928 Case Development and Resolution (4) Theory and development of skills for case development and management: interviewing, counseling, and fact investigation. Ways of resolving disputes without litigation.
Comment(s): Not open to students who have taken 927.

935 Gratuitous Transfers (3) Gifts; will substitutes; nature, creation, termination and modification of trusts; interstate succession; execution, revocation, probate and contest of wills; statutory protections against disinheritance, and introduction of the concept of half the estate, basic problems of wills construction, powers of attorney, and planning for disability and death.

937 Estate Planning Seminar (2) Estate planning problems: relationship to estate planning of law and practice of fiduciary administration, insurance, property, wills, future interests, trusts, corporations, and partnerships. Required dragging, explaining and implementing documents.
(De) Prerequisite(s): 935 and 973.
Recommended Background: 818.
Comment(s): Limited enrollment.

940 Land Finance Law (3) Financing devices: mortgages, deeds of trust and land contracts; problems of priorities; transfer of secured interests when debt assumed or taken subject to security interest; default, exercise of equity of redemption and/or statutory right of redemption; mechanics and material men’s liens; contemporary developments in areas as condominiums, cooperatives, housing subdivisions, and shopping centers.

942 Land Use Law (3) Private land use controls: nuisance, easements, real covenants, equitable servitude and home owner associations; public land use controls: zoning, subdivision controls, eminent domain, and regulatory takings.

946 Business Law Clinic (6) Supervised fieldwork assuming substantial responsibility for representing clients with various business and transactional matters. Exploration and development of fundamental professional skills involved in practicing law: interviewing and counseling clients, negotiating with other attorneys, planning for transactions and dispute resolutions, initiating and defending claims, conducting factual investigations, and presenting evidence.
Credit Restriction: May not receive credit for both 905 and 946 or both 905 and 947.
(De) Prerequisite(s): 920.
Comment(s): Third-year standing required.

947 Prosecution Externship (6) Supervised fieldwork required to be admitted as a prosecutor and to assume substantial responsibility for prosecution of criminal cases in state or federal courts. Classes on Tennessee or federal criminal law and procedure and prosecution function. Under direct supervision of full-time, experienced prosecutor and other professional prosecutors in office. Assist in investigation of crimes, interview and preparation of witnesses, drafting of relevant documents, negotiation and formal presentation of guilty pleas, presentation of cases to grand jury, and representation of government in preliminary hearings and felony trials.
Credit Restriction: Students may not receive credit for both 947 and 905.
(De) Prerequisite(s): 813, 920, and either 854 or 855.
Comment(s): Limited enrollment.
Registration Permission: Consent of instructor.

954 Copyright Law (3) Considers copyright theory, doctrine, and practice and how the law is changing in response to globalization and advances in information technology. Topics include the subject matter of the copyright, the exclusive rights provided by the Copyright Act, substantive and procedural aspects of infringement actions, and remedies. Satisfies expository writing requirement.

955 Patent Law (3) Covers the major aspects of patent law, primarily as applied in the U.S. Patentability, including patentable subject matter, utility, enablement and written description, novelty, and nonobviousness; infringement; ownership and licensing; and remedies. Emphasizes essential legal principles, useful as background for non-patent lawyers and as a foundation for patent lawyers.
Recommended Background: Intellectual property course.
Comment(s): Science or engineering background not required.

956 Entertainment Law (3) Role of law and lawyer in entertainment industry. Course content varies. Music industry: music copyright laws; artist/manager relationships; recording contract negotiations; industry labor unions; and performing right organizations.
957 Law, Science and Technology (3) Legal implications of advanced technologies; adaptation of law to challenges posed by new kinds of knowledge and new ways of doing things. Biotechnology, regulation of scientific research, space law, legal issues relating to new information technologies, nanotechnologies, and others designated by instructor.

958 Women and The Law (3) Treatment and status of women in American legal system: women as political actors, as family members, as participants in workforce, as targets of violence and as members of legal profession; introduction to current competing approaches to gender justice.

959 Intellectual Property (3) Intellectual property and related interests under federal and state law; patents; trademarks; trade secrets; copyright; right of publicity; unfair competition.

960 Employee Benefits Law (2-3) Employee Retirement Income Security Act, federal law governing employee benefit plans sponsored by private employers; problem of instruction: questions, issues, and problems involving employee benefit plans likely to arise in general litigation or business transaction practice. For three credit hours, includes Chapter 400 of Internal Revenue Code.

962 Law and Medicine Seminar (2) Effects of legal rules on delivery and quality of medical care; nature of physician-patient relationship; unauthorized practice of medicine; medical education, licensing and specialization; hospital staff privileges; medical malpractice liability; standard of care, proof, causation, defenses, and damages; protection of patient autonomy; Consent, informed consent, conception and abortion, choice of treatment, and death and dying; control of communicable diseases; organ transplantation and medical resource allocation.

963 Health Care Law and Regulation (3) Surveys legal issues confronting the American health care system, considering federal and state law. Topics include quality control; licensing and accreditation; access to health care, including private health insurance, managed care, Medicare, Medicaid, and emergency health care; privacy regulations; relationships between health care entities and physicians; fraud and abuse regulations; antitrust considerations; and research restriction.

964 Health Care Policy (2) Considers ethical perspectives on health care policy, relating to decisions both on individual patient care and on systemic resource allocation. Considers basic theories of bioethics, including how these ethical perspectives may inform analysis of current issues in health care law and policy and how they are expressed in the national policy debate. Topics include organizing and financing health care, quality and accountability in health care, equality and discrimination in access to health care, privacy issues raised by new technology, legal and ethical issues in managed care, and tort reform. Satisfies the perspectives requirement.

965 Community Development (3) Considers legal issues faced by under-represented constituencies. Students work on law-related field projects under lawyer supervision, collaborating with organizations that serve or advocate for the under-represented in and around Knoxville. Projects may include legal research, legislative drafting and advocacy, creation of educational materials or events, empirical research, and recording of oral histories.

966 Community Legal Education (3) Considers how to advance the law-related education of under-represented constituencies. Under lawyer supervision, students work on law-related education projects for the under-represented in and around Knoxville. Projects may include classroom talks, and the creation, development or production of law-related written materials, skits, interactive workshops, videos, or Web pages. Satisfies the perspectives requirement.

967 Media Impact on Justice (3) Explores the impact that the media has on the perception and reality of justice in the United States, including its impact on courts, counsel, legislatures, and executive branches.

972 Income Taxation of Business Organizations (3) Survey and comparative analysis of federal patterns of income taxation of partnerships, subchapter C corporations, subchapter S corporations, and limited liability companies; introduction to transaction analysis and business planning. Required written exercises; drafting of portions of partnership agreements, opinion letters, and legal memoranda.

973 Wealth Transfer Taxation (3) Taxation of gratuitous transfers of wealth during life (gift tax) and at death (estate tax) and of generation skipping transfers. (DE) Prerequisite or (DE) Corequisite: 935.

975 Tax Theory (3) Method and purposes of governmental revenue collection through examination of economic and political theory; comparative analysis of various actual and proposed patterns of taxation: income tax, consumption tax, sales tax, and value-added tax. Required preparation of expository essay on aspect of tax theory chosen by student.

978 Transactional Tax Planning (3) Advanced study of taxation of business organizations; tax treatment of business acquisitions, tax planning for financially troubled entities, and review of recent transactions involving cutting-edge tax planning and shaping changes in law.

979 Tax Policy Seminar (2) Advanced study of legal and tax policy issues affecting businesses and individuals; review of current tax theory and policy as well as study of recent legislation, judicial decisions, and administrative pronouncements. Required written exercises: drafting of portions of partnership agreements, opinion letters, and legal memoranda.

980 Insurance (3) Types of insurance: life, property, health, accident and liability insurance; regulation of insurance industry; interpretation of insurance contracts; insurable interest requirement; conditions, warranties and representations; coverage and exclusions; duties of agents; excess liability; subrogation; and bad faith actions against insurers. Liability insurance defense problems: duty to defend, notice and cooperation issues, and conflicts of interest.

983 Products Liability (3) Scope of doctrine and theories of recovery; potential plaintiffs and defendants; statutory and contractual limitations on recovery; damages; causation; and defenses.

985 Workers’ Compensation (3) Workers’ Compensation system for compensating victims of work-related accidents and diseases; requirements for covered employer-employee relationship; accidental injuries or occupational diseases arising out of and in course of employment; causation; nature of medical, disability, and death benefits; exclusiveness of compensation remedy against employer and co-employees; and rights and liabilities of non-employers; administrative and procedural aspects of Workers’ Compensation practice and various law reform measures.

990 Issues in the Law (3) Selected topics. Repeatability: May be repeated.

991 Issues in the Law Seminar (2) Selected topics. Repeatability: May be repeated.

993 Directed Research (1-2) Independent research and writing under direct supervision of faculty member. Proposals must be approved by the supervising faculty member and by the dean or the dean’s designee. Repeatability: May be taken a maximum of once each semester during last 2 years of study. Comment: Second-year standing required.

994 Independent Study (1-4) Independent study under direct supervision of faculty member. Proposals must be approved by the supervising faculty member and by the dean or the dean’s designee. Repeatability: May be taken a maximum of once each semester during the last 3 semesters of study.

995 Transactions: The Tennessee Journal of Business Law (1-2) Performance of duties of staff member or editor of Transactions: The Tennessee Journal of Business Law. Responsibilities vary each semester; writing of case synopsis, writing of article, and/or performing other assigned duties related to operation. Members of Transactions who are not on senior editorial board receive one hour of credit for successfully completing two consecutive semesters of service. Members of senior editorial board receive two hours of credits for each full year of satisfactory service.

996 Law Review (1) Performance of duties as staff member or editor of Tennessee Law Review. Responsibilities vary each semester as specified in Tennessee Law Review Policy Manual: writing of case note, comment or article, and/or performance of other assigned duties related to operations of Tennessee Law Review. Completion of potentially publishable comment or article for Tennessee Law Review satisfies expository writing requirement. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: Does not count toward total number of elective upper-division courses taken.

997 Moot Court (1) Participation as member of faculty-supervised interscholastic moot court competition. Repeatability: May be repeated. Credit Restriction: Does not count toward total number of elective upper-division courses taken Satisfactory/No Credit.

998 Planning and Drafting Project (1) Preparation and completion of planning and drafting project under faculty supervision in conjunction with substantive courses when such planning and drafting option is provided by course instructor. Repeatability: May be repeated.
Legal Studies (617)
430 United States Constitutional Law: Sources of Power and Restraint (3) (See Political Science 430.)
431 United States Constitutional Law: Civil Rights and Liberties (3) (See Political Science 431.)
435 Criminal Law and Procedure (3) (See Political Science 435.)
442 Administrative Law (3) (See Political Science 442.)
445 Administration of Justice (3) (See Political Science 445.)
451 Criminal Justice (3) (See Sociology 451.)
455 Society and Law (3) (See Sociology 455.)
490 Language and Law (3) (See English 490.)
496 The Rhetoric of Legal Discourse (3) (See English 496.)

Life Sciences (621)
500 Thesis (1-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 12 hours.

503 Graduate Research Participation (3-12) Special advanced research project not related to dissertation research. Topics chosen with consent of instructor.
Repeatability: May be repeated. Maximum 12 hours.

505 Research Rotation (2) Laboratory rotations with faculty member on clearly defined projects. Written proposal and oral report.
Repeatability: May be repeated. Maximum 8 hours.

507 Bioinformatics and Computational Biology (1-3) Topics to be covered include the application of computing, modeling, data analysis, and information technology to fundamental problems in the life sciences.
Repeatability: May be repeated. Maximum 12 hours.

510 Special Topics in Life Sciences (1-3) Specializations in biotechnology; cellular, molecular, and developmental biology; environmental toxicology; ethnology; plant, physiology and genetics; and physiology.
Repeatability: May be repeated. Maximum 9 hours.

