, as well, using on-line platforms as auxiliaries to brick and mortar presence and/or to create new and experimental forms of community. Drawing on scholarship on visual culture and new media, this course explores the theological, political, and communal import of these changes. [3] Ms. Armour

**REL6861 - Feminism, Religion, and Race: Mary Daly and Audre Lorde**  
**Title**

Feminism, Religion, and Race: Mary Daly and Audre Lorde

**Catalog Description**

This is a figure seminar on two mightily formative writers of the 20th century in theology and literature. This means that the reading list will be entirely composed of their own works. We will focus on their individual developments and will reflect on various issues in gender, religion, and race that they appear to share, as well as those that publically divide them. [3] Ms. Schneider

**REL6862 - Ethical Approaches to Preaching**  
**Title**

Ethical Approaches to Preaching

**Catalog Description**

This course investigates four ethical approaches to preaching: the social gospel and activist ethics within the preaching of the civil rights movement, the countercultural ethic within post-liberal homiletics, the communicative ethic within conversational and collaborative homiletics, and the ethic of risk and solidarity in liberationist homiletics. Students will preach sermons that make use of these theoretical and theological approaches. [3]

**REL6870 - The Craft of Academic Writing in Theology and Religion**  
**Title**

The Craft of Academic Writing in Theology and Religion

**Catalog Description**

This course is focused on the craft of academic research and writing in theology and religion and is designed around opportunities for practicing the craft, giving and receiving feedback, honing a publishable article, and reading memoirs on writing and literature on the craft of research and writing. Restricted to graduate students. Divinity students by request only. [3]

**REL6893 - African American Biblical Interpretation**  
**Title**

African American Biblical Interpretation

**Catalog Description**

This seminar attends to the aesthetics and politics of African American Biblical interpretation during the Harlem Renaissance, the eras of Civil Rights and the Black Power Movements, and within the rise of Black Academic Biblical Interpretation. [3]

**REL6900 - Introduction To Homiletics**  
**Title**

Introduction To Homiletics

**Catalog Description**

The course is an examination of the theologies and methods of preparing sermons from Biblical texts and an exploration of hermeneutical approaches, oral/aural skills, rhetorical strategies, narrative and connective logic; students are responsible for developing a working theology of the Word, reviewing major homiletic theories, completing exegetical assignments, skill-building exercises, sermon sketches, and sermon manuscripts; in-class preaching is required. [3]

## **REL6901 - Fundamentals of Preaching**

### **Title**

Fundamentals of Preaching

### **Catalog Description**

Examination of theologies and methods of preparing sermons from Biblical texts. Hermeneutical approaches, oral/aural skills, rhetorical strategies, narrative and connective logic. Students are responsible for developing a working theology of the Word, review of major homiletic theories, exegetical assignments, skill-building exercises, sermon sketches, and sermon manuscripts. In-class preaching required. [3]

## **REL6903 - Worship Across Traditions and Cultures**

### **Title**

Worship Across Traditions and Cultures

### **Catalog Description**

Working to expand our familiarity with preaching and worship across denominational and cultural patterns and across faith traditions, this course will study preaching and worship practices and formation that embrace the ever-increasing experience of multiculturalism or pluralism within and between faith communities. [3]

## **REL6907 - Preaching the Headlines**

### **Title**

Preaching the Headlines

### **Catalog Description**

This course examines the use of current events at local, national, and global levels within the creative process of preaching. Subject exploration will include, but is not limited to matters of gender and sexuality, race, violence, poverty, the environment, and religion. The goal of the course is to help participants become astute in the pastoral and prophetic practices of proclamation that engage the world in which we live; critical processes of theological reflection support these practices. [3] Ms. Thompson

## **REL6908 - Preaching Jesus: postcolonial Approaches**

### **Title**

Preaching Jesus: postcolonial Approaches

### **Catalog Description**

This course focuses on the question: What would it be like preaching Jesus from a postcolonial perspective? Students are invited to engage in conversation around this question and practice preaching in class by exploring the theological and ethical issues emerging from the Christological themes. Through this course, students study not only decolonizing the pulpit but also refurbishing the pulpit with postcolonial images, metaphors, and stories of the "hybrid Jesus." [3]

## **REL6909 - Ministry Praxis: Weddings and Funerals**

### **Title**

Ministry Praxis: Weddings and Funerals

### **Catalog Description**

This praxis course is designed to provide experiential education in two practices of ministry that students will encounter in their vocations. By integrating theology, theory, and practice in the ministerial areas of weddings and funerals, students will reflect upon their theologies of marriage and their theologies of death and will engage in practices related to the two ministries. [3]

## **REL6921 - Oratory and Rhetoric for Proclamation**

### **Title**

Oratory and Rhetoric for Proclamation

### **Catalog Description**

This course studies the formulaic oratory structures of folk traditions among oral cultures and rhetorical structures of public discourse among classical and contemporary traditions for homiletics and the preaching event. [3]

## **REL6922 - Ministry, Voice, and Vocation: Civil Rights, Martin Luther King Jr., and Preaching**

### **Title**

Ministry, Voice, and Vocation: Civil Rights, Martin Luther King Jr., and Preaching

### **Catalog Description**

This course will integrate study in the social and preaching ministries of Martin Luther King Jr. The course will explore the social and cultural contexts of King's life from a national and global perspective, giving careful attention to the secular and sacred elements that shaped both his life and the Civil Rights movement. The critical theological voices and practical theological influences that shaped his ministry and mission will serve as evaluative material for analysis of his voice in American religion. This course will also weigh this important dialectic for preaching and social justice ministry in the contemporary Church extending between cross-cultural and multi-cultural public ministries. Primarily, our examination of the sacred-secular dialectic in public ministry, exemplified by King and the Civil Rights era, will be oriented to issues of race, gender, and class, which in the end evaluates or explores the pastoral-prophetic dialectic of preaching and public ministry to deal with social conflict or oppressive conditions today. [3]

## **REL6924 - Preaching In The African American Tradition**

### **Title**

Preaching In The African American Tradition

### **Catalog Description**

The theology and styles of black preaching. Sermons of the most effective black preachers of today and yesterday. Methodologies for effective outlining, manuscript development, and use of illustrations are discussed. [3]

## **REL6925 - History and Theology of Preaching**

### **Title**

History and Theology of Preaching

### **Catalog Description**

An historical study of the relationship between theology and preaching from the Early Church to the Modern Era by exploring the ways Christian theology influences homiletical theories and practices, and vice versa. [3]

## **REL6927 - New Perspectives on Preaching**

### **Title**

New Perspectives on Preaching

### **Catalog Description**

Homiletic theory and practice have undergone tremendous changes in the past century. This course traces developments from the deductive and propositional homiletics of the late nineteenth century, through the liberal topical and "project" method of the early twentieth century, new-orthodox and Barthian emphases, inductive homiletics, narrative homiletics, structuralist and phenomenological models, and more recent postmodern construals of homiletic theory. Students will read and analyze sermons using these theories, and opportunity will be given to construct sermons using these methods as well. [3]

## **REL6928 - Non-pulpit Preaching: Homiletics in Popular Culture**

### **Title**

Non-pulpit Preaching: Homiletics in Popular Culture

### **Catalog Description**

What religious themes are prevalent in popular music today? How does popular music shape religious identity? How does faith shape popular music? What religious and spiritual experiences shape how music is heard, performed, consumed, or otherwise experienced? How is the music industry shaped by, and a shaper of, religious truth and identity today? These are among the questions this course will seek to address. [3]

## **REL6931 - Readings in Liturgical Theology**

### **Title**

Readings in Liturgical Theology

### **Catalog Description**

This seminar course will explore diverse topics in liturgical theology, including history, specific liturgical traditions (both denominational and cultural), pedagogy, ritual studies, feminist and gender studies, multicultural worship and inculturation, ecumenics and liturgical renewal, liturgical language, the arts, ethics, pastoral care, and contemporary liturgical theology. It will also look at different methodologies employed for the use of liturgical studies, especially in the study of historical texts. This course is designed for those students who want an in depth look at liturgical theology, particularly doctoral students preparing for their comprehensive exams in this area. [3]

## **REL6932 - Voice, Imagination, and Sacred Utterances**

### **Title**

Voice, Imagination, and Sacred Utterances

### **Catalog Description**

This course explores using one's voice as act of imagination that is connected to our deepest convictions. Participants will engage various genres of historical and contemporary works and place these works in conversation with traditions of religious rhetoric (including: sermons, testimonies, prayers, and speeches). [3]

## **REL6933 - Womanist Proclamation and the Arts**

### **Title**

Womanist Proclamation and the Arts

### **Catalog Description**

This course explores Black women's experiences and artistic expressions as acts of moral agency, forms of resistance, and theological utterances. Participants will engage womanist theology, homiletic and narrative theories, and theological aesthetics to reimagine theological meaning in public spaces and faith communities. The course will provide opportunities for field site visits, a practicum, and learning leadership. [3] Ms. Thompson

**REL6934 - Intersex in Christian Traditions: Perspectives from Science, Law, Culture, and Theology**  
**Title**

Intersex in Christian Traditions: Perspectives from Science, Law, Culture, and Theology

**Catalog Description**

This course examines the lived experiences of intersex people who have faced erasure due to the sexually dimorphic assumption that all humans are either 'female' or 'male.' It will explain intersex and understandings of sex/gender in the areas of science, law, culture, Christian theology, and Christian liturgy. Centered in the real-life experiences of intersex people it will also identify issues that intersex people face in these five areas due to sexual dimorphism. Finally, it will determine ways to advocate for and support intersex people in a movement toward sexual polymorphism. This course may be applied to the Religion, Gender, and Sexuality concentration and may also be used to fulfill the praxis requirement for the concentration. [3] Ms. Budwey

**REL6940 - Homiletic Analysis**

**Title**

Homiletic Analysis

**Catalog Description**

Students will learn criterion and skills for analyzing, evaluating, and providing feedback on sermons. The course will focus on establishing essential criteria for sermon evaluation, learning methods for offering sermon feedback in small groups, and developing skills for individual sermon supervision. [3]

**REL6941 - Practical Theology and the Public Church**

**Title**

Practical Theology and the Public Church

**Catalog Description**

This course studies practical theology topics and methods/methodology for the church's role in society/public arena, dealing with public theology and a range of social, cultural, economic, and political issues. [3]

**REL6942 - Liturgy and Preaching**

**Title**

Liturgy and Preaching

**Catalog Description**

An exploration of the historical roots of liturgical preaching, preaching and sacraments, preaching the Church Year and other calendars, lectionary preaching, preaching inclusivity and worship, preaching performance and worship arts, and occasional sermons in liturgical context. [3] Staff

**REL6943 - Bodies Power and the Pulpit**

**Title**

Bodies Power and the Pulpit

**Catalog Description**

This course examines the interplay of embodiment and power as they connect to culture, the pulpit space and rhetoric, the person of the preacher, and Scripture. Participants will engage texts, films, and colleagues in order to inform a critical discussion about the tasks, content, and performance of preaching. [3] Ms. Thompson

## **REL6944 - Language, Communication, and Practical Theology**

### **Title**

Language, Communication, and Practical Theology

### **Catalog Description**

Most works in the field of practical theology contain normative assumptions about the nature of language and communication. These assumptions inform the analysis of situations, persons, or contexts, and influence the theology shaped in light of those analyses. This course will look especially at the ways in which poetics (theories of myth, symbol, and metaphor), speech act theory, semiotics, rhetoric, narrative theory, communicative action theory, cultural hermeneutics, and ritual theory inform a range of texts in practical theology. Scholars of language and communication under consideration are Suzanne Langer, Kenneth Burke, Claude Levi-Strauss, James Carey, J. L. Austin, Paul Ricoeur, Catherine Bell, Northrop Frye, Gregory Bateson, Ferdinand de Saussure, Alfred Schutz, Jean Piaget, C.S. Pierce, Ian Barbour, and Victor Turner. Practical theologians under consideration include James Fowler, James Hopewell, Denham Grierson, Robert Shreiter, Alex Garcia-Rivera, Don Browning, Elaine Ramshaw, Herbert Anderson, and Edward Foley, James Loder, Mary Fulkerson, Johannes A. Van der Ven, Gerrit Immink, and Gerben Heitink.

## **REL7000 - Pastoral Theology And Care**

### **Title**

Pastoral Theology And Care

### **Catalog Description**

This course introduces students to basic theories and methods of pastoral care, especially in the ecclesial context. This course assumes that care is mediated through acts of pastoral leadership, liturgy, preaching, and the forming of congregational life and programming as well as through specific individual conversations. Special attention is paid to the person of the pastor as caregiver and leader of a community of faith and care. [3]

## **REL7002 - Pastoral Care and Global Consumerism**

### **Title**

Pastoral Care and Global Consumerism

### **Catalog Description**

This course delineates the salient features of late capitalism, often designated by the term neoliberalism, and its profound effects upon global politics and economics, societies, communities, and institutions. It focuses particularly on how contemporary technologies and cultural assumptions extend the influence of free markets into interpersonal relationships and individual selves, as well as into religious congregations, theological reflection, and the practices of pastoral care and counseling. In each instance it asserts that the effects include distorted notions of freedom, identity and tolerance, as well as affective alterations, all of which erode or even corrupt these areas of life and thus contribute to widespread human suffering. Finally, it explores possible practices for congregations and pastoral caregivers that might oppose and alleviate these effects, as well as theories that might guide such practices. [3]

## **REL7003 - Theology and Personality**

### **Title**

Theology and Personality

### **Catalog Description**

This seminar from the pastoral theology and counseling discipline explores variable topics. [3]



## **REL7004 - Theories Of Personality**

### **Title**

Theories Of Personality

### **Catalog Description**

A study of representative theorists within each of the four forces of psychology to clarify alternative understandings of the nature of personality and approaches to the psychological sciences. Attention is given to relationships with pastoral theology and counseling. [3] B. Miller-McLemore.

## **REL7005 - Methods In Theology And The Social Sciences**

### **Title**

Methods In Theology And The Social Sciences

### **Catalog Description**

A study of the relationship of theology and science in general and religion and personality theory specifically. Uses several classic models as illustrative of the ways that persons have attempted to bring these two disciplines and enterprises together. [3] B. Miller-McLemore.

## **REL7008 - Solution-Focused Brief Therapy**

### **Title**

Solution-Focused Brief Therapy

### **Catalog Description**

This seminar is an introduction to Solution-focused Brief Therapy (SFBT), a short-term, goal-directed, collaborative approach giving counsel and providing care. SFBT is built around specific techniques that awaken hope, empower change, and instill resilience. It reflects a social constructionist worldview, i.e., every person has a unique approach to life. Through diverse roleplays, students will embody SFBT techniques. SFBT can be used in many forms of caregiving and leadership, ranging from congregational contexts, to chaplaincy, to non-profit leadership, activism, and coaching. It is an effective approach in interfaith and intercultural contexts due to its positive, social constructionist, and non-hierarchical views. [3]

## **REL7009 - Theopoetics: Embodied God-Talk in Works of Art and Culture**

### **Title**

Theopoetics: Embodied God-Talk in Works of Art and Culture

### **Catalog Description**

Theopoetics is the work of deep theological discourse and beauty in art and culture; however, much of its iteration stays within the halls of academia and Western philosophy. This course takes the legacy of this deep thinking, favor of imagination, and inclusion of the arts to do the work of interpreting the ways Good/the Divine is embodied in art and culture. We turn to the neighborhoods, front porches, and articulations of every theopoetics; from the people not situated in places of power and social elites or society pages. [3]

## **REL7010 - Models of Sustainable Hope for Persons and Communities**

### **Title**

Models of Sustainable Hope for Persons and Communities

### **Catalog Description**

This course introduces students to theologies, philosophies, and systems of hope and future within, but not limited to, the Christian tradition. Students will explore collective patterns in religious systems as well as the psychological implications for the individual. A sustainable hope refers to a hope that can be maintained and traditioned. We will look at questions such as, how does one flourish amid crisis and hardship? What are the implications of articulating a responsible and sustainable hope? How do we engage a plurality of religious traditions in collaboration with materializing hope? At the end of the class the student should be able to define and map a system of hope for their religious/spiritual context. [3] Ms. Gonzalez-Justiniano

## **REL7021 - Women, Psychology, And Religion**

### **Title**

Women, Psychology, And Religion

### **Catalog Description**

An exploration of the psychological and religious ideas that support a system of advantage based on gender and sexuality, with particular focus on women's development, self-concept, and altered views of counseling and religious practice. [3] B. Miller-McLemore.

## **REL7022 - Men, Psychology, and Religion**

### **Title**

Men, Psychology, and Religion

### **Catalog Description**

This course undertakes an examination and critique of culturally dominant forms of "masculinity" and explores alternative versions, utilizing contemporary social theories, historical perspectives, psychological theories, religious practices and theology. [3] Rogers-Vaughn

## **REL7023 - Bodies and Theological Knowledge**

### **Title**

Bodies and Theological Knowledge

### **Catalog Description**

This class will be conducted as a seminar based on shared reading and discussion rather than lecture and will explore the question of how theological knowledge is shaped in and through the body, focusing on exploratory reading in human science research, critical theory, constructive theology, and practical theology. [3]

## **REL7024 - Theology and Health in a Therapeutic Culture**

### **Title**

Theology and Health in a Therapeutic Culture

### **Catalog Description**

Introduces the empirical study of the relationship between health and religion. The ways in which the disciplines of theology, religion, psychology, and medicine inform these studies are examined. [3]

## **REL7026 - Self And Social Context**

### **Title**

Self And Social Context

### **Catalog Description**

Pastoral theology and practices of care are aided and directed by operative understandings of the self. What is the self? Is it real? Is it universal? How does it come into being? How does it develop, and how does it relate to the divine? These are fundamental questions in pastoral theology. Responding to the insights of feminists, social theorists, and philosophers, contemporary pastoral theologians have been revising their theological anthropologies to include an understanding of the self that takes more seriously its social dimensions. What does attention to the situated self tell us about effective pastoral care, the meaning of healing/salvation, and the nature of God? In this course we will read social scientific, philosophical, and theological accounts of a self formed within its social, institutional, and cultural contexts. We will also explore the implications of this theological anthropology for a variety of practices. [3]

## **REL7029 - Evil, Aggression and Cultural Trauma**

### **Title**

Evil, Aggression and Cultural Trauma

### **Catalog Description**

Evil, Aggression and Cultural Trauma: This advanced course is concerned with the lived experience - and life shaping reality - of evil, aggression and cultural trauma. The course will concern itself with the "habitus" of evil and aggression and the the trauma of culture as well as traumas acted against, upon and throughout the cultural landscapes in which we are embedded. Religion, Psychology and Culture course aimed at advanced masters level students and doctoral students in need of a course on trauma and religion. Doctoral students will, in addition to other course requirements, write a research paper appropriate for submission for publication and/or presentation at a guild conference.

## **REL7030 - Latino/a/x Pastoral Theology and Thought**

### **Title**

Latino/a/x Pastoral Theology and Thought

### **Catalog Description**

This seminar explores aims, sources and methods developed by Latino/a/x pastoral theologians, primarily in the US but also in Latin America and the Caribbean. This class is interdisciplinary and intersectional in approach, and we will engage theology, "Third" World Feminism, Post-colonial, Decolonial, as well as Lesbian, Trans and Queer perspectives. As a course concerned with critical theological and religious reflection on lived experience, we will also explore that significance of colorism, ethnicity, gender, language, race and sexuality in critical reflection. [3]

## **REL7032 - Womanist Ethnography**

### **Title**

Womanist Ethnography

### **Catalog Description**

This course introduces students to womanist ethnography generated by Black and Brown women, primarily of the US, who identify as womanist and whose research approach is ethnographic and centered around the lives of black diasporic experience in religion and society. This class re-situates knowledge production by decentering notions of "objective" vs. "subjective" vs. "intersubjective" vs. "intrapsychic" and directs our attention to narrative, stories, and process as epistemological sources of theory and practice.[3] Ms. Sheppard

### **REL7033 - Seminar in Catastrophe, Trauma, and Hope**

#### **Title**

Seminar in Catastrophe, Trauma, and Hope

#### **Catalog Description**

In this course we will analyze the practical and ideological implications of a hope that lies at the center of community, not at the end of times. We will explore monstrosities, crisis that can trigger trauma, and catastrophes in search of new revelation through sustainable practices of hope. We will speak of collective patterns that are influenced by trauma that especially minoritized bodies continue to experience. [3]

### **REL7037 - Shame And Guilt**

#### **Title**

Shame And Guilt

#### **Catalog Description**

Students enrolled in this seminar will examine the dynamics of shame and guilt in social and personal life from theological, psychological, and pastoral perspectives. [3] Flesberg.

### **REL7038 - Sexuality: Ethics, Theology, And Pastoral Practice**

#### **Title**

Sexuality: Ethics, Theology, And Pastoral Practice

#### **Catalog Description**

A critical investigation of selected readings in the general area of sexuality, intimacy, and relationships as they inform pastoral practice. Uses autobiography and case study methods in conversation with theories in social sciences, ethics, and theology. [3] Flesberg.

### **REL7039 - Gender, Sexuality, And The Family**

#### **Title**

Gender, Sexuality, And The Family

#### **Catalog Description**

Addresses such issues as divorce, custody, blended families, reproductive issues, infidelity and adultery, unpaid labor in the household, rape, incest, domestic violence, and coming out. The class will focus on the delivery of pastoral care and counseling related to these issues and will also address the utilization of community resources to facilitate further care. The course's design seeks to equip those who intend to be front-line care providers; an introductory course in pastoral care is a prerequisite unless approval is given by the instructor. [3] Flesberg.

### **REL7040 - Pastoral Theology For Transitions And Crises**

#### **Title**

Pastoral Theology For Transitions And Crises

#### **Catalog Description**

Examines various pastoral responses to persons facing transitions (e.g., birth, vocational choice, partnering, marriage, aging, and dying) and crises (e.g., illness, bereavement, and interpersonal discord). Close attention paid to the theological and psychological dimensions of these experiences. Current research in coping and religious coping theory to develop strategies for theological reflection and pastoral action. Prerequisite; 7000. [3] Flesberg.

## **REL7041 - Pastoral Care for Persons with Mental Disorders and Addictions**

### **Title**

Pastoral Care for Persons with Mental Disorders and Addictions

### **Catalog Description**

In this seminar, students engage in a rigorous examination of the behavioral patterns that characterize addictions and study the effects of the addictive behavior not only on the patient but upon the patient's family and peers. The course will also explore the different approaches to pastoral care both to the patient and to those who are affected by the patient's illness.

## **REL7042 - Seminar in Pastoral Care: Death and Dying**

### **Title**

Seminar in Pastoral Care: Death and Dying

### **Catalog Description**

Addresses the issues of theology and pastoral practice that pertain to ministering to the dying and the bereaved. Participants will have opportunities to consider and to clarify their theological postures regarding theodicy, eschatology, sin and sickness, prayer, suicide, euthanasia, and hope. The course also will examine how ones' theological commitments translate into authentic acts of care such as accompanying the dying, offering support to the bereaved, and assisting the family in making decisions.

## **REL7049 - The Religious Self According to Jung**

### **Title**

The Religious Self According to Jung

### **Catalog Description**

The religious core of human existence as related to the concepts of the archaic unconscious and the birth of the self in C. G. Jung's analytical psychology. Study of the life and thought of Jung as illustrated by his autobiography, Memories, Dreams, Reflections. Critical assessment of his theory as a means of understanding religious phenomena. [3]

## **REL7050 - Psychology Of Ritual And Myth**

### **Title**

Psychology Of Ritual And Myth

### **Catalog Description**

Examination of religious rituals and myths from both Christian and other traditions. Critical review of major psychological theories of ritual and myth and their relevance to an understanding of myth and ritual as religious phenomena. To be offered alternately with 3752. [3] Gay.

## **REL7051 - Freudian Theories And Religion**

### **Title**

Freudian Theories And Religion

### **Catalog Description**

An intense reading and discussion of fundamental texts in psychoanalysis and their relationship to Freud's critique of religion. The basic requirements and texts are introductory; more advanced students can use supplementary texts and approaches. [3] Gay.

## **REL7052 - Post-Freudian Theories And Religion**

### **Title**

Post-Freudian Theories And Religion

### **Catalog Description**

An examination of the Object Relations school of contemporary psychoanalysis (M. Klein, D. Winnicott, W. R. D. Fairbairn, Otto Kernberg, Heinz Kohut). Focus on both the clinical and the explanatory theories as they relate to the examination of religious experience and similar self states. [3]

## **REL7053 - Contemporary Psychotherapy And Pastoral Counseling**

### **Title**

Contemporary Psychotherapy And Pastoral Counseling

### **Catalog Description**

Recent trends in psychotherapy. Theories of personality and personality change, as do strategies for psychotherapy. Students will assess critically the implications of these theories for pastoral counseling.

## **REL7054 - Critical Issues In Psychotherapy**

### **Title**

Critical Issues In Psychotherapy

### **Catalog Description**

Examination of key areas of psychotherapy including patient's experience of therapy, unconscious thought processes in therapy, interpretation as intervention, transference and the interpretation of transference. [3] Gay.

## **REL7055 - Play, Subversion, and Change**

### **Title**

Play, Subversion, and Change

### **Catalog Description**

Designed for those pursuing pastoral leadership, this seminar explores play and its liminal quality as foundational to social life in general and a spiritual/religious life in particular. Play is a practice that restores and rejuvenates even as it facilitates emotional, relational, and spiritual well-being. As a form of knowing, play teaches, informs, and invites discoveries. Through select readings, seminar participants will become knowledgeable about the anthropological and sociological roots of play, the neuroscience and psychodynamics behind play, play and human development, and various other dimensions of play (such as ritual, fantasy, rough-and-tumble, and technological play). Playful practices will be explored and special attention will be given to play within pastoral leadership and religious education. Mr. Hamman [3]

## **REL7056 - Pastoral Care and Community Justice**

### **Title**

Pastoral Care and Community Justice

### **Catalog Description**

This course situates pastoral care as communal in nature and invested in pastoral theology and practices that seek to listen to and effectively collaborate with those in communities subjected to structural and interpersonal injustices. [3] Ms. Sheppard

## **REL7057 - Franz Fanon's Psychology: Race, Gender, and Religion**

### **Title**

Franz Fanon's Psychology: Race, Gender, and Religion

### **Catalog Description**

This course is an introduction to the work of Franz Fanon and will explore his critical psychology as a resource for understanding the psycho-cultural dynamics of racial and gender oppression, anti-colonial resistance, and the contemporary implications and potential of his work in psychology and society. [3] Ms. Sheppard

## **REL7058 - Religion, Science and Evolution**

### **Title**

Religion, Science and Evolution

### **Catalog Description**

The course is designed into five sections: Section one is on Darwin's core concepts of evolution; two is on the response to Darwin by religionists, among many; three is on contemporary uses of Darwinian theory to model religion and other value systems; four is on attempts to mimic human cognition using immense computing power, e.g., IBM's "Watson" system which won a famous "Jeopardy" game against human opponents; five is on ethical implications and further questions. [3] Mr. Gay

## **REL7059 - Decolonizing Theologies of Care**

### **Title**

Decolonizing Theologies of Care

### **Catalog Description**

The theology and practice of pastoral care is only beginning to grapple fully with its colonial roots. This course will examine critically the continuing implications of colonialism's infused approaches through the lens of contemporary critiques and indigenous, cultural, ritual, local, ancestral practices of healing. At the core of the course is the importance of the understanding of pastoral, spiritual, chaplaincy, therapeutic, soul care as communal and sacred. In this conceptualizing of theology and care, the psychological and the spiritual are intertwined and inextricably tied; furthermore, to serve in a caring role is not a job but a response to the community's need for maintaining, and restoring, wholeness and harmony of the community because the community has called forth this role. Finally, decolonized theology and care recognizes that we exist in socio-political contexts that affect the well being of the community, and decolonized approaches must take this into account in its practice of care. Thus, decolonizing care is a form of resistance to the destructive effects of colonialism. [3] Ms. Sheppard

## **REL7064 - Humanity and Artificial Intelligence**

### **Title**

Humanity and Artificial Intelligence

### **Catalog Description**

Artificial Intelligence is an intersectional power shaping lives. Chatbots, social media platforms, e-commerce, and security agents ensure a close human-AI relationship. Seeking human flourishing, this seminar draws transversally on psychodynamic theory, philosophical reflection, cultural criticism, and practical wisdom. [3] Mr. Hamman

## **REL7065 - Pastoral Method In Ministry**

### **Title**

Pastoral Method In Ministry

### **Catalog Description**

Critical examination of pastoral method in the ministry of care and counseling. Close attention given to the place of the social sciences in pastoral method. Considers issues in the use of quantitative and qualitative research methods. [3]

## **REL7066 - Method And Evaluation**

### **Title**

Method And Evaluation

### **Catalog Description**

The use of the social sciences in the investigation of religious phenomena. The psychological analysis of religion. Representative studies and empirical investigations are sampled. [3] Gay.

## **REL7067 - Pastoral Theologies and Ethics of the Streets**

### **Title**

Pastoral Theologies and Ethics of the Streets

### **Catalog Description**

This course takes as its point of departure the local-of the streets-contexts of the pastoral theologies and ethical impulses that shape and guide individuals and communities' public theologies and practices. Too frequently these kind of explicit and implicit motivations undergirding local-on the ground-responses to community concerns fail to make their way in to academic and scholarly discourse. The end result is that, except with rare exception, local-of the street and on the ground-pastoral theologies and ethical categories are not represented in most of the scholarship appropriated for pastoral theological education. This course is demanding in its requirement that students spend significant time listening to those whose vocational practices are lived out in their own communities and represent their commitment to individual and social transformation. [3] Ms. Sheppard

## **REL7068 - Work, Love, and Vocation: Composing a Life**

### **Title**

Work, Love, and Vocation: Composing a Life

### **Catalog Description**

To what are people called in each phase of life, and how do these callings evolve and transform as we change and develop? How do we discern our callings, and how do we help others do so? What are some of the unspoken complexities and challenges of callings that we hesitate to name? In a word, how do people compose their lives despite or amid impediments, failures, and diverse pressures and demands? This class focuses on a classic Christian theme-vocation. But it disrupts conventional understandings and invites fresh engagement with life choices as a living breathing evolving reality, shaped by culture, time, and our physical embodiment, a matter of composition and recurrent recreation rather than simply a once-in-a-lifetime summons, a lofty religious aspiration, or a vague doctrinal claim. The class provides tools to analyze and explore your own vocational desires and those of others, resources to understand how vocation arises at different life phases, and a sampling of spiritual life writing in which other people recount their efforts to reach vocational clarity about life. [3] Ms. Miller-McLemore



## **REL7076 - Theories of Inequality, Diversity, and Social Justice**

### **Title**

Theories of Inequality, Diversity, and Social Justice

### **Catalog Description**

The course reflects the multi-level orientation of the department and includes readings that critically address structural, community, and individual levels of analysis. The focus of the course will be on careful reading and critical evaluation of classic and contemporary texts about inequality with the goal of helping students develop a sophisticated theoretical grounding from which to approach their studies. [3] Ms. Barnes

## **REL7078 - Heinz Kohut, Self-Psychology, and Religion**

### **Title**

Heinz Kohut, Self-Psychology, and Religion

### **Catalog Description**

Investigates the writings on self psychology of theorist and analyst Heinz Kohut, with attention to the implications of his ideas about the formation and fragmentation of the self for individual health and development, cultural context, psychotherapy, and pastoral care and counseling. Evaluation of the theory in conversation with various critical theological perspectives. [3] Ms. Miller-McLemore

## **REL7079 - Faith, Film and Pastoral Care**

### **Title**

Faith, Film and Pastoral Care

### **Catalog Description**

This course offers an alternative avenue to learning and practicing pastoral care in a variety of institutional settings and capacities. It uses film, reading, and experiential learning, all in dialogue with one another, to stimulate and enrich imagination, understanding, and capacity to practice care. Following a general introduction, the class meets for four extended Friday/Saturday sessions approximately every other week to review and analyze the film; explore the assigned reading; and engage in exercises to learn specific pastoral skills, strategies, and practices. [3] Ms. B. Miller-McLemore

## **REL7080 - Spirituality and Social Activism: In a Time of Trauma**

### **Title**

Spirituality and Social Activism: In a Time of Trauma

### **Catalog Description**

Spirituality and Social Activism is a practice-theo-pastoral-reflection course where we will focus on the need to amplify the need for sustaining spiritual practices in a time of spiritual, communal, and cultural trauma in the work of social transformation. Drawing on life - our own and cultural figures, film, music, news/social media, guest speakers, and auto-ethnography, this course will embody a commitment to intersectionality, justice, and deep heart work. Wisdom will be sought from the spiritual practices we do together and the social activism we do in the age of virtual reality and global crisis. The class will gather on May 18th for a Virtual Retreat 9:00-3:00 pm and will meet from 9-12 for the remainder of the class for discussion, spiritual practice, planning, and engaging in social activism in this current space of spiritual, communal, and cultural trauma. [3] Ms. Sheppard

## **REL7081 - Young Adult Faith, Spirituality and Leadership**

### **Title**

Young Adult Faith, Spirituality and Leadership

### **Catalog Description**

This seminar explores the faith, spirituality, and leadership of the "nones" and the "somes" - young adults who do not (readily) identify with traditional and/or mainline religious identities. Drawing on primarily a postfoundationalist spirituality, young adults are creating alternative communities, ministries, and non-profits of social, economic, and ecological justice. As such, the seminar asks the question: What is the young adult witness (or testimony) to human life discovered in the narratives of personal, political, and societal resistance to structures of abuse and oppression? The seminar suggests that the witness can be summarized as: embracing anxiety, loss, and trauma; believing in belonging (or community); nurturing one's spiritual life; seeking racial, social, political, economic, and environmental accountability while working toward a just society; and, making a positive difference in the world. In these foci lie hidden The Good Life, which can be distinguished from The Good News (of personal salvation in Jesus Christ and the traditional focus of mainline Christianity). The seminar draws primarily on philosophical, sociological/cultural, ethnographic, anthropological, psychological, economic, theological, and biblical sources. Guests of and visits to innovative ministries and non-profit work in Nashville will explore the importance of place. Students will be encouraged to identify and create an action plan to guide their cause engagement, advocacy, activism, and leadership. [3] Mr. J. Hamman

## **REL7082 - Climate Violence & Earth Justice**

### **Title**

Climate Violence & Earth Justice

### **Catalog Description**

Even in places where protest against injustice has a long legacy, people do not always recognize the earth as a subject of subjugation. This class speaks to this oversight and takes one small step toward addressing the "wicked" problems of climate change and environmental degradation. It enlists non-conventional sources, turning in the first part of the class to the literary arts, fiction, tree science, and indigenous knowledge to foster new ways of seeing and fresh tools to aid students in affecting change. The second part of the class sustains the concrete focus, looking at pastoral and prophetic implications and inviting students to deliberate on steps to stimulate earth justice in local and global communities. [3] Ms. B. Miller-McLemore

## **REL7083 - Climate Change: Religion, Ecology, and Economics**

### **Title**

Climate Change: Religion, Ecology, and Economics

### **Catalog Description**

Since the publication of Lynn White's classic 1967 article in "Science," Western Christianity has come under intense scrutiny for contributing to the current ecological crisis, which finds its culmination in climate change. Less discussed but equally important is White's sense that science in the West has also been influenced by these intellectual currents and is, therefore, not able to solve the problems on its own. This class brings together theological, ethical, economic, and scientific perspectives in an examination of what has contributed to our current ecological crisis. While there is widespread agreement in these fields that we are living in the "Anthropocene," an age that is determined by humanity after the end of the "Holocene," how can we better understand humanity's role in environmental degradation and climate change, and how is humanity changing under those conditions? The goal of this analysis is to identify how the problems might be addressed and what alternatives could be developed. Conducted on the Campus of the Oregon Extension ([www.oregonextension.org](http://www.oregonextension.org)), the class will have access to ecological resources with the ability to study how humans affect the environment even in remote parts of the country, what possibilities there are to live sustainably on the land, and how Christian and other religious traditions have been able to create more sound relationships with the earth, in conversation with alternative religious expressions and members of the Klamath Tribe of Native Americans that lives in the region. [1-3] Mr. Reside and Mr. Rieger

**REL7084 - Nonviolence in Theory and Practice****Title**

Nonviolence in Theory and Practice

**Catalog Description**

Grounded by lived experience and ethnographies, this course explores the ethics, theology, history and practice of nonviolent movements. Using a case study approach, we examine the methods of nonviolent movements, the spiritual and psychological motivations for pursuing social justice through nonviolent means, and theories of change that undergird the practice. This course will include travel to greater Nashville community sites. [3] Ms. Sheppard

**REL7085 - Religion, Culture, and Society****Title**

Religion, Culture, and Society

**Catalog Description**

Relationships between cultural, political, and social dynamics and religion. How religions and spiritual practices shape cultures and are changed by them. Contexts and issues that arise from the religious and spiritual dimensions of human life. [3] Ms. Sheppard

**REL7089 - The Psychology of Religion****Title**

The Psychology of Religion

**Catalog Description**

A psychological approach to the understanding of religious experience, with an emphasis on intersectionality and culture from psychodynamic perspectives. Specific attention will be given to the implications for ministries of chaplaincy. [3]

**REL7101 - Methods In Ethics****Title**

Methods In Ethics

**Catalog Description**

A survey of various methods, styles, and contexts under which moral philosophy has been developed and transmitted in Western thought. Topics treated are classical moral philosophy (Plato, Aristotle, Cicero), Christian sources (Augustine, Thomas Aquinas), modern philosophical ethics (Spinoza, Kant, Mill, and several twentieth century thinkers). [3] Anderson.

**REL7102 - Ethics Human Develop****Title**

Ethics Human Develop

**Catalog Description**

Ethics Human Develop

### **REL7103 - Ethics in Crisis**

#### **Title**

Ethics in Crisis

#### **Catalog Description**

This course is an intensive examination of what has been most famously referenced as the "seven deadly sins:" pride, envy, gluttony, sloth, wrath, lust, and greed, and how these transgressive principles actually have shaped the moral character and sociopolitical condition of American society and culture. We will examine how the innermost workings of US society are informed and ultimately beholden to these "capital vices." Furthermore, given Gandhi's summative reassessment of these vices as the "world's seven great blunders," his framework will serve as an important schema for self-examination, social analysis, and moral formation for the central foci of the course. By utilizing liberative ethics, liberation theology, critical race theory, and feminist-womanist thought, this course will equip students with critical methodological skills and theological competencies associated with ethical theory and moral practices necessary for effective conflict analysis and crisis intervention in service of social transformation as well as justice making efforts. [3] Ms. Floyd-Thomas

### **REL7104 - Exodus in America: Black Christians and White Jews in Interreligious Dialogue**

#### **Title**

Exodus in America: Black Christians and White Jews in Interreligious Dialogue

#### **Catalog Description**

This interreligious seminar will examine the central role the Exodus narrative and motif have played in the religious and identity formation of both black Christians and white Jews in the United States. The examination will be guided by an interdisciplinary framework: Scriptural Interpretation and Witness; Cultural Traditions; Moral Reasoning; and Experiences of Oppression. For each component of this framework, the appropriation, application, and interpretation of the Exodus experience for both communities will be described, compared, and contrasted. The interdisciplinary approaches of Black Church studies and Jewish studies will serve as the methodological basis for these comparisons and contrasts, with special attention given to their subsidiary disciplines of Biblical studies and religious ethics. [3] Ms. Floyd-Thomas.

### **REL7119 - Models of Interfaith Engagement**

#### **Title**

Models of Interfaith Engagement

#### **Catalog Description**

The contemporary "interfaith" sector is expanding exponentially as more organizations, persons, and governments realize the importance of constructive engagement among diverse "religious" traditions. This course maps major models of interfaith engagement (e.g., dialogue, faith-based diplomacy/peacebuilding, service leadership, organizing, etc.) and equips students with the practical and social ethical knowledge needed to be an interfaith leader in varied institutional spaces (e.g., congregations, non-profits, social movements, universities, chaplaincy, and government) . With an eye to analysis of power, conflict, and ethical potential, we explore specific historical and contemporary case studies such as the Parliament of World Religions (beginning in 1863); the Black Freedom movement and Black Muslims in the 1950s and 1960s; the Second Vatican Council of the Vatican in the 1960s; and the rise of service leadership and community organizing models in the last fifty years in the living wage campaigns, broad-based organizing, and Movements for Black Lives. We engage the emerging field of literature on the interfaith movement, particularly in the U.S., along with questions addressing the categories of "religion" and "secularism" in interfaith movements. [3]

## **REL7120 - Modern Christian Political Thought**

### **Title**

Modern Christian Political Thought

### **Catalog Description**

Surveying Christian Political Thought from the late nineteenth century to contemporary debates, we will analyze theo-ethical understandings of the relation of Christianity to political life. Some questions the course will focus on are: Is there a necessary and important relationship between Christianity and democracy? What is the role of the public theo-ethicist in political debates? In what ways do various ecclesial and theological assumptions impact the political engagement of the church? Social gospel, Christian Realist, Anabaptist, Liberation, Catholic Social Thought, Feminist, and Fundamentalist approaches will receive particular attention. A theory-practice option for those who want to study the concurrent U.S. campaign season is available. [3] Snarr.

## **REL7121 - Religion And Social Movements**

### **Title**

Religion And Social Movements

### **Catalog Description**

This course focuses upon the roles of religious organizations, persons, and resources in social-political movements for change. Students will be engaged in the interdisciplinary conversations on the contributions and constraints that religious groups provide for social movements. Among the questions students will investigate are: What makes an activist? In what ways do religions provide resources-materially, ideationally, and culturally for the emergence and maintenance of social movements? In what ways are religious groups transformed by their interaction with the political process?

## **REL7122 - Religion And War In An Age Of Terror**

### **Title**

Religion And War In An Age Of Terror

### **Catalog Description**

Looking at both Christian and Islamic political thought, this course will wrestle with questions such as: When, if ever, is it appropriate to go to war? How has the emergence of "terrorism" as a form of war challenged traditional just war and pacifist theories? Are there ways in which religion and violence are inherently connected? How have religion and war been linked historically? In what ways do religious worldviews challenge or complement contemporary efforts at peacemaking? [3] Snarr.

## **REL7123 - Christian Social Ethics**

### **Title**

Christian Social Ethics

### **Catalog Description**

This course is a critique of selected readings from contemporary Christian social ethical perspectives. We will employ historical and ethical analyses of case studies in order to gain some orientation to doing ethical reasoning on current perennial social issues and pursue reading in the literature of the field. The fundamental problems guiding our inquiry will be: (1) the way in which each account interprets morality as the relation between justice and good; (2) the social theoretical assumptions and views that make each of these accounts intelligible and help explain their differences, this will include special attention to the relevant intellectual and social history of each issue and its public advocates; and (3) the theological warrants for how a just society may reside in religious and secular communities of moral discourse.

## **REL7124 - Twentieth-Century North Atlantic Ethics**

### **Title**

Twentieth-Century North Atlantic Ethics

### **Catalog Description**

An examination of figures and movements that influenced the discourse on religious ethics in both Europe and North America. Special attention to representatives of History of Religions School (Troeltsch, Ott); logical positivism, political theology (Moltmann, Metz, Habermas); neo-orthodox and existential theologies (Brunner, Barth, Buber, Reinhold Niebuhr); as well as ethics influenced by Wittgenstein. [3] Anderson.

## **REL7125 - American Pragmatism & Empirical Theology**

### **Title**

American Pragmatism & Empirical Theology

### **Catalog Description**

Explores the philosophical, theological, and ethical legacies of American philosophers and theologians who have significantly influenced theology and ethics in the United States and American public discourse. Students may encounter the traditions of American pragmatism, American Empirical Theology, Theology of the Social Gospel, American Neo-Orthodoxy, and American Public Theology and figures from William James and R. and H. R. Niebuhr to James M. Gustafson. [3] Anderson.

## **REL7126 - Political Ethics: The Tradition Of Political Liberalism**

### **Title**

Political Ethics: The Tradition Of Political Liberalism

### **Catalog Description**

An examination of the political thought of prominent thinkers. [3] Anderson.

## **REL7127 - Liberation Ethics**

### **Title**

Liberation Ethics

### **Catalog Description**

An examination of how religious commitments, particularly Christian sensibilities, work to ameliorate or perpetuate the oppression resulting from race, class, and gender.

## **REL7128 - Critical Race Theory and Social Ethics**

### **Title**

Critical Race Theory and Social Ethics

### **Catalog Description**

Drawing on literature from criminology, critical race theory, social ethics and feminist/womanist thought, this seminar will reflect on the religious, legal, and intellectual context out of which white supremacy, hypermasculinity, and economic exploitation pervade our understanding of normativity. Students will map and critically examine the multiple trajectories along which the moral authority of the state is engendered by the convergence of racism, sexism and classism under the guise of normality, social order, common good and the will of God. Further we will explore how to develop social interventions that disrupt these normative patterns of discrimination and facilitate the elimination of racially-based, gender biased structures and practices in order to facilitate critical pedagogy, moral leadership, legal practice, and social movement organizing. [3] Ms. Floyd-Thomas.

## **REL7129 - Moral Philosophy of Black Popular Culture**

### **Title**

Moral Philosophy of Black Popular Culture

### **Catalog Description**

A critical examination of aesthetics and moral philosophical traditions as a lens by which to understand black popular culture; this course explores the cultural currency of a black aesthetic, its significance to and dissonance with the religious. [3] Ms. Floyd-Thomas and Mr. Floyd-Thomas

## **REL7130 - Ethics and Feminism**

### **Title**

Ethics and Feminism

### **Catalog Description**

Ethics and Feminism. Implications of gender theory for understanding the Judeo-Christian moral traditions. Topics include: the nature of the moral subject, the social construction of gender, patriarchal consciousness, the abuse of women, black feminism, motherhood, and feminist ecology. [3]

## **REL7131 - Feminist Theological Ethics**

### **Title**

Feminist Theological Ethics

### **Catalog Description**

Using resources from feminist traditions (womanist, mujerista, Asian, white), the course focuses on some major methodological, theoretical, and policy issues in feminist theological ethics. After tracing the historical development of the field of feminist theological/social ethics, we will analyze how feminists choose/use theological resources, the impact of varying theoretical frameworks on feminist analysis, major policy foci of feminists, and whether/how to stay with a "patriarchal" religious tradition. Readings from Christian, post-Christian, pagan, Islamic feminist. [3] Snarr.

## **REL7132 - Womanist Ethics and Theology**

### **Title**

Womanist Ethics and Theology

### **Catalog Description**

This seminar places the moral agency and theological reflections of African American women at the center of human social relations and ecclesiastical institutions. Using various womanist ethical methods and theories, we will develop a range of tools, conceptual and practical, by which to assess ways for going beyond normative reflections of theology and dominant ethical systems which often discount the exigencies of tripartite oppression. This course will explore and analyze the insights into the relationship between black women and the Divine and the ways this relationship shapes their moral agency in attaining wholeness, integrity, and meaning. Issues under our investigation will include womanist explorations of: the Divine or ultimate reality; the origin and purpose of human existence; authority and freedom in religious understanding; pluralism and religious truth; embodiment and sexuality, evil, suffering and death; compassion, joy, and hope; and Divine involvement in human history. [3] Ms. Floyd-Thomas

### **REL7133 - Womanist Literature**

#### **Title**

Womanist Literature

#### **Catalog Description**

This seminar examines the Black women's literary tradition as a repository for doing constructive ethics. Attention will be given to how Black women of various periods, cultures, and literary traditions have brought distinctive imaginative and critical perspectives to bear on "the sacred." In addition to addressing the complicated presence of religious themes, biblical references, and theological issues in these texts, literary and religious methods of "reading" and "writing" will be employed by comparing constructive and hermeneutical approaches among both literary writers and womanist ethicists. [3]

### **REL7134 - Women's Bodies, Politics and Policy Making**

#### **Title**

Women's Bodies, Politics and Policy Making

#### **Catalog Description**

In this course, students will be active participants in exploring the many dimensions of politics in the United States and abroad concerning how women have organized to subvert the oppression of women's bodies in an effort to have a greater role in politics and the skills women need to fully participate in politics and policymaking. Students explore how politics and government, morality and religion, church and state affect women's lives today, and examine the ways that women participate in the social and religious political process in order to influence the course of public policy. Readings and class discussion on the intersection of race/ethnicity and gender/sexuality, work/class and ability/aesthetics in policies are central to the theoretical perspectives that provide the foundation of this course.

### **REL7135 - Race, Sexuality, Class, and Inequality**

#### **Title**

Race, Sexuality, Class, and Inequality

#### **Catalog Description**

This seminar considers practical applications for religious leaders. [3]

### **REL7139 - What is in a Text?**

#### **Title**

What is in a Text?

#### **Catalog Description**

A detailed examination of one formative text in Christian ethics to explore a thinker's ideas and how he or she states a theme, develops an argument, and is able to argue his or her case in a persuasive manner. Attention to consistency, reasoning, style, and rhetoric are also a part of the course. Finally, we consider the book in relation to the renewal of the church, its implication for ministry, and its place in enriching scholarly debate and thought. Students may repeat the course as different texts are studied. For Spring 2016, the text will be Cornel West's "Keeping Faith: Philosophy and Race in America." [3] Ms. Townes

### **REL7141 - The Political Economy of Misery**

#### **Title**

The Political Economy of Misery

#### **Catalog Description**

An examination of the ways in which the intersections of various forms of oppression; such as racism, sexism, ageism, heterosexism, and classism; coalesce to form lifestyles of misery that produce social patterns of domination & subordination. [3] Emilie Townes



## **REL7142 - Vexations: Religion and Politics in the Black Community**

### **Title**

Vexations: Religion and Politics in the Black Community

### **Catalog Description**

This course explores the theo-ethical perspectives of the intersection between religion and politics in Black communities in the United States that forms a matrix of vexation-the complex encounter with social problems on a multi-dimensional basis. We take up the challenge of how to use Christian ethics to examine contemporary social issues, how to identify basic elements of Christian ethical reflection in political discourse, how to consider a variety of ethical perspectives for decision-making, and how to evaluate Black ethical thinkers as they respond to concrete political and social issues. Our conversations may be informed by social issues such as mass incarceration, gang violence, health care, poverty, drugs, voting rights, education, unemployment, and police brutality as entry points to the matrix, the impact of these social issues on Black communities in the U.S., and their implications for prophetic witness in the academy, community, church, and society. [3] Ms. Townes

## **REL7144 - Metaphors of Evil**

### **Title**

Metaphors of Evil

### **Catalog Description**

This course is an examination of the ways in which metaphors and symbols function at the intersections of various forms of oppression that coalesce into lifestyles of misery to produce social patterns of domination and subordination. We will consider how conversations between Christian ethics and theology as well as other disciplines help frame possible trajectories of justice and justice making. [3] Ms. Townes

## **REL7145 - African American Social Ethics**

### **Title**

African American Social Ethics

### **Catalog Description**

This course is an introduction to the African American moral landscape as espoused by Black moral thinkers and the real-lived plight of Black people. This broad experience will be explored via social ethics and through the collective quest for freedom, the struggle for liberation, the meaning agency, and the nature of moral faith and witness. In depth study will be given to particular contestable ethical issues (namely, sexuality, violence, rage, racism, sexism, poverty, and justice) via the religious rationale of Black people whose efforts have been to link divine justice and social justice. This course is taught with a commitment to social change through attention to anti-racism, diversity, and multiculturalism. [3] Ms. Floyd-Thomas

## **REL7221 - Healthcare Ethics: Theory & Practice**

### **Title**

Healthcare Ethics: Theory & Practice

### **Catalog Description**

This seminar examines contemporary healthcare ethics in the U.S. and the disciplinary perspectives that inform this field. Attention is given to the political and cultural forces that have shaped the chief ethical problems in healthcare and to the philosophical, religious and social scientific tools used to address them. A major aim of the seminar is to gain critical purchase on these tools, and to assess their uses and limits. We will explore a range of practical issues, probing the ways these concerns shape professional and public life beyond their immediate sphere of occurrence. This seminar serves as a gateway for additional work in the field. [3]

## **REL7222 - Ethics in Healthcare: Theological and Philosophical Perspectives**

### **Title**

Ethics in Healthcare: Theological and Philosophical Perspectives

### **Catalog Description**

This course examines a broad range of theological and philosophical methods for addressing ethical questions in American healthcare. Texts will be drawn from Protestant and Catholic Christianity, Jewish thought, contemporary Anglo-American philosophy and the virtue traditions. Issues to be considered will include those at the beginning and ending of life, routine patient care and questions of health policy and social justice. Churchill and Meador. [3]

## **REL7226 - Ecology and Health: Climate, Food, and Justice**

### **Title**

Ecology and Health: Climate, Food, and Justice

### **Catalog Description**

Global climate change is the most pressing issue of our lifetime due to its potential to disrupt almost every facet of daily life. Everything from food production and transportation to medical supply chains and healthcare delivery will be affected by our changing climate. This semester-long seminar invites students from across disciplines to engage the relationship between our ecological crisis and human health and flourishing. While this topic is far-reaching, we will enter the discourse by first considering our current food system, how it both contributes to climate change and is affected by it, as well as its relations to poor and inequitable health outcomes. The course will then move to consider the diverse ways climate change will affect community flourishing from air pollution and heat waves to mental health and migration. We will consider both the problems that arise and practices of care in response. Throughout the course, we will consider ethical questions concerning justice and intergenerational ethics. We will fundamentally ask, "How do we care of our communities in the midst of and in response to ecological change?" Faculty for the course will include community colleagues/practitioners with expertise in farm management and policy development along with Vanderbilt School of Medicine faculty and staff. [3]

## **REL7240 - Seminar In Sociology Of Religion**

### **Title**

Seminar In Sociology Of Religion

### **Catalog Description**

Religion is a constitutive feature of social life, always shaping and being shaped by its particular social context. Indeed, the very content and form of religion itself is always and necessarily formed from the stuff of the socio-cultural world (language, symbols, ritual interactions, resources, organizations, norms, etc). The sociology of religion has focused on this relationship of religion and its broader socio-cultural world, and has developed a particular set of preoccupations: secularization, modernization, myth and meaning-making, and the role of religion in social ordering, for example. In this course, we hope to examine and experiment with some of the core assumptions of the sociological study of religion. What does it mean to be religious? What is the relationship of religion and culture? Do we live in a secular society? How do we enact religious life? How is religion produced and re-produced? [3]

## **REL7999 - Master's Thesis Research**

### **Title**

Master's Thesis Research

### **Catalog Description**

[0-6]

## **REL8000 - Theology And Practice Colloquy**

### **Title**

Theology And Practice Colloquy

### **Catalog Description**

The colloquy provides a social space for deliberation about the goods of theological education. Driven by student presentations, the colloquy considers especially questions of vocation, teaching, and research. Enrollment is limited to fellows in the Program in Theology and Practice. Fellows are required to enroll in the colloquy in each semester of their first three years of doctoral study. Pass/Fail. [1, awarded at the end of each full year] [0-3]

## **REL8001 - Theology And Practice Core Seminar - Research for Ministry**

### **Title**

Theology And Practice Core Seminar - Research for Ministry

### **Catalog Description**

"Why didn't they tell me? The wisdom the disciplines have to offer the practice of faith (but rarely do)". I'm saying this is an opportunity for a graduate students to remember the joy in learning that brought them to their disciplines out of a life a faith, perhaps in seminary, and to see ways to return the wisdom back to the faithful in more direct ways. All grad students are welcome. Same format with faculty colleagues as resources on the front end. \*\*Open to all Graduate Students\*\*

## **REL8002 - Theories and Practices in Critical Pedagogy: Identity Politics in Teaching Theology and Religion**

### **Title**

Theories and Practices in Critical Pedagogy: Identity Politics in Teaching Theology and Religion

### **Catalog Description**

This doctoral seminar explores critical, liberative and emancipatory pedagogies, and interrogates their applicability for teaching theological education and religious studies. Particular attention will be devoted to critical theories grounded in race, gender, and class analysis, as well as to the promise and problems posed by doing critical pedagogy on the margins of academe and religious life. This seminar will also survey inter/multi/disciplinary pedagogical approaches in order to demonstrate the manner in which subject matter impacts both knowledge production and concrete, everyday life experience. Finally, students will begin working on intellectual design and course development skills in an effort to articulate their own signature pedagogy.

## **REL8003 - Qualitative Research**

### **Title**

Qualitative Research

### **Catalog Description**

This doctoral seminar introduces qualitative research methods geared to practical theological methodologies. Students will encounter a range of research methods and exercises drawn from various qualitative designs, but often regarded as shared practices among respective disciplines. This course weighs the philosophical and practical bases of said designs and their theories to construct or study research questions. Students will develop skills in conceptualizing and conducting a qualitative research project: determining a research question and research design, accessing a research site, collecting and analyzing data, writing up the findings, and weighing the challenges of theory building. Students will also learn about a range of ethical considerations involved in conducting research. [3]

## **REL8004 - Practicum in the Teaching of Religion, Part I**

### **Title**

Practicum in the Teaching of Religion, Part I

### **Catalog Description**

This two-semester (no credit) course for first year PhD students in the GDR. This course will be led by a GDR faculty member and will include various faculty members presenting on selected topics, as scheduled in the syllabus. The focus will be on training in the basics of teaching in a university setting. Topics include syllabus preparation and course design, inclusivity in the classroom, grading, lecturing, discussion leadership, technologies in teaching, teaching documentation (teaching statements, etc.), grant design and writing. In addition, discussion of mentoring in the GDR, using the GDR mentoring policy as a guide, planning a strategy for professional development training catered to each student's needs and expectations. This plan includes specific Center for Teaching certificates that the student is expected to complete, and other training offered in the CFT. [0]

## **REL8005 - Clinical Seminar**

### **Title**

Clinical Seminar

### **Catalog Description**

This two-semester (fall/spring required) 3-hour credit supervisory course focuses on discussion of readings from a clinical practice orientation (the first hour) and presentation of cases from a context in which students provide care or counseling (the second hour). Requirements include critical engagement with the assigned texts, rigorous clinical discussion, and the submission and presentation of written case reports. Participants must be actively engaged in pastoral ministry or other care-giving roles. Enrollment is limited to six doctoral and upper level divinity students. Divinity students are admitted only after interview and confirmation by clinical seminar faculty. [0-3] Instructors: Drs. S. Bruce Rogers-Vaughn and Evon O. Flesberg.

## **REL8008 - Practicum in the Teaching of Religion, Part II**

### **Title**

Practicum in the Teaching of Religion, Part II

### **Catalog Description**

Students shadow a faculty member in one course, as approved by the GDR chair. In each case, they and their faculty mentor commit to a limited number of hours (approximately 12) to discuss course planning, syllabus writing, lecture preparation, classroom observation, grading, and other matters relevant to teaching. [0]

## **REL8010 - Religion Research for MA students**

### **Title**

Religion Research for MA students

### **Catalog Description**

Required of entering M.A. students in their first semester. Workshops that examine introductory issues related to teaching and research in religious and theological studies. [0]

## **REL8050 - Special Topics in Religion**

### **Title**

Special Topics in Religion

## **REL8600 - Winnicott & Interpretation Religion and Psychology Seminar**

### **Title**

Winnicott & Interpretation Religion and Psychology Seminar

### **Catalog Description**

This graduate seminar will explore the work of the post-Freudian pediatrician and psychoanalyst D. W. Winnicott (1896 - 1971) and his significance for psychodynamic theory and psychology of religion. Winnicott is the leading theorist of the Independent Group in British psychoanalysis (who located themselves between Anna Freud and Melanie Klein). Winnicott has been described as "intriguing, intellectually invigorating, startlingly innovative, clinically helpful, and sometimes frustration to read and understand." He informs our understanding of especially, children, families, play, and the creative impulse. Besides, reading a significant amount of Winnicott's work, the seminar will discuss works by contemporary interpreter and critics. [3] Hamman.

## **REL8801 - Martin Luther King, Jr**

### **Title**

Martin Luther King, Jr

### **Catalog Description**

King's role as a religious leader and as an agent of social change, with some attention to the intellectual sources of his thought and social activism. His views concerning the social roles of religion are seen against the background of classical Christian views, late nineteenth-century dissenting traditions, the early twentieth-century American Social Gospel Movement, and the more radical ideas of Malcolm X and Albert B. Cleage, Jr., during the 1960s. Critical evaluations of King are also made in terms of classical Christian views (e.g., Aquinas, Luther, Calvin, Wesley). [3]

## **REL8803 - Postmodern Theory: In the Wake of the Death of God**

### **Title**

Postmodern Theory: In the Wake of the Death of God

### **Catalog Description**

If modernism is understood to be the age of the subject, the age that begins when self-consciousness says, "I think, therefore I am" (Descartes, 1638), making itself the foundation of its very existence, postmodernity begins when this postulate of the autonomous, self-grounding subject enters into crisis and collapses. Without the individual subject as secure foundation, the presumably stable values of modern tradition since the Renaissance are undermined in all domains from market economies based on the free choices of independent individuals to aesthetic styles of subjective self-expression familiar, for example, in Romantic and Expressionist art. The new sense of a lack of foundations, of no tangible or knowable reality underlying and grounding the flux of appearances in experience, opens thought and praxis in the diverse directions that have come to be characterized as postmodern. Simulacra, inauthenticity, lack of origins or originals, hence proliferating pluralities which nevertheless evince no real distinctions from one another in a consumer society of mass production are some of the typical manifestations of this postmodern milieu. We will undertake to survey important theoretical responses to this predicament particularly from philosophers of religion, primarily those in the continental tradition writing currently.

## **REL8804 - The Nature of Evil**

### **Title**

The Nature of Evil

### **Catalog Description**

Human evil as expressed in the Shoah, religious fundamentalism, and ethnic cleansing. Theological, philosophical, biological, and literary texts. Evil transformed by scientific inquiry since 1600.

## **REL8805 - Jewish Theories of Religion**

### **Title**

Jewish Theories of Religion

### **Catalog Description**

Critical analysis and discussion of modern Jewish constructions of religion: politically, symbolically, ethically, normatively, and aesthetic-mystically. Selected readings from Cohen, Buber, Rosenzweig, Kaplan, and social philosophers such as Simmel and Habermas on the function, nature, and meaning of religion in secular culture.

## **REL8807 - Mythologies and Epics of South Asia**

### **Title**

Mythologies and Epics of South Asia

### **Catalog Description**

Classical Hindu and Buddhist mythologies of South Asia; Sanskrit Mahabharata and Ramayana epics; regional adaptations of mythical themes in vernacular languages; Buddhist and Islamic narratives of romance and chronicle; interpretive and performative strategies, orality, literacy, and modes of visual representation; political deployment of mythic tropes. [3]

## **REL8808 - Devotional Traditions of South Asia: Hindu, Muslim, Sikh**

### **Title**

Devotional Traditions of South Asia: Hindu, Muslim, Sikh

### **Catalog Description**

Mythology of Hindu pantheon and worship through devotion or bhakti. Techniques for inculcating devotion through meditation, temple rituals, and pilgrimage. Entry of Islam into South Asia. Shi'i and Sufi practices. Sikh traditions. Role of vernacular languages in creating local traditions. Hindu-Muslim interaction, syncretism, and shared sacred space. Challenges to orthodoxy. [3] Taneja

## **REL8811 - Mysticism In Islam**

### **Title**

Mysticism In Islam

### **Catalog Description**

A survey of the origins and development of Islamic mysticism, the rise of asceticism, the development of the Sufi orders, the gradual systematization of Sufi teachings, and modern forms of Sufism. The spread of Islamic mysticism was primarily due to the teachings of great thinkers such as Ibn Arabi, Rabi'a, al-Hallaj, Rumi, al-Ghazali, and others. No prior knowledge of Islam is required. [3] McGregor.

## **REL8812 - The Qur'an And Its Interpreters**

### **Title**

The Qur'an And Its Interpreters

### **Catalog Description**

This course will focus upon the Qur'an and the Islamic tradition of interpretation through a critical examination of the treatment of the biblical prophets, Jesus, and Satan. Interpretations will be drawn from the earliest period to the modern era. Rationalist, dogmatic, Shi'i, and mystical schools of interpretation will be discussed. [3] McGregor.

## **REL8814 - Asian Conceptions of Wisdom, Liberation, and Enlightenment**

### **Title**

Asian Conceptions of Wisdom, Liberation, and Enlightenment

### **Catalog Description**

Philosophical conceptions and practices as found in classical works, including the Bhagavad Gita, the Confucian Analects, the Tao Te Ching, and Buddhist texts that have functioned as religious life-guides in India, China, and Japan for thousands of years.

## **REL8815 - Chinese Rel. through Stories**

### **Title**

Chinese Rel. through Stories

### **Catalog Description**

Analysis of narratives from various religious traditions and genres within early and medieval China. The role of narrative in Chinese religious, cultural, and political life. Primary texts in English translation. Offered on a graded basis only. [3] Company.

## **REL8816 - Sacred Space in the Tibetan World**

### **Title**

Sacred Space in the Tibetan World

### **Catalog Description**

How is sacred space created, mediated, and reproduced in the greater Tibetan world? To investigate this question, we proceed through loci of increasing scale, from religious icons and bodies to built structures to sacred geographies. In the process, we analyze how sacred space is formed and affirmed through narrative, ritual, cosmology, and interaction with natural environments. We will attend to interactions between Buddhist, Bv'an, and local religious traditions, as well as to continuities and changes from premodern to modern periods. Our case studies will extend beyond the current political borders of Tibet to include ethnically Tibetan communities in India and Nepal, historically significant sites in China and Bhutan, and the circulation of Tibetan objects and bodies in America and worldwide. [3]

## **REL8817 - The Holocaust: Its Meanings And Implications**

### **Title**

The Holocaust: Its Meanings And Implications

### **Catalog Description**

This course examines the systematic destruction of European Jewry and other groups during World War II, its background, and its aftermath. It addresses the attempts by victims, bystanders, perpetrators, and their descendants-and we are all their descendants-to create meaningful narratives about an event that appears to lack discernible meaning. To that end it focuses upon historical accounts, case studies, memoirs, fiction, and theology and such issues as history, memory, witness, conscience, language, evil, and otherness that they raise. Particular emphasis is upon the many roles of film in both the Third Reich and the postwar world. National Socialism employed films to mobilize support for its rule and to inculcate its racial-eugenic worldview. In the wake of the Holocaust, film has been employed for other purposes: to document, to bear witness, to mitigate or reduce its import, to provide meaning, to unmask attempts to mystify or suppress the past, to explore relationships between those events and contemporary societies, to say the unsayable, to examine the life of the traumatized victim. No prior study is presupposed of these events that have come to be known as the Holocaust. [3] Geller.

**REL8824 - Apophatic Mysticism****Title**

Apophatic Mysticism

**Catalog Description**

Unsayable or negative, theology from Plato and Neoplatonism through medieval mysticism, Kabbalah and Sufism. Baroque expressions in Silesius Angelus and John of the Cross. Romantic authors and modern and postmodern writers. Chinese Taoism, Advaita Vedanta, and the Buddhism of Nagarjuna. [3]

**REL8830 - Islam in South Asia****Title**

Islam in South Asia

**Catalog Description**

History of Islam in South Asia. Cultural memory of conquest. Inter-religious interactions. Sufism and Bhakti. Mughal traditions of cosmopolitanism. Legacy of colonialism. Impact of Partition. Shared popular culture and shared sacred spaces. [3]. Taneja.

**REL8835 - Islam in the Modern World****Title**

Islam in the Modern World

**Catalog Description**

Impact of colonialism on Muslim societies and everyday life in the cities of the Middle East. Analysis through literary, religious, political, and ethnographic texts. Relationship of Sharia to the modern state; impact of modernity on the understanding and practice of religion. [3]

**REL8900 - The Study Of Religion****Title**

The Study Of Religion

**Catalog Description**

Required of entering Ph.D. students in their first semester. Discussion of such topics as the methods, diversities, connections, purposes, and contexts of religious studies. [3]

**REL8999 - Non-Candidate Research****Title**

Non-Candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**REL9000 - Readings in Hebrew Bible****Title**

Readings in Hebrew Bible

**Catalog Description**

A directed readings course in the discipline of the Hebrew Bible in which selected texts are read and studied in selected Biblical languages. [3]



**REL9100 - Reading Course In Ethics**

**Title**

Reading Course In Ethics

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9150 - Reading Course In Medical Ethics**

**Title**

Reading Course In Medical Ethics

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9200 - Readings Course in History of Ancient Israel**

**Title**

Readings Course in History of Ancient Israel

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9201 - NW Semitic Epigraphy**

**Title**

NW Semitic Epigraphy

**Catalog Description**

Independent Study. [1-3] Azzoni

**REL9300 - Reading Course In Homiletics**

**Title**

Reading Course In Homiletics

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9350 - Reading Course In Liturgics**

**Title**

Reading Course In Liturgics

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9400 - Reading Course In American Church History**

**Title**

Reading Course In American Church History

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9415 - Reading Course In Reformation History**

**Title**

Reading Course In Reformation History

**Catalog Description**

[1-3] Staff.

**REL9425 - Reading Course In Modern European Church History**

**Title**

Reading Course In Modern European Church History

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9450 - Reading Course In Early Church History**

**Title**

Reading Course In Early Church History

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9475 - Reading Course In Historical Theology**

**Title**

Reading Course In Historical Theology

**Catalog Description**

[1-3] Staff.

**REL9500 - Reading Course In New Testament**

**Title**

Reading Course In New Testament

**Catalog Description**

May be repeated. [3] Staff.

**REL9600 - Reading Course In Religion, Psychology, And Culture**

**Title**

Reading Course In Religion, Psychology, And Culture

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9650 - Reading Course In Pastoral Theology**  
**Title**

Reading Course In Pastoral Theology

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9675 - Readings In Religion/Gender/Sexuality**  
**Title**

Readings In Religion/Gender/Sexuality

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9700 - Reading Course In Systematic Theology**  
**Title**

Reading Course In Systematic Theology

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9750 - Reading Course In Philosophical Theology**  
**Title**

Reading Course In Philosophical Theology

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9800 - Reading Course In Judaism**  
**Title**

Reading Course In Judaism

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9820 - Reading Course In History And Critical Theories Of Religion**  
**Title**

Reading Course In History And Critical Theories Of Religion

**Catalog Description**

May be repeated. [1-3] Staff.

**REL9999 - Ph.D. Dissertation Research**

**Title**

Ph.D. Dissertation Research

**Catalog Description**

May be repeated. [0-12] Staff.

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## Religious Studies

**RLST5178 - Native American Religious Traditions**

**Title**

Native American Religious Traditions

**Catalog Description**

(Also listed as RLST 3178) Diversity of First Nation religious traditions in North America, especially Eastern Woodlands and Plains. Spiritual and cultural dimensions of diversity, cosmologies, stereotypes, cultural resilience, creativity and storytelling, humor, rituals and practices, healing, and sovereignty. No credit for students who have earned credit for 3178. [3]

**RLST5225 - Sexuality in the Hebrew Bible and the Ancient Near East**

**Title**

Sexuality in the Hebrew Bible and the Ancient Near East

**Catalog Description**

(Also listed as RLST 3225) Issues of sexuality in the Hebrew Bible in the context of the Ancient Near East. Homosexuality, virginity, and incest. No credit for students who have earned credit for 3225. [3]

**RLST5270 - Jewish Theories of Religion**

**Title**

Jewish Theories of Religion

**Catalog Description**

(Also listed as RLST 3270) Critical analysis and discussion of modern Jewish constructions of religion: politically, symbolically, ethically, normatively, and aesthetic-mystically. Selected readings from Cohen, Buber, Rosenzweig, Kaplan, and social philosophers such as Simmel and Habermas on the function, nature, and meaning of religion in secular culture. No credit for students who have earned credit for 3270. [3]

**RLST5371 - Through the Eyes of the Other: A History of Muslim-Christian Relations**

**Title**

Through the Eyes of the Other: A History of Muslim-Christian Relations

**Catalog Description**

Travelogues and interpretive accounts of encountering the religious and cultural 'Other,' Christian or Muslim. Increased awareness of long-standing relationship between two major religious traditions. [3]

**RLST5459 - Buddhist Traditions****Title**

Buddhist Traditions

**Catalog Description**

Historical and thematic survey of foundational, Mahayana, and esoteric Buddhist traditions. Mythology, doctrine, meditation, devotional practices, and institutions. Contemporary case studies from Asia and North America. [3]

**RLST5461 - Islam in Africa****Title**

Islam in Africa

**Catalog Description**

(Also listed as RLST 2461) Social and cultural development of Islam across Africa from the eighth century to the present, as illuminated by historical, ethnographic, and literary sources. Interplay between Muslims and outside religious groups, jihads in pre-colonial Africa, and Islam during European colonization. Attention to Sub-Saharan Africa. No credit for students who have earned credit for 2461. [3]

**RLST5472 - Religion, Ecology, and Power in Africa****Title**

Religion, Ecology, and Power in Africa

**Catalog Description**

(Also listed as 2472) The interrelationship between religion and ecology in Africa; the ways power relations in pre-colonial Africa through the present have determined human-Earth relations. Divine origin and development of the Earth and its peoples; influence on African social structure, ethnically-based occupations, and stewardship over the environment. No credit for students who have earned credit for 2472. [3]

**RLST5552 - Reformers of the Islamic Tradition****Title**

Reformers of the Islamic Tradition

**Catalog Description**

(Also listed as RLST 4552) Historical survey of Muslim reformists. Religious responses to crises in the pre-modern debates over orthodoxy and heresy; modern (Western colonialism) and recent periods. No credit for students who have earned credit for 4552. [3]

**RLST5562 - Culture, Religion, and Politics of the Arab World****Title**

Culture, Religion, and Politics of the Arab World

**Catalog Description**

(Also listed as RLST 4562) Diversity and unity in Arab culture. Religious, sociopolitical, and historical factors shaping Arab identity in the modern age. Encounters and relationships between Arabs and the Western world. The Israeli-Palestinian conflict. No credit for students who have earned credit for 4562. [3]

**RLST5592 - Advanced Seminar in Arabic****Title**

Advanced Seminar in Arabic

**Catalog Description**

(Also listed as RLST 4592) Analysis of style and forms. Poetry, novels, popular literature, and historical chronicles. Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 4592. [3]

**RLST5593 - Advanced Seminar in Islamic Tradition****Title**

Advanced Seminar in Islamic Tradition

**Catalog Description**

(Also listed as RLST 4593) Analysis of original Arabic texts, manuscript reading, and research methods. Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 4593. [3]

**RLST5665 - Mythologies and Epics of South Asia****Title**

Mythologies and Epics of South Asia

**Catalog Description**

(Also listed as RLST 4665) Classical Hindu and Buddhist mythologies of South Asia. Sanskrit Mahabharata and Ramayana epics. Regional adaptations of mythical themes in vernacular languages. Buddhist and Islamic narratives of romance and chronicle. Interpretive and performance strategies. Oral, literary, and visual modes of representation. Political deployment of myths. No credit for students who have earned credit for 4665. [3]

**RLST5666 - Devotional Traditions of South Asia: Hindu, Muslim, Sikh****Title**

Devotional Traditions of South Asia: Hindu, Muslim, Sikh

**Catalog Description**

(Also listed as RLST 4666) Mythology of Hindu pantheon and worship through devotion or bhakti. Techniques for inculcating devotion through meditation, temple rituals, and pilgrimage. Entry of Islam into South Asia. Shi'i and Sufi practices. Sikh traditions. Role of vernacular languages in creating local traditions. Hindu-Muslim interaction, syncretism, and shared sacred space. Challenges to orthodoxy. No credit for students who have earned credit for 4666. [3]

**RLST5669 - Sacred Space in the Tibetan World****Title**

Sacred Space in the Tibetan World

**Catalog Description**

(Also listed as RLST 3669) Creation, mediation, and reproduction of sacred space from artifacts to built structures to geographies. Narrative, ritual, and cosmological aspects of Tibetan Buddhist, Bvān, and local religious traditions. Cases include premodern to modern periods, and local to global contexts. No credit for students who have earned credit for 3669. [3]

## **RLST5670 - Buddhism and the State**

### **Title**

Buddhism and the State

### **Catalog Description**

(Also listed as RLST 3670W) Models relating Buddhism and the state in ancient and modern Asia. Kingship and spiritual leadership; sacred territory and national identity; legitimation theory and its alternatives; and religious responses to the modern state. Case studies from India, Nepal, Thailand, Burma, Tibet, Mongolia, China, and Japan. No credit for students who have earned credit for 3670W. [3]

## **RLST5747 - Daoist Tradition**

### **Title**

Daoist Tradition

### **Catalog Description**

(Also listed as RLST 3747) Historical and thematic survey of the Daoist tradition in China. Philosophical classics and religious scriptures, as well as social history are covered. Daoism today. No credit for students who have earned credit for 3747. [3]

## **RLST5753 - East Asian Buddhism**

### **Title**

East Asian Buddhism

### **Catalog Description**

(Also listed as RLST 3753) East Asian Buddhist texts. Key Buddhist ideas, values, practices, and institutions. Chronological surveys of key developments in major historical periods. No credit for students who have earned credit for 3753. [3]

## **RLST5775 - Chinese Religions through Stories**

### **Title**

Chinese Religions through Stories

### **Catalog Description**

(Also listed as RLST 3775) Analysis of narratives from various religious traditions and genres within early and medieval China. The role of narrative in Chinese religious, cultural, and political life. Primary texts in English translation. Offered on a graded basis only. No credit for students who have earned credit for 3775. [3]

## **RLST5900 - Mysticism and Spirituality, Comparative Study**

### **Title**

Mysticism and Spirituality, Comparative Study

### **Catalog Description**

(Also listed as RLST 3900) Philosophical, historical, and textual perspectives. Key mystical traditions, philosophies, texts, and figures from Hindu, Buddhist, and Christian traditions. The popular emergence of spirituality as a contemporary mode of religiosity in advanced capitalist societies. No credit for students who have earned credit for 3900. [3]

### **RLST5921 - Ethics and Ecology**

#### **Title**

Ethics and Ecology

#### **Catalog Description**

(Also listed as RLST 2291) Relationships among humans, nature, and the sacred. Focus on understandings of our 'dominion' over non-human nature. The role of religion in shaping attitudes and behaviors regarding the environment. Topics include eco-centered ethics, 'creation care,' reliance on fossil fuels, and alternative sustainable scenarios. [3]

### **RLST5926 - Ancient Goddesses**

#### **Title**

Ancient Goddesses

#### **Catalog Description**

(Also listed as RLST 3926) Ancient concepts of the feminine divine in literature and iconographic evidence. Specific goddesses, their spheres of influence, and their place in the various pantheons. Cultic practices and religious syncretism across cultures, including Mesopotamia, Egypt, and Ancient Israel. Offered on a graded basis only. No credit for students who have earned credit for 3926. [3]

### **RLST5938 - Marriage in the Ancient Near East and the Hebrew Bible**

#### **Title**

Marriage in the Ancient Near East and the Hebrew Bible

#### **Catalog Description**

(Also listed as RLST 4938) Religious, legal, and socio-economic aspects of marriage. Survey of ancient Sumerian, Assyrian, Babylonian, and Egyptian sources, and relevant sections of the Hebrew Bible. Marriage as an institution at the beginning of recorded history. No credit for students who have earned credit for 4938. [3]

### **RLST5940 - The Nature of Evil**

#### **Title**

The Nature of Evil

#### **Catalog Description**

(Also listed as RLST 3940) Human evil as expressed in the Shoah, religious fundamentalism, and ethnic cleansing. Theological, philosophical, biological, and literary texts. Evil transformed by scientific inquiry since 1600. No credit for students who have earned credit for 3940. [3]

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## **Responsible Conduct in Research**

### **RCRG6303 - Responsible Conduct of Research**

#### **Title**

Responsible Conduct of Research

#### **Catalog Description**

Responsible Conduct of Research: Lectures and small group discussions about responsible conduct of research including individual and group responsibilities, recording and use of data, intellectual property and technology transfer, ethical questions in and about research, societal responsibility of researchers, and Federal and institutional guidelines.



**RCRG6304 - Peer Review and Publication****Title**

Peer Review and Publication

**Catalog Description**

Discussion, case studies dealing with publication standards and plagiarism.

**RCRG6305 - Mentor/Trainee and COI Discussion****Title**

Mentor/Trainee and COI Discussion

**Catalog Description**

Discussion and case studies on the relationship between students and mentors and conflict of interest.

**RCRG6306 - Data Management/Research Misconduct Discussion****Title**

Data Management/Research Misconduct Discussion

**Catalog Description**

Discussion and case studies on proper data archival and protection, fraud and honesty in research.

**RCRG6307 - Special Topics Discussion****Title**

Special Topics Discussion

**Catalog Description**

Special Topics Discussion

**RCRG6308 - Responsible Conduct of Research in the Humanities****Title**

Responsible Conduct of Research in the Humanities

**Catalog Description**

Preparation for the responsible conduct of research in the humanities through discussion of case studies and issues. [0]

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## Russian

**RUSS5231 - Jews in Russian Culture: Survival and Identity****Title**

Jews in Russian Culture: Survival and Identity

**Catalog Description**

(Also listed as RUSS 3231) A course on the history of Jewish contributions to Russian culture, including literature, the visual arts, theatre, and film. Questions of assimilation, the rise of Jewish national consciousness, and interest in Jewish heritage are discussed. No knowledge of Russian required. No credit for students who have earned credit for 3231. [3]

## **RUSS5810 - Revolutions and Post-Communisms in Eastern Europe and Eurasia, 1981**

### **Title**

Revolutions and Post-Communisms in Eastern Europe and Eurasia, 1981

### **Catalog Description**

Life in the Soviet Imperium. Revolutions of 1989 in Eastern Europe. Disintegration of the U.S.S.R., 1989-1991. Challenges of neoliberal transitions to free-market democracies. Post-socialist culture. Ecology and environmentalism; globalization; gender; religion and ideology; mass media; violence; ethno-nationalism; and authoritarianism. Taught in English. Serves as repeat credit for students who have earned credit for HIST 2212, EUS 2212 or RUSS 2810/5810. [3]

## **RUSS5820 - Eastern Europe: Critical Encounters**

### **Title**

Eastern Europe: Critical Encounters

### **Catalog Description**

Eastern Europe from Enlightenment to 1989. Nineteenth century imperial competition, birth of nation-states. Minority rights, World War II and the Holocaust, socialist experimentation, police state, and dissent. Revolutions of 1989. [3]

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## **Scientific Computing**

### **SC5250 - Scientific Computing Toolbox**

#### **Title**

Scientific Computing Toolbox

#### **Catalog Description**

(Also listed as SC 3250) Use of computational tools in multiple science and engineering domains. Simulations of complex physical, biological, social, and engineering systems, optimization and evaluation of simulation models, Monte Carlo methods, scientific visualization, high performance computing, or data mining. No credit for students who have earned credit for 3250. FALL. [3]

### **SC5260 - High Performance Computing**

#### **Title**

High Performance Computing

#### **Catalog Description**

(Also listed as SC 3260) Parallel computing, grid computing, GPU computing, data communication, high performance security issues, performance tuning on shared-memory-architectures. SPRING. [3]

### **SC5890 - Special Topics**

#### **Title**

Special Topics

#### **Catalog Description**

(Also listed as SC 3890) No credit for students who have earned credit for 3890. [1-3]

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## **Second Language Studies**

### **SLS6030 - Foreign Language Learning and Teaching**

#### **Title**

Foreign Language Learning and Teaching

#### **Catalog Description**

(Also listed as Spanish 6030, Portuguese 6030, French 6030, German 5310) Principles and practices of teaching a second language with concentration on recent interactive and communicative models of foreign language instruction. Classroom observations, journal writing, development of materials, and a small action research project. [3]

### **SLS7040 - Second Language Acquisition Theories and Research**

#### **Title**

Second Language Acquisition Theories and Research

#### **Catalog Description**

(Also listed as French 7040 and German 5311) A review of current sociocultural and cognitive theories and research. [3]

### **SLS8090 - Special Topics in Second Language Studies**

#### **Title**

Special Topics in Second Language Studies

#### **Catalog Description**

Topics in applied linguistics including second language acquisition, curriculum design, and assessment. [3]

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## **Sociology**

### **SOC6302 - Theoretical Foundations of Sociology**

#### **Title**

Theoretical Foundations of Sociology

#### **Catalog Description**

Classical and modern perspectives and theorists including theories of Durkheim, Marx, and Weber, and neo-Marxist, functionalist, structuralist, conflict, interactionist, exchange/rational choice, and feminist perspectives. [3]

### **SOC6310 - Second-Year Research Practicum**

#### **Title**

Second-Year Research Practicum

#### **Catalog Description**

Introduction to research methods, including theory construction, sociological reasoning, study design, and specific research and analysis techniques. Development of research project and preparation of research paper. Hands-on training in sociological research. Normally limited to graduate students in the department. [3]

**SOC6311 - Multivariate Analysis I****Title**

Multivariate Analysis I

**Catalog Description**

Basic concepts in probability and statistical analysis. Multivariate analysis of sociological data, with special attention to regression analysis. The use of computers. Prerequisite: enrollment in graduate program in sociology or permission of the instructor. [3]

**SOC6312 - Multivariate Analysis II****Title**

Multivariate Analysis II

**Catalog Description**

The general linear model in analyzing sociological data, including analysis of variance, regression, path analysis, and parametric techniques for contingency-table analysis. Practice in the use of computers. Prerequisite: 6311 or an equivalent statistics course approved by the instructor. [3]

**SOC7400 - Teaching Workshop****Title**

Teaching Workshop

**Catalog Description**

For students wanting to improve their teaching skills. Students visit the classrooms of outstanding teachers on campus and discuss their approach to teaching; deliver lectures in the presence of critics; examine their own lectures on videotape; discuss methods of evaluation; read outstanding books on college teaching; and survey teaching materials produced by the American Sociological Association. Normally limited to graduate students in the department. Graded P/F only. [3]

**SOC7500 - Workshop on Sociological Criticism****Title**

Workshop on Sociological Criticism

**Catalog Description**

Intensive introduction to peer review for publication, using materials from journal submissions to editorial correspondence. [3]

**SOC7600 - Quantitative Methods Workshop****Title**

Quantitative Methods Workshop

**Catalog Description**

Analysis of large data sets from the social sciences or of data brought to the course by students. Scaling and measurement; nonparametric analysis of contingency tables; and advanced topics in regression and path analysis. Prerequisite: 6312 or an equivalent statistics course approved by the instructor. [3]

**SOC7700 - Qualitative Methods Workshop****Title**

Qualitative Methods Workshop

**Catalog Description**

Organization and execution of research in natural settings. Processes of collecting, analyzing, and reporting qualitative social data and documentary evidence. Theoretical and methodological bases of comparative-historical sociology. No credit for students who earned credit for 371 section 1 in fall 2009, spring 2011, fall 2012, or spring 2014. [3]

**SOC7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-12]

**SOC8329 - Survey Seminar on Gender and Sexuality****Title**

Survey Seminar on Gender and Sexuality

**Catalog Description**

Recent contributions to the field, including micro- and macro-level theories of the development of gender ideology/roles, labor force stratification, gender and social protest, and feminist methodologies. Attention to research on sexual meanings, identities, and behaviors. No credit for students who earned credit for 367 in spring 2013. [3]

**SOC8331 - Survey Seminar on Collective Behavior and Social Movements****Title**

Survey Seminar on Collective Behavior and Social Movements

**Catalog Description**

Theories accounting for causes, dynamics, and consequences of collective behavior and/or social movements. Critiques of such theories for understanding historically specific revolutions, rebellions, and nonviolent forms of protest. [3]

**SOC8333 - Survey Seminar on Cultural Sociology****Title**

Survey Seminar on Cultural Sociology

**Catalog Description**

The creation of culture, including values, norms, beliefs, symbols, and life-styles. The reproduction of society through culture; institutions that purposefully preserve, produce, and transmit aspects of culture. [3]

**SOC8335 - Survey Seminar on Deviant Behavior and Social Control**

**Title**

Survey Seminar on Deviant Behavior and Social Control

**Catalog Description**

Major works on crime, juvenile delinquency, and forms of extralegal deviance. Social control in connection with counteraction of deviance, sociology of law, and manipulation of human behavior. [3]

**SOC8337 - Survey Seminar on Race and Ethnic Relations**

**Title**

Survey Seminar on Race and Ethnic Relations

**Catalog Description**

Analyses of enduring topics in the study of race and ethnicity, including stratification, discrimination, immigration, assimilation, and politics. Other topics include racial and ethnic identity and the social construction of race and ethnic categories. [3]

**SOC8339 - Survey Seminar on Political Sociology**

**Title**

Survey Seminar on Political Sociology

**Catalog Description**

Classical and modern theories about the nature and distribution of power in society and in other human groups. Social bases and implications of major political institutions, the state in particular; and political order and change. [3]

**SOC8341 - Survey Seminar on Population Studies and Human Ecology**

**Title**

Survey Seminar on Population Studies and Human Ecology

**Catalog Description**

Population processes, elements of social organization, and their interaction. Major theories and research pertaining to fertility, mortality, migration, urbanization, urban structure, technology, and the division of labor. [3]

**SOC8343 - Survey Seminar on Social Psychology**

**Title**

Survey Seminar on Social Psychology

**Catalog Description**

The interaction of social structure and personality. Socialization, social perception, small groups, exchange theory, and symbolic interactionism. [3]

**SOC8345 - Survey Seminar on Social Stratification**

**Title**

Survey Seminar on Social Stratification

**Catalog Description**

Major theories and lines of research pertaining to the origin, nature, and functioning of systems of social inequality. [3]

**SOC8347 - Survey Seminar on Sociology of Science and Knowledge**

**Title**

Survey Seminar on Sociology of Science and Knowledge

**Catalog Description**

How ideas and systems of thought are related to the social structure and culture of societies. Institutionalization of scientific and intellectual activity, scientific and intellectual communities or organizations, and social influences on the directions of research by scientists and academicians. [3]

**SOC8351 - Survey Seminar on Medical Sociology**

**Title**

Survey Seminar on Medical Sociology

**Catalog Description**

Theoretical paradigms and methodologies for the study of social and cultural factors in the perception, diagnosis, treatment, and distribution of disease. Emphases on medicalization, mental health, medical technology, and roles of patients and medical professionals. [3]

**SOC8353 - Survey Seminar on Social Networks and Health**

**Title**

Survey Seminar on Social Networks and Health

**Catalog Description**

Social network-based concepts, theories, and methodologies; applications to health and illness. Social integration, cohesion, capital, regulation, support. Negative social interactions and comparisons. Social contagion and social cost. [3]

**SOC8355 - Survey Seminar on Sociology of Family**

**Title**

Survey Seminar on Sociology of Family

**Catalog Description**

Examinations of the family as a social institution. Principles of social organization applied to family relationships. Macro-level analyses of family structure, the effects of families on individuals, and interactions of family systems with other institutions. [3]

**SOC8357 - Survey Seminar on Sociology of Education**

**Title**

Survey Seminar on Sociology of Education

**Catalog Description**

Comparative and functional analyses of education in society and education as society. Theories accounting for the form, role, and evolution of educational systems. Intersection of education and other institutions. [3]

### **SOC8359 - Survey Seminar on International Migration**

#### **Title**

Survey Seminar on International Migration

#### **Catalog Description**

Key current theoretical debates about international migration and intersection with the empirical data and case studies. Emphases on interdisciplinarity and method, and comparative studies. No credit for students who earned credit for 361 section 1 in fall 2011. [3]

### **SOC8999 - Non-candidate Research**

#### **Title**

Non-candidate Research

#### **Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

### **SOC9361 - Special-Topic Seminars on Social Phenomena at the Macro Level**

#### **Title**

Special-Topic Seminars on Social Phenomena at the Macro Level

#### **Catalog Description**

Each focuses on some aspect of social structure, social organization, culture, international relations, global systems, spatial organization, or the social division of labor. Cities, communities, urban areas, metropolitan areas, regions, countries, or status categories are the principal units of comparison. May be repeated more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

### **SOC9363 - Special-Topic Seminars on Institutions and Organizations**

#### **Title**

Special-Topic Seminars on Institutions and Organizations

#### **Catalog Description**

Each focuses on some type of institution-economic, educational, familial, medical, political, or religious-or some type of organization, including business firms and voluntary associations. May be repeated more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

### **SOC9365 - Special-Topic Seminars on Norms, Power, and Related Normative Phenomena**

#### **Title**

Special-Topic Seminars on Norms, Power, and Related Normative Phenomena

#### **Catalog Description**

Each focuses on a particular type of deviance, the sociology of law, social control, or political sociology. May be repeated more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]



### **SOC9367 - Special-Topic Seminars on Social Processes and Social Change**

#### **Title**

Special-Topic Seminars on Social Processes and Social Change

#### **Catalog Description**

Each focuses on collective behavior, social movements, innovation and diffusion, societal development, cultural evolution, revolutions, migration, mortality, fertility, or mobility. May be repeated more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

### **SOC9369 - Special-Topic Seminars on Methodology**

#### **Title**

Special-Topic Seminars on Methodology

#### **Catalog Description**

Each seminar focuses on a particular kind of research method or statistical technique. May be repeated more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

### **SOC9371 - Special-Topic Seminars on Theory**

#### **Title**

Special-Topic Seminars on Theory

#### **Catalog Description**

Each seminar focuses on a particular theorist, a particular theoretical perspective, or the methodology of theory construction. May be repeated more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

### **SOC9400 - Dissertation Proposal Seminar**

#### **Title**

Dissertation Proposal Seminar

#### **Catalog Description**

Focus on theoretical, methods, and data aspects of each student's dissertation project. Devise research question, conduct literature review, articulate theoretical arguments, develop research design, and draft preliminary dissertation proposal. [3]

### **SOC9888 - Directed Studies**

#### **Title**

Directed Studies

#### **Catalog Description**

Students work independently on topics of special interest not covered in depth in course offerings. Work in a tutorial relationship with an individual faculty member or in a student seminar, subject to faculty approval, should several students share a common interest. Prerequisite: consent of the instructor. May be repeated more than once if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3]

**SOC9889 - Directed Studies****Title**

Directed Studies

**Catalog Description**

Students work independently on topics of special interest not covered in depth in course offerings. Work in a tutorial relationship with an individual faculty member or in a student seminar, subject to faculty approval, should several students share a common interest. Prerequisite: consent of the instructor. May be repeated more than once if there is no duplication in topic, but students may earn only up to 3 credits per semester of enrollment. [1-3]

**SOC9995 - Half-time Ph.D. Dissertation Research****Title**

Half-time Ph.D. Dissertation Research

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

**SOC9999 - Ph.D. Dissertation Research****Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]

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## Spanish

**SPAN5111 - Spanish for Graduate Reading****Title**

Spanish for Graduate Reading

**Catalog Description**

Survey of grammar and vocabulary, with extensive reading. Available only to graduate students for "No Credit". [0]

**SPAN5315 - Contrastive Analysis of Spanish and English****Title**

Contrastive Analysis of Spanish and English

**Catalog Description**

(Also listed as SPAN 4315) A comparison of the phonological, morphological, and syntactical structures of Spanish and English to demonstrate the similarities and differences between the linguistic systems of these two languages. No credit for students who have earned credit for 4315. [3] (SBS)

**SPAN5320 - The Sounds of Spanish****Title**

The Sounds of Spanish

**Catalog Description**

(Also listed as SPAN 4320) Analysis of the production, nature, and systematic function of the sounds of the Spanish language, as well as of problems frequently experienced by non-native speakers. Both standard and dialectal features of Spanish are examined. No credit for students who have earned credit for 4320. [3]

**SPAN5325 - Dialectology****Title**

Dialectology

**Catalog Description**

(Also listed as SPAN 4325) Formation, general characteristics, distinctive features, and geographical extension of the principal dialectal regions of Spain and Spanish America. Both historical and modern dialects are considered. Emphasis on non-standard dialectal varieties of Spanish. No credit for students who have earned credit for 4325. [3] (SBS)

**SPAN5335 - Grammatical Structure of Spanish****Title**

Grammatical Structure of Spanish

**Catalog Description**

(Also listed as SPAN 4335) An introduction to the principles of modern Spanish morphology (word formation) and syntax (phrase structure and usage) through an analysis of the native speaker's organization of reality and use of language to reflect and to express that organization. No credit for students who have earned credit for 4335. [3]

**SPAN5340 - History of Spanish Lang****Title**

History of Spanish Lang

**Catalog Description**

(Also listed as SPAN 4340) Origins and evolution of the Spanish (Castilian) language. Emphasis on the phonological and morphological development of Spanish within historical and cultural contexts of the Iberian Peninsula. No credit for students who have earned credit for 4340. [3] (SBS)

**SPAN5345 - The Languages of Spain****Title**

The Languages of Spain

**Catalog Description**

(Also listed as SPAN 4345) Origins, development, and the contemporary sociolinguistic situation of the principal languages and dialects of Spain, including Castilian, Catalan, Galician, and Basque. No credit for students who have earned credit for 4345. [3]

**SPAN5350 - Communicating Across Cultures****Title**

Communicating Across Cultures

**Catalog Description**

(Also listed as SPAN 4350) Relationships among discourse, identity, and culture. Linguistic construction of ethnicity and gender. Latin American and U.S. Latino ways of speaking. Serves as repeat credit for student who completed 295 section 1 in spring 2005 or spring 2008. [3] (SBS)

**SPAN5355 - Spanish in Society****Title**

Spanish in Society

**Catalog Description**

(Also listed as SPAN 4355) Language variation and linguistic change. Regional, socioeconomic, gendered, and ethnic differences in spoken Spanish. Language as it shapes the identities of speakers. Language use in social contexts with comparisons to English. Prerequisite: 3303. [3] (SBS)

**SPAN5375 - Film and Culture in Latin America****Title**

Film and Culture in Latin America

**Catalog Description**

(Also listed as SPAN 3375) Latin American cinema from the perspective of cultural history; screenings and supplementary texts, including manifestos and critical readings. No credit for students who have earned credit for 3375. [3]

**SPAN5400 - The Origins of Spanish Literature****Title**

The Origins of Spanish Literature

**Catalog Description**

(Also listed as SPAN 4400) From its beginnings to the Renaissance; the creation of a social order and a cultural tradition. Close study of three literary landmarks - Poema del Cid, Libro de Buen Amor, La Celestina - and other prose and poetry selections. No credit for students who have earned credit for 4400. [3]

**SPAN5405 - Literature of the Spanish Golden Age****Title**

Literature of the Spanish Golden Age

**Catalog Description**

(Also listed as SPAN 4405) Representative works from early modern Spain, including poetry, prose, and drama of the Renaissance and Baroque periods. No credit for students who have earned credit for 4405. [3]

### **SPAN5410 - Spanish Literature from the Enlightenment to 1900**

#### **Title**

Spanish Literature from the Enlightenment to 1900

#### **Catalog Description**

(Also listed as SPAN 4410) Essays and Neoclassic literature. Romanticism, Realism, and Naturalism. Representative works and authors from all genres. No credit for students who have earned credit for 4410. [3]

### **SPAN5415 - Spanish Literature from 1900 to the Present**

#### **Title**

Spanish Literature from 1900 to the Present

#### **Catalog Description**

(Also listed as SPAN 4415) Representative authors and works. No credit for students who have earned credit for 4415. [3]

### **SPAN5420 - Spanish American Literature from the Conquest to 1900**

#### **Title**

Spanish American Literature from the Conquest to 1900

#### **Catalog Description**

(Also listed as SPAN 4420) Development of all forms from colonial times to the end of the 19th century. Patterns of interaction of Amerindian, African, and European cultural traditions. Unity and diversity of Spanish American literature. No credit for students who have earned credit for 4420. [3]

### **SPAN5425 - Spanish American Literature from 1900 to the Present**

#### **Title**

Spanish American Literature from 1900 to the Present

#### **Catalog Description**

(Also listed as SPAN 4425) The works of Neruda, Borges, Paz, Garcia M<sup>v</sup>°rquez and others. No credit for students who have earned credit for 4425. [3]

### **SPAN5440 - Development of the Short Story**

#### **Title**

Development of the Short Story

#### **Catalog Description**

(Also listed as SPAN 4440) From early manifestations in Spain through its current forms in Spain and Spanish America. No credit for students who have earned credit for 4440. [3]

### **SPAN5445 - Development of the Novel**

#### **Title**

Development of the Novel

#### **Catalog Description**

(Also listed as SPAN 4445) From the seventeenth century through Realism and Naturalism in Spain and Spanish America. No credit for students who have earned credit for 4445. [3]

### **SPAN5450 - The Contemporary Novel**

#### **Title**

The Contemporary Novel

#### **Catalog Description**

(Also listed as SPAN 4450) New forms in the twentieth-century novel in Spain and Spanish America. No credit for students who have earned credit for 4450. [3]

### **SPAN5455 - Development of Drama**

#### **Title**

Development of Drama

#### **Catalog Description**

(Also listed as SPAN 4455) Spanish theatrical works from 1600 to 1900, including the Golden age comedia, neoclassicism, romanticism, and early realism in drama. No credit for students who have earned credit for 4455. [3]

### **SPAN5465 - The Theory and Practice of Drama**

#### **Title**

The Theory and Practice of Drama

#### **Catalog Description**

(Also listed as SPAN 4465) Critical works and plays from different periods. Introduction to the principles of dramaturgy. No credit for students who have earned credit for 4465. [3]

### **SPAN5470 - Development of Lyric Poetry**

#### **Title**

Development of Lyric Poetry

#### **Catalog Description**

(Also listed as SPAN 4470) Popular and traditional forms; the sonnet and other Renaissance and Baroque classical forms. Romanticism. No credit for students who have earned credit for 4470. [3]

### **SPAN5475 - Contemporary Lyric Poetry**

#### **Title**

Contemporary Lyric Poetry

#### **Catalog Description**

(Also listed as SPAN 4475) From Modernism to the present in Spain and Spanish America. No credit for students who have earned credit for 4475. [3] (HCA)

### **SPAN5550 - The Theory and Practice of Literary Translation**

#### **Title**

The Theory and Practice of Literary Translation

#### **Catalog Description**

(Also listed as SPAN 4550) Theoretical approaches and their consequences for the interpretation of translated texts. Practical application of these principles in the translation of both Spanish and Portuguese texts into English. Taught in Spanish. Written work in Spanish or Portuguese. No credit for students who have earned credit for 4550. [3]

**SPAN5620 - Love and Honor in Medieval and Golden Age Literature**

**Title**

Love and Honor in Medieval and Golden Age Literature

**Catalog Description**

(Also listed as SPAN 4620) The evolution of the key themes of love and honor in works from various genres of medieval and Golden Age Spanish literature with special attention to sociohistorical context. No credit for students who have earned credit for 4620. [3]

**SPAN5640 - Don Quixote**

**Title**

Don Quixote

**Catalog Description**

(Also listed as SPAN 4640) Directed reading and intensive study of the novel. No credit for students who have earned credit for 4640. [3]

**SPAN5720 - Literary Genres and National Identities in Latin America**

**Title**

Literary Genres and National Identities in Latin America

**Catalog Description**

(Also listed as SPAN 4720) A comparative approach to the rise of the national literary traditions from independence to the latter half of the twentieth century. Indigenist novels, abolitionist narratives, and gaucho poetry by colonial figures, including African slaves, indigenous peoples, and Argentine Gauchos. No credit for students who have earned credit for 4720. [3]

**SPAN5730 - Modern Latin American Poetry**

**Title**

Modern Latin American Poetry

**Catalog Description**

(Also listed as SPAN 4730) Development of poetry in Spanish America and Brazil during the twentieth century. Major poets and movements, including both Spanish American Modernismo and Brazilian Modernismo. Poetry as a genre; composition and discussion of students' poetry. Taught in Spanish. No credit for students who have earned credit for 4730. [3]

**SPAN5740 - Spanish-American Literature of the Boom Era**

**Title**

Spanish-American Literature of the Boom Era

**Catalog Description**

(Also listed as SPAN 4740) The Boom novel of the 1960s: Carlos Fuentes' *La muerte de Artemio Cruz*, Julio Cortázar's *Rayuela*, Mario Vargas Llosa's *La ciudad y los perros*, Guillermo Cabrera Infante's *Tres tristes tigres*, and Gabriel García Márquez's *Cien años de soledad*. No credit for students who have earned credit for 4740. [3]

**SPAN5741 - Spanish-American Literature of the Post-Boom Era**

**Title**

Spanish-American Literature of the Post-Boom Era

**Catalog Description**

(Also listed as SPAN 4741) The post-Boom novel from the 1970s to the present; analysis of related films. Manuel Muig's *Boquitas pintadas*, *Me llamo Rigoberta Menchú*, Laura Esquivel's *Coma agua para chocolate*, Reinaldo Arená's *Viaje a La Habana*, and Daisey Rubiera Castillo's *Reyita, sencillamente*. No credit for students who have earned credit for 4741. [3]

**SPAN5745 - Love in the Latin American Novel**

**Title**

Love in the Latin American Novel

**Catalog Description**

(Also listed as SPAN 4745) Conceptions of love in Latin American novels beginning in the nineteenth century. The effect of history, race, and morals on the shaping of affective response. No credit for students who have earned credit for 4745. [3] (HCA)

**SPAN5750 - Afro-Hispanic Literature**

**Title**

Afro-Hispanic Literature

**Catalog Description**

(Also listed as SPAN 4750) From nineteenth-century slave narrative to modern writers such as Miguel Barnet, Alejo Carpentier, and Quince Duncan. No credit for students who have earned credit for 4750. [3]

**SPAN5755 - Latina and Latin American Women Writers**

**Title**

Latina and Latin American Women Writers

**Catalog Description**

(Also listed as SPAN 4755) Contemporary writing of women in Latin America and of Latinas in the United States. Representation of sexuality and the maternal body. No credit for students who have earned credit for 4755. [3]

**SPAN5760 - Contemporary Mexican Literature and Culture**

**Title**

Contemporary Mexican Literature and Culture

**Catalog Description**

Twentieth- and twenty-first-century-Mexican history through literature, the visual arts, film, and performance. Taught in Spanish. Offered on a graded basis only. [3]



**SPAN5891 - Special Topics in Hispanic Culture****Title**

Special Topics in Hispanic Culture

**Catalog Description**

(Also listed as SPAN 3891) May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3891. [3] (No AXLE credit)

**SPAN5892 - Special Topics in Spanish Language and Linguistics****Title**

Special Topics in Spanish Language and Linguistics

**Catalog Description**

(Also listed as SPAN 3892) May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3892. [3] (No AXLE credit)

**SPAN5893 - Special Topics in Hispanic Literature****Title**

Special Topics in Hispanic Literature

**Catalog Description**

(Also listed as SPAN 3893) May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. No credit for students who have earned credit for 3893. [3] (No AXLE credit)

**SPAN5995 - Contemporary Latin American Prose Fiction in English Translation****Title**

Contemporary Latin American Prose Fiction in English Translation

**Catalog Description**

(Also listed as SPAN 2995) Themes and techniques of the contemporary novel, novella, and short story written by both men and women in Spanish America and Brazil. No credit for graduate students in Spanish or Portuguese. No credit for students who have earned credit for 2995. [3]

**SPAN6010 - Literary Analysis and Theory****Title**

Literary Analysis and Theory

**Catalog Description**

(Also listed as Portuguese 6010) Methods of literary analysis for the teaching of literature. The systematic application of contemporary theories - structuralist and poststructuralist - in the analysis of poetry and narrative. [3]

### **SPAN6020 - Ibero-Romance Philology**

#### **Title**

Ibero-Romance Philology

#### **Catalog Description**

(Also listed as Portuguese 6020) Study of the evolution of the languages and dialects of the Iberian Peninsula. Analysis of selected linguistic developments and readings from medieval texts. [3]

### **SPAN6030 - Foreign Language Learning and Teaching**

#### **Title**

Foreign Language Learning and Teaching

#### **Catalog Description**

(Also listed as Portuguese 6030) Principles and practices of teaching a second language with concentration on recent interactive and communicative models of foreign language instruction. Classroom observations, journal writing, development of materials, and a small action research project are expected. Required of all entering teaching assistants. [3]

### **SPAN6040 - Research and Grant Proposal Writing**

#### **Title**

Research and Grant Proposal Writing

#### **Catalog Description**

Designed for Humanities students. Issues of professionalization, career choices, and the job search. Models, guidance, and practice in formulating research projects and writing dissertation and grant proposals. Peer evaluation. [3]

### **SPAN6080 - Comprehensive Exam Study**

#### **Title**

Comprehensive Exam Study

#### **Catalog Description**

Individualized preparation for the exam. Does not count for degree requirements. May be taken only once. [3]

### **SPAN7000 - Survey of Medieval Spanish Literature**

#### **Title**

Survey of Medieval Spanish Literature

#### **Catalog Description**

Introduction to major works of pre-modern Spanish literature through the fifteenth century. [3]

### **SPAN7010 - Seminar: The Baroque**

#### **Title**

Seminar: The Baroque

#### **Catalog Description**

Readings in Spanish baroque literature and culture, including works by Góngora, Quevedo, Cervantes, Marqués de Zayas, Calderón, and Graciano. [3]

**SPAN7050 - Introduction to Latin American Colonial Studies****Title**

Introduction to Latin American Colonial Studies

**Catalog Description**

(Also listed as Portuguese 314) Provides a panoramic introduction to the canonical works of the colonial period from "discovery" to "independence," as well as an overview of the theoretical debates in colonial studies within the Latin American context. Topics include the construction and reshaping of identities and otherness through various stages of Latin American cultural history, the emergence of what has been called the American consciousness during the "New World Baroque," and the discourses of "independence" and early nation building. [3]

**SPAN7060 - Seminar: Modernismo****Title**

Seminar: Modernismo

**Catalog Description**

The major literary movement of the end of the nineteenth century and beginning of the twentieth century in the Spanish-speaking world. Major authors, their context, and the fundamental ideological and literary shifts evident in their works. [3]

**SPAN7070 - Spanish American and Brazilian Literature I****Title**

Spanish American and Brazilian Literature I

**Catalog Description**

(Also listed as Portuguese 7070) Spanish-American and Brazilian literature from the conquests to the end of the nineteenth century. Authors may include: Sor Juana, Matos, Alencar, Assis, and Carrasquilla. [3]

**SPAN7071 - Spanish American and Brazilian Literature II****Title**

Spanish American and Brazilian Literature II

**Catalog Description**

(Also listed as Portuguese 7071) Spanish American and Brazilian literature from twentieth century and to the present. Texts may include: Os sertões, La guerra del fin del mundo, Ficciones, Perto do coração selvagem, and Água viva. [3]

**SPAN7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

[0-12]

**SPAN8100 - Seminar: Studies in Medieval Literature**

**Title**

Seminar: Studies in Medieval Literature

**Catalog Description**

Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN8110 - Seminar: Early Modern Spanish Narrative**

**Title**

Seminar: Early Modern Spanish Narrative

**Catalog Description**

Readings in Spanish prose fiction from 1550 to 1700, including the picaresque tradition and works by Cervantes, Mar√≠a de Zayas, and other writers. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN8120 - Seminar: Studies in Golden Age Drama**

**Title**

Seminar: Studies in Golden Age Drama

**Catalog Description**

The comedia nueva in cultural and critical contexts. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN8130 - Seminar: Studies in Eighteenth- and Nineteenth-Century Spanish Literature**

**Title**

Seminar: Studies in Eighteenth- and Nineteenth-Century Spanish Literature

**Catalog Description**

A broad survey of specific topics such as: textual civil wars; literary constructions of the nation; reconstruction of the narrative genre (1700-1900); eccentricities of Spanish Enlightenment and/or Spanish Romanticism; theatrical spectacles. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN8140 - Seminar: Modern Hispanic Poetry and Poetics**

**Title**

Seminar: Modern Hispanic Poetry and Poetics

**Catalog Description**

Key moments of Spanish lyric poetry during the nineteenth and twentieth centuries. Theory and praxis, Romanticism, Avant-Garde, and Post-Modernism. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN8150 - Seminar: Studies in 20th- and 21st-Century Spanish Literature**

**Title**

Seminar: Studies in 20th- and 21st-Century Spanish Literature

**Catalog Description**

Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN8200 - Seminar: Studies in Colonial Literature**

**Title**

Seminar: Studies in Colonial Literature

**Catalog Description**

(Also listed as Portuguese 8200) May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN8210 - Seminar: Hispanic American Essay**

**Title**

Seminar: Hispanic American Essay

**Catalog Description**

(Also listed as Portuguese 8210) May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN8220 - Seminar: Studies in Spanish American Literature in a Global Context**

**Title**

Seminar: Studies in Spanish American Literature in a Global Context

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN8300 - Seminar: Studies in Trans-Atlantic Literature and Culture**

**Title**

Seminar: Studies in Trans-Atlantic Literature and Culture

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN8400 - Seminar: Studies in Inter-American Literature**

**Title**

Seminar: Studies in Inter-American Literature

**Catalog Description**

(Also listed as Portuguese 8400) Comparative approaches to literary texts from such New World cultures as Brazil, Spanish America, the United States, the Caribbean, and Canada (both its French and English traditions). Fluency in Spanish and/or Portuguese required; reading competency in English and French. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN8500 - Seminar: Issues in Hispanic Cinema**

**Title**

Seminar: Issues in Hispanic Cinema

**Catalog Description**

Possible topics include: feminine reflections in contemporary Spanish cinema; Hispanic variations on the cinematic Bildungsroman; traveling films; delivering the nation (Spain 1975-2005). [3]

**SPAN8600 - Seminar: Issues in Latin American Cinema**

**Title**

Seminar: Issues in Latin American Cinema

**Catalog Description**

Films from Brazil and Argentina in the early twenty-first century. Globalization, gender, sexuality, ethnicity, and race. Brazilian films will have English subtitles. [3]

**SPAN8999 - Non-candidate Research**

**Title**

Non-candidate Research

**Catalog Description**

Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

**SPAN9110 - Love in Late Medieval Spanish Literature**

**Title**

Love in Late Medieval Spanish Literature

**Catalog Description**

Examination of the different conceptions and discourses of love in Spain during the fourteenth and fifteenth centuries. [3]

**SPAN9140 - Seminar: The Realist Novel of the Nineteenth-Century**

**Title**

Seminar: The Realist Novel of the Nineteenth-Century

**Catalog Description**

A multifaceted approach to the Spanish Realist novel with attention to the sociopolitical context, contemporary cultural discourses and practices; European literary and artistic currents of the day, and theoretical formulations on the genre. [3]

**SPAN9240 - Ordering and Disrupting Fictions in Latin America**

**Title**

Ordering and Disrupting Fictions in Latin America

**Catalog Description**

Fictions of the mid nineteenth and early twentieth centuries. The racialized and sexualized nature of these imagined communities and their uncanny tendency to disassemble themselves. [3]

**SPAN9250 - Self-Writing in Latin America**

**Title**

Self-Writing in Latin America

**Catalog Description**

Theory and practice of self-writing; memoir, testimony, autobiography in Latin America. The connection between the body, language, and memory in a subject of both national and individual dimensions. [3]

**SPAN9260 - The Spanish American Novel of the Boom Period**

**Title**

The Spanish American Novel of the Boom Period

**Catalog Description**

An examination of the Boom novel, from the 1960s: La muerte de Artemio Cruz, Rayuela, La casa verde or Conversación en la Catedral, Tres tristes tigres, and Cien años de soledad. [3]

**SPAN9265 - The Melancholy Novel in Latin America**

**Title**

The Melancholy Novel in Latin America

**Catalog Description**

Construction of a melancholy subject built on the loss of a linguistic, sexual, and racial identity. The works of mourning and remembering of an abject maternal body. Texts by Latin American women writers and Latinas. [3]

**SPAN9270 - The Politics of Identity in Latino U.S. Literature**

**Title**

The Politics of Identity in Latino U.S. Literature

**Catalog Description**

The writings of Latinas/Latinos from the four largest groups: Chicanos, Cuban Americans, Puerto Rican Americans, and Dominican Americans. Redefinition of borders, cultures, and languages. [3]

**SPAN9300 - Comparative Methodology**

**Title**

Comparative Methodology

**Catalog Description**

(Also listed as Portuguese 9300) Comparative literature as an academic discipline; scholarly and theoretical distinctions; methodologies, applications, relationship to national literature units and humanities programs. [3]

**SPAN9510 - Special Topics in Spanish Literature**

**Title**

Special Topics in Spanish Literature

**Catalog Description**

Topics vary. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN9520 - Special Topics in Spanish American Literature**

**Title**

Special Topics in Spanish American Literature

**Catalog Description**

Topics vary. For list of previous topics, please see departmental Web page. May be repeated for credit more than once if there is no duplication in topic. Students may enroll in more than one section of this course each semester. [3]

**SPAN9560 - Special Studies in Spanish Linguistics**

**Title**

Special Studies in Spanish Linguistics

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 6 credits per semester of enrollment. [1-6]

**SPAN9660 - Special Studies in Spanish Literature**

**Title**

Special Studies in Spanish Literature

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 6 credits per semester of enrollment. [1-6]

**SPAN9670 - Special Studies in Spanish American Literature**

**Title**

Special Studies in Spanish American Literature

**Catalog Description**

May be repeated for credit more than once if there is no duplication in topic, but students may earn only up to 6 credits per semester of enrollment. [1-6]

**SPAN9995 - Half-time Ph.D. Dissertation Research**

**Title**

Half-time Ph.D. Dissertation Research

**Catalog Description**

For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

**SPAN9999 - Ph.D. Dissertation Research**

**Title**

Ph.D. Dissertation Research

**Catalog Description**

[0-12]



**SPED7999 - Master's Thesis Research****Title**

Master's Thesis Research

**Catalog Description**

Open only to candidates for the Master of Science degree engaged in thesis research and writing. Consent of major professor required. [Variable credit 0-6]

**SPED8100 - Proseminar I****Title**

Proseminar I

**Catalog Description**

Advanced review of research and scientific principles, methods, and the status of research and other professional developments in special education. Required for post-master's degree students in special education. [3]

**SPED8200 - Proseminar II: Contrasting Research Methodologies in Special Education Research****Title**

Proseminar II: Contrasting Research Methodologies in Special Education Research

**Catalog Description**

The purpose of this course is to provide an overview of the frameworks and major designs within three alternative research methodologies within Special Education: single-subject research, group design, and qualitative methods. Prerequisite: 8100. [3]

**SPED8300 - Research Design in Special Education****Title**

Research Design in Special Education

**Catalog Description**

Provides in-depth analysis of group research methodology within Special Education. Design features and statistical methods are reviewed; research is critiqued; and sample studies are designed. Prerequisite: 8100, 8200. [3]

**SPED8400 - Experimental Analysis of Behavior****Title**

Experimental Analysis of Behavior

**Catalog Description**

Overview of basic behavioral processes. Presents information relating to human and nonhuman learning with a focus on the experimental analysis of behavior. Topics covered include environmental feedback mechanisms, schedules of reinforcement, establishing operations, multi-operant performances, discriminative stimulus control, stimulus equivalence, rule-governed behavior, behavioral pharmacology, and remembering/forgetting. The course also focuses on research methodologies and the critical analysis of research. Students apply their skills using computer based simulations of laboratory experiments. [3]

## **SPED8600 - Leadership in Special Education**

### **Title**

Leadership in Special Education

### **Catalog Description**

This is a doctoral seminar focusing on areas where leadership is critical to the field. Leadership in special education, regardless of career choice, requires continuing development toward excellence in teaching, research and service. The major focus of this course is to develop knowledge, understandings, and skills that continue the trajectory toward excellence and leadership abilities in these areas. At this time, this course addresses the following areas: the role of theory in leading, informing, and organizing research; research, practice, and leadership in college teaching; current research, needs, and leadership in preservice teacher preparation; and an exploration of career choices after the Ph.D. [3]

## **SPED8810 - Introduction to Single Case Research Design**

### **Title**

Introduction to Single Case Research Design

### **Catalog Description**

Initial course in the use of single case research methodology within special education. Overview of behavioral measurement, single case research designs, and methods of data analysis. Critical analysis of research articles. Development of a single case research proposal is required. [3]

## **SPED8820 - Advanced Procedures in Single-Subject Research Methodology**

### **Title**

Advanced Procedures in Single-Subject Research Methodology

### **Catalog Description**

Use of research procedures to investigate problems in the education of persons with disabilities. Advanced procedures in single-subject research methodology, including design strategies and experimental control, are emphasized. Design and implementation of a research study is required. Prerequisite: 8810, 7400. [3]

## **SPED8830 - Hierarchical Linear Modeling in Educational Research**

### **Title**

Hierarchical Linear Modeling in Educational Research

### **Catalog Description**

This course provides an introduction to hierarchical linear modeling (HLM). HLM is a methodology that can be used when a dataset possesses some form of nesting or hierarchical structure. This includes conditions where data are collected among clustered units, such as students within schools or employee within organizations. It also includes many longitudinal studies, as repeated measures can be viewed as nested with persons. (Not currently offered) [3]

## **SPED8840 - Observational Methods**

### **Title**

Observational Methods

### **Catalog Description**

This doctoral-level course addresses what is known about quantitative, systematic observation of behavior to measure behavior that may or may not be used to infer status on psychological constructs. The content emphasis is on providing students with the rationale for selecting among the many options at all stages of observational measurement. Among the topics covered are (a) classical measurement theory and Generalizability theory as they relate to observational measurement, (b) principles for selecting measurement procedures, selecting behavior sampling methods, designing coding systems, selecting appropriate metrics (including nonsequential and sequential variables), (c) sequential analysis of behavior, (d) the tension between ecological validity, representativeness, and construct validity, (e) interobserver reliability issues, and (f) other issues related to the direct observation of behavior. [3] Yoder.

## **SPED8999 - Non-Candidate Research**

### **Title**

Non-Candidate Research

### **Catalog Description**

Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

## **SPED9995 - Half-time Ph. D. Dissertation Research**

### **Title**

Half-time Ph. D. Dissertation Research

### **Catalog Description**

Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0-9]

## **SPED9999 - Ph.D. Dissertation Research**

### **Title**

Ph.D. Dissertation Research

### **Catalog Description**

Ph.D. Dissertation Research. [0-12]

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## **Tibetan Language**

### **TBTN5101 - Elementary Tibetan I (UVA)**

#### **Title**

Elementary Tibetan I (UVA)

#### **Catalog Description**

(Also listed as TBTN 1101) Grammar and syntax of spoken and written Tibetan. Listening, speaking, reading and writing from Tibetan short stories, proverbs, and other sources. Tibetan culture. Offered on a graded basis only. No credit for students who have earned credit for 1101. [4]

**TBTN5102 - Elementary Tibetan II (UVA)****Title**

Elementary Tibetan II (UVA)

**Catalog Description**

Grammar and syntax of spoken and written Tibetan; listening, speaking, reading and writing. Examples from Tibetan short stories and proverbs, among other sources. Exposure to Tibetan culture to improve communication skills, using a dynamic, interactive format . Offered on a graded basis only. Prerequisite: 5101. [4]

**TBTN5201 - Intermediate Tibetan I (UVA)****Title**

Intermediate Tibetan I (UVA)

**Catalog Description**

(Also listed as TBTN 2201) Grammar and syntax of spoken and written Tibetan. Listening, speaking, reading, and writing through the integrated use of spoken and literary forms. Enhanced knowledge of Tibetan culture. Offered on a graded basis only. No credit for students who have earned credit for 2201. [4]

**TBTN5202 - Intermediate Tibetan II (UVA)****Title**

Intermediate Tibetan II (UVA)

**Catalog Description**

Grammar and syntax of spoken and written Tibetan; listening, speaking, reading and writing through spoken and literary forms. Further study of Tibetan culture to improve communication skills. Offered on a graded basis only. Prerequisite: 5201. [4]

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## University Courses

**UNIV5150 - Justice, Mercy, and Mass Incarceration****Title**

Justice, Mercy, and Mass Incarceration

**Catalog Description**

Mass incarceration is a central legal and moral challenge of our era, which draws upon the historically powerful synergies between law and religion. Mass incarceration is a legal creation, and law defines the experience of incarceration and re-entry. But theories of crime and punishment have long depended upon religious legitimation, and the impact of mass incarceration on our society ultimately presents deeply moral and theological questions. The issue cannot be effectively addressed from the perspective of a single discipline. By addressing mass incarceration through law and religion together, this course will equip students with a deeper understanding of the causes and consequences of our current system, and it will address the racial dimensions of incarceration as both legal and religious constructions. It will explore the legal structures and justifications that create mass incarceration as well as the moral and theological arguments mass incarceration provokes. This interdisciplinary study will enable students to become better advocates for change through policy, law, outreach, and activism. [3] Mr. Reside and Mr. Rubin

**UNIV5225 - Social Entrepreneurship****Title**

Social Entrepreneurship

**Catalog Description**

This course will help nascent social entrepreneurs consider both opportunities and challenges presented by this emerging form of social action. Through a combination of lecture and discussion, guest speakers and written case studies, we will engage the important questions of "what," "so what," and "what next" that drive the ideas and practice of social entrepreneurs. While the course will place particular emphasis on the areas of education and community development, time will be spent looking at social change in other arenas as well. [3]

**UNIV5278 - Tackling Big Questions with Mobile Cloud Computing****Title**

Tackling Big Questions with Mobile Cloud Computing

**Catalog Description**

This course will address big questions motivated by the rapid growth of interest across disciplines in computing technologies that have occurred over the past decade, due in part to the pervasive and profound impact of mobile devices and powerful cloud computing services on many aspects of our daily lives. Examples of these big questions include how mobile cloud computing technologies are (1) being used to engage teens with chronic diseases, (2) changing political discourse in the US and around the world, and (3) helping economically disadvantaged individuals bridge the digital divide to obtain better guidance on nutrition and legal matters. This class will provide a multidisciplinary environment where undergraduate and graduate students from multiple Schools team with Computer Science students to address big questions in a project-based format. Each project will be sponsored and mentored by a subject matter expert in the field from other Schools on campus, with the goal of providing students a hands-on experience understanding and applying key mobile cloud computing techniques, tools, and principles needed to tackle these big questions. FALL, SPRING [3 each semester; maximum of 6 hours total for all semesters]

**UNIV5315 - Planetary Health, Policy and Social Justice****Title**

Planetary Health, Policy and Social Justice

**Catalog Description**

This is a three credit hour elective course designed for students interested in exploring the intersections between primary care, planetary health and climate change (according to WHO, currently the greatest threat to global health), social justice and policy. The causes of climate change and the resulting primary, secondary and tertiary impacts on people and communities will be examined through the lens of global health and policy. Students will develop evidence based and targeted adaptation and mitigation strategies as well as policy-based solutions, all incorporating science and engineering, political science and policy, law and economics as well as nursing and medicine to address healthspan disparities related to climate change and social vulnerability. [3]

## **UNIV5320 - The Causes and Consequences of LGBT Public Policies**

### **Title**

The Causes and Consequences of LGBT Public Policies

### **Catalog Description**

This new Multicultural University Course will introduce students to critical questions about public policies relevant to LGBTQIA populations, including: legal access to same-sex marriage; nondiscrimination policies in employment, housing, and public accommodation, including whether they are trans-inclusive; so-called 'bathroom bills'; religious freedom restoration laws (also called 'conscience' acts); and others. The course will investigate the causes, correlates, and consequences of these policies using the lenses of economics, law, sociology, political science, and public health and medicine. Students will critically analyze leading research articles and mainstream media discussions of LGBTQ-related public policies; hear from guest speaker experts; perform an immersive research project; and visit Tennessee policymakers to understand views on a range of LGBTQ-related issues. [3]

## **UNIV5325 - Health Policy Analysis & Advocacy**

### **Title**

Health Policy Analysis & Advocacy

### **Catalog Description**

Health is both wildly sought after and wildly controversial. We race for cures, rally for affordable and accessible health care, debate the ethics of various treatments and pass laws meant to keep our people healthy. This Multicultural University Course will prepare students to be more effective and skillful participants in debates over health policy by immersing them in the national and Tennessee health policy environment. This course promotes critical scholarship and leadership through engagement with national policy experts, media and locally elected officials. Students will learn how to leverage publicly available data to write policy reports that address important health policy problems; additional readings and skills-based exercises are required for graduate students. [3]

## **UNIV5330 - The History of Science and Brewing**

### **Title**

The History of Science and Brewing

### **Catalog Description**

Historical and scientific perspectives on brewing beer and related beverages. History of brewing and beer production, religious dimensions of beer consumption in past societies, biochemical processes of fermentation and alcohol abuse, and neuroscience of reward and addiction. The course includes a laboratory component. [3]

## **UNIV5350 - Design Thinking, Design Doing**

### **Title**

Design Thinking, Design Doing

### **Catalog Description**

This course is an introduction to theories and practices of design. The design thinking elements of the course offer a critical understanding of methods for researching interactions between humans and the social and built environment, whereas the design doing elements teach how to develop purposeful interventions that result in more meaningful and effective interactions. Throughout, we will examine how (and what) people can learn while engaged in the design process. Working in teams, students in the course will spend significant time observing, listening, analyzing, storytelling, and otherwise engaging users as they work in teams to develop and implement meaningful and transformative designs to projects in the domains of education, health and business. [3]

## **UNIV5360 - Data Science Methods for Smart City Applications**

### **Title**

Data Science Methods for Smart City Applications

### **Catalog Description**

Integrating technological and socio-economic approaches to challenges facing metropolitan areas experiencing unprecedented growth. Infrastructure and resources needed for sustainable development and maintaining quality of life. Adapting technology-driven internet-of-things framework to Smart Cities concept of urban development. Ethical and justice concerns, including privacy and equitable access to data. Algorithmic methods of machine learning and statistics, such as supervised and unsupervised learning, factor analysis, multi-dimensional regression analysis, and hierarchical linear modeling. Agent-based and equation-based simulation modeling. Linear and nonlinear optimization. Mixed methods approaches to gathering and analyzing qualitative and quantitative socio-economic data. Computational methods for data from large distributed infrastructure. The course will combine lectures on the fundamental material, and a semester-long multi-disciplinary group project. [3]

## **UNIV5370 - Cultural Heritage in Context: The Future of the Past**

### **Title**

Cultural Heritage in Context: The Future of the Past

### **Catalog Description**

Cultural heritage is under threat globally as a casualty of war, economic development, and environmental changes. This course is concerned with the preservation the tangible and intangible products of human societies from prehistory to the present. Given the complexities of cultural heritage management, this course is relevant to multiple disciplines in the humanities (anthropology, archaeology, art, history, history of art, philosophy), social sciences (communication studies, economics, sociology) and physical sciences (aerospace, computer science, materials sciences), as well as law and music. Students will learn about current issues in cultural heritage from Vanderbilt faculty and invited experts and will undertake independent research projects. [3]

## **UNIV5655 - Historic Black Nashville**

### **Title**

Historic Black Nashville

### **Catalog Description**

This course will explore the under-developed history of black Nashville from settlement to the early twentieth century. Through instructor and guest lectures, digital humanities instruction, site visits, and independent research in local archives, students will recover and document the lives of the city's enslaved and free people of color as well as the community institutions and social and artistic movements that defined the black experience in Nashville. As students gain substantive expertise, they will also learn research methods and multiple media and technologies for telling historical narratives. No credit for students who have earned credit for HIST 2655. Offered on a graded basis only. FALL [3] (US) Landers and Sharfstein.