Program Overview

Offered through the Department of Mathematics at Texas State, this Mathematics Ph.D. program provides student the flexibility to select a concentration in general mathematics, applied mathematics or statistics. The program includes elements designed to prepare students for both research careers in industry and the more traditional Ph.D. careers in academia. Studies will study in an environment where academia and industry interact. Students will gain a breadth of mathematical and statistical knowledge, the ability to produce new innovative research, the ability to write and communicate technical knowledge and disseminate that knowledge to a broad audience, acquire and develop grant writing skills, and practical experience aligned with their chosen long-term professional and career goals.

Educational Goal

The main goal of the doctoral program in mathematics is prepare students for success in our rapidly changing technological society. Graduates of the program will

- have demonstrated skill in conducting original research in mathematics, applied mathematics, or statistics.
- be introduced to the joy of problem solving in mathematics and exposed to open problems in the field.
- have a well-balanced foundation in a breadth of mathematical and/or statistical areas relevant to their desired concentration.
- have an in-depth understanding of their chosen field of concentration.
- be able to clearly communicate mathematical ideas and concepts both to specialists in their chosen field and to a broader audience.

In addition,

- Doctoral graduates who desire careers in academia will be familiar with basic principles of mathematics education. Graduates will be able to apply those principles in the classroom.
- Doctoral graduates who desire careers outside of academia will have practical experience applying doctoral level mathematics and/or statistics to solve real world problems.
- Doctoral graduates with a concentration in Applied Mathematics or Statistics will have demonstrated proficiency in at least one of R, Python, or Matlab.

Application Requirements

The items listed below are required for admission consideration for applicable semesters of entry during the current academic year. Submission instructions, additional details, and changes to admission requirements for semesters other than the current academic year can be found on The Graduate College's website (http://www.gradcollege.txstate.edu). International students should review the International Admission Documents page (http://mycatalog.txstate.edu/graduate/admission-documents/international/) for additional requirements.

- completed online application
- $55 non-refundable application fee
- or
- $90 non-refundable application fee for applicants with international credentials
- completed bachelor's degree in mathematics, statistics, or a closely related discipline, from an accredited college or university. Applicants who have completed a master's degree in mathematics, statistics, or a closely related discipline from an accredited college or university can, upon approval of the program advisor, have up to 30 hours of coursework waived based on courses taken during the master's degree that closely align with courses in the program.
- official transcripts from **each institution** where course credit was granted
- competitive GPA
- GRE not required. Applicants whose GPA is not deemed competitive by the program may be offered the opportunity to submit GRE scores for review.
- resume/CV outlining education, work experience, scholarships/grants, publications/presentations, other accomplishments
- statement of purpose outlining the applicant's background and professional goals, including their rationale for pursuing a doctoral degree in mathematics at Texas State
- three letters of recommendation evaluating the applicant's professional and academic background as well as research potential. Letters should address teaching potential for applicants interested in applying for funding as an instructional assistant.
- interviews may be conducted with semifinalists

TOEFL, PTE, IELTS or Duolingo Scores

Non-native English speakers who do not qualify for an English proficiency waiver:

- official TOEFL iBT scores required with a 78 overall.
- official PTE scores required with a 52 overall.
- official IELTS (academic) scores required with a 6.5 overall and minimum individual module scores of 6.0
- official Duolingo Scores required with a 110 overall.
- official TOEFL Essentials scores required with an 8.5 overall.

This program does not offer admission if these scores are not met.

Degree Requirements

The Doctor of Philosophy (Ph.D.) degree with a major in Mathematics concentration in Statistics with a requires 72 semester credit hours.

Course Requirements

Code	Title	Hours
Required Courses		
MATH 7303	Analysis I	3
MATH 7313	Analysis II	3
Statistics Concentration		
MATH 5315	Mathematical Statistics	3
MATH 7325	Statistics 1	3
MATH 7335	Statistics II: Linear Modeling	3
MATH 7337	Mathematical Statistics II	3
MATH 7375D	Advanced linear Modeling	3
MATH 7363B	NUMERICAL ANALYSIS	3
Practicum		
Choose 9 hours from the following:		9
MATH 7306	Current Research in Math Education	

MATH 7328	Instructional Techniques & Assessments	
MATH 7366F	Research in Undergraduate Mathematics Education I	
MATH 7387	Consulting	
MATH 7389	Internship	
Prescribed Electives		
Choose 21 hours from the following:		21
MATH 5315	Mathematical Statistics	
MATH 5335	Survival Analysis	
MATH 5340	Scientific Computation	
MATH 5360	Mathematical Modeling	
MATH 5376A	Design and Analysis of Experiments	
MATH 5376B	Analysis of Variance	
MATH 5376D	Statistical Applications in Genetics and Bioinformatics	
MATH 5376E	Introduction to Data Science	
MATH 5376F	Introduction to Probability Theory and Models	
MATH 5393	Numerical Optimization	
MATH 7303	Analysis I	
MATH 7306	Current Research in Math Education	
MATH 7307	Algebra I	
MATH 7309	Topology I	
MATH 7313	Analysis II	
MATH 7315	Calculus of Variations	
MATH 7317	Algebra II	
MATH 7319	Topology II: Algebraic Topology	
MATH 7321	Graph Theory	
MATH 7324	Curriculum Design & Analysis	
MATH 7325	Statistics 1	
MATH 7328	Instructional Techniques & Assessments	
MATH 7331	Combinatorics	
MATH 7335	Statistics II: Linear Modeling	
MATH 7337	Mathematical Statistics II	
MATH7361		
MATH 7363A	COMPLEX ANALYSIS	
MATH 7363B	NUMERICAL ANALYSIS	
MATH 7363C	FUNCTNL ANALYSIS	
MATH 7363E	Numerical Analysis II	
MATH 7363F	Functional Analysis II	
MATH 7366A	Teaching Post-Secondary Students (Developmental Math, Service Courses, and Majors)	
MATH 7366C	Teaching Teachers (In-Service; Pre-Service)	
MATH 7366E	Developmental Mathematics Curriculum	
MATH 7366F	Research in Undergraduate Mathematics Education I	
MATH 7367B	ADV GROUP THEORY	
MATH 7369C	Low-dimensional topology	
MATH 7369D	Characteristic Classes	
MATH 7369E	Differential Geometry	
MATH 7371A	Advanced Graph Theory	
MATH 7371B	Advanced Combinatorics	
MATH 7371C	Combinatorial Number Theory	
MATH 7371D	Discrete Optimization	
MATH 7371F	Probabilistic Methods in Discrete Mathematics	
MATH 7371G	Applied Discrete Mathematics	
MATH 7373B	Partial Differential Equations I	
MATH 7373C	Partial Differential Equations II	
MATH 7373G	Spectral Methods	
MATH 7375C	Time Series Analysis	
MATH 7375D	Advanced linear Modeling	
MATH 7375E	Computational Statistics	
MATH 7375F	Multivariate Data Analysis	
MATH 7375G	Bayesian Methods	
MATH 7375I	Advanced Statistical Learning	
MATH 7385	Independent Study in Mathematics	
MATH 7387	Consulting	
MATH 7389	Internship	
CS 7312	Advanced Data Mining	
CS 7314	Bioinformatics	
CS 7341	Cyberspace Security	
CS 7389E		
CS 7389G	Human-Centered Data Science	
MSEC 7355	Fluid Flow in Porous Media	
BIO 7360I	Bayesian Statistics for Biology	
BIO 7360Y	Applied Bioinformatics	
BIO 7361C	Advanced Genomics and Bioinformatics	
CJ 7350E	Discrete Multivariate Models	
CJ 7350I	Introduction to Structural Equation Modeling	
Dissertation		
Choose a minimum of 18 hours from the following:		18
MATH 7199A	Dissertation in Mathematics Education	
MATH 7299A	Dissertation in Mathematics Education	
MATH 7399A	Dissertation	
MATH 7599A	Dissertation in Mathematics Education	
MATH 7699A	Dissertation in Mathematics Education	
MATH 7999A	Dissertation in Mathematics Education	
Total Hours		**72**

Application for Advancement to Candidacy

The Dean of The Graduate College approves advancement to candidacy once all requirements are met. Doctoral students must be advanced to candidacy within five years of initiating Ph.D. course work applied toward the degree. Students need to indicate their intent to advance to candidacy during the term they complete the required course work and other departmental requirements. The doctoral candidacy requirements include:

- Completion of all required course work with the exception of dissertation credit hours.
- Successful passage of all three qualifying exams.
- Successful passage of the comprehensive exam.
- Approval of the dissertation proposal.
- At least a 3.5 GPA on all doctoral required courses.

Advancement to Candidacy Time Limit

No credit will be applied toward the doctoral degree for course work completed more than five years before the date on which the student is advanced to candidacy. This time limit applies toward credit earned at Texas State as well as credit transferred to Texas State from other accredited institutions. Requests for a time extension must be submitted to the doctoral program director, who in turn submits a recommendation to the dean of The Graduate College.

Grade-Point Requirements for Advancement to Candidacy

To be eligible for advancement to candidacy, the student must have a minimum GPA of 3.5. No grade earned below a "B" on any graduate course may apply toward a Ph.D. at Texas State. Incomplete grades must be cleared through the office of The Graduate College before a student can be approved for advancement to candidacy.

Qualifying Examination

Typically, after completion of the core course work or by the end of the second year in residence, each student will be required to take written examinations. To be eligible to take the examinations, the student normally will have a minimum grade point average of 3.5 on all the core courses including the transferred equivalent courses that the student has completed. Students are expected to complete the exams by the end of their second year in the program and must have attempted the exams by the end of their third year in the program. These times will be adjusted for part-time students. Any student who does not pass the qualifying exam by the time they have accrued 70 credit hours will be dismissed from the program. If the qualifying exam is not passed, the student will have the option of taking a second exam. Students will be encouraged to make full use of study aids provided by the department prior to retesting. Students who fail the exam, or a portion of the exam, a second time, will be required to retake the relevant course sequence(s) prior to a third attempt. Students will be dismissed from the program if they do not pass the qualifying exam the third time.

The qualifying exams will consist of a series of three topic examinations based on core components of the program. The three topics will be administered and scored separately so that a student can receive a partial pass. A student who fails to pass one or more of the three portions of the exam need only retest on the failed portion. The exams will be administered at least twice per academic year. Students may take their topic exams during one administration or may separate the topic to take during multiple administrations. Each topic exam will be administered as a written, proctored exam. Students will typically be prepared for the exams through their core course work. Students can strengthen their preparation through additional study and through working with faculty to take practice oral exams and discuss the topics in depth. Exam topics include: algebra, analysis, discrete mathematics, numerical analysis, partial differential equations, statistics, and topology. Students in the general mathematics program will take two of: algebra, analysis, and topology, and a third topic of their choice. Students in the statistics concentration will take statistics, analysis, and a topic of their choice. Students in the applied mathematics concentration will take analysis, numerical analysis, and a topic of their choice.

Comprehensive Oral Exam

A comprehensive oral examination will be administered by the candidate's dissertation committee as part of the student's proposal defense. The exam will be approximately 30 minutes long and will involve a discussion of content closely related to the student's proposed dissertation topic. Committee members will work together to provide the candidate with a list of suitable readings designed to prepare the student in the selected area. The focus should be on topics necessary for the student to begin to approach the selected dissertation question, with an understanding that the student will continue to study related topics during the course of their research. The dissertation advisor and committee members are expected to work with the student prior to the exam to ensure the student has the information necessary to prepare for this exam. Any student who does not pass the comprehensive exam by the end of the fourth year in the program may be dismissed from the program. If the comprehensive exam is not passed on the first try, the student will have the option of taking a second comprehensive exam. The dissertation chair should meet with the student after a failed attempt and create a plan for that, if followed, will aid the student in being successful in the second attempt. Normally, the second exam will be taken in the following long semester and will be the final attempt with failure resulting in dismissal from the program. Exceptions must be approved by the Graduate Program Committee. Students who do not pass the exam on the first attempt are expected to work closely with their committee members to ensure they are well-prepared for the second exam.

Dissertation Proposal

To be advanced to candidacy, a student must select a doctoral dissertation advisor and committee, submit a dissertation proposal, and successfully defend the proposal in an oral examination with the dissertation committee. Information about the formation of the dissertation committee can be found in the "Dissertation Research and Writing" section of this catalog. The proposal should identify the intended mathematical question to be addressed by the dissertation and include a brief survey of relevant literature. The goal of the proposal is to establish that the student has a sufficient grasp of the fundamentals of the chosen dissertation topic to execute the research. The proposal defense entails a public presentation. The student should give a 50-minute presentation on a specialized topic closely related to their dissertation question. The public presentation will be followed immediately by a closed defense of the proposal attended only by the student and his/her dissertation committee. The dissertation proposal must be approved by the student's dissertation advisor and a majority of the remaining members on the dissertation committee.

Recommendation for Advancement to Candidacy

The doctoral program committee recommends the applicant for advancement to candidacy to the doctoral program director, the department chair, and the dean of The Graduate College. The dean of The Graduate College certifies the applicant for advancement to candidacy once all requirements have been met. To be eligible for admission to candidacy, the student must have successfully completed the qualifying and/or comprehensive exam(s), completed all course work, and successfully defended the dissertation proposal.

After being admitted to candidacy, students must be continuously enrolled for dissertation hours each fall and spring semester until the defense of their dissertation. All students in the program will take a minimum of 18 semester credit hours of dissertation coursework. Students may take dissertation coursework prior to completing elective and practicum credit hour requirements if approved by their dissertation advisor. Students should work with their dissertation advisor to determine the correct number of dissertation hours to take in a semester. All candidates for graduation must be enrolled in dissertation hours (e.g., MATH 7199A) during the semester in which the degree is to be conferred, even if they have already satisfied the minimum dissertation hours. Note

that the second digit in the course numbers below refers to the number of dissertation credit hours.

Dissertation Committee

The initial dissertation committee chair assignment, and its continuation, is subject to the approval of both parties. A dissertation committee chair can be changed with the approval of a student's assigned dissertation committee chair, a student's new dissertation committee chair, and the doctoral program director. If a dissertation committee chair withdraws mentorship, the student must secure a new dissertation committee chair within one long semester to stay on track in the program. Failure to do so will result in dismissal from the program.

The Dissertation Committee will be responsible for administering the Comprehensive Exam and the Dissertation Proposal Defense and will oversee the research and writing of the student's dissertation. The committee will consist of 4 members, including the student's dissertation committee chair who must be a regular graduate faculty member in the program, two other graduate faculty members from the mathematics department, and one doctoral graduate faculty from another department at Texas State University or from another university. The student's dissertation committee chair will chair the committee. The student, the dissertation committee chair, and the Dean of The Graduate College will approve the composition of the dissertation committee.

As per The Graduate College policy, the Dissertation Committee Chair Assignment form and the Dissertation Committee Request form must be completed and approved by the Dean of The Graduate College to form the dissertation committee. Any changes to the dissertation committee must be submitted using the Dissertation Committee Chair/Committee Member Change Request form for approval of the dissertation committee chair, the doctoral program director, and the Dean of The Graduate College. Committee changes must be submitted no later than 60 days before the dissertation defense.

Dissertation Defense

Once the dissertation has been completed, a final exam (referred to as the dissertation defense) on the dissertation must be conducted. The dissertation defense cannot be scheduled until all other academic and program requirements have been fulfilled. A complete draft of the dissertation must be given to the members of the dissertation committee at least one month before the defense. However, students are highly encouraged to provide drafts earlier so that the committee members can provide feedback, which the student, in consultation with the dissertation advisor, will address in later drafts to ensure that the dissertation is defendable, and each committee member is satisfied before the dissertation defense takes place.

The dissertation defense consists of two parts. The first part is a public presentation of their dissertation research. The second part of the defense immediately follows the public presentation. It is restricted to participation of the student's dissertation committee and entails an oral examination of the dissertation research. Approval of the dissertation requires positive votes from the student's dissertation advisor and from the majority of the remaining members of the dissertation committee. Notice of the defense presentation will be publicly posted at least two weeks in advance.

If the dissertation defense is not approved, the student will have the option of taking a second and final dissertation defense in the following long semester. Students who do not pass the dissertation defense the second time will be dismissed from the program.

The results of the dissertation defense must be recorded in the Dissertation Defense Report Form and submitted to The Graduate College before the Dean of The Graduate College can give final approval of the dissertation. This form can be downloaded from The Graduate College's website. The student must submit his/her dissertation to The Graduate College for final approval. The guidelines for submission and approval of the dissertation can be obtained from The Graduate College.

Doctoral level courses in Mathematics: MATH (p. 4), CS (p. 12), MSEC (p. 15), BIO (p. 20), CJ (p. 27)

Mathematics (MATH)

MATH 7111. Seminar in Teaching.
Seminar on individual study projects concerned with selected problems in the teaching of mathematics. This course does not earn graduate degree credit.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Graduate Assistantship|Exclude from Graduate GPA
Grade Mode: Leveling/Assistantships

MATH 7188. Seminar in Mathematics Education.
Students are required to attend weekly research seminars in Mathematics Education and to give at least one research presentation in the seminar during the semester. This course is repeatable for credit.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7199A. Dissertation.
Original research and writing in Mathematics Education to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

MATH 7299A. Dissertation.
This course represents a Mathematics Education student's dissertation enrollments. The course can be repeated as necessary. The dissertation credit (18 hours) will not be awarded until the dissertation is submitted for binding. Prerequisite: completion of the core and required concentration courses, or approval of student's dissertation advisor.
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

MATH 7301. Studies in Mathematics.
This course provides basic foundations in Mathematics for students entering the doctoral program in Mathematics or Mathematics Education. This course may be repeated. This course does not earn graduate degree credit.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Exclude from Graduate GPA|Leveling
Grade Mode: Leveling/Assistantships

MATH 7302. History of Mathematics.
A study of the development of mathematics and of the accomplishments of men and women who contributed to its progress.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7303. Analysis I.
This course covers foundations of modern analysis. Topics include: sequences, LimSup, LimInf, Sigma Algebras of sets that include open and closed sets, sequences of functions, pointwise and uniform convergence, lower and upper semi-continuity, Borel sets, outer measure, and Lebesgue measure. Prerequisite: MATH 4315.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7306. Current Research in Math Education.
This course surveys the various current social, political, and economic trends in local, state, national, and international settings that are related to research in Mathematics Education.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7307. Algebra I.
Applications of Algebra and topics in modern algebra, including permutation groups, symmetry groups, Sylow theorems, and select topics from Ring Theory. Prerequisite: MATH 4307.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7309. Topology I.
A course in point-set topology emphasizing topological spaces, continuous functions, connectedness, compactness, countability, separability, metrizability, CWcomplexes, simplicial complexes, nerves, and dimension theory. Prerequisite: MATH 4330.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7313. Analysis II.
This course covers the theory of integration with special emphasis on Lebesgue integrals. Topics include: Lebesgue integral, Bounded Convergence theorem, differentiation and integration, absolute continuity, and Lp spaces. Prerequisite: Math 7303.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7315. Calculus of Variations.
This course will involve the study of properties of functionals including first and second variations, application to extremal problems, Euler-Lagrange equations, and stability theory. Prerequisite: MATH 7303 with a grade of "B" or higher.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7317. Algebra II.
A study of the important algebraic structures of rings and fields. Topics covered include rings, ideals, modules, polynomial rings, Euclidean algorithm, finite fields, and field extensions. Topics also include an introduction to Galois Theory with an emphasis on the geometric applications. Prerequisite: MATH 7307.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7319. Topology II: Algebraic Topology.
This course covers the fundamental concepts and tools of algebraic topology. Topics include the fundamental group, covering spaces, homotopy type, the higher homotopy groups, singular homology theory, and the computation of homology groups via exact sequences and applications. Prerequisite: MATH 7307 and MATH 7309.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7321. Graph Theory.
Topics in this course include trees, connectivity of graphs, Eulerian graphs, Hamiltonian graphs, planar graphs, graph coloring, matchings, factorizations, digraphs, networks, and network flow problems. Prerequisite: MATH 3398.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7323. Theories of Knowing and Learning in Mathematics Education.
This course surveys the major theories of knowing and learning that have influenced mathematics education. These theories include behaviorism, constructivism, sociocultural theories, situated cognition, and others.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7324. Curriculum Design & Analysis.
This course examines, analyzes, and evaluates the various concepts, topics, methods, and techniques that are related to curriculum design in Mathematics Education for grade levels P-16.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7325. Statistics 1.
A study of the mathematical and probabilistic underpinnings of the techniques used in statistical inference. Topics covered include sampling, sampling distributions, confidence intervals, and hypothesis testing with an emphasis on both simulations and derivations. Prerequisite: Math 2321 and Math 3305.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7328. Instructional Techniques & Assessments.
This course examines, analyzes, and evaluates the various concepts, topics, methods, and techniques of instruction in Mathematics Education and the related assessment procedures for each for grade levels P-20.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7331. Combinatorics.
This course is a study of fundamental principles of combinatorics. Topics include: permutations and combinations, the Pigeonhole principle, the principle of inclusion-exclusion, binomial and multinomial theorems, special counting sequences, partitions, posets, extremal set theory, generating functions, recurrence relations, and the Polya theory of counting. Prerequisite: MATH 3398.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7335. Statistics II: Linear Modeling.
A study of the formulation and statistical methodologies for fitting linear models. Topics include the general linear hypothesis, least-squares estimation, Gauss-Markov theorem, assessment of model fit, effects of departures from assumptions, model design, and criteria for selection of optimal regression models. Prerequisite: MATH 3377 and MATH 7325.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7337. Mathematical Statistics II.
This course covers foundations of classical and modern mathematical statistics. Topics include multivariate normal distributions, central limit theorem (including Lindeberg condition), data reduction principles, delta method, asymptotic theories for likelihood-based method, decision-theoretic formulation of estimation and testing of hypotheses, minimaxity, admissibility, and bootstrap.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7346. Quantitative Research Analysis in Mathematics Education.
This course surveys the various research techniques used in quantitative analysis for mathematics education and covers topics such as experimental design, statistical analysis, and use of appropriate design methodologies to achieve the strongest possible evidence to support or refute a knowledge claim. Prerequisite: MATH 7306 and MATH 7325.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7354. Advanced Qualitative Research.
This course encompasses the techniques and tools needed for the development, investigation, and demonstration of competence in conducting qualitative research in mathematics education. Principles of qualitative data analysis are a significant focus of the course, with particular attention given to specific methods used to code and analyze data. Prerequisite: ED 7352 with a grade of "B" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

MATH 7356B. Advanced Qualitative Research.
This course encompasses investigation, development, and demonstration of competence, design, and execution for mathematics education problems in qualitative research. Prerequisite: ED 7352 or CI 7352.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7356C. Action Research in Mathematics Education.
This course examines underlying theory and issues in action research model and the development of action research projects. Prerequisites: MATH 7346 or ED 7352.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7358. Advanced Quantitative Research in Mathematics Education.
This course surveys the various research techniques used in quantitative analysis for mathematics education and covers topics such as experimental design, statistical analysis, and the use of appropriate design methodologies to achieve the most substantial evidence to support or refute a knowledge claim. Prerequisite: MATH 7346 with a grade of "B" or better or permission of instructor.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7361. Seminar in Advanced Mathematics.
Material in course will vary with the interest of students and faculty. A detailed study of subject matter may be chosen from advanced areas of analysis; algebra; topology and geometry; applied mathematics; and probability and statistics. This course is repeatable for credit when subject matter varies.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7363A. COMPLEX ANALYSIS.
This course is a brief introduction to the complex number system and basic point-set topology of the complex plane, followed by a proof-based and rigorous study of the principal results of the analysis of functions of a single complex variable. Prerequisite: MATH 4315 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7363B. NUMERICAL ANALYSIS.
This course will involve the analysis of algorithms from science and mathematics, and the implementation of these algorithms using computer algebra systems. Symbolic, numerical, and graphical techniques will be studies. Applications will be drawn from the sciences, engineering, and mathematics. Prerequisite: MATH 3323 with a grade of "D" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7363C. FUNCTNL ANALYSIS.
This course presents the three basic fundamentals theorems of functional analysis: the Hanh-Banach theorem, the uniform boundedness theorem, and the open mapping theorem. Prerequisite: MATH 7303 with a "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7363E. Numerical Analysis II.
This course will involve the analysis and numerical implementation of algorithms to solve partial differential equations. Applications will be drawn from science, engineering, and mathematics. Topics include the numerical solution of linear partial differential equations and the related linear systems of equations. Prerequisite: MATH 7363B with a letter grade of a "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7363F. Functional Analysis II.
This course will involve the analysis of infinite dimensional vector spaces including spaces of functions, measures, and distributions. Topics include Fourier transforms, theory of Banach spaces, and operator theory. Prerequisite: MATH 7363C with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7366A. Teaching Post-Secondary Students (Developmental Math, Service Courses, and Majors).
This course examines how to develop and teach post-secondary students. The course references the recommendations of government agencies and professional organizations and allows for the investigation of research-based models. Prerequisites: MATH 7306.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7366B. Teaching K-12 Students (Elementary, Middle School, and High School).
This course examines how to develop and teach K-12 students. The course references the recommendations of government agencies and professional organizations and allows for the investigation of research-based models. Prerequisite: MATH 7306.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7366C. Teaching Teachers (In-Service; Pre-Service).
This course examines how to prepare teachers of mathematics. The course references the recommendations of government agencies and professional organizations and allows for the investigation of research-based models. Prerequisite: MATH 7306.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7366D. Teaching Specialized Content.
This course will be an in-depth study of a specialized content area in mathematics with an emphasis on teaching. The specific content area will vary by instructor. Examples include Euclidean Simplex Geometry and Discrete Probability Spaces with Implications for Public School Curriculum.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7366E. Developmental Mathematics Curriculum.
This course surveys the research, development, and evaluation of the scope and sequence of developmental mathematics curriculum. The course references the recommendations of government agencies and professional organizations and allows for the investigation of research-based models.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7366F. Research in Undergraduate Mathematics Education I.
Students will develop the requisite knowledge to become a good consumer of Research in Undergraduate Mathematics Education (RUME) research. The course will cover the theoretical underpinnings of current and historic RUME research. Students will develop the knowledge to understand relevant theoretical stances and the role they play in research. Prerequisite: Math 7306 or permission from the instructor.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7366G. Research in Undergraduate Mathematics Education II.
In this course, students will develop necessary knowledge to design/conduct RUME research via a topic-driven look at current RUME research. Core topics include proof, analysis/calculus, abstract algebra, linear algebra, and differential equations. Students will develop a depth of knowledge related to these topics and engage in research design and development. Prerequisite: MATH7306 and MATH7366F.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7367B. ADV GROUP THEORY.
This course covers topics including properties of solvable, p-solvable and nilpotent groups, group actions, transfer theorems, simple groups and composition series, the generalized Fitting subgroup, automorphism groups, classical groups and linear representations of groups. Prerequisite: MATH 7307 with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7369C. Low-dimensional topology.
This course is an introduction to low-dimensional topology. Topics include surfaces, 3-manifolds, knots, and 4-manifolds. Prerequisite: MATH 7307 and MATH 7309 both with grades of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7369D. Characteristic Classes.
This course is an introduction to vector bundles and characteristic classes. Topics covered include Stiefel-Whitney classes, Chern classes, Euler class, Pontrjagin classes, and their computation. Additional topics may include manifold immersion problems. Prerequisite: MATH 7317 and MATH 7319 both with grades of a "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7369E. Differential Geometry.
This course is an introduction to modern tools of differential geometry. Topics covered include manifolds, Riemannian metrics, connections, covariant derivatives, geodesics, curvatures, extrinsic and intrinsic computations. Other possible topics include hyperbolic geometry, Lie groups, Chern-Weil theory, surfaces of prescribed mean curvature, the Gauss-Bonnet theorem, and the Cartan-Hadamard theorem. Prerequisite: MATH 7307 and MATH 7309 both with grades of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7371A. Advanced Graph Theory.
Topics in this course include Turan's problems, Ramsey theory, random graph theory, extremal graph theory, algebraic graph theory, domination of graphs, distance problems, and applications. Prerequisite: MATH 7321.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7371B. Advanced Combinatorics.
Topics in this course include Block designs, Latin squares, combinatorial optimization problems, coding theory, matroids, difference sets, and finite geometry. Prerequisite: MATH 7331.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7371C. Combinatorial Number Theory.
A study of fundamental techniques in combinatorial number theory. Topics will include Waring's problem, additive number theory, and probabilistic methods in number theory. Prerequisite: MATH 7331.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7371D. Discrete Optimization.
A study of some fundamental techniques in discrete optimization. Topics include discrete optimization, linear programming, integer programming, integer nonlinear programming, dynamic programming, location problem, scheduling problem, transportation problem, postman problem, traveling salesman problem, matroids, and NP-completeness. Prerequisites: MATH 7321 and 7331.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7371E. Algorithms and Complexity.
A study of some fundamental concepts of computability and complexity. Topics include polynomially bounded problems, NP-complete problems, exponentially hard problems, undecidable problems, and reducibility. Prerequisite: MATH 7331.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7371F. Probabilistic Methods in Discrete Mathematics.
A study of some fundamental probabilistic techniques used to solve problems in graph theory, combinatorics, combinatorial number theory, combinatorial geometry, and algorithm. Topics include linearity of expectation, alterations, second moment, local lemma, correlation inequalities, martingales, Poisson paradigm, and pseudo-randomness. Prerequisites: MATH 7321 and 7331.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7371G. Applied Discrete Mathematics.
This course introduces fundamental concepts in logic, Boolean algebra, and binomial coefficients; and applications in different fields such as complexity of algorithms and network theory. Prerequisites: MATH 2472 and MATH 4307, all with a grade of “C” or better, or with departmental approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7371H. Combinatorial Networks.
Combinatorial Networks is an area of study of certain types of networks using combinatorial methods extensively. This course introduces fundamental basics as well as the latest development in this area of research. Prerequisite: MATH 5307/7307 with a grade of "C" or higher.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7373B. Partial Differential Equations I.
This course covers the theory and application of partial deferential equations, typical equations of mathematical physics, Cauchy problem for equations of the first order, classification of second-order equations, Cauchy problem for second-order hyperbolic equations, Duhamel's principle, potential theory and elliptic equations, maximum principle, and parabolic equations. Prerequisite: MATH 3323, 3373 and 3380 with grades of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7373C. Partial Differential Equations II.
This course covers the existence and uniqueness theory for boundary value problems of partial differential equations (PDE) including the topics linear evolution equations, variational techniques, non-variational techniques, Hamilton-Jacobi equations, conservation laws. Prerequisite: MATH 7373B with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7373G. Spectral Methods.
This course covers the essentials of spectral collocation methods with an emphasis on numerically implementing algorithms. The problems studied will include ordinary and partial differential equations connected with fluid mechanics, quantum mechanics, waves, and other fields. The techniques used will include both Fourier and Chebychev methods. Prerequisite: MATH 7363E with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7375C. Time Series Analysis.
A study of the theory of time-dependent data. The analysis includes modeling, estimation, and testing; alternating between the time domain; using autoregressive and moving average models and the frequency domain; and using spectral analysis. Prerequisite: MATH 7335.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7375D. Advanced linear Modeling.
The course provides an extension of regression methodology to more general settings where standard assumptions for ordinary least squares are violated. Topics include generalized least squares, robust regression, bootstrap, regression in the presence of autocorrelated errors, generalized linear models, and logistic and Poisson regression. Prerequisite: MATH 7335.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7375E. Computational Statistics.
This course focuses on commonly used sampling and optimization algorithms in statistics. Topics include accept-reject method, importance sampling, Markov Chain Monte Carlo algorithms, Fisher scoring algorithm, expectation-maximization algorithm, and minorization-maximization algorithm. Prerequisite: MATH 5305 or equivalent with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7375F. Multivariate Data Analysis.
This course focuses on statistical methodologies based on multivariate analysis. Topics include multivariate normal distribution, tests of hypothesis on means, multivariate analysis of variance, discriminant analysis, principal component analysis, factor analysis and canonical correlation analysis. Prerequisite: MATH 5305 and (MATH 3376 or MATH 3377) with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7375G. Bayesian Methods.
This course focuses on Bayesian statistical analysis and associated theories. Topics include one-parameter and multi-parameter Bayesian models, choices of priors, formulation of regression models in the Bayesian framework, and related data analysis. Prerequisite: MATH 5305 or equivalent with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7375I. Advanced Statistical Learning.
This course covers the theoretical foundations in statistical learning and deep learning. Topics include the framework of empirical risk minimization, metric entropy, Vapnik-Chervonenkis dimension, Rademacher and Gaussian complexity, symmetrization and chaining techniques, contraction principle, uniform law of large numbers, sample complexity, and neural networks. Prerequisite: MATH 7337 with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7378A. Problem Solving, Reasoning, and Proof.
A study of the fundamental concepts of problem solving, logic, set theory, and mathematical proof and applications of these concepts in mathematics curriculum for grades P-20. Prerequisite: MATH 7306.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7378B. Connecting and Communicating Math.
This course examines one of the basic principles involved in mathematics education: Connecting and Communicating Mathematics. This fundamental theme will be reviewed, researched, and discussed. Prerequisite: MATH 7306.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7378C. Representing Fundamental Math Ideas (Function, Data Analysis, and Enumeration).
This course examines the basic principles involved in mathematics education. The process of representing fundamental mathematical ideas will be reviewed, researched, and discussed. Prerequisite: MATH 7306.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7378D. Math Technologies.
This course examines the basic principles involved in mathematics education: Technology. This fundamental theme will be reviewed, researched, and discussed. Prerequisite: MATH 7306.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7378E. Developmental Mathematics Perspectives.
This course examines developmental mathematics-specific strands including technological course support and placement tools/decisions. Issues related to the first mathematics core course required of undergraduates will aslo be addressed.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

MATH 7378F. Research on Mathematical Problem Solving in Secondary Schools.
In this course a careful study is made of elementary techniques for problem solving in a variety of domains, including algebra, number theory, combinatorics, geometry, and logic puzzles. Students will learn these techniques by actually working on a collection of problems in each of these areas. Students will read and examine research about various aspects of problem solving and research in math education that includes both teacher training and student learning.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7378G. Discourse Processes, Traditions, and Analysis in Mathematics Education.
Discourse and discourse analysis have been used to answer research questions across disciplines throughout the humanities and social sciences. This course will focus on theory and methods for the analysis of discourse in mathematical settings. We will learn how different approaches to discourse are used to understand mathematics learning. Prerequisite: MATH 7306.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7378H. Equity in Mathematics Education.
Equity in Mathematics Education is a course examining research on equity issues in mathematics education. These equity issues will range from race, culture, class, and gender as they relate to the teaching, learning, and schooling of mathematics education. We will look at how equity is framed within the field of mathematics education, what has been addressed, and what has not been conceptualized. The course will help students understand the literature in the field, critique the extant research literature, design research, and consider important facets of teaching for various student groups. Prerequisite: MATH 7306 with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MATH 7385. Independent Study in Mathematics.
Student will work directly with a faculty member and develop in-depth knowledge in a specific topic area of mathematics. Topics vary according to student's needs and demands. Repeatable with different emphasis.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7386. Independent Study in Mathematics Education.
Student will work directly with a faculty member and develop in-depth knowledge in a specific topic area of Mathematics Education. Topics vary according to student's needs and demands. Repeatable with different emphasis.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7387. Consulting.
This course focuses on developing skills in the collaborative practice of mathematics and statistics. This will be done through class discussion, readings, and different projects. Students will learn how to apply mathematics or statistics to solve real-world problems through case studies and collaborative projects. They will also learn how to apply ethical considerations to their professional practice. Taking this course will allow students to gain skills in problem solving and providing consulting services. Prerequisite: MATH 5305 or equivalent with a grade of a "C" or better.
3 Credit Hours. 2 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

MATH 7389. Internship.
In this course, students will work under the supervision of a faculty member to gain practical knowledge in their field. Student experience can come from industry, government agencies, or other sources but must directly apply to furthering knowledge of applications of mathematics or mathematics education.
3 Credit Hours. 0 Lecture Contact Hours. 10 Lab Contact Hours.
Grade Mode: Standard Letter

MATH 7396. Mathematics Education Research Seminar.
Collaborative research projects with faculty through identifying an educational issue, reviewing literature, creating a research question, designing a methodology, analyzing data, drawing conclusions, implications, and creating a draft of a publishable paper. Prerequisite: MATH 7356, and ED 7352 or MATH 7346, all with a grade of "B" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

MATH 7399A. Dissertation.
This course represents a Mathematics or Mathematics Education student's dissertation enrollments. The course can be repeated as necessary. The dissertation credit (18 hours) will not be awarded until the dissertation is submitted for binding. Prerequisite: completion of the core and required concentration courses, or approval of student's dissertation advisor.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

MATH 7599A. Dissertation.
This course represents a Mathematics Education student's dissertation enrollments. The course can be repeated as necessary. The dissertation credit (18 hours) will not be awarded until the dissertation is submitted for binding. Prerequisite: completion of the core and required concentration courses, or approval of student's dissertation advisor.
5 Credit Hours. 5 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

MATH 7699A. Dissertation.
This course represents a Mathematics Education student's dissertation enrollments. The course can be repeated as necessary. The dissertation credit (18 hours) will not be awarded until the dissertation is submitted for binding. Prerequisite: completion of the core and required concentration courses, or approval of student's dissertation advisor.
6 Credit Hours. 6 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

MATH 7999A. Dissertation.
This course represents a Mathematics Education student's dissertation enrollments. The course can be repeated as necessary. The dissertation credit (18 hours) will not be awarded until the dissertation is submitted for binding. Prerequisite: completion of the core and required concentration courses, or approval of student's dissertation advisor.
9 Credit Hours. 9 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

Computer Science (CS)

CS 7100. Graduate Computer Science Internship.
This course provides advanced training supervised by computer scientists in internship programs approved by the department.
1 Credit Hour. 0 Lecture Contact Hours. 1 Lab Contact Hour.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CS 7199. Dissertation.
Original research and writing in computer science is to be accomplished under the direct supervision of the Ph.D. research advisor. While conducting dissertation research and writing, the student must be continuously enrolled each long semester. Graded on a credit (CR), progress (PR), no-credit (F) basis. Repeatable for credit. Prerequisite: Instructor approval.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CS 7299. Dissertation.
Original research and writing in computer science is to be accomplished under the direct supervision of the Ph.D. research advisor. While conducting dissertation research and writing, the student must be continuously enrolled each long semester. Graded on a credit (CR), progress (PR), no-credit (F) basis. Repeatable for credit. Prerequisite: Instructor approval.
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CS 7300. Introduction to Research in Computer Science.
This credit/no credit course is designed to develop research and communication skills for Ph.D. students. Topics covered include research processes, research methods, ethics, conducting literature review, critiquing papers, preparing research proposals, faculty research presentations, and the software tools and platforms available for conducting applied computing research.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

CS 7308. Computer Science Studies.
This course provides foundations in computer science for students entering the doctoral program who may need certain background or leveling coursework. The course does not earn graduate degree credit. It is repeatable with a different emphasis.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Exclude from Graduate GPA|Leveling
Grade Mode: Leveling/Assistantships

CS 7309. Professional Development of Doctoral Assistants.
This course is designed to equip the doctoral students with skills and an understanding of the proper procedures to be effective doctoral instructional and teaching assistants. This course does not earn graduate degree credit.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Graduate Assistantship|Exclude from Graduate GPA
Grade Mode: Leveling/Assistantships

CS 7311. Data-Driven Computational Methods and Infrastructure.
This course covers computational and statistical methods for using large-scale data sets ('big data') to answer scientific and business questions. It focuses on framing research questions, understanding how data can answer them, and using modern software tools for scalable data storage, processing, and analysis.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7312. Advanced Data Mining.
This course provides in-depth coverage of advanced data mining and information retrieval principles and techniques. It also offers extensive training and practice opportunities in frontier research directions. Prerequisite: CS 5316 with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7313. Advanced Machine Learning and Pattern Recognition.
This course provides students advanced theoretical and practical skills to learn, design, implement, and apply machine learning and pattern recognition approaches. The students will gain analytical and problem-solving skills by studying machine learning and pattern recognition techniques and applying them to solve real problems.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7314. Bioinformatics.
This course introduces advanced algorithms for data-intensive computational analysis targeting biological applications such as drug response prediction, gene network analysis, and protein/RNA structure prediction. Main techniques include greedy search, linear regression, clustering, network analysis, expectation maximization, and Hidden Markov models, which are widely applicable beyond biological data. Prerequisite: CS 5329 or CS 5369L either with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7315. Network Science.
This course provides in-depth coverage of the fundamentals and research frontiers of network science. The main topics include mathematical models and computational algorithms for analyzing the structure of complex networks and predicting dynamic processes on networks. Other topics include machine learning and data mining on graphs.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7321. Human Computer Interaction: Concepts, Models, and Methodologies.
This course provides an introduction to Human Computer Interaction (HCI) research, methods, and topics, including fundamentals of user interface and experimental design, usability, evaluation methods, software toolkits for interactive applications, graphics, visualization, mobile design, collaborative and social computing, biological factors, and human computation.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7322. Human Factors and Ergonomics.
This course combines knowledge in the fields of intelligent user interfaces, human factors, ergonomics, and environmental psychology. Topics include HCI principles, human information processing, anthropometry, principles of eye tracking and their effects on human factors research, as well as operations of biometrics systems and human factors influencing those systems.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7323. Image Processing and Computer Vision.
Image Processing and Computer Vision are research areas with a variety of modern applications ranging from the analysis of images and videos to real-time processing of image streams coming from self-driving vehicles and robotic agents. This course will prepare students with advanced state of the art knowledge in those fields. Prerequisite: CS 5329 with a grade of "B" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7324. HCI Paradigms for Animation, Visualization, and Virtual/Augmented Reality.
This course introduces advanced methods for enhancing user experience and presents effective HCI models via computer graphics, imaging, animation, simulation, visualization, augmented reality, and immersive virtual reality. Additionally, the course presents related science and engineering foundations as well as graphic design, cognitive science, and perceptual psychology theories and models. Prerequisite: CS 5329 with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7331. High-Performance Computing.
This course covers the advanced design, analysis, and optimization of high-performance applications. Topics include high-performance computer architectures, including accelerators and systems-on-chip, performance modeling and benchmarking, data and control dependence analysis, data locality estimation, memory hierarchy management, techniques for exposing parallelism, and code transformations. Different workloads are studied. Prerequisite: CS 5329 with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7332. Advanced Parallel Computing.
This course covers advanced design of parallel algorithms, performance modeling, parallel hardware, language support for parallel programming, and programming models for shared- and distributed-memory systems ranging from handheld multicore devices to large-scale clusters and accelerators. The students will gain applied knowledge and skills by developing parallel software for multiple platforms. Prerequisite: CS 5351 with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7333. Advanced Green Computing.
This course covers hardware and software techniques to improve the energy-efficiency of computing systems. Topics include best practices in building energy-efficient data centers and mobile devices, current trends in reducing the energy consumption of processors and storage components, energy-aware resource management, software optimizations, and hands-on experience on power-measurable systems. Prerequisite: CS 5351 and CS 5369Y both with grades of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7334. Scalable Systems for Supercomputing.
This course will teach basic aspects of building a scalable high performance computing (HPC) system. Specifically, it will focus on the design principles for scaling parallel communication and I/O operations for accessing HPC storage using a message-passing programming model. The course will use two large-scale systems—checkpointing for resilience and a parallel file system for storage as use cases to demonstrate how these principles are used in practice. Students will develop components of a scalable system and use software tools to measure and analyze their performance.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7341. Cyberspace Security.
This course presents recent advances in methodologies, models, systems and applications of cyberspace security research. Topics include in-depth coverage of the state-of-the-art security technologies and research issues on information security, software security, network security, secure system design, secure programming, applied cryptography, vulnerability, and threats. Prerequisite: CS 5378 with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7342. Advanced Computer Networking.
This course covers recent research ideas, methodologies and approaches in networking research. The course focuses on the development of protocols and the analysis of related algorithms. Topics include new network architectures, cloud computing, software defined networking, wireless systems, social networks, and security and privacy. Prerequisite: CS 5310 or CS 5343 either with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7343. Mobile Networks and Computing.
This course provides an in-depth study of wireless mobile communication networks, wireless network measurements and modeling, channel assignments and coverage, wireless network protocols, mobile data management, wireless security, and various wireless network applications including ad hoc, sensor networks, delay-tolerant networks, and mobile social networks. Prerequisite: CS 5310 or CS 5343 either with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7351. Advanced Software Engineering.
Software engineering is the application of scientific methods to software development and maintenance. This course provides an in-depth study of advanced concepts and techniques of automatic software generation and analysis. Topics include software process programming, symbolic execution, model checking, property generation and checking, and runtime verification of complex software systems. Prerequisite: Instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7352. Real-time Systems.
This course covers issues related to the design and analysis of systems with real-time constraints. The problem of ensuring such constraints is ultimately a scheduling problem, so much attention is devoted to such problems. This course aims to provide a solid foundation for conducting research in real-time systems or related areas.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CS 7387. Research in Computer Science.
This course covers current research topics in computer science under the direction of a supervising professor. Prerequisite: Instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CS 7389A. Service Computing.
This course introduces concepts and principles for enabling the development of software as a service based on Service-Oriented Architecture (SOA), methodology of SOA systems development, the main technologies used in achieving SOA, and state of the art techniques and advances in emerging cloud and edge (Internet of Things) services. Prerequisite: CS 5329 with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CS 7389B. Advanced Software Evolution.
This topics course provides an in-depth study of state-of-the-art software evolution techniques and tools based on the current research literature. Software evolution has become increasingly important in software development. Software systems often evolve to fix defects, to improve performance, or to adapt to various other requirements. Prerequisite: Instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CS 7389F. Secure Cyber-Physical Systems: Cryptography and Machine Learning.
This course is designed to introduce students to the fundamentals of cryptography and machine learning and how they can be used to ensure security and privacy in cyber-physical systems (CPS). Topics will include an overview of cyber-physical systems, cryptographic techniques, machine learning algorithms, and security threats and attacks on CPS. The course will also cover privacy-preserving machine learning techniques and design principles for secure CPS. Students who successfully complete this course will be well-versed in cryptography and machine learning approaches for cybersecurity in CPS and be able to use these techniques to address practical real-world issues. Prerequisite: CS 3354 and CS 3358 both with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CS 7389G. Human-Centered Data Science.
This course is to study the process of deriving insights from data in order to make optimal decisions. Human-Centered Data Science addresses various data science problems with attention to improve the quality of decisions by incorporating human experts in the learning process, e.g., interactive Machine Learning and eXplainable Artificial Intelligence. Prerequisite: CS 3358 with grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CS 7389H. Human-Centric Deep Learning.
This course provides an in-depth exploration of deep learning, emphasizing multi-layer neural networks and their applications. Students will explore core topics like convolutional, recurrent, and graph neural networks, along with optimization algorithms and generative models. The curriculum uniquely integrates multimedia processing, Human-Computer Interaction (HCI), and "human in the loop" approaches, demonstrating how deep learning can be applied to image, video, and audio analysis, as well as to create user-centric and interactive systems. Practical aspects, including data preprocessing, model evaluation, and framework implementation, will also be covered, equipping students with the skills to apply deep learning techniques in a human-centered context.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CS 7389J. Advanced Natural Language Processing.
This course is an interdisciplinary field that combines computational linguistics with statistical and machine learning techniques to enable the computer to understand, interpret, generate, and learn natural language. Natural Language Processing (NLP) introduces key concepts, tasks, and techniques, including recent advancements such as neural networks and large language models. It covers applications such as question answering, automatic speech recognition, and machine translation. Students will gain an understanding of fundamental concepts, advanced algorithms, and practical applications, and will also learn methods for acquiring and annotating text data, and representing linguistic structures. Familiarity with Linear Algebra and Python Programming is required.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CS 7399. Dissertation.
Original research and writing in computer science is to be accomplished under the direct supervision of the Ph.D. research advisor. While conducting dissertation research and writing, the student must be continuously enrolled each long semester. Graded on a credit (CR), progress (PR), no–credit (F) basis. Repeatable for credit. Prerequisite: Instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CS 7599. Dissertation.
Original research and writing in computer science is to be accomplished under the direct supervision of the Ph.D. research advisor. While conducting dissertation research and writing, the student must be continuously enrolled each long semester. Graded on a credit (CR), progress (PR), no–credit (F) basis. Repeatable for credit. Prerequisite: Instructor approval.
5 Credit Hours. 5 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CS 7699. Dissertation.
Original research and writing in computer science is to be accomplished under the direct supervision of the Ph.D. research advisor. While conducting dissertation research and writing, the student must be continuously enrolled each long semester. Graded on a credit (CR), progress (PR), no–credit (F) basis. Repeatable for credit. Prerequisite: Instructor approval.
6 Credit Hours. 6 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CS 7999. Dissertation.
Original research and writing in computer science is to be accomplished under the direct supervision of the Ph.D. research advisor. While conducting dissertation research and writing, the student must be continuously enrolled each long semester. Graded on a credit (CR), progress (PR), no–credit (F) basis. Repeatable for credit. Prerequisite: Instructor approval.
9 Credit Hours. 9 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

Materials Science, Engineering, and Commercialization (MSEC)

MSEC 7100. Doctoral Assistant Development.
The course is designed to equip the doctoral students with skills and an understanding of proper procedures to be effective teaching assistants. This course does not earn graduate degree credit.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Graduate Assistantship|Exclude from Graduate GPA
Grade Mode: Leveling/Assistantships

MSEC 7101. Commercialization Forum.
The course is a seminar series exposing students to commercialization issues. The series includes as speakers: successful entrepreneurs, businessmen, research directors, production and process control engineers, intellectual property and licensing experts, management consultants, and technology transfer specialists. Repeatable four times for credit.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

MSEC 7102. MSEC Seminar.
This course is an introduction to current materials science and engineering topics with presentations by subject matter experts as the basis for weekly discussions. Students participate by asking questions and actively engaging the seminar speaker. Students are also expected to give public presentations based upon their own field of research at the STAR (Student Technology and Research) Showcase. Repeatable four times for credit.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

MSEC 7103. Research in Materials Science, Engineering, and Commercialization.
This research course is for students in Materials Science, Engineering, and Commercialization who have not yet passed their candidacy exam, typically under supervision of the PhD Research Advisor. Repeatable (with MSEC 7203 & MSEC 7303 hours) for doctoral credit up to 6 hours.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

MSEC 7199. Dissertation.
Original research and writing in Materials Science, Engineering, and Commercialization, is to be accomplished under direct supervision of the PhD Research Advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester. Repeatable for credit.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

MSEC 7203. Research in Materials Science, Engineering, and Commercialization.
This research course is for students in Materials Science, Engineering, and Commercialization who have not yet passed their candidacy exam, typically under supervision of the PhD Research Advisor. Repeatable (with MSEC 7103 and MSEC 7303 hours) for doctoral credit up to 6 hours.
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

MSEC 7299. Dissertation.
Original research and writing in Materials Science, Engineering, and Commercialization, is to be accomplished under direct supervision of the PhD Research Advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester. Repeatable for credit.
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

MSEC 7301. Practical Skills in Commercialization and Entrepreneurship.
This course is the first of a two-course series to impart business and commercialization skills by producing a business plan. Key areas covered include intellectual property law, technology transfer and licensing strategies, business plan development, business finance strategies, management structures, project management methods, statistical quality and process control.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7302. Leadership Skills in Commercialization and Entrepreneurship.
This course is the second of a two-course series to impart business and commercialization skills by producing a business plan. Key areas covered include intellectual property law, technology transfer and licensing strategies, business plan development, business finance strategies, management structures, project management methods, statistical quality and process control. Prerequisite: MSEC 7301 with a grade of "B" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7303. Research in Materials Science, Engineering, and Commercialization.
This research course is for students in Materials Science, Engineering, and Commercialization who have not yet passed their candidacy exam, typically under supervision of the PhD Research Advisor. Repeatable (with MSEC 7103 & MSEC 7203 hours) for doctoral credit up to 6 hours.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

MSEC 7304. Collaborative Research/Commercialization Experience.
This course allows Ph.D. level graduate students to initiate, conduct and participate in a collaborative research or commercialization experience with graduate faculty in addition to research conducted under MSEC 7103, MSEC 7303, MSEC 7199 and MSEC 7399. This course recognizes the collaborative nature of the scientific and commercialization enterprise. Repeatable for doctoral credit up to 6 hours.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

MSEC 7310. Nanoscale Systems and Devices.
This course is an in-depth treatment of physical phenomena in nanoscale structures, and consequences for electronic, photonic, mechanical and other types of devices. The course provides a strong background in devices with applications in nanoelectronics, biomedical systems, micro- and nanoscale manipulation, adaptive optics, and microfluidics.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7311. Materials Characterization.
This course covers skills and knowledge required for microscopy methods including transmission electron microscopy, scanning electron microscopy, scanning tunneling electron microscopy, atomic force microscopy, and confocal microscopy. It covers x-ray and neutron diffraction techniques including structure analysis, powder and glancing angle diffraction, pole figure, texture analysis, and small angle scattering.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Dif Tui- Science & Engineering
Grade Mode: Standard Letter

MSEC 7315. Quantum Mechanics for Materials Scientists.
This course includes quantum-mechanical foundation for study of nanometer-scale materials, principles of quantum physics, stationary-states for one-dimensional potentials, symmetry considerations, interaction with the electromagnetic radiation, scattering, reaction rate theory, spectroscopy, chemical bonding and molecular orbital theory, solids, perturbation theory, and nuclear magnetic resonance.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7320. Nanocomposites.
Characteristics of nanoparticles utilized in nanocomposites, techniques for surface modification, methods for nanoparticle dispersion forming nanocomposites, types of nanocomposites, characteristics of nanocomposites, analytical methods for characterization of composites, and common applications will be discussed. Particular attention will be given to the science and theories explaining the unique behavior of nanocomposites.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7325. Principles of Technical Project Management.
This course includes planning, budgeting, identification of risks and risk mitigation approaches, resource allocation, review of milestones and schedules, and evaluating projects to measure success. Responsibilities of project managers in the areas of problem solving, motivating and managing creative technical staff in project and matrix organizations will be included.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7330. Computational Materials Science.
Application of computational techniques to molecular and atomic modeling of materials is discussed along with quantum mechanical modeling, density functional theory approaches, forcefield based molecular modeling, mesoscale modeling, energy minimization, molecular dynamics, vibrational spectra, crystal structures, phase equilibria, physical property prediction, and electronic structure related to magnetic and electrical properties. Prerequisite: CHEM 3340 with a grade of "B" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7340. Biomaterials and Biosensors.
The course covers the growing field of biomaterials science including materials for prosthetics and implants, mimetic materials, biosensors, diagnostic devices, and drug delivery systems. Particular attention will be given to nanomaterials for diagnosis and treatment of diseases including targeted cancer treatments, drug delivery systems, and advanced imaging methods.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7350. Frontiers of Nanoelectronics.
This course provides an introduction to the operating principles of nanoscale electronic and optical devices. The emphasis is on how leading edge nano-fabrication technology takes advantage of quantum mechanics of reduced sizes and dimensions. Specific examples of devices based on quantum wells, wires, dots and molecular electronics are given.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7355. Fluid Flow in Porous Media.
In this course, the fundamental theory of transport and fluid flow in heterogeneous porous media will be presented. First, the equations that govern transport and fluid flow processes will be derived. Both analytical and numerical methods will be used to solve these equations in order to characterize and predict flow fields in porous media. These skills will then be applied to practical problems that involve porous media such as soils, rocks, biological tissues, concrete, etc. The knowledge gained from studies of fluid flow in natural porous materials will be employed to design/optimize systems with engineered porous media.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7360. Nanomaterials Processing.
The course will cover various aspects of materials processing related to semiconductor devices. Topics covered include properties of electronic materials, thin film deposition, etching, lithography, and related device physics with an emphasis on the nanoscale. Fabrication and characterization techniques will be covered, including clean room usage. Prerequisite: MSEC 7401 with a grade of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7370. Advanced Polymer Science.
Advanced topics in polymer science are discussed with a focus on high performance polymers such as high impact, conducting, shape memory, high temperature and the underlying phenomena that provide these unusual properties, and advanced polymer topic areas such as flame retardancy, barrier properties, dielectric properties, rheology, and fiber reinforced composites.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7395A. Microwave & Power Device Physics and Materials.
This course will develop an understanding of basic microwave and power device physics and technology and the advanced materials that are used in today's cutting-edge research & development. The primary focus will be wide bandgap semiconductor materials and devices, and their performance metric versus the industry standard Si-based devices. Prerequisite: MSEC 7401 and MSEC 7402 both with grades of "B" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395B. Thin Film Photovoltaic Devices.
This course is a survey of the Materials Science of photovoltaic devices with emphasis on device physics including the photovoltaic effect, photon absorption, electrons and holes, generation and recombination, the pn-junction, charge separation, monocrystalline solar cells, thin film solar cells, III-V solar cells, and losses. Prerequisite: MSEC 7401 and MSEC 7402 both with grades of "B" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395C. Materials for Sustainable Energy.
This course introduces principles and applications of sustainable energy materials used for energy generation, conversion, and storage. Topics of study include principles (thermodynamics, kinetics, transport phenomena, equivalent circuits, catalysis, and electrochemistry) and selection and performance criteria important for applications including batteries, supercapacitors, fuel cells, electrolyzers, dielectrics, biomass, and piezoelectrics. Prerequisite: MSEC 7401 and MSEC 7402 both with grades of "B" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395D. Polymer Characterization and Processing.
This course will cover the concepts critical to the characterization and processing of organic polymers. Topics critical to characterization will include molecular weight determination, thermo/mechanical characterization, X-ray scattering, and polymer spectroscopy. Processing topics will include polymer rheology, principles of polymer processing, solution processing, and extrusion. Prerequisite: CHEM 4351 or CHEM 5351 or MSEC 7370 any with a grade of "B" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395E. Industrial Ecology and Sustainability Engineering.
This course covers the basic principles of life cycle analysis (LCA) of engineered products, materials, and processes. Topics covered include: biological ecology, industrial ecology, resource depletion, product design, process design, material selection, energy efficiency, product delivery, use, end of life and LCA.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395F. Catalysis in Materials Science.
This course introduces principles and applications of catalysis in materials science. The primary topics of study will include catalysis as a means of synthesizing materials and materials as catalysis. Subtopics will focus on specific catalysts (Ziegler-Natta, ROMP, and cross-coupling catalysts) and specific catalytic processes (hydrogenation, photoredox, and electrocatalysis).
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395G. Applied Plasma Physics.
Applied plasma physics focusing on the broad range of technical plasma devices, and to analyze and describe the main plasma physical characteristics and principles of operation. Emphasis will be on physical insight, application, and problem solving. Prerequisite: MSEC 7401 and MSEC 7402 both with grades of "C" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395H. Environmental Chemistry.
Advanced study in environmental chemistry, with an emphasis on aquatic resources and materials science and engineering. Principles of geochemistry and atmospheric chemistry will be covered as they relate to environmental pollution monitoring and control. Principles and applications of green chemistry will also be discussed.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395I. Structure and Properties of Alloys.
This course in an advanced exploration of the structure and properties of engineering alloys. Strengthening mechanisms of alloys are explored with specific applications to the alloys studied. The processing, properties, and structure of ferrous and nonferrous alloys are explored including new and emerging alloys. Prerequisite: Instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395J. Advanced Concrete Materials and Durability.
This course delves into a comprehensive coverage of Portland cement concrete materials as well as resilient and sustainable materials used for building and transportation infrastructure. Topics include cement and aggregate properties, chemical and mineral admixtures, mixture proportioning, concrete microstructure, concrete durability, long-term performance, durability prediction and modeling, durability of alternative cement, multi-scale assessment, and dimensional stability.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395K. Electrical and Magnetic Characterization Methods.
This course introduces electric and magnetic characterization methods important to metals, magnetic and semiconductor materials and devices. Various measurement techniques and methods will be reviewed. Students will learn to work with characterization tools.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395L. Advanced Solid State Physics.
This course reviews models of a solid and energy band theory. Additional topics may include interaction of electromagnetic waves with solids, lattice vibrations and phonons, many body effects in solids, device physics, quantum phenomena, carrier transport properties, current device configurations, and materials interface problems. Prerequisite: MSEC 7401 with a grade of "B" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395M. Semiconductor Devices and Processing.
This course addresses the basics of semiconductor devices, silicon and compound semiconductor material fabrication, photolithography, etching, control of dopant profiles for the formation of shallow junctions needed for nanoscale devices, ion implantation and microstructure engineering, different types of doping phenomena, the carrier action and charge transport properties, defect microstructures, low-resistivity Ohmic contacts, and different fabrication concepts of conventional and emerging micro-/nano-electronic devices. In addition, students will be involved in laboratory projects and seminar presentations. Prerequisite: MSEC 7401 with a grade of "B" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395N. Advanced Infrastructure Materials.
This course provides a comprehensive presentation of advanced infrastructure materials including cement concrete, asphalt concrete, wood, steel, etc. Emphasis is placed on a fundamental understanding of the raw ingredients of cement concrete and how these ingredients affect concrete fresh and hardened properties. A brief introduction of other common infrastructure materials is also included in this course. Students will be asked to solve an infrastructure material related problem using advanced analytical and simulation tools.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7395O. Modern Concepts in Materials Science.
This course provides an overview of the modern concepts and principles that are used to describe and predict the physical properties of materials. An emphasis will be placed on developing and applying fundamental materials science concepts: atoms and atomic bonding, fundamentals of crystallography, elementary diffraction by solid-state materials, defects, solid solution and phase equilibrium. Particular attention will be given to the science and theories explaining the unique behavior of different classes of materials, i.e. ceramics, metals, polymers, electronic materials and composites.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

MSEC 7399. Dissertation.
Original research and writing in Materials Science, Engineering, and Commercialization, is to be accomplished under direct supervision of the PhD Research Advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester. Repeatable for credit.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

MSEC 7401. Fundamental Materials Science and Engineering.
Course covers fundamentals of chemical kinetics, physical properties, and continuum mechanics. Topics include electronic and atomic structure, structure of crystalline materials, imperfections, thermodynamic and kinetic principles and equations for closed and open systems, statistical models, phase diagrams, diffusion, phase transformations, conservation laws, and kinematics.
4 Credit Hours. 4 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7402. Advanced Materials Science and Engineering Concepts.
Fundamentals of quantum mechanics, physics of solid state, and physical electronics and photonics for advanced materials will be discussed. Topics will include quantum basis for properties of solids, lattice vibration, free electron model for magnetism, semiconductors, nanostructures and mesoscopic phenomena, superconductivity, and recent advances in new types of materials. Prerequisite: MSEC 7401 with a grade of "C" or better.
4 Credit Hours. 4 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

MSEC 7599. Dissertation.
Original research and writing in Materials Science, Engineering, and Commercialization, is to be accomplished under direct supervision of the PhD Research Advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester. Repeatable for credit.
5 Credit Hours. 5 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

MSEC 7699. Dissertation.
Original research and writing in Materials Science, Engineering, and Commercialization, is to be accomplished under direct supervision of the PhD Research Advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester. Repeatable for credit.
6 Credit Hours. 6 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

MSEC 7999. Dissertation.
Original research and writing in Materials Science, Engineering, and Commercialization, is to be accomplished under direct supervision of the PhD Research Advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester.
9 Credit Hours. 9 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

Biology (BIO)

BIO 7100. Professional Development.
This course is seminar-based and covers topics related to teaching, research, and employment responsibilities. Completion of the course is required as a condition of employment for graduate assistants. This course does not earn graduate degree credit. Repeatable with different emphasis.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Graduate Assistantship|Exclude from Graduate GPA
Grade Mode: Leveling/Assistantships

BIO 7102. Seminar in Aquatic Resources.
This course is an interactive discussion of timely issues and problems, designed to introduce students to the range of scientific, socioeconomic and policy issues likely to be encountered within the field of aquatic resources. All students seeking a doctoral degree in Aquatic Resources must enroll in BIO 7102 at least twice.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

BIO 7103A. Ecology and Society.
Interactive discussion on relationships between society and the life-supporting ecosystems on which humans depend. Topics include roles of naturalsystems in social systems; effects of social, economic and political institutions on ecological systems and services; and the means by which humans develop and sustain desired ecological and social states.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7103B. Aquaculture.
The course comprises a survey of aquaculture production throughout the world. It also examines and discusses the impacts of aquaculture on nutrition, fisheries and the economy.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7103D. Molecular Biology of the Cell.
Interactive discussion of current literature on molecular biology of the cell. The course is designed to discuss concepts and their applications and methodology associated with the structure and function of the cell at cellular and molecular level.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7103E. Contemporary Problems in Ecology.
This course is an interactive discussion of the theoretical foundations and empirical basis for controversial topics in ecology, designed to develop critical thinking skills, and the ability to evaluate and integrate the biological, chemical and physical factors that affect the structure, functions, and interactions characterizing communities and ecosystems.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7103F. Molecular Genetics of Plant Development.
The study of plant development is rapidly changing as plant genome projects discover a multitude of new genes, and their expression and interaction patterns are understood. This course is designed to discuss concepts in plant development, and developmental processes as pathways of gene regulatory activities.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7103G. Ecohydrology.
A review of the concept of ecohydrology, its scientific foundation, and its ecological-hydrological linkages. Current topics in ecohydrology in the literature will be discussed, including manipulation of biota and hydrology interactions in a landscape, and the possibility of augmenting the resilience of ecosystems to anthropogenic changes.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7103H. Integrated Waterbird Management.
This course focuses on the ecology and management of waterbirds, with an emphasis on the inland and coastal waterbirds of Texas. The basic ecology of waterbirds, waterbird management techniques, and waterbird habitat management will be discussed.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7103I. Avian Ecology and Evolution.
This course is an interactive discussion of avian ecology and evolution, providing students with a critical examination of theories, hypotheses, and lab and field-based data that support or refute there hypotheses. This course also discusses peerreviewed literature that challenges some paradigms in avian ecology and evolution.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7104. Marine Pollution.
In this course, students will read and discuss the scientific literature on the sources, bioaccumulation, trophic transfer, and health effects of contaminants in the marine environment. Papers will address a variety of marine life including plankton, crustaceans, mollusks, fishes, marine mammals, turtles, and birds. Contaminants to be reviewed include trace elements, PCBs, oil, pesticides, radionuclides, plastics, pharmaceuticals, illegal drugs, and personal care products.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7105. Environmental Issues through Documentaries.
In this course, students will examine how environmental issues are addressed in documentaries. Students will learn how to critically evaluate documentaries for scientific content, imagery, biases, and ease of understanding. Topics to be examined include overfishing, the wildlife trade, habitat degradation, pollution, energy resources, climate change, sustainability, and conservation.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7114. Collaborative Research.
This course (concurrent enrollment allowed) allows Ph.D. level graduate students to initiate, conduct, and participate in collaborative research with graduate faculty of the Department of Biology that is in addition to research conducted under BIO 7303, BIO 7399A, or BIO 7699A. This course recognizes the collaborative nature of scientific investigation.
1 Credit Hour. 1 Lecture Contact Hour. 1 Lab Contact Hour.
Grade Mode: Standard Letter

BIO 7120. Population Biology Seminar.
This course facilitates exploration of current topics in population and conservation biology through reading and discussion of contemporary primary and secondary literature.
1 Credit Hour. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7199A. Dissertation.
Original research and writing in Aquatic Resources, to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

BIO 7214. Collaborative Research.
This course (concurrent enrollment allowed) allows Ph.D. level graduate students to initiate, conduct, and participate in collaborative research with graduate faculty of the Department of Biology that is in addition to research conducted under BIO 7303, BIO 7399A, or BIO 7699A. This course recognizes the collaborative nature of scientific investigation.
2 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7299A. Dissertation.
Original research and writing in Aquatic Resources, to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester.
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

BIO 7300. Communicating Science.
This course explores how to successfully disseminate science through visualizations, oral presentations, and written works to multiple audiences. Special emphasis will be placed on communicating with the general public, media, granting agencies, and science peers.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7301. College Science Teaching.
This course is designed for graduate students in the sciences who are interested in improving their science teaching and/or are interested in pursuing careers in academia. This course focuses on the central question, "How do college students best learn science, and thus how do we best teach them?".
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7302. Problems in Aquatic Resources.
Individual study on specific state, national, or international aquatic resources issues, under direct supervision of a doctoral or associate faculty member. Students may not enroll in BIO 7302 more than twice for doctoral credit without the approval of the Graduate Program Director.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7303. Research.
Research course for students who have not yet passed their Candidacy Exam, typically under direction of research-dissertation supervisor. Pre-candidacy students must enroll in course every semester until admission to Candidacy, although it may not be taken more than three times for doctoral credit without the approval of Graduate Program Director.
3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7308. History of Vegetation and Climate.
An overview of past vegetation and its relationship to changing climate. Topics include principles of paleovegetation analysis, paleoclimatology, the rise of flowering plants, vegetation during the age of dinosaurs, the rise of the grasslands, and the Quaternary Ice Age. Prerequisites: Instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Grade Mode: Standard Letter

BIO 7310. Global Aquatic Resources.
Introduction to global, national, and regional aquatic resource issues, including scientific, environmental policy and socioeconomic components and perspectives. Water quantity and quality issues and their root causes in different regions of the world are examined, with an emphasis on case studies.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7311. Ecology of Temporary Waters.
The course explores the diversity of temporary bodies of water and of the species that rely on them, including their special adaptations, population and community dynamics, the ecological role of temporary waters, and how these systems are impacted by humans. Background coursework or independent study in ecology is recommended.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7314. Collaborative Research.
This course (concurrent enrollment allowed) allows Ph.D. level graduate students to initiate, conduct, and participate in collaborative research with graduate faculty of the Department of Biology that is in addition to research conducted under BIO 7303, BIO 7399A, or BIO 7699A. This course recognizes the collaborative nature of scientific investigation.
3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7324. Natural History and Conservation of Large Mammals.
This course will introduce students to advanced details of natural history, research, and conservation of large mammals. Topics considered will include natural history, range and population status (historic and current), importance to and interaction with humans, research design and analysis, and the development of conservation and management plans.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7326. Immunobiology.
This lecture-based course will cover the mechanisms and biology of the innate and adaptive immune system. Emphasis will include relationship to cancer, transplantation, hypersensitivity (allergy), and disease. Students will evaluate current research in immunology.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7327. Ecological Immunology.
This course explores the roles of immunity in natural ecosystems, focusing on central concepts in ecological immunology. From viruses to parasites, pathogenic threats are omnipresent. As epizootic outbreaks become more common, it is important to integrate immunological knowledge with traditional ecological perspectives. Background coursework in immunology is recommended.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7331. Human Dimensions of Wildlife and Fisheries Conservation.
This course will provide principles, concepts, and case studies to understand how the human experience (e.g., culture, politics, economics) influences conservation outcomes. Students will have an opportunity to integrate human dimensions into decision-making.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7332. Introduction to R Programming for Biologists.
This course introduces the programming language R. The course will focus on best practices in programming and the use of Base-R and RStudio. Topics include navigating the R and RStudio environment, installing packages, loading, manipulating, and visualizing data, declaring variables, writing loops, and writing functions.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7333. Phylogenetic Comparative Methods.
This course introduces students to modern phylogenetic comparative methods and teaches how to perform them. Topics include constructing phylogenies, dating phylogenies, finding and using previously published phylogenetic datasets, phylogenetic data visualization, and a variety of methods to test ecological and evolutionary hypotheses in a phylogenetic framework.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7336. Evolutionary Ecology.
This course will use an evolutionary perspective to explore questions provided by natural selection and sexual selection through assessment of current theory and research related to topics such as competition, coevolution, and phenotypic plasticity. Students will achieve comprehension and familiarity with the field through discussions and writing.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7342. Virology.
This course examines the structure, multiplication and genetics of bacterial, plant, and animal viruses as well as the role of viruses in human and plant disease. Students are expected to become familiar with the research literature in virology.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7346. Conservation Biology.
Examination of the alteration of habitats and associated biological changes threatening the continued existence of species and basic ecosystems. Topics include conservation ethics, working paradigms, levels and loss of global biodiversity, conservation at population and ecosystem levels, restoration ecology, endangered species biology and conservation laws. Recent Advances are stressed.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7353. Biogeography.
Examines historical and ecological explanations of the geographic distribution of organisms including the role of geologic, climatic, and biologic changes. Emphasizes the historical and philosophical development of the science and modern methods of analysis.
3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Grade Mode: Standard Letter

BIO 7354. Applied Analyses of Populations.
In this course students will learn and apply a variety of statistical techniques for analyzing populations. They will build code to conduct and compare statistical analyses as they apply to real population data. Students will use real-world data sets to generate objectives and test hypotheses including conducting all data visualization and validations, performing models, selecting appropriate models, and estimating latent variables and their predictors. Analyses include assessing the effects of environmental attributes on occupancy, relative abundance, abundance, space (habitat) use, home range size, local colonization, local extinction, survival, and recruitment.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7355. Plant-Water Relations.
Examination of the physiology and ecology of water use in higher plants, including the uptake, utilization, and movement of water, transpiration and adaptation to variable water availability including drought, and the ecological role of water in structuring plant communities.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7360A. Industry and Sustainable Aquatic Resources.
Examination of industrial water needs and uses, the types and quantities of water pollutants produced by different industries, problems faced by industry regarding process water for different manufacturing activities, and the possibilities for industry to contribute to the goal of sustainable aquatic resources.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360B. Environmental Linkages and Sustainable Aquatic Resources.
Introduction to the environmental relationships between humans and other living beings and the ecological systems in which they exist. Emphasis will be on the potential for individual environmental problems to have serious impacts on other environmental components, as well as the nature of these impacts.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360C. Role of State and Federal Courts in Protection and Maintenance of Aquatic Resources.
Examination of current or emerging state, national and international aquatic resources issues, including root causes and their human and ecosystem interactions. The course may be repeated for credit, depending on the topic. No more than six hours can be counted for doctoral credit without the approval of the Program Director.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360D. Evolutionary Ecology.
Examination of current or emerging state, national and international aquatic resources issues, including root causes and their human and ecosystem interactions. The course may be repeated for credit, depending on the topic. No more than six hours can be counted for doctoral credit without the approval of the Program Director.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360E. Advances in Water Quality Investigations.
Examination of current or emerging state, national and international aquatic resources issues, including root causes and their human and ecosystem interactions. The course may be repeated for credit, depending on the topic. No more than six hours can be counted for doctoral credit without the approval of the Program Director.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360F. Approaches to Aquatic Resource Modeling.
Examination of current or emerging state, national and international aquatic resources issues, including root causes and their human and ecosystem interactions. The course may be repeated for credit, depending on the topic. No more than six hours can be counted for doctoral credit without the approval of the Program Director.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360G. Molecular Techniques in Microbial Ecology.
Lectures on molecular techniques used to analyze structure and function of uncultured microbial communities in the environment with selected examples of applications.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

BIO 7360H. Parasites and Diseases of Fishes and Other Aquatic Animals.
Examination of current or emerging state, national and international aquatic resources issues, including root causes and their human and ecosystem interactions.
3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Lab Required|Topics

Grade Mode: Standard Letter

BIO 7360I. Bayesian Statistics for Biology.
This course examines the theory and mathematical foundations of Bayesian statistics and provides instruction and experience conducting Bayesian analyses using computer-based procedures. The course emphasizes practical applications for Bayesian statistical procedures for problems in biological sciences.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360K. Evolution.
Examination of current or emerging state, national and international aquatic resources issues, including root causes and their human and ecosystem interactions. The course may be repeated for credit, depending on the topic. No more than six hours can be counted for doctoral credit without the approval of the Program Director.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360L. Landscape and Biogeography of Texas.
Examination of current or emerging state, national and international aquatic resources issues, including root causes and their human and ecosystem interactions. The course may be repeated for credit, depending on the topic. No more than six hours can be counted for doctoral credit without the approval of the Program Director.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360P. Regulation of Plant Growth and Development.
Examination of current or emerging state, national and international aquatic resources issues, including root causes and their human and ecosystem interactions. The course may be repeated for credit, depending on the topic. No more than six hours can be counted for doctoral credit without the approval of the Program Director.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360Q. Spatial Ecology of Animals.
Examination of current or emerging state, national and international aquatic resources issues, including root causes and their human and ecosystem interactions. The course maybe repeated for credit, depending on the topic. No more than six hours can be counted for doctoral credit without the approval of the Program Director.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360R. Community and Ecosystem Ecology.
Examination of current or emerging state, national and international aquatic resources issues, including root causes and their human and ecosystem interactions. The course may be repeated for credit, depending on the topic. No more than six hours can be counted for doctoral credit without the approval of the Program Director.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360S. Soil Biology.
An introduction to the biology of soil systems, including the roles of biota in forming and maintaining soils, and the interactions between biotic and abiotic components in soils.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360T. Karst Hydrogeology and Geomorphology.
An introduction to, and advanced understanding of, karst hydrogeology, geology, and geomorphology, with emphasis on field and theoretical applications of this information to the study of karst systems, and recognition and understanding of karst landforms at the surface and their relationships with subsurface processes. Prerequisite: Instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

BIO 7360U. Sustainability in a Changing World.
Understanding the ecological-social interface, including policies, product development and actions towards sustainability, with emphasis on integrating and implementing theories and methods across disciplines, and improving the knowledge and experience base for public policy and decision-making regarding human-environment linkages within the context of sustainable development. Prerequisite: Instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

BIO 7360V. Techniques in Aquatic Biology.
The course will provide hands on experience with a suite of physical, chemical, and biological sampling techniques and gear used in applied river studies. Students will be exposed to the fundamentals of data quality objectives, accuracy, precision, detection limits, data visualization, exploratory analysis, univariate and multivariate statistics.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7360Y. Applied Bioinformatics.
This course provides an introduction to scripting and other computational techniques used for visualizing and analyzing large biological datasets. Computational techniques include sequence and structural alignment, data mining, phylogenetic tree construction, and data clustering using UNIX, Python, and R. Students will gain a solid foundation in broadly applicable bioinformatics skills.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

BIO 7361A. Discipline-Based Educational Research Methods.
This course will expose science graduate students to educational research in a practical setting, supervised by a professor experienced in conducting discipline-based educational research, focusing primarily on qualitative methods.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Topics
Grade Mode: Standard Letter

BIO 7361C. Advanced Genomics and Bioinformatics.
This course provides hands-on experience in processing and analyzing data produced from contemporary genomics tools for thesis students with basic bioinformatics training. Prerequisite: BIO 7360Y with a grade of "B" or better and instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

BIO 7361D. Raptor Ecology.
This course will examine the evolution, taxonomy, ecology, behavior, anatomy, physiology, and conservation of birds of prey of the world with emphasis on diurnal raptors, including those from Texas. Field trips will include at least two overnight visits to significant migration and over wintering areas.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

BIO 7399A. Dissertation.
Original research and writing in Aquatic Resources, to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each semester (including summer) for at least three dissertation hours.
3 Credit Hours. 3 Lecture Contact Hours. 5 Lab Contact Hours.
Grade Mode: Credit/No Credit

BIO 7402. Molecular Field Techniques.
The application of molecular tools for identifying, quantifying, and interpreting biological diversity assessments in aquatic systems. The course focuses on micro organismal identification and vertebrate model systems.
4 Credit Hours. 0 Lecture Contact Hours. 4 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7405. Statistics and Experimental Design I.
Introduction to inferential statistics, including exploratory and confirmatory data analysis, estimation and hypothesis testing, analysis of variance and regression, and non-parametric techniques, as applied to aquatic resource issues. Computer applications emphasized.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7406. Statistics and Experimental Design II.
Introduction to the principles of experimental design, including randomization, replication, sample-size determination, completely randomized and randomized block design, factorial design, repeated measure design, and analysis of variance and covariance, as applied to aquatic resource issues. Computer applications emphasized. Prerequisite: BIO 7405 with a grade of "C" or better or instructor approval.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7410. Aquatic Microbial Ecology.
Examination of microbial organisms, communities, and interactions affecting the form, structure, and functional aspects of aquatic ecosystems. Field trips may be required. Prerequisite: BIO 2400 with a grade of "D" or better or instructor approval.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7412. Environmental Hydrology.
Overview of the properties, distribution, and movement of water over and under the land surface and its relation to sustainable aquatic ecosystems, including quantitative methods to assess cumulative impacts of human activities on such systems. Field trips may be required. Knowledge of calculus recommended.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7414. Ecology of Infectious Diseases of Wildlife.
Concepts of the ecology of infectious diseases in wildlife are studied in depth with emphasis on their application to the management and conservation of wildlife species and for the control of zoonotic diseases. Prerequisite: Instructor approval.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7419. Stream Ecology.
Study of ecological theories, concepts, and processes occurring at the population, community, and ecosystem levels of organization in running water. Laboratory includes sampling methods, descriptive and comparative studies, experiments, and critical discussion of literature. Field trips may be required.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7426. Ecology and Management of Aquatic Macrophytes.
Examination of aquatic macrophytes and their ecology, taxonomy, distribution and management. Field trips may be required.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7427. Principles of Population Biology I.
This course provides a foundation in theory and mathematics of basic population biology. The course is divided into modular components, including defining evolutionarily significant units, ecology of populations, genetics of populations, and evolutionary genetics. A background in genetics and general ecology is recommended.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7428. Principles of Population Biology II.
This course provides a foundation in theory and mathematics of basic population biology. The course is divided into modular components which include: 1) Ecology of Communities, 2) Evolution of Behavior, 3) Phylogenetic Methods, and 4) Biological Diversity and Conservation Biology.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7430. Mycology.
This course provides an introduction to the organisms in the Kingdom Fungi and to fungus-like organisms, their ecology and evolution, and their role in industry and disease. Special emphasis will be placed on morphology, culturing, and using laboratory techniques for identification.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7433. Population Genetics.
This course examines the theoretical foundations of population genetics, including the description of population genetic structure and the forces creating it. The course emphasizes application of principles to a wide range of current problems in evolution, systematics and ecology. Molecular methods, data interpretation and computer-based data analysis are emphasized.
4 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7434. Herpetology.
A course treating the origin and evolution of amphibians and reptiles; their reproductive and physiological tactics; taxonomy/systematics; and population biology. While cosmopolitan in scope, emphasis will be placed on North American species and those groups inhabiting Texas.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7440. Aquatic Toxicology.
Introduction to principles for identifying and assessing the adverse effects of chemicals and other compounds and mixtures on aquatic organisms and ecosystems.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7447. Microbial Physiology.
Prokaryotes, including bacteria and archaea, are the most diverse group of organisms on earth. Many prokaryotes live in environments which are inhospitable to other life forms. This course covers major aspects of prokaryotic physiology that permit them to be so successful.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7466. Phylogenetics.
Study of the use of phylogenetic methodologies in aquatic research, including practical data collection, management, and analysis in the reconstruction of phylogenies. Laboratory exercises will introduce phylogenetic and DNA analysis software. Prerequisite: BIO 2450 and BIO 4369 and BIO 5466 all with grades of "C" or better or instructor approval.
4 Credit Hours. 2 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7468. Groundwater Resources.
Study of the geological, physical, chemical and biological factors influencing sustainable groundwater resources, including hydrologic linkages and interactions with surface aquatic resources. Emphasis will be on the karst aquifer systems of Central Texas, and other groundwater aquifer systems of the United States.
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter

BIO 7469. Introduction to Ecological Modeling.
Mathematical models range from simple conceptual models to complex mechanistic models for mimicking behavior of natural systems. This course provides a broad overview of modeling objectives, techniques and assumptions, as well as the practical skills needed to conduct modeling projects. Computer applications emphasized. Prerequisite: MATH 2471 with a grade of "C" or better or instructor approval.
4 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.
Grade Mode: Standard Letter

BIO 7599A. Dissertation.
Original research and writing in Aquatic Resources, to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester.
5 Credit Hours. 5 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

BIO 7699A. Dissertation.
Original research and writing in Aquatic Resources, to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each semester (including summer) for at least three dissertation hours.
6 Credit Hours. 6 Lecture Contact Hours. 10 Lab Contact Hours.
Grade Mode: Credit/No Credit

BIO 7999A. Dissertation.
Original research and writing in Aquatic Resources, to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester.
9 Credit Hours. 9 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

Criminal Justice (CJ)

CJ 7199. Dissertation.
Original research and writing in criminal justice to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester for at least three dissertation hours.
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CJ 7299. Dissertation.
Original research and writing in criminal justice to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester for at least three dissertation hours.
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CJ 7301. Instructional Assistant Supervision.
This course prepares doctoral students employed as research or teaching assistants to perform effectively in diverse instructional settings. The course provides for regular and planned opportunities for continuing evaluation of students. This course does not earn graduate degree credit.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Graduate Assistantship|Exclude from Graduate GPA
Grade Mode: Leveling/Assistantships

CJ 7309. Proseminar.
This course introduces students to information that is useful to their success as Ph.D. students and after graduation. Topics include the criminal justice discipline, teaching, publishing, grants and fellowships, writing dissertations, and post-doctoral employment. Emphasis is placed on identifying and coordinating opportunities for research and scholarship among faculty and students. Must have completed 12 hours of doctoral credit in Criminal Justice to enroll in this course.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7310. Philosophy of Law, Justice, and Social Control.
A current, thorough, and comprehensive review of the criminal justice system focused on how the system functions, and its current needs and future trends. Students submit extensive critiques and participate in panel discussions.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7311. Advanced Criminological Theory.
An overview of the major criminological paradigms is presented focusing on the causes of crime and deviant behavior. The course includes a discussion of criminological theories from a philosophy of science perspective focusing on such issues as theory construction, theoretical integration, and the formal evaluation of theory and policy.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7313. Race and Ethnicity in Crime and Criminal Justice.
An exploration of how issues related to racial and ethnic minorities and criminal behaviors impact criminal justice reactions. Topics include racial disparities related to law enforcement and sentencing, and policy implications related to policing, probation, pre-sentencing and post-release issues. (MULT).
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Multicultural Content
Grade Mode: Standard Letter

CJ 7314. Policing.
This course examines current problems in American policing and the role of research in their examination and solution. Official crime and victimization statistics and measure of police performance are explained, with a focus on their collection, development, limitations, and utility. Methods and issues in policing research are explored.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7315. Corrections.
This course examines the history, forms, and functions of correctional institutions, their programs and policies, as well as theories of punishment. Topics include the structure and functions of prisons and jails, community corrections, intermediate sanctions, reentry, supermax prisons, and the death penalty.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7320. Quantitative Research Methods.
A course that demonstrates the practical aspects of conducting criminal justice research that uses quantitative methodologies and design. Topics include the philosophy of science; research ethics; methodological designs in establishing causation; nonexperimental/descriptive research; sampling techniques; secondary data sources and data gathering techniques.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7321. Linear Regression for Criminal Justice Research.
Instruction on the use of advanced linear modeling techniques in criminal justice research is addressed. After completing this course, students should be able to evaluate quantitative research articles in the major criminal justice journals and be prepared to complete a major quantitative research project of their own.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7322. Advanced Research for Planning and Evaluation.
An introduction to evaluation and research design methodologies, assessment techniques including modeling and case studies, agency management issues, and on-going policy implications. Course gives students an understanding of the principles and techniques commonly used to evaluate the effectiveness and efficiency of criminal justice interventions.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7323. Applied Statistics and Quantitative Data Analysis.
This is a course in statistics and data analysis for the purposes of original quantitative research. Topics include descriptive statistics, statistical inference for single and multivariable analysis, and principles underlying the techniques. This course makes extensive use of statistics software and data preparation techniques.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7330. Qualitative Research Methods.
A discussion of the methods and techniques used for achieving interpretable qualitative results in social research. Topics covered include ethnography, focus groups, in-depth interviewing and case studies. Students will be trained in inductive reasoning and coordinating qualitative with quantitative methods.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7331. Law and Behavioral Science.
A review of the issues addressed in the application of the behavioral sciences to the criminal law system. Topics include criminal sanctions and diminished responsibility, civil commitment, victimology, psychology in the courtroom, the role of media, drugs, and alcohol to violence, and how the justice system reacts to violent offenders.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7336. Survey Research Methods for Criminal Justice.
This course addresses the procedures and techniques used to create social surveys including question formulation, metrics, and question scaling. Students learn how to prepare face-to-face, telephone, and mail surveys, and are trained in sampling procedures related to survey administration.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

CJ 7350A. Forecasting, Trend Analysis, and Data Interpretation.
A review of quantitative approaches to public policy analysis, the diverse conceptions of the goals and objectives that should be served by policy, and the appropriate role of the policy analyst. Policy consequences are traced to indirect and subtle incentives and disincentives.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CJ 7350B. Academic Scholarship and Communication.
A course on conducting academic research, interpreting results and how to prepare manuscripts for publication in refereed journals. Included is a survey of the audiences, topical focus, and submission requirements of the major criminal justice, criminology, and law publications, along with specialized knowledge on achieving success in the scholarship environment.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CJ 7350C. Qualitative Data Collection, Coding and Analysis.
This course takes a structured approach to understanding and implementing the various information collection methods used in qualitative research, including formatting the information for coding, coding schemes, and information interpretation.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CJ 7350E. Discrete Multivariate Models.
This course focuses on regression models for discrete outcome variables, sometimes called limited or categorical dependent variables. Topics include maximum likelihood estimation, binary and multinomial logistic models and negative binomial models. Prerequisite: CJ 7321 with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CJ 7350F. Environmental Criminology.
Crime distributes unevenly in space/time. As such, the course examines such questions as (1) What places are dangerous? (2) Why do we study specific crime types? (3) Where do crime types concentrate? (4) Where do offenders go in their normal activities? (5) What are the temporal patterns for crime? Prerequisite: CJ 7311 with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CJ 7350G. Seminar in Macro Criminology.
This course has a macro focus, examining criminological theory and research that takes cities, geographical regions, states, and nations as the units of comparison. The importance and relevance of macro criminology for understanding the causes of crime and key criminal justice issues, such as police resources, are explored in depth. Prerequisite: CJ 7311 with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CJ 7350I. Introduction to Structural Equation Modeling.
The course provides an introduction to structural equation modeling, which is sometimes called mean and covariance structure analysis or latent variable analysis. Topics include recursive and non-recursive models, path analysis, measurement models, and factor analysis. Prerequisite: CJ 7321 with a grade of "B" or better or instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CJ 7350K. Criminal Justice Forecasting and Policy Analysis.
This course examines the inputs and outputs of criminal justice programs. It covers forecasting methods using statistical bootstrapping techniques including line fitting methods, moving averages, cohort propagation matrixes, and systems simulations.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CJ 7350L. Sex Offenders: Theory, Research & Policy.
This course will focus on application of theory to explain sexual offenses, research design issues related to researching this salient population of offenders (e.g., ethical issues, gaining IRB approval, research design limitations, social desirability problems in self-report data, and examining available data sources), and examining policy related issues.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CJ 7350N. Cold Case Investigations.
This course introduces students to the concepts and issues of cold cases and their investigation. The major causes of uncleared crimes will be examined. The nature of crime and criminality will be explored with an emphasis on serial sexual crime, stranger offenders, and victim risk. Solving cold cases, evidence structure, relevant forensic methodologies, and interviewing approaches are discussed. The issue of missing persons and its relationship to cold cases is examined. Methods of crime linkage analysis, behavioral profiling, and geographic profiling are outlined and explained. The course will use a number of case studies and in-class exercises.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

CJ 7360. Independent Study.
Students will work closely with a particular doctoral faculty member and develop in-depth knowledge in a specific topic area of criminal justice. Topics vary according to a student's program needs. Repeatable once for credit with different emphasis. Prerequisite: Instructor approval.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CJ 7399. Dissertation.
Original research and writing in criminal justice to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester for at least three dissertation hours.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CJ 7599. Dissertation.
Original research and writing in criminal justice to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester for at least three dissertation hours.
5 Credit Hours. 5 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CJ 7699. Dissertation.
Original research and writing in criminal justice to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester for at least three dissertation hours.
6 Credit Hours. 6 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit

CJ 7999. Dissertation.
Original research and writing in criminal justice to be accomplished under direct supervision of the dissertation advisor. While conducting dissertation research and writing, students must be continuously enrolled each long semester for at least three dissertation hours.
9 Credit Hours. 9 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Credit/No Credit