515 Introduction to Genome Science and Technology I (1) Introduction to research in genome science and technology concentration.
Grading Restriction: Satisfactory/No Credit grading only.

516 Introduction to Genome Science and Technology II (1) Science and ethics of practice of science.
Grading Restriction: Satisfactory/No Credit grading only.

520 Genome Science and Technology I (4) Overview of genomics, advanced genetics principles.

521 Genome Science and Technology II (4) Analytical technologies and special techniques.

540 Colloquium (1) Invited speakers. Topics announced in advance.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 12 hours.

541 Colloquium (1) Invited speakers. Topics announced in advance.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 12 hours.

550 Mammalian Genetics and Genomics (3) Genetic variation, inheritance, phenotypic traits, molecular genetics and genomics, mutagenesis in laboratory rodents and other mammals.
(DE) Prerequisite(s): 520 and 521.

591 Foreign Study (1-15)
Repeatability: May be repeated. Maximum 15 hours.

592 Off-Campus Study (1-15)
Repeatability: May be repeated. Maximum 15 hours.

593 Independent Study (1-15)
Repeatability: May be repeated. Maximum 15 hours.

595 Special Topics in Genome Science and Technology (1-3) Tutorials or lectures in variety of special topics to be chosen by instructor.
Repeatability: May be repeated. Maximum 12 hours.

596 Special Topics in Genome Science and Technology (1-3) Tutorials or lectures in variety of special topics to be chosen by instructor.
Repeatability: May be repeated. Maximum 12 hours.

600 Doctoral Research and Dissertation (3-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

615 Journal Club in Genome Science and Technology (1) Reading and discussion based on current literature.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 12 hours.

695 Advanced Topics in Genome Science and Technology (1-3) Tutorials or lectures on variety of advanced topics to be chosen by instructor.
Repeatability: May be repeated. Maximum 12 hours.

696 Advanced Topics in Genome Science and Technology (1-3) Tutorials or lectures on variety of advanced topics to be chosen by instructor.
Repeatability: May be repeated. Maximum 12 hours.

Linguistics (623)
400 Topics in Linguistics (3) Repeatability: May be repeated. Maximum 6 hours.

411 Linguistic Anthropology (3) (See Anthropology 411.)
423 The Development of Diachronic and Synchronic Linguistics (3) Development of Western linguistic thought from the Hebrews and Greeks through modern times. Readings from Boas, Sapir, Bloomfield, and others.
(DE) Prerequisite(s): 9 hours of courses required for undergraduate linguistics concentration (300-level or above) or consent of instructor.

425 Introduction to Descriptive Linguistics (3) (See French 425.)
426 Methods of Historical Linguistics (3) (See German 426.)
429 Romance Linguistics (3) (See French 429.)
431 Topics in Hispanic Linguistics (3) (See Spanish 430.)
435 Structure of the German Language (3) (See German 435.)
436 History of the German Language (3) (See German 436.)
471 Sociolinguistics (3) (See English 471.)
472 American English (3) (See English 472.)

474 Teaching English as a Second or Foreign Language I (3) (See English 474.)
476 Second Language Acquisition (3) (See English 476.)
477 Pedagogical Grammar for ESL Teachers (3) (See English 477.)
485 Special Topics in Language (3) (See English 485.)
490 Language and Law (3) (See English 490.)

510 Special Topics (3) Repeatability: May be repeated. Maximum 6 hours.

575 Issues in Second/Foreign Language Rhetoric and Composition (3) (See English 575.)

Logistics (626)
502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

510 Statistics and Operations Management (3) (See Operations and Management Science 540.)
546 Logistics and Supply Chain Strategy (3) Development of strategy for logistics systems and supply chain processes. Executive-level integration of logistics strategy with marketing, production, finance, and other decision areas.
(DE) Prerequisite(s): 510 and Business Administration 511, 512, 513, and 514.

547 Global Logistics and Supply Chain Management (3) Logistics strategy in global firm: materials management, international sourcing and procurement, global production and distribution, import/export activity. Design and operation of supply chains in global environment.
(DE) Prerequisite(s): 510 and Business Administration 511, 512, 513, and 514.

593 Independent Study (3-6) Directed research and study.
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

599 Special Topics in Logistics (3-6) Seminar designed to study specific current problem areas in logistics. Topic announced prior to offering.
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.
Management (625)

440 Organizational Psychology (3) (See Psychology 440.)

500 Thesis (1-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

551 Leveraging Information Through Descriptive and Prescriptive Modeling (3) Concepts and tools for emulating business operations (descriptive modeling) and for determining optimal operational or tactical strategies (prescriptive modeling). Visualization, optimization, and simulation concepts reinforced through hands-on experience with technologies: geographic information systems (GIS), spreadsheet-based models, simulation packages, and supply chain optimization software.

593 Management Science Problems (1-6) Directed research on subject of mutual interest.

594 Management Science Problems (1-6) Directed research on subject of mutual interest.

600 Doctoral Research and Dissertation (3-15) Grading Restriction: P/NP only.
Repeatability: May be repeated.

614 Evolution of Logistics Thought (3) Survey of concepts, frameworks, theory, research issues, and empirical research in content areas related to logistics and supply chain management. Conceptual foundations, issue controversies, and future directions.

615 Survey of Models in Marketing and Logistics Research (3) Survey of models and methodologies and their application in logistics and marketing research, topical coverage at discretion of instructor. (See Industrial Engineering 526.)

616 Supply Chain Management Thought (3) Survey of concepts and research methods of interorganizational systems. Supply chains will be studied from multiple perspectives including the following: institutional design and structure, transaction cost economics, operations and logistics cost economics, exchange behaviors and strategies, supply chain relationship types, and evaluation of supply chain performance.

621 Network Flows (3) Treatment of network optimization algorithms, transportation and transshipment models and primal-dual and primal-dual basis tree methods.

632 Marketing (632)

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

510 Principles of Marketing Management for Non-MBA Students (3) For students from other disciplines interested in obtaining knowledge of marketing discipline at graduate level.

520 Marketing and Customer Value (3) Frameworks, techniques, and processes required for customer relationship management and demand planning in organizations. Twin problems of analyzing markets and customers and translating these analyses into actionable marketing strategies.
(De) Prerequisite(s): Business Administration 511, 512, and 513 or consent of instructor.
500 Thesis (1-15)  Grading Restriction: P/NP only.  Repeatability: May be repeated.  (DE) Prerequisite(s): MBA core.

502 Registration for Use of Facilities (1-15)  Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.  Grading Restriction: Satisfactory/No Credit grading only.  Repeatability: May be repeated.  Credit Restriction: May not be used toward degree requirements.

503 Graduate Seminar in Materials Science and Engineering (1)  Grading Restriction: Satisfactory/No Credit grading only.  Repeatability: May be repeated.  Comment(s): Admission to graduate program required.

504 Graduate Seminar in Polymer Engineering (1)  Grading Restriction: Satisfactory/No Credit grading only.  Repeatability: May be repeated.  Comment(s): Admission to graduate program required.

505 Engineering Analysis (3)  (See Chemical Engineering 505.)

507 Application of Linear Algebra in Engineering Systems (3)  (See Chemical Engineering 507.)

509 Multidisciplinary Project (1)  (Same as Industrial Engineering 509.)

511 Fundamentals of Materials Science and Engineering I (3)  Chemical bonding, structures, defects, scattering, thermodynamics, diffusion, phase diagrams, microstructures, and phase transformations.

512 Fundamentals of Materials Science and Engineering II (3)  Physical properties: electrical and thermal conduction, elementary quantum physics, band theory, dielectric materials, magnetic and optical properties, mechanical behavior: stress and strain at a point, elastic constitutive equations, phenomenological bulk behavior, and deformation mechanisms.


516 Mechanical Metallurgy (3)  Deformation and fracture of metals and alloys: dislocation theory, strengthening mechanisms, macro-scale descriptions of plasticity, fracture mechanics, fatigue, and time-dependent behavior.  (DE) Prerequisite(s): 512.

522 Defects in Crystals (3)  Analytical and experimental analysis of defect interactions in solids.  (DE) Prerequisite(s): 421 or consent of instructor.
524 Metallurgical Thermodynamics (3) Applications of chemical thermodynamics to metallurgical problems: refining, oxidation, surface treatments, alloy systems.

(DE) Prerequisite(s): 570 or equivalent.

525 Welding Metallurgy (3) Welding processes; physical metallurgy of welding; phase transformations; heat flow; residual stresses; theories of hot cracking, cold cracking and porosity formation; applications to process utilization.

(DE) Prerequisite(s): 570 or equivalent.

526 Welding Metallurgy (3) Welding processes; physical metallurgy of welding; phase transformations; heat flow; residual stresses; theories of hot cracking, cold cracking and porosity formation; applications to process utilization.

528 Ceramic Matrix Composites: Material and Mechanics (3) (See Engineering Science 528.)

531 Advanced Corrosion (3) Analyses of corrosion processes in terms of polarization measurements and Pourbaix diagram. Influence of environmental and mechanical factors contributing to pitting, crevice, fretting, and stress corrosion.

(DE) Prerequisite(s): 470 or consent of instructor.


(DE) Prerequisite(s): Course in mechanical behavior.

540 Basic Polymer Chemistry (3) Synthesis, reactions and degradation of polymers. Molecular characterization: solution methods and spectroscopy.

(DE) Prerequisite(s): Semester of organic chemistry and thermodynamics.

541 Polymer Rheology (3) Deformation and flow of polymeric materials. Development of empirical models, linear viscoelasticity and finite strain constitutive equations; material functions, temperature dependence and rheometry with applications to synthesis and processing. Elementary kine
tic theory of elastic dumbbell suspensions. (Same as Chemical Engineering 541.)

(DE) Prerequisite(s): Chemical Engineering 240 or equivalent.

542 Further Topics in Polymer Processing (3) Description and analy
sis of selected polymer processing operations.

(DE) Prerequisite(s): 541.

543 Basic Polymer Physics (3) Essential structure-property relations in materials. Physical structure of polymers. Mechanical, electrical and thermal properties.

(DE) Corequisite(s): 540.

544 Polymer Solution Thermodynamics and Characterization (3) Theories of solutions, statistical thermodynamics. Characterization, treatment of chromatography, viscosity, light scattering and osmotic pressure.

(DE) Prerequisite(s): Undergraduate physical chemistry course.

545 Polymer Engineering Processing and Characterization Labora
tory (3) Polymer film casting, film blowing, mixing and extrusion are operated and studied. Flow rates, temperatures, pressures and velocity profiles are acquired and used in finite element modeling and simulation to correlate the polymeric material properties and morphology. Support
ing instrumentation includes linear viscoelastic rheometry, capillary vis
cometry, SEM, OM, FTIR, etc. Fundamentals of processing-structure-
property relationships are documented in a literature review paper.

Registration Permission: Consent of instructor.

546 Mechanical Properties of Solid Polymers (3) Types of mechanical behavior; Hookean and rubber elasticity; plastic deformation; fracture; linear viscoelasticity; dynamic mechanical behavior and testing; loss tan
gent; experimental methods. Introduction to mechanical properties of polymeric composites.

549 Laboratory Methods in Polymer Engineering (1) Basic experimental techniques and instrumentation associated with characterization, x-ray and light scattering, calorimetry, rheometry, mechanical properties of solid polymers, polymer processing operations.

Grading Restriction: Satisfactory/No Credit grading only.

(DE) Prerequisite(s): 540 or equivalent.

550 Laboratory Methods in Polymer Engineering (2) Basic experimental techniques and instrumentation associated with characterization, x-ray and light scattering, calorimetry, rheometry, mechanical properties of solid polymers, polymer processing operations.

(DE) Prerequisite(s): 540 or equivalent.

552 Fiber Science (3) Physical properties, mechanical properties and microstructure of polymeric fibers; relation to end-use properties.

(DE) Prerequisite(s): Organic chemistry course and thermal physics course.

553 Nonwovens Science and Technology I (3) Nonwoven fabric technolo
gy; different web forming processes; and relationships among the chemical, morphological and mechanical properties of fibers and orientation in webs to final performance properties of bonded structures.

(DE) Prerequisite(s): Organic chemistry course or consent of instructor.

554 Nonwovens Science and Technology II (3) Interrelations between mechanics of production and mechanical properties of nonwoven fabrics; characterization of fiber morphology and web structure; chemistry of non
woven binders and finishes; and engineering of specific fabric properties.

(DE) Prerequisite(s): 553 or equivalent.

555 Laboratory Methods in Nonwovens Processing and Characteri
zation (3) Laboratory experience in nonwovens fabrication processes and characterization techniques. Effect of processing conditions on structure development and properties of different types of webs.

(DE) Prerequisite(s): 552 and 553.

560 Principles of Ceramic Processing (3) Treatment of ceramic pro
cessing; raw materials preparation and characterization; powder consolid
ation; drying, firing, sintering techniques, mechanisms and kinetics.

(DE) Prerequisite(s): 360 or equivalent.

570 Optical Microscopy (4) Basic compound and polarizing microscopy for imaging. Optical property measurements, and structure elucidation. Other methods of optical microscopy.

Contact Hour Distribution: 3 hours and 2 labs.

(DE) Prerequisite(s): Physics 232 and Physics 240.

572 X-Ray Diffraction (3) Symmetry of crystals, space group theory, reciprocal lattice and application to definition of structures; powder and single crystal x-ray techniques; introduction to crystal structure determina
tion; characterization of orientation; application to inorganic, metallic and polymer structures.

575 Surface Characterization (3) Analytical techniques for characteriz
ing surfaces of textile materials. Applications of well-established tech
iques: spectroscopy and microscopy.

(DE) Prerequisite(s): 552.

576 Special Topics in Materials Science and Engineering (3) Topics of current significance and interest.

Repeatability: May be repeated.

Registration Permission: Consent of instructor.


Registration Permission: Consent of faculty committee.

594 Culminating Integrated Project Report (3) (See Mechanical Engi
neering 594.)

600 Doctoral Research and Dissertation (3-15)

Grading Restriction: PINP only.

Repeatability: May be repeated.

621 Theoretical Metallurgy (3) Topics in solid state physics as applied to metallurgy; introduction to quantum theory, specific heats, electron theory of solids, electrical and thermal conductivity, magnetic properties, theories of alloy formation.

Registration Permission: Consent of instructor.

625 Materials Lifetime Science and Engineering I (3) Fundamentals of aqueous and high-temperature corrosion and fatigue; methods of mate
rials lifetime modeling.

(DE) Prerequisite(s): 531 and 532 or consent of instructor.

626 Materials Lifetime Science and Engineering II (3) Interactions be
tween corrosion and fatigue at ambient and high temperatures; lifetime modeling of materials simultaneously subjected to corrosion and fatigue.

(DE) Prerequisite(s): 625.

627 Case Studies in Materials Lifetime Science and Engineering (3) Studies of, and participation in, industrial analyses of lifetimes of structur
al materials subjected to aqueous-corrosion/fatigue and high-tempera
ture-oxidation/fatigue, performed as part of the student’s industrial and national-laboratory internship programs.

(DE) Prerequisite(s): 531 and 532 or consent of instructor.

628 Graduate Seminar in Materials Lifetime Science and Engineer
ing (1) Seminars by students, faculty, and visiting scholars on materials lifetime science and engineering; processes, mechanisms, and materials lifetime modeling.

Grading Restriction: Satisfactory/No Credit grading only.

(DE) Prerequisite(s): 531 and 532 or consent of instructor.
630 Thin Film Materials Processing (3) Students learn materials issues and thin film processing techniques used to manufacture semiconductor devices. Topics include basic vacuum technology, plasma physics, sputtering, evaporation (resistive, electron beam, laser ablation), chemical vapor deposition, and etching. The mechanisms of each process are explored and relevant material chemistries are discussed. Thin film growth models are also explained and processing variables are related to material properties.

Registration Permission: Consent of instructor.

632 Advanced Topics in Intermetallic Compounds and Composites (3) Thermodynamics, mechanical behavior, corrosion and oxidation, and modelling of intermetallic compounds and composites.

(DE) Prerequisite(s): 476 or consent of instructor.

633 Design of Intermetallic Compounds and Composites (3) Team-based design projects, including literature review, material selection, material/component design and fabrication, material properties, and theoretical modeling.

(DE) Prerequisite(s): 476 and 632 or consent of instructor.


(DE) Prerequisite(s): 552 and mechanics of materials course.

642 Advanced Topics in Polymer Processing (3) Application of theories of rheological behavior and of structure development to analysis of polymer processing operations. (Same as Chemical Engineering 642.)

(DE) Prerequisite(s): 541.

643 Phase Transformations in Polymers (3) Glass transition and glassy state; annealing of polymeric glasses; crystallization of polymers; nucleation, growth and morphology; secondary nucleation theory; solidification of copolymers; crystallization under stress.

(DE) Prerequisite(s): 543.

644 Optoelectronic Processes in Polymeric Materials (3) This course introduces fundamental molecular orbital and energy band theories and discusses (1) optical and electronic properties of polymeric materials, (2) principles of device characterization of polymeric optoelectronic devices, and (3) applications of laser spectroscopy in polymer characterization. The focus is to understand electron related processes and optoelectronic characterizations of polymeric materials and devices. The fundamentals of laser spectroscopy are also explained in determining structure-property relationships in polymer research.

(DE) Prerequisite(s): 543 or equivalent.

Registration Permission: Consent of instructor.

672 Introduction to Transmission EM and Electron Diffraction (3) Fundamentals of electron scattering, reciprocal space, the Ewald Sphere construction. Basic electron optics, operation of the transmission electron microscope TEM (includes laboratory sessions) and sample preparation. The kinematic theory of imaging of perfect and imperfect crystals in the TEM. Problems with the kinematic theory. Introduction to the dynamical theory of TEM imaging. The effect of inelastic scattering in the TEM. Fundamentals of analytical electron microscopy. The Scanning Transmission Electron Microscope (STEM) and its relation to the TEM.

(DE) Prerequisite(s): 405 or 511 or 572.

Registration Permission: Consent of instructor.

673 Introduction to Scanned Probe Microscopies (3) A survey of techniques for surface imaging and characterization. Young’s Topografiner, field emission, and the beginning of scanning tunneling microscopy (STM). Practical operation of the STM (includes laboratory sessions). Image reconstruction and interpretation in the STM, analytical STM imaging. The theory and control of feedback loops in SPM. The generalized Scanning Probe Microscope (SPM) and the Atomic Force Microscope (AFM). Theory of operation of AFM, limits to resolution, and image interpretation (includes laboratory session). Important variants of the SPM including scanning capacitance, scanning near field optical, and scanning thermal microscopes. The metrology of nanoscale structures.

Registration Permission: Consent of instructor.

676 Advanced Topics in Materials Science and Engineering (3) Latest developments and/or advanced special topics.

Repeatability: May be repeated.

Registration Permission: Consent of instructor.

678 Seminar in Recent Advances in Materials Science and Engineering (3) Directed and independent study of advanced topics.

Repeatability: May be repeated.

Registration Permission: Consent of instructor.

Mathematics (641)

400 History of Mathematics (3) Development of major ideas in mathematics from ancient to modern times and the influence of these ideas in science, technology, philosophy, art, and other areas. Includes at least one in-class essay examination and 3,000 words of writing outside class.

(DE) Prerequisite(s): 251 or 257 and 300.

403 Mathematical Methods for Engineers and Scientists (3) Matrix computations, numerical methods, partial differential equations, Sturm-Liouville Theory and special functions as used in engineering and science.

Credit Restriction: Does not satisfy major requirements for the mathematics major (Bachelor of Science or Master of Science).

(DE) Prerequisite(s): 231, 241, and familiarity with operating system and programming language.

404 Applied Vector Calculus (3) Topics from multivariable and vector calculus: line and surface integrals, divergence theorem and the theorems of Gauss and Stokes.

(DE) Prerequisite(s): 241 or 247.

405 Models in Biology (3) Difference and differential equation models of biological systems.

Credit Restriction: May not be applied toward graduate degree.

411 Mathematical Modeling (3) Construction and analysis of mathematical models used in science and industry. Projects emphasized.

(DE) Prerequisite(s): 231, 241, and 251 or 257.

421 Combinatorics (3) Introduction to problems of construction and enumeration for discrete structures such as sequences, partitions, graphs, finite fields and geometries, and experimental designs.

(DE) Prerequisite(s): 323 or consent of instructor.

423 Probability I (3) Axiomatic probability, multivariate distributions, conditional probability and expectations, methods of moment generating/characteristic functions. Laws of large numbers and central limit theorem.

(DE) Prerequisite(s): 300-level probability course or consent of instructor.

424 Probability II (3) Elements of stochastic processes: Random walk, Markov chains and Poisson processes. Other topics as selected by the instructor.

(DE) Prerequisite(s): 423.

425 Statistics (3) Derivation of standard statistical distributions: T, F and X2; independence of sample mean and variance; basic limit theorems; point and interval estimation, Bayesian estimates; statistical hypotheses, Neyman-Pearson theorem; likelihood ratio and other parametric and non-parametric tests; sufficient statistics.


(DE) Prerequisite(s): 200 or 251 or 257 or 231.

435 Partial Differential Equations (3) Separation of variables, Fourier series, solution of Laplace, wave, and heat equations.

(DE) Prerequisite(s): 231, 241 or 247.

443 Complex Variables I (3) Introduction to the theory of functions of a complex variable, including residue theory and contour integrals.

(DE) Prerequisite(s): 241 or 247.

445 Advanced Calculus I (3) Introduction to the theory of sequences, series, differentiation, and Riemann integration of functions of one or more variables.

(DE) Prerequisite(s): 241 or 247 and 300 or consent of instructor.

446 Advanced Calculus II (3) Introduction to the theory of sequences, series, differentiation, and Riemann integration of functions of one or more variables.

(DE) Prerequisite(s): 241 or 247 and 300 or consent of instructor.

447 Honors: Advanced Calculus I (3) Honors version of 445.

(DE) Prerequisite(s): 341 or consent of instructor.

448 Honors: Advanced Calculus II (3) Honors version of 446.

(DE) Prerequisite(s): 341 or consent of instructor.

453 Matrix Algebra II (3) Advanced topics in matrix theory including Jordan canonical form.

(DE) Prerequisite(s): 251 or 257.

455 Abstract Algebra I (3) Introduction to algebraic structures such as groups, rings, fields, vector spaces, and linear transformations.

(DE) Prerequisite(s): 251 or 257 and 300 or consent of instructor.

456 Abstract Algebra II (3) Introduction to algebraic structures such as groups, rings, fields, vector spaces, and linear transformations.

(DE) Prerequisite(s): 251 or 257 and 300 or consent of instructor.
457 Honors: Abstract Algebra I (3) Honors version of 455.
(DE) Prerequisite(s): 351 or consent of instructor.

458 Honors: Abstract Algebra II (3) Honors version of 456.
(DE) Prerequisite(s): 351 or consent of instructor.

460 Geometry (3) Axiomatic and historical development of neutral, Euclidean, and hyperbolic geometry stressing proof technique and critical reasoning. Models of Non-Euclidean geometries.
(DE) Prerequisite(s): 300 or consent of instructor.

461 Topology (3) Includes topology of line and plane, separation properties, compactness, connectedness, continuous functions, homeomorphisms, continua and topological invariants.
(DE) Prerequisite(s): 241 or 247 and 300 or consent of instructor.

471 Numerical Analysis (3) Introduction to computation, instabilities, and rounding. Interpolation and approximation by polynomials and piecewise polynomials. Quadrature and numerical solution of initial and boundary value problems of ordinary differential equations, stiff systems. (Same as Computer Science 471.)
(DE) Prerequisite(s): 371 or consent of instructor.

472 Numerical Algebra (3) Direct and iterative methods for systems of linear equations. Solution of single nonlinear equation and nonlinear systems. Orthogonal decomposition, least squares and algebraic eigenvalue problem. (Same as Computer Science 472.)
(DE) Prerequisite(s): 371 or consent of instructor. Recommended Background: 453.

475 Industrial Mathematics (3) Modeling, analysis, and computation applied to scientific/technical/industrial problems.
(DE) Prerequisite(s): 231 and familiarity with an operating system and a programming language (e.g. 171, 371, or Computer Science 102).

490 Readings in Mathematics (1-3) Open to superior students. Independent study with faculty guidance. Repeatability: May be repeated. Maximum 9 hours. Comment(s): Consent of faculty mentor to supervise independent work required. Registration Permission: Consent of department head.

499 Seminar in Mathematics (1-3) Topics vary. Requires out-of-class projects and in-class presentations by students. Students must register for the number of credit hours announced for a particular seminar. Repeatability: May be repeated. Maximum 9 hours. Registration Permission: Consent of instructor.

500 Thesis (1-15)
Grading Restriction: P/NP only. Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

504 Discrete Mathematics for Teachers (3) Mathematical logic and methods of argument, sets, functions and relations, combinatorics. Normally, the first graduate course for students seeking Master of Mathematics degree.
Credit Restriction(s): May not apply toward mathematics major (Master of Science).
Recommended Background: 1 year of calculus or equivalent. Comment(s): For students in Master of Mathematics program and for students in graduate programs in the College of Education, Health, and Human Sciences.

505 Analysis for Teachers (3) Development of differential and integral calculus, proofs of basic theorems.
Credit Restriction(s): May not apply toward mathematics major (Master of Science).
Recommended Background: 1 year of calculus or equivalent. Comment(s): For students in Master of Mathematics program and for students in graduate programs in the College of Education, Health, and Human Sciences.

506 Algebra for Teachers (3) Algebraic structures: integral domains and fields and their applications to algebra of integers and polynomials.
Credit Restriction(s): May not apply toward mathematics major (Master of Science).
Recommended Background: 1 year of calculus or equivalent. Comment(s): For students in Master of Mathematics program and for students in graduate programs in the College of Education, Health, and Human Sciences.

Credit Restriction(s): May not apply toward mathematics major (Master of Science).
Recommended Background: 1 year of calculus or equivalent. Comment(s): For Students in Master of Mathematics program and for students in graduate programs in the College of Education, Health, and Human Sciences.

509 Seminar for Teachers (3) Repeatability: May be repeated. Maximum 12 hours. Credit Restriction(s): May not apply toward mathematics major (Master of Science). Comment(s): For Students in Master of Mathematics program and for students in graduate programs in the College of Education, Health, and Human Sciences. Registration Permission: Consent of instructor.

(DE) Corequisite(s): 511 or 512.

511 Methods in Applied Mathematics (3) Fundamentals and techniques associated with discrete and continuous models of physical, engineering and biological systems: difference equations, networks and graphs, optimization, time series analysis, qualitative analysis of differential and delay-differential equations, and other topics.
(DE) Prerequisite(s) or (DE) Corequisite(s): 445 or 447 and 453.
(DE) Corequisite(s): 510.

512 Methods in Applied Mathematics (3) Fundamentals and techniques associated with discrete and continuous models of physical, engineering and biological systems: difference equations, networks and graphs, optimization, time series analysis, qualitative analysis of differential and delay-differential equations, and other topics.
(DE) Prerequisite(s) or (DE) Corequisite(s): 445 or 447 and 453.
(DE) Corequisite(s): 510.

(DE) Prerequisite(s): 431, 435, and 445 and 444 or 404 or consent of instructor.

(DE) Prerequisite(s): 431, 435, and 445 and 446 or 404 or consent of instructor.

515 Analytical Applied Mathematics (3) Analysis of advanced techniques in modern context for applied problems: dimensional analysis and scaling, perturbation theory, variational approaches, transform theory, wave phenomena and conservation laws, stability and bifurcation, distributions, integral equations.
(DE) Prerequisite(s): 446 or 448, 453, and either 511 and 512 or 431 and 435.

516 Analytical Applied Mathematics (3) Analysis of advanced techniques in modern context for applied problems: dimensional analysis and scaling, perturbation theory, variational approaches, transform theory, wave phenomena and conservation laws, stability and bifurcation, distributions, integral equations.
(DE) Prerequisite(s): 446 or 448, 453, and either 511 and 512 or 431 and 435.

517 Mathematical Methods in Physics I (3) (See Physics 571.)
518 Mathematical Methods in Physics II (3) (See Physics 572.)

519 Seminar in Applied Mathematics (1-3) Repeatability: May be repeated. Maximum 12 hours.

521 Enumerative Combinatorics (3) Sieve methods, recursion, generating functions, and permutation groups applied to enumeration of discrete structures. Incidence algebras and combinatorics of partially ordered sets.

522 Enumerative Combinatorics (3) Sieve methods, recursion, generating functions, and permutation groups applied to enumeration of discrete structures. Incidence algebras and combinatorics of partially ordered sets.

523 Probability (3) Pertinent facts from measure theory, definition of abstract probability spaces; Kolmogorov's existence theorem; series of independent random variables and laws of large numbers; general theory of distributions of random vectors and their characteristic functions; weak convergence concept, weak compactness and Levy's continuity theorem in Euclidean spaces; infinitely divisible distributions and central limit problem; general concept and properties of conditional expectation, martingales, Doob's martingale and optional sampling theorems.
(DE) Prerequisite(s): 445 and 446. Recommended Background: 423.
524 Probability (3) Pertinent facts from measure theory, definition of abstract probability spaces; Kolmogorov’s existence theorem; series of independent random variables and laws of large numbers; general theory of distributions of random vectors and their characteristic functions; weak convergence concept, weak compactness and Levy’s continuity theorem in Euclidean spaces; infinitely divisible distributions and central limit problem; general concepts and properties of conditional expectation, martingales, Doob’s martingale and optional sampling theorems.

(DE) Prerequisite(s): 445 and 446.
Recommended Background: 423.

525 Statistics (3) Pertinent facts from probability theory; formulation of statistical models; sufficiency, Fisher-Neyman factorization theorem, exponential families, Bayesian models; methods of estimation and optimality theory; uniform minimum variance unbiased estimates, asymptotic efficiency and optimality; the confidence procedures and hypothesis testing; optimal tests and confidence intervals, the Neyman-Pearson lemma, uniformly most powerful tests; general linear models, estimation and tests in linear models; non-parametric models, rank methods for comparison, linear regression and independence, robust tests; topics from decision theory.

(DE) Prerequisite(s): 445 and 446.
Recommended Background: 425.

526 Statistics (3) Pertinent facts from probability theory; formulation of statistical models; sufficiency, Fisher-Neyman factorization theorem, exponential families, Bayesian models; methods of estimation and optimality theory; uniform minimum variance unbiased estimates, asymptotic efficiency and optimality; the confidence procedures and hypothesis testing; optimal tests and confidence intervals, the Neyman-Pearson lemma, uniformly most powerful tests; general linear models, estimation and tests in linear models; non-parametric models, rank methods for comparison, linear regression and independence, robust tests; topics from decision theory.

(DE) Prerequisite(s): 445 and 446.
Recommended Background: 425.

527 Stochastic Modeling (3) Models in probability applied to real world situations; queuing theory; branching processes; Monte Carlo simulation.

(DE) Prerequisite(s): 445 and 446 or consent of instructor.

529 Seminar in Stochastics (1-3)
Repeatability: May be repeated. Maximum 12 hours.


(DE) Prerequisite(s): 231, 251, 445, and 446.


(DE) Prerequisite(s): 231, 251, 445, and 446.

534 Calculus of Variations (3) Necessary conditions for extrema. Euler’s equation, broken extremals, Weierstrass-Erdmann conditions. Sufficient conditions for extrrema-Legendre’s and Jacobi’s conditions, conjugate points. Multiple integrals.

(DE) Prerequisite(s): 431.

535 Partial Differential Equations (3) First order equations, classification of equations and properties of elliptic, hyperbolic, and parabolic equations in several variables.

(DE) Prerequisite(s): 445, 446, and 231 or consent of instructor.

536 Partial Differential Equations (3) First order equations, classification of equations and properties of elliptic, hyperbolic, and parabolic equations in several variables.

(DE) Prerequisite(s): 445, 446, and 231 or consent of instructor.

537 Mathematical Principles of Continuum Mechanics (3) Conservation principles, equations of equilibrium and motion for fluids and elastic solids, constitutive relations and stress, convexity properties, bifurcation phenomena, existence theory.

(DE) Prerequisite(s): 431, 435, and 446 or 448 or consent of instructor.

538 Mathematical Principles of Continuum Mechanics (3) Conservation principles, equations of equilibrium and motion for fluids and elastic solids, constitutive relations and stress, convexity properties, bifurcation phenomena, existence theory.

(DE) Prerequisite(s): 431, 435, and 446 or 448 or consent of instructor.

539 Seminar in Differential Equations (1-3)
Repeatability: May be repeated. Maximum 12 hours.
Registration Permission: Consent of instructor.

545 Real and Complex Analysis (3) Measure theory, Lebesgue integration, Hölder and Minkowski inequalities, Radon-Nikodym theorem, Fubini’s theorem, holomorphic functions, Cauchy’s theorem, Maximum Modulus theorem, Schwarz’s lemma, normal families, Riemann mapping theorem.

(DE) Prerequisite(s): 445 and 446.

546 Real and Complex Analysis (3) Measure theory, Lebesgue integration, Hölder and Minkowski inequalities, Radon-Nikodym theorem, Fubini’s theorem, holomorphic functions, Cauchy’s theorem, Maximum Modulus theorem, Schwarz’s lemma, normal families, Riemann mapping theorem.

(DE) Prerequisite(s): 445 and 446.

547 Applied Linear Analysis (3) Banach and Hilbert spaces, linear operators and spectral theory with applications to integral and differential equations, optimization, numerical analysis, and quantum mechanics, Sobolev spaces and embedding theorems.

(DE) Prerequisite(s): 445 and 446.

548 Applied Linear Analysis (3) Banach and Hilbert spaces, linear operators and spectral theory with applications to integral and differential equations, optimization, numerical analysis, and quantum mechanics, Sobolev spaces and embedding theorems.

(DE) Prerequisite(s): 445 and 446.

549 Seminar in Analysis (1-3)
Repeatability: May be repeated. Maximum 12 hours.

551 Modern Algebra (3) Groups, rings, modules and linear algebra, fields and Galois theory.

(DE) Prerequisite(s): 551 and 552 or consent of instructor.
Comment(s): 551 and 552 must be taken in sequence.

552 Modern Algebra (3) Groups, rings, modules and linear algebra, fields and Galois theory.

(DE) Prerequisite(s): 455 and 456 or consent of instructor.
Comment(s): 551 and 552 must be taken in sequence.

553 Linear Programming (3) Theory and applications.

(DE) Prerequisite(s): 43 or consent of instructor and programming ability.

554 Nonlinear Programming (3) Theory and applications.

(DE) Prerequisite(s): 553.
Recommended Background: 445 and 446.

555 Number Theory (3) Introduction to algebraic number theory.

(DE) Prerequisite(s): 455 and 456 or consent of instructor.

556 Number Theory (3) Introduction to algebraic number theory.

(DE) Prerequisite(s): 455 and 456 or consent of instructor.

559 Seminar in Algebra (1-3)
Repeatability: May be repeated. Maximum 12 hours.
Registration Permission: Consent of instructor.


567 Differential Geometry (3) Classical differential geometry in two and higher dimensions: curves and surfaces in Euclidean space, Gauss map, curvature, Gauss-Bonnet theorem, hyperbolic geometry. Manifolds and Riemannian metrics; connections, geodesics, Jacobi fields, sectional curvature. Differential forms and moving frames.

(DE) Prerequisite(s): 445 and 446 or consent of instructor.

568 Differential Geometry (3) Classical differential geometry in two and higher dimensions: curves and surfaces in Euclidean space, Gauss map, curvature, Gauss-Bonnet theorem, hyperbolic geometry. Manifolds and Riemannian metrics; connections, geodesics, Jacobi fields, sectional curvature. Differential forms and moving frames.

(DE) Prerequisite(s): 445 and 446 or consent of instructor.

569 Seminar in Topology (1-3)
Repeatability: May be repeated. Maximum 12 hours.


(DE) Prerequisite(s): 445, 446, 453, 471, and 472.
572 Numerical Mathematics (3) Direct and iterative methods for linear systems. The algebraic eigenvalue problem and the singular decomposi-
tion theorem. Newton and quasi-Newton methods for systems of nonlin-
ear equations. Numerical techniques for initial value problems of ordinary differential equations. Two-point boundary value problems. Finite differ-
ence and finite element methods for selected partial differential equa-
tions. Fast Poisson solvers. (Same as Computer Science 572.)
(PE) Prerequisite(s): 445, 446, 453, 471, and 472.

574 Finite Element Methods (3) Finite element techniques for solution of bound-
ary and initial-boundary value problems. Variational formulation. Finite
dimensional subspaces and their approximating properties; rates of conver-
gence. Computer implementation. (Same as Computer Science 574.)
(PE) Prerequisite(s): 445, 471, and either 453 or 472.
Recommended Background: 445, 446, and 573.

575 Matrix Theory and Techniques in Numerical Analysis (3) Ad-
vanced topics in study of iterative and direct methods for large systems of linear equations: sparse matrix analysis, relationship to modern com-
puter architectures. (Same as Computer Science 575.)
Repeatability: May be repeated. Maximum 9 hours.
(PE) Prerequisite(s): 435, 471, and 472 or consent of instructor.

577 Optimization (3) Major topics in optimization with problems de-
veloped from real-world applications including constrained and uncon-
strained optimization with analysis of major algorithms and utilization of appropriate software.
(PE) Prerequisite(s): 453, 445, 446, and a numerical algorithms course.

578 Numerical Methods for Partial Differential Equations (3) Numer-
ical approximation of solutions of partial differential equations including
conservation laws and hyperbolic, parabolic, and elliptic problems. Der-
ivation, physical meaning, and implementation of schemes.
(PE) Prerequisite(s): 435 or 512 or 515, and a Fortran or C course or consent of instructor.

579 Seminar in Numerical Mathematics (1-3)
Repeatability: May be repeated. Maximum 12 hours.

581 Mathematical Ecology (3) Deterministic and stochastic models of popu-
lations, communities, and ecosystems. (Same as Ecology and Evolu-
tionary Biology 581.)
(PE) Prerequisite(s): 431 and 453 or consent of instructor.

582 Mathematical Ecology (3) Deterministic and stochastic models of popu-
lations, communities, and ecosystems. (Same as Ecology and Evolu-
tionary Biology 582.)
(PE) Prerequisite(s): 431 and 453 or consent of instructor.

583 Mathematical Evolutionary Theory (3) Population genetics and evolu-
tionary ecology. (Same as Ecology and Evolutionary Biology 585.)
(PE) Prerequisite(s): 431 and 453 or consent of instructor.

585 Optimal Control Theory (3) Deterministic optimal control. Exam-
iples involving calculus of variations, optimal trajectories, and engineering control problems. Introduction to stochastic control.
(PE) Prerequisite(s): 431, 445, and 446 or consent of instructor.

589 Seminar in Mathematical Ecology (1-3)
Repeatability: May be repeated. Maximum 12 hours.

593 Independent Study (1-12)
Repeatability: May be repeated. Maximum 12 hours.

598 Graduate Reading in Mathematics (1-3) Independent study with fac-
tulty guidance.
Repeatability: May be repeated. Maximum 6 hours.
Comment(s): Graduate standing required.
Registration Permission: Consent of instructor.

599 Seminar in Mathematical Presentations (1)

600 Doctoral Research and Dissertation (3-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

617 Lie Algebras in Mechanics and Physics (3) Analytical tools of me-
chanics and physics arising from differentiable manifolds, tensors, Lie
derivatives, Lie groups, differential forms, Lie algebras, applications to Hamiltonian mechanics, adiabatic and barotropic fluids and plasmas, nu-
merical methods in continuum mechanics.
(PE) Prerequisite(s): 431, 435, 547, 571, and 572.

619 Seminar in Applied Mathematics (1-3)
Repeatability: May be repeated. Maximum 12 hours.

623 Advanced Probability (3) Selected topics in modern theory of prob-
ability and stochastic processes: Ito’s calculus and stochastic differential
equations, integration prediction theory, ergodic theory, probability on al-
gebraic structures, limit theorems, geometry and probability in Banach
spaces, probability methods in analysis.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 523 and 524 or consent of instructor.

624 Advanced Probability (3) Selected topics in modern theory of prob-
ability and stochastic processes: Ito’s calculus and stochastic differential
equations, integration prediction theory, ergodic theory, probability on al-
gebraic structures, limit theorems, geometry and probability in Banach
spaces, probability methods in analysis.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 523 and 524 or consent of instructor.

629 Seminar in Combinatorics (1-3)
Repeatability: May be repeated with consent of department. Maximum 12 hours.

631 Advanced Ordinary Differential Equations (3) Theory of ordinary
differential equations from advanced viewpoint. Topics from current liter-
ature. Subject matter varies according to interests and preparations of students.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 531 and 532 or consent of instructor.

632 Advanced Ordinary Differential Equations (3) Theory of ordinary
differential equations from advanced viewpoint. Topics from current liter-
ature. Subject matter varies according to interests and preparations of students.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 531 and 532 or consent of instructor.

635 Advanced Partial Differential Equations (3) Selected topics in classical and modern theoretical partial differential equations.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 545 and 546 or 547 and 548.
Registration Permission: Consent of instructor.

636 Advanced Partial Differential Equations (3) Selected topics in classical and modern theoretical partial differential equations.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 545 and 546.

641 Functional Analysis (3) Topological vector spaces, distributions, and
Banach algebras with applications to Fourier analysis and differen-
tial equations: theorems of Krein-Milman, Paley-Wiener, Lax, Malgrange-
Ehrenpreis, Gelfand-Naimark, and spectral theory of normal operators.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 545 and 546.

642 Functional Analysis (3) Topological vector spaces, distributions, and
Banach algebras with applications to Fourier analysis and differen-
tial equations: theorems of Krein-Milman, Paley-Wiener, Lax, Malgrange-
Ehrenpreis, Gelfand-Naimark, and spectral theory of normal operators.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 545 and 546.

643 Harmonic Analysis (3) Fourier series and Fourier transforms on Eu-
clidean spaces or topological groups: convergence, summability, unique-
ness, inversion, duality, Plancherel transform, Hilbert transform, Hardy-
Littlewood maximal function, interpolation of operators, or Fefferman-
Stein duality.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 545 and 546.

644 Harmonic Analysis (3) Fourier series and Fourier transforms on Eu-
clidean spaces or topological groups: convergence, summability, unique-
ness, inversion, duality, Plancherel transform, Hilbert transform, Hardy-
Littlewood maximal function, interpolation of operators, or Fefferman-
Stein duality.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 545 and 546.

649 Seminar in Analysis (1-3)
Repeatability: May be repeated with consent of department. Maximum 12 hours.

651 Advanced Modern Algebra (3) Selected topics in modern algebra or number theory.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 551 and 552 or consent of instructor.

652 Advanced Modern Algebra (3) Selected topics in modern algebra or number theory.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(PE) Prerequisite(s): 551 and 552 or consent of instructor.

659 Seminar in Algebra (1-3)
Repeatability: May be repeated with consent of department. Maximum 12 hours.

661 Modern Topology (3) Technical background to current literature in
topology. Topics vary.
Repeatability: May be repeated with consent of department. Maximum 12 hours.

662 Modern Topology (3) Technical background to current literature in
topology. Topics vary.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
663 Algebraic Topology (3) Homology, cohomology and homotopy theories: duality theorems and Hurewicz isomorphism theorem.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(DE) Prerequisite(s): One year of abstract algebra, 561, 562, 455 and 456 or 551 and 552.

664 Algebraic Topology (3) Homology, cohomology and homotopy theories: duality theorems and Hurewicz isomorphism theorem.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(DE) Prerequisite(s): One year of abstract algebra, 561, 562, 455 and 456 or 551 and 552.

667 Advanced Differential Geometry (3) Selected topics from Riemannian geometry and analysis on manifolds: Lie groups, metric geometry, spectrum of Laplacian, Hodge Theory, variational problems, curvature and topology of manifolds.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(DE) Prerequisite(s): 567 and 568 or consent of instructor.

668 Advanced Differential Geometry (3) Selected topics from Riemannian geometry and analysis on manifolds: Lie groups, metric geometry, spectrum of Laplacian, Hodge Theory, variational problems, curvature and topology of manifolds.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(DE) Prerequisite(s): 567 and 568 or consent of instructor.

669 Seminar in Topology (3)
Repeatability: May be repeated with consent of department. Maximum 12 hours.

673 Advanced Topics in Numerical Partial Differential Equations (3)
Theoretical aspects of finite difference and finite element methods for initial and boundary value problems.
Repeatability: May be repeated with consent of department. Maximum 12 hours.
(DE) Prerequisite(s): 547, 548, 573, and 574.

679 Seminar in Numerical Mathematics (1-3)
Repeatability: May be repeated with consent of department. Maximum 12 hours.

681 Advanced Mathematical Ecology (3) Selected topics in theoretical and applied mathematical ecology: population, community, ecosystem ecology and applied topics such as demography, ecototoxicology, epidemiology, environmental change, and resource management. (Same as Ecology and Evolutionary Biology 681.)
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): 581 and 582.

682 Advanced Mathematical Ecology (3) Selected topics in theoretical and applied mathematical ecology: population, community, ecosystem ecology and applied topics such as demography, ecototoxicology, epidemiology, environmental change, and resource management. (Same as Ecology and Evolutionary Biology 682.)
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): 581 and 582.

Mathematics Education (642)

485 Teaching Mathematics, Grades 7-12 (3) Preparation of teaching plans, evaluation, materials for teaching mathematics; teaching simulation and directed observation in schools.
Comment(s): Admission to teacher education required.

522 Programs and Materials in School Mathematics (3) Examination, development and use of materials for creating an active learning environment for learning mathematics for all ages.

523 Diagnosis and Correction of Children’s Difficulties in Learning Mathematics (3) Children’s difficulties in learning mathematics and procedures for helping classroom teachers correct difficulties.
(DE) Prerequisite(s): 522 or consent of instructor.

530 Teaching Mathematics to Young Children: K-4 (3) Unit planning, daily planning, grouping and other strategies of teaching mathematics. Course is for those with little preparation in teaching elementary school mathematics.

543 Teaching Mathematics in Middle School: 5-8 (3) Unit planning, daily planning, grouping and other strategies of teaching mathematics. Course is for those with little preparation in teaching elementary school mathematics.


581 Mathematics Curriculum (3) Past, present and future issues influencing mathematics curriculum in schools, elementary through college. Teacher’s role in curriculum development and implementation. Rationales for curriculum decisions.

583 Teaching Mathematics in Senior High Schools and Community Colleges (3) Topics appropriate for high school and community/junior college mathematics curriculum. Special problems related to enrichment, problem solving, and use of microcomputers. Opportunities for special projects.

622 Research Trends in Mathematics Teacher Education (3) Analysis of current research trends in mathematics teacher education and impact of current research on development of teachers both pre-service and in-service.
(DE) Prerequisite(s): Minimum 9 hours of 500-level mathematics education courses.

683 Advanced Studies in Mathematics Education (3) Analysis of current research in mathematics education and implications of research for classroom practice.
(DE) Prerequisite(s): 2 graduate courses in mathematics education.

Mechanical Engineering (650)
Not all the courses listed below are available at both the University of Tennessee, Knoxville, and UTSI campuses.

449 Mechanical Engineering Laboratory (3) Designing, conducting and reporting results of experimental exercises. Test standards and specifications. Analysis of data and formation of conclusions.
(DE) Prerequisite(s): 344 and 345.

451 Control Systems (3) Analysis and design of feedback control systems using transient and frequency response techniques, stability analysis in the time and frequency domain.
(DE) Prerequisite(s): 363.

452 Finite Element Analysis (3) Conversion of fundamental conservation principles in mechanics to simulation form via finite element implementation; applications in heat transfer, solid mechanics, mechanical vibrations, fluid mechanics and heat/mass transport. Extensive computer lab experiments using Matlab-based and commercial software systems.
(DE) Prerequisite(s): 321, 344, and 363.

466 Elements of Machine Design II (3) Application of strength and properties of materials, design factors, theories of failure to design of machine elements. Mini-design experiences.
(DE) Prerequisite(s): 321 and Materials Science and Engineering 201.

475 Thermal Engineering (3) Thermal systems with emphasis on turbo-machinery, heat exchangers, gas-vapor mixtures and psychrometry, fuels and combustion; chemical equilibrium; system analysis and design.
(DE) Prerequisite(s): 344.

483 Introduction to Reliability Engineering (3) (See Nuclear Engineering 483.)

484 Introduction to Maintainability Engineering (3) (See Nuclear Engineering 484.)

494 Selected Topics in Mechanical Engineering (1-4) Problems and topics related to developments and practice in mechanical engineering. Repeatability: Not Repeatable. May be taken once for 1-4 hours. Registration Permission: Consent of instructor.

495 Selected Topics in Mechanical Engineering (1-4) Problems and topics related to developments and practice in mechanical engineering. Repeatability: Not Repeatable. May be taken once for 1-4 hours. Registration Permission: Consent of instructor.

500 Thesis (1-15)
Grading Restriction: P/np only.
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or facilities before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Credit Restriction: May not be used toward degree requirements.

504 Product Development Process (1) Basic elements in product development process and project management. Business and engineering interfaces to development and commercial manufacturing of new products. Multidisciplinary teams to explore possible new product opportunities. (Same as Industrial Engineering 504.)
Registration Permission: Consent of instructor.

(DE) Prerequisite(s): Electronics and computer circuits course.
Registration Permission: Consent of instructor.
506 Product Selection and Evaluation (2) Development of operational requirements and features for new product having potential for business venture. Market potential, design feasibility and manufacturing requirements. Design alternatives created and evaluated against set of performance requirements determined from market analysis. Preferred product concept selected by end of semester. (Same as Industrial Engineering 506.)

(DE) Prerequisite(s): 504.

507 Application of Linear Algebra in Engineering Systems (3) (See Chemical Engineering 507.)

508 Integrated Product, Process and Manufacturing System Design (3) (See Industrial Engineering 508.)

509 Multidisciplinary Project (1) (See Industrial Engineering 509.)

510 Prototype Development and Evaluation (3) Prototype of selected product made and tested against required operating conditions. Design changes implemented to meet customer's needs. Fabrication drawings and manufacturing plans finalized for introduction of product to market-place. Prototype development managed using project management plan. (DE) Prerequisite(s): 555.


512 Heat Transfer II (3) Analysis of steady-state and time-dependent heat conduction by numerical methods. Analysis of laminar and turbulent convection heat transfer in internal and external flows, forced and buoyancy driven flows. (DE) Prerequisite(s): 541.

514 Phase Change Transfer Heat Transfer (3) Mechanisms and modeling of nucleate, transition and film boiling processes; critical heat flux; forced convection boiling and post dry-out heat transfer; condensation processes; heterogeneous nucleation; dropwise and filmwise condensation; flow condensation; liquid-solid phase change processes; moving phase fronts; mathematical modeling. (DE) Prerequisite(s): 344 and 511.


519 Technology Product Development and Entrepreneurship (3) Technology and innovation, technology transfer, patent protection, legal formation and intellectual property, knowledge management, generation, and transmission, launching a technology based business, sources of capital, small business growth and operation. Multidisciplinary teams will develop a business plan based on a technological product. (DE) Prerequisite(s): 506 or consent of instructor.

521 Thermodynamics I (3) Macroscopic thermodynamics, including First and Second Law analyses, availability, phase and chemical equilibrium criteria, combustion, gas mixtures, and property relations, determination of thermodynamic properties from molecular structure, spectroscopic data, kinetic theory, statistical mechanics, quantum physics, Schroedinger equation. (DE) Prerequisite(s): 332.

522 Thermodynamics II (3) Macroscopic thermodynamics, including First and Second Law analyses, availability, phase and chemical equilibrium criteria, combustion, gas mixtures, and property relations, determination of thermodynamic properties from molecular structure, spectroscopic data, kinetic theory, statistical mechanics, quantum physics, Schroedinger equation. (DE) Prerequisite(s): 332.

523 Special Topics in Thermodynamics (3) Application of thermodynamics to topics of current interest in mechanical engineering. Registration Permission: Consent of instructor.

525 Combustion and Chemically Reacting Flows I (3) Fundamentals; thermochemistry, chemical kinetics and conservation equations; phenomenological approach to laminar flames; diffusion and premixed flame theory; single droplet combustion; deflagration and detonation theory; stabilization of combustion waves in laminar streams; flammability limits of premixed laminar flames; introduction to turbulent flames. (DE) Prerequisite(s): 522 and 541 or consent of instructor.

526 Combustion and Chemically Reacting Flows II (3) Advanced topics: phenomenological approaches to turbulent flames; fundamentals of turbulent flow; application of probability density functions to turbulent flames; turbulent reacting flows with premixed and/or non-premixed reactants; spray combustion models; fluidized bed combustion; chemically reacting boundary layer flow; gas turbine and/or rocket motor combustors; furnaces; introduction to supersonic combustion and hypersonic flows. (DE) Prerequisite(s): 525.

527 Thermal Systems Analysis I (3) Application of basic principles of heat transfer, fluid mechanics, and thermodynamics to develop solution models for parametric analysis of thermal systems problems via commercial software. (DE) Prerequisite(s): 344.


531 Advanced Biomechanics I (3) (See Biomedical Engineering 531.)

533 Dynamics (3) Kinematics and dynamics of particles in three dimensions. Rotating coordinate systems. Hamilton's principle. Lagrange's equations of motion. Kinematics and dynamics of rigid bodies. (Same as Aerospace Engineering 533; Engineering Science 533.) (DE) Prerequisite(s): 391 or Mathematics 431 and an undergraduate vibrations course.

534 Mechanical Vibrations (3) Vibrations of linear, discrete, undamped and damped systems. Lagrange's equations for holonomic systems. Modal analysis. Laplace transform. Response to mechanical transients. (Same as Aerospace Engineering 535; Biomedical Engineering 534; Engineering Science 534.) (DE) Prerequisite(s): An undergraduate vibrations course.

537 Mechanical Systems Analysis (3) Application of basic principles of rigid body dynamics, strength of materials, and continuum mechanics to development of models for parametric analysis of mechanical systems using commercial software. (DE) Prerequisite(s): 231 and 321.

539 Continuum Mechanics (3) (See Engineering Science 539.)


541 Fluid Mechanics I (3) Derivation of equations governing flow of incompressible and viscous fluids (conservation of mass, Newton's second law, conservation of energy). Equations of state and constitutive relations. Euler and Navier-Stokes forms and nondimensionalization. Exact solutions and introduction to potential and boundary-layer flows. (Same as Aerospace Engineering 541; Biomedical Engineering 541; Engineering Science 541.) (DE) Prerequisite(s): A fluid mechanics course.

542 Fluid Mechanics II (3) Equations of viscous fluid flows. Basic concepts and equations of turbulent flow. Separation, stability and transition. Laminar and turbulent boundary-layer flows. Exact, approximate, and numerical solutions. (Same as Aerospace Engineering 542; Engineering Science 542.) (DE) Prerequisite(s): 541.

547 Advanced Linear Control (3) Multivariable feedback systems; transfer function and state-space techniques; stability of linear systems; actuator and sensor; control system design. (DE) Prerequisite(s): 507 or equivalent.

551 Mechanical Engineering Design (3) Design of mechanical engineering devices and systems. Registration Permission: Consent of instructor.

552 Mechanical Engineering Design (3) Design of mechanical engineering devices and systems. Registration Permission: Consent of instructor.

555 Human Vibrations Analysis and Protection (3) (See Biomedical Engineering 555.)
559 Advanced Mechanics of Materials I (3) Elasticity in three dimensions: equations of equilibrium, strain-displacement relations, compatibility, constitutive equations. Energy methods. Beams on elastic foundation, unsymmetrical bending, shear center, beam-columns, buckling, plastic collapse. (Same as Aerospace Engineering 559; Biomedical Engineering 559; Engineering Science 559.)

(De) Prerequisite(s): 321.

561 Finite Elements for Engineering Applications (3) (See Engineering Science 551.)

562 Computational Fluid-Thermal Systems (3) (See Engineering Science 552.)

563 Computational Solid Mechanics (3) (See Engineering Science 553.)


(De) Prerequisite(s): 321 and 363 or consent of instructor.

577 Neural Networks in Engineering (3) (See Nuclear Engineering 577.)

581 Rocket Propulsion I (3) Rocket propulsion fundamentals; thermodynamics of nonreacting and chemically reacting ideal gases, rocket nozzle design; ideal rocket performance parameters; rocket heat transfer; chemistry of propellants; liquid rocket engine systems; ground testing; introduction to solid propellant rockets.

Registration Permission: Consent of instructor.

582 Rocket Propulsion II (3) Solid propellant rocket performance, homogeneous and heterogeneous propellant chemistry and combustion system; performance; thermal decomposition and gas phase reaction models; effect of chamber pressure and additives on solid propellant burn rates, erosive burning; analysis of two-phase solid rocket exhaust flow. Introduction to nuclear and electric propulsion; electrical resistance and electric field (ion) engine performance, magnetohydrodynamic thrusters, traveling wave thrusters; exotic propulsion systems.

Registration Permission: Consent of instructor.

584 Turbomachinery Systems I (3) Ideal cycle analysis of turbine engines, real cycle analysis, component performance analysis, component design and systems integration (inlets, nozzles, combustors, compressors, turbines), flowthrough theory, engine component matching, transient operation, surge and rotating stall, engine control systems, structural considerations.

Comment(s): First-year graduate standing required.

Registration Permission: Consent of instructor.

585 Turbomachinery Systems II (3) Ideal cycle analysis of turbine engines, real cycle analysis, component performance analysis, component design and systems integration (inlets, nozzles, combustors, compressors, turbines), flowthrough theory, engine component matching, transient operation, surge and rotating stall, engine control systems, structural considerations.

Comment(s): First-year graduate standing required.

Registration Permission: Consent of instructor.

586 Mechanics and Control of Robotic Manipulators (3) Fundamentals of robotic manipulation: kinematics and dynamics of manipulators, control systems design, trajectory planning, advanced force and impedance control strategies.

(De) Prerequisite(s): 451 and 533.

587 Dynamic Modeling and Simulation (3) Modeling and analysis of physical systems. Systems and parameter identification. Mathematical modeling methods: approximations, digital simulation techniques and practices. Design and control applications. (Same as Biomedical Engineering 587.)

(De) Prerequisite(s): 363.

588 Introduction to Hybrid Electric Vehicles (3) Series, parallel, and dual configurations. Sizing and analysis of typical HEV components: motors, auxiliary power sources, on-board energy storage, and fuels. Steady-state HEV force and power modeling schemes. Power train design using various computer simulation tools.

Registration Permission: Consent of instructor.

589 Hybrid Electric Vehicle Control Systems Design and Analysis (3) Dynamic modeling, simulation and analysis of complete hybrid electric vehicle systems. Linear control design techniques and discrete logic design applied to HEV power trains and operating mode controls. Digital and real-time control and hardware issues of automotive systems. Design and human factors engineering issues of vehicle controls and displays.

(De) Prerequisite(s): 588 or consent of instructor.

590 Selected Engineering Problems (2-6)

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated.

Comment(s): Enrollment limited to students in the problems option.

Registration Permission: Consent of advisor.

594 Culminating Integrated Project Report (3) Final phase of product development process. Multidisciplinary teams submit and defend comprehensive project report. Report includes all engineering and business considerations needed to convince potential investors to fund proposed business venture. (Same as Chemical Engineering 594; Electrical and Computer Engineering 594; Industrial Engineering 594; Materials Science and Engineering 594; Nuclear Engineering 594.)

Registration Permission: Consent of instructor.

595 Seminar (1) All phases of mechanical engineering, reports on current research at the University of Tennessee, Knoxville, and the University of Tennessee Space Institute.

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated.

599 Special Topics in Mechanical Engineering (1-3)

Repeatability: May be repeated. Maximum 6 hours.

Registration Permission: Consent of instructor.

600 Doctoral Research and Dissertation (3-15)

Grading Restriction: P/NP only.

Repeatability: May be repeated.

610 Advanced Topics in Thermal/Fluid Science (3) Advanced theory and applications in the thermal/fluid sciences.

Repeatability: May be repeated. Maximum 9 hours.

Registration Permission: Consent of instructor.

613 Advanced Radiation Heat Transfer (3) Radiation heat transfer in absorbing, emitting and scattering media; interaction of thermal radiation with conduction and convection heat transfer.

(De) Prerequisite(s): 511 and 512.

615 Engineering Optics and Optical Techniques (3) Closely related optical theories to engineering applications for advanced optical measurements and diagnostic techniques. This course also provides knowledge for engineers in the areas of micro/nano/bio-fluidics and energy transport using and developing optical techniques.

Registration Permission: Consent of instructor.

621 Advanced Topics in Solid Mechanics (3) Advanced theory and applications in mechanics, dynamics, vibrations, and strength of materials.

Repeatability: May be repeated. Maximum 9 hours.

Registration Permission: Consent of instructor.

631 Advanced Biomechanics II (3) (See Biomedical Engineering 631.)

642 Advanced Topics in Thermodynamics (3) Comparison of macroscopic and microscopic approach; equilibrium of pure substances, metastable states. Non-equilibrium thermodynamics.

Registration Permission: Consent of instructor.


(De) Prerequisite(s): 540 and 542.

647 Nonlinear Control Systems (3) Qualitative behavior of nonlinear systems; Lyapunov stability theory; passivity and absolute stability theory; frequency domain methods; nonlinear feedback systems; nonlinear design techniques.

(De) Prerequisite(s): 547 or Electrical and Computer Engineering 512.

651 Advanced Topics in Computational Fluid Dynamics (3) (See Engineering Science 651.)

652 Advanced Topics in Computational Fluid Dynamics (3) (See Engineering Science 652.)

653 Advanced Topics in Computational Solid Mechanics (3) (See Engineering Science 653.)

654 Advanced Topics in Computational Solid Mechanics (3) (See Engineering Science 654.)

659 Advanced Mechanics of Materials II (3) Plane stress and plane strain in rectangular and polar coordinates; stress functions. Torsion of noncircular sections. Disks, thick-walled tubes, thick-walled pressure vessels. Theory of rectangular and circular plates, plates with holes, axisymmetric shells. Stress concentrations. (Same as Aerospace Engineering 659; Biomedical Engineering 659; Engineering Science 659.)

(De) Prerequisite(s): 559 or consent of instructor.
### 661 Advanced Vibrations (3)
Analysis of linear and nonlinear single degree of freedom systems. Random vibration. Mechanical transients.

(DE) Prerequisite(s): 534.

### 671 Advanced Topics in Applied Artificial Intelligence (3) *(See Nuclear Engineering 671.)*

### 686 Telerobotic Systems (3)

(DE) Prerequisite(s): 586 or consent of instructor.

### 689 Hybrid Electric Vehicle Advanced Controls (3)

(DE) Prerequisite(s): 589.

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### Medieval Studies (674)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>401</td>
<td>Dante and Medieval Culture</td>
<td>(See Italian 401.)</td>
</tr>
<tr>
<td>402</td>
<td>Petrarch and Boccaccio</td>
<td>(See Italian 402.)</td>
</tr>
<tr>
<td>405</td>
<td>Medieval Literature</td>
<td>(See English 401.)</td>
</tr>
<tr>
<td>406</td>
<td>Chaucer</td>
<td>(See English 402.)</td>
</tr>
<tr>
<td>410</td>
<td>Medieval French Literature</td>
<td>(See French 410.)</td>
</tr>
<tr>
<td>415</td>
<td>Medieval Architecture</td>
<td>(See Architecture 415.)</td>
</tr>
<tr>
<td>431</td>
<td>Medieval Art of the West, 800-1400</td>
<td>(See Art History 431.)</td>
</tr>
<tr>
<td>441</td>
<td>Northern European Painting, 1350-1600</td>
<td>(See Art History 441.)</td>
</tr>
<tr>
<td>451</td>
<td>The Art of Italy, 1250-1450</td>
<td>(See Art History 451.)</td>
</tr>
<tr>
<td>475</td>
<td>Ancient and Medieval Political Thought</td>
<td>(See Political Science 475.)</td>
</tr>
</tbody>
</table>

### Microbiology (684)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>410</td>
<td>Bacterial Physiology</td>
<td>(3) Modern concepts of structure and function of bacterial cell.</td>
</tr>
<tr>
<td>(DE) Prerequisite(s): 310.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>411</td>
<td>Bacterial Genetics</td>
<td>(3) Transmission and expression of genetic information by bacteria.</td>
</tr>
<tr>
<td>(DE) Prerequisite(s): 310.</td>
<td></td>
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<tr>
<td>420</td>
<td>Medical Microbiology</td>
<td>(3) Disease-producing microorganisms, including bacteria, rickettsia, chlamydia, and fungi.</td>
</tr>
<tr>
<td>(DE) Prerequisite(s): 310.</td>
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</tr>
<tr>
<td>429</td>
<td>Medical Microbiology Laboratory</td>
<td>(2) Laboratory exercises in medically important areas of microbiology including microorganisms, pathogenesis, and immunology.</td>
</tr>
<tr>
<td>(DE) Prerequisite(s): 319 and 430.</td>
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<tr>
<td>(DE) Corequisite(s): 420.</td>
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<tr>
<td>430</td>
<td>Immunology</td>
<td>(3) Principles of inflammation and immunity; immunoglobulin structure and theories of formation and diversity; complement, hypersensitivities, cell cooperation and recognition in immune mechanisms; soluble factors.</td>
</tr>
<tr>
<td>(DE) Prerequisite(s): Biology 240.</td>
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</tr>
<tr>
<td>440</td>
<td>Virology</td>
<td>(3) Pathogenesis and molecular biology of viruses.</td>
</tr>
<tr>
<td>(DE) Prerequisite(s): 310.</td>
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<tr>
<td>470</td>
<td>Microbial Ecology</td>
<td>(3) Physiological diversity and taxonomy of microorganisms from natural environments. Functional role of microorganisms in natural and simulated ecosystems.</td>
</tr>
<tr>
<td>(DE) Prerequisite(s): 310.</td>
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<tr>
<td>500</td>
<td>Thesis</td>
<td>(1-15)</td>
</tr>
<tr>
<td>Grading Restriction: P/NP only.</td>
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<tr>
<td>Repeatability: May be repeated.</td>
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</tr>
<tr>
<td>502</td>
<td>Registration for Use of Facilities</td>
<td>(1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.</td>
</tr>
<tr>
<td>Grading Restriction: Satisfactory/No Credit grading only.</td>
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<tr>
<td>Repeatability: May be repeated.</td>
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<tr>
<td>Credit Restriction: May not be used toward degree requirements.</td>
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</tr>
<tr>
<td>540</td>
<td>Genomics and Bioinformatics</td>
<td>(3) Fundamentals of a new scientific discipline based on sequencing genomes (entire DNA) of individual organisms. Goals, principles and types of genome analysis are covered in a traditional lecture course. Computational tools for genome analysis (bioinformatics) are presented in both lecture and hands-on (computer-laboratory) settings.</td>
</tr>
<tr>
<td>Credit Restriction: Students may not receive credit for both 480 and 540.</td>
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</tr>
<tr>
<td>550</td>
<td>Molecular Epidemiology and Mycology</td>
<td>(3) <em>(See Entomology and Plant Pathology 550.)</em></td>
</tr>
<tr>
<td>575</td>
<td>Applied Microbiology and Bioengineering</td>
<td>(3) <em>(See Chemical Engineering 575.)</em></td>
</tr>
<tr>
<td>591</td>
<td>Foreign Study</td>
<td>(1-9)</td>
</tr>
<tr>
<td>Repeatability: May be repeated. Maximum 9 hours.</td>
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<tr>
<td>592</td>
<td>Off-Campus Study</td>
<td>(1-9)</td>
</tr>
<tr>
<td>Repeatability: May be repeated. Maximum 9 hours.</td>
<td></td>
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</tr>
<tr>
<td>593</td>
<td>Independent Study</td>
<td>(1-9)</td>
</tr>
<tr>
<td>Repeatability: May be repeated. Maximum 9 hours.</td>
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</tr>
<tr>
<td>595</td>
<td>General Seminar</td>
<td>(1) Lectures and seminars by invited speakers, faculty, and graduate students.</td>
</tr>
<tr>
<td>Repeatability: May be repeated. Maximum 18 hours.</td>
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</tr>
<tr>
<td>596</td>
<td>Laboratory Rotation</td>
<td>(1) Familiarization with research areas in department through series of rotations in laboratories of individual faculty members.</td>
</tr>
<tr>
<td>Grading Restriction: Satisfactory/No Credit grading only.</td>
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<tr>
<td>Repeatability: May be repeated. Maximum 3 hours.</td>
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<tr>
<td>600</td>
<td>Doctoral Research and Dissertation</td>
<td>(3-15)</td>
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<tr>
<td>Grading Restriction: P/NP only.</td>
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<tr>
<td>Repeatability: May be repeated.</td>
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<tr>
<td>601</td>
<td>Journal Club in Microbial Physiology</td>
<td>(1) Readings and discussions based on current literature.</td>
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<tr>
<td>Grading Restriction: Satisfactory/No Credit grading only.</td>
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<tr>
<td>Repeatability: May be repeated. Maximum 18 hours.</td>
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</tr>
<tr>
<td>602</td>
<td>Journal Club in Microbial Pathogenesis</td>
<td>(1) Readings and discussions based on current literature.</td>
</tr>
<tr>
<td>Grading Restriction: Satisfactory/No Credit grading only.</td>
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<tr>
<td>Repeatability: May be repeated. Maximum 18 hours.</td>
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</tr>
<tr>
<td>603</td>
<td>Journal Club in Immunology</td>
<td>(1) Readings and discussions based on current literature.</td>
</tr>
<tr>
<td>Grading Restriction: Satisfactory/No Credit grading only.</td>
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<tr>
<td>Repeatability: May be repeated. Maximum 18 hours.</td>
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<tr>
<td>604</td>
<td>Journal Club in Virology</td>
<td>(1) Readings and discussions based on current literature.</td>
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<tr>
<td>Grading Restriction: Satisfactory/No Credit grading only.</td>
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<tr>
<td>Repeatability: May be repeated. Maximum 18 hours.</td>
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<tr>
<td>605</td>
<td>Journal Club in Microbial Genetics</td>
<td>(1) Readings and discussions based on current literature.</td>
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<tr>
<td>Grading Restriction: Satisfactory/No Credit grading only.</td>
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<tr>
<td>Repeatability: May be repeated. Maximum 18 hours.</td>
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<tr>
<td>606</td>
<td>Journal Club in Microbial Ecology</td>
<td>(1) Readings and discussions based on current literature.</td>
</tr>
<tr>
<td>Grading Restriction: Satisfactory/No Credit grading only.</td>
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<tr>
<td>Repeatability: May be repeated. Maximum 18 hours.</td>
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<tr>
<td>610</td>
<td>Topics in Microbial Physiology</td>
<td>(1-3)</td>
</tr>
<tr>
<td>Repeatability: May be repeated. Maximum 12 hours.</td>
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<tr>
<td>(DE) Prerequisite(s): 410 or consent of instructor.</td>
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<tr>
<td>620</td>
<td>Topics in Microbial Pathogenesis</td>
<td>(1-3)</td>
</tr>
<tr>
<td>Repeatability: May be repeated. Maximum 12 hours.</td>
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<tr>
<td>(DE) Prerequisite(s): 420 and 430 or consent of instructor.</td>
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<tr>
<td>630</td>
<td>Topics in Immunology</td>
<td>(1-3)</td>
</tr>
<tr>
<td>Repeatability: May be repeated. Maximum 12 hours.</td>
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<tr>
<td>(DE) Prerequisite(s): 430 or consent of instructor.</td>
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<tr>
<td>640</td>
<td>Topics in Virology</td>
<td>(1-3)</td>
</tr>
<tr>
<td>Repeatability: May be repeated. Maximum 12 hours.</td>
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<tr>
<td>(DE) Prerequisite(s): 440 or consent of instructor.</td>
<td></td>
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<tr>
<td>660</td>
<td>Topics in Eukaryotic Pathogens</td>
<td>(3)</td>
</tr>
<tr>
<td>Repeatability: May be repeated. Maximum 12 hours.</td>
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<tr>
<td>Registration Permission: Consent of instructor.</td>
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<tr>
<td>650</td>
<td>Topics in Microbial and Molecular Genetics</td>
<td>(1-3)</td>
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<tr>
<td>Repeatability: May be repeated. Maximum 12 hours.</td>
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<tr>
<td>(DE) Prerequisite(s): 411 or consent of instructor.</td>
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</tr>
<tr>
<td>670</td>
<td>Advanced Topics in Environmental Microbiology</td>
<td>(1-3)</td>
</tr>
<tr>
<td>Repeatability: May be repeated. Maximum 12 hours.</td>
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<tr>
<td>Registration Permission: Consent of instructor.</td>
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</tbody>
</table>
Modern Foreign Languages and Literatures (686)

482 Special Topics in Global Cinema (3) Content varies. Focus from global perspectives on directors, stars, film genres, national and regional cinema movements or other topics. Taught in English. (Same as CInema Studies 482; Global Studies 482.)

Repeatability: May be repeated. Maximum 6 hours.

582 Special Topics in Global Cinema (3) Content varies. Focus from global perspectives on particular directors, stars, film genres, national and regional cinema movements, film theory/criticism, or other topics. Taught in English. (Same as Cinema Studies 582.)

Repeatability: May be repeated. Maximum 6 hours.

Music Education (707)

510 Foundations of Music Education (3) Historical, philosophical and aesthetic bases.

Registration Permission: Consent of instructor.

520 Research in Music Education (3) Definition of research problems, data collection and analysis, and research report writing. Application of knowledge of research techniques to analysis of existing research literature in music education.

Registration Permission: Consent of instructor.

550 Curriculum Development and Evaluation in Music Education (3) Principles of curriculum development applied to music education programs. Formulating objectives; construction of evaluation instruments; survey of appropriate literature.

Registration Permission: Consent of instructor.


570 Studies in Multicultural Music Education (3) Study of music literature, art and customs of various cultures appropriate for students in K-8. Strategies and techniques for teaching music at this level.

571 Musical Repertoire Laboratory (2) Examination and production of musical repertoire appropriate for student in grades K-8. Addresses singing, dancing, acting, costumes, set design, traditional and non-traditional instrumental ensembles.

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Limited to students majoring or concentrating in art, dance or theatre.

Registration Permission: Consent of instructor.

574 Analysis for Teaching for Professional Development (2) Strategies to document and analyze effectiveness of teaching and professional development. Study and application of various approaches.

(REG) Corequisite(s): 573.

575 Professional Internship in Teaching (1-8) Teaching and teaching-related experiences in professional settings in public schools.

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Admission to teacher education required. Enrollment limited to post-baccalaureate students in professional year program.

Registration Permission: Consent of School of Music.

580 Seminar in Music Education (3) Class investigation and individual reporting of pertinent topics and issues in music education.

Repeatability: May be repeated. Maximum 6 hours.

Registration Permission: Consent of instructor.

590 Special Topics in Music Education (1-3)

Repeatability: May be repeated. Maximum 6 hours.

Registration Permission: Consent of instructor.

591 Clinical Studies (4) Group and individual seminar activities during full-time internship. Application and evaluation of professional core competencies. Completion and presentation of portfolio and analysis of teaching project.

(REG) Corequisite(s): 575.

593 Special Problems in Music Education (3)

Repeatability: May be repeated. Maximum 6 hours.

Registration Permission: Consent of instructor.

Music Ensemble (708)

502 Jazz-Saxophone Ensemble (1)

Repeatability: May be repeated. Maximum 4 hours.

Comment(s): Requires audition or consent of instructor.

503 Small Jazz Ensemble (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

504 Jazz Ensemble (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

505 Studio Orchestra (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

506 Trombone Choir (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

510 Percussion Ensemble (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

511 Marimba Choir (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

515 Chamber Music Ensemble (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

530 Chamber Singers (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

540 Opera Theatre (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

550 Concert Band (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

552 Symphonic Band (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

553 Wind Ensemble (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

554 Varsity Band (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

559 Marching Band (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

560 Symphony Orchestra (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

580 Concert Choir (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

583 Men’s Chorale (1)

Repeatability: May be repeated. Maximum 4 hours.

Comment(s): Requires audition or consent of instructor.

589 Women’s Chorale (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

599 Accompanying (1)

Repeatability: May be repeated. Maximum 12 hours.

Comment(s): Requires audition or consent of instructor.

Music General (698)

500 Thesis (1-15)

Grading Restriction: P/INP only.

Repeatability: May be repeated.

501 Graduate Recital (2)

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated.

Credit Restriction: May not be used toward degree requirements.

510 Music Bibliography (3) Bibliographic methodology in music.

511 Lecture Recital (2)

520 Musical Styles (3) Elements of design and their role in definition of musical styles.

Registration Permission: Consent of instructor.

521 Special Topics in Performance (1-3)

Registration Permission: Consent of school director.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Contact Hour Distribution</th>
<th>Comment(s)</th>
<th>Registration Permission</th>
<th>Repeatability</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>490</td>
<td>Instrumental Conducting (3)</td>
<td></td>
<td>Knowledge and skills in instrumental conducting; various periods and composers and relationship</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>485</td>
<td>Suzuki Piano Method I (2)</td>
<td></td>
<td>Study of the philosophy, procedures, and literature of the Suzuki Piano Methods Books I and II</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>491</td>
<td>Internship (2)</td>
<td></td>
<td>Opportunity for students to gain experience in teaching beginning students under the supervision</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>495</td>
<td>Suzuki Piano Method II (2)</td>
<td></td>
<td>Study of procedures and literature of the Suzuki Piano Method Books III and above.</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>480</td>
<td>Teaching Class Piano (3)</td>
<td></td>
<td>Historical survey and evaluation of teaching materials and methodology for college and/or adult</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>470</td>
<td>The Organ and Its Literature I (3)</td>
<td></td>
<td>Development of the organ and organ literature from the Middle Ages to approximately 1750;</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>460</td>
<td>The Organ and Its Literature II (3)</td>
<td></td>
<td>Development of the organ and organ literature from the Middle Ages to approximately 1750;</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>410</td>
<td>Organ Practicum (1)</td>
<td></td>
<td>Improvisation, hymn playing, and accompanying on the organ.</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>411</td>
<td>Bassoon (1-3)</td>
<td></td>
<td>Development of individual and solving individual problems in jazz improvisation.</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>412</td>
<td>Jazz Pedagogy (1)</td>
<td></td>
<td>Methods and materials relating to teaching of jazz, designing and administering jazz programs,</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>413</td>
<td>Saxophone (1-3)</td>
<td></td>
<td>Development of the organ and organ literature from the Middle Ages to approximately 1750;</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>414</td>
<td>Clarinet (1-3)</td>
<td></td>
<td>Development of the organ and organ literature from the Middle Ages to approximately 1750;</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>415</td>
<td>Clarinet (1-3)</td>
<td></td>
<td>Development of the organ and organ literature from the Middle Ages to approximately 1750;</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>416</td>
<td>Clarinet (1-3)</td>
<td></td>
<td>Development of the organ and organ literature from the Middle Ages to approximately 1750;</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
<tr>
<td>417</td>
<td>Bassoon (1-3)</td>
<td></td>
<td>Development of the organ and organ literature from the Middle Ages to approximately 1750;</td>
<td>Consent of instructor</td>
<td>May be repeated. Maximum 3 hours</td>
<td>2nd or 3rd instrument.</td>
</tr>
</tbody>
</table>
425 Horn (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 326 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 326.
Registration Permission: Consent of instructor.

426 Horn (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 425 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 425.
Registration Permission: Consent of instructor.

430 Trumpet (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 331 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 331.
Registration Permission: Consent of instructor.

431 Trumpet (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 430 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 430.
Registration Permission: Consent of instructor.

436 Trombone (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 336 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 336.
Registration Permission: Consent of instructor.

435 Trombone (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 435 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 435.
Registration Permission: Consent of instructor.

441 Baritone (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 341 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 341.
Registration Permission: Consent of instructor.

446 Tuba (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 346 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 346.
Registration Permission: Consent of instructor.

450 Percussion (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 351 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 351.
Registration Permission: Consent of instructor.

451 Percussion (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 450 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 450.
Registration Permission: Consent of instructor.

455 Voice (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 355 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 356.
Registration Permission: Consent of instructor.

456 Voice (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 455 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 455.
Registration Permission: Consent of instructor.

460 Violin (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 361 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 361.
Registration Permission: Consent of instructor.

461 Violin (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 460 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 460.
Registration Permission: Consent of instructor.

465 Viola (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 366 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 366.
Registration Permission: Consent of instructor.

470 Cello (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 371 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 371.
Registration Permission: Consent of instructor.

471 Cello (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 470 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 470.
Registration Permission: Consent of instructor.

472 Electric Bass (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 373 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 373.
Registration Permission: Consent of instructor.

473 Electric Bass (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 472 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 472.
Registration Permission: Consent of instructor.

474 String Bass (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 375 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 375.
Registration Permission: Consent of instructor.

480 Piano (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 380 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 381.
Registration Permission: Consent of instructor.

481 Piano (1-3)
Repeatability: May be repeated. Maximum 8 hours.
(DE Prerequisite(s): 480 and Music General 101.
Comment(s): Requires audition, registration for ensemble appropriate to degree program, and C or higher in 480.
Registration Permission: Consent of instructor.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Pre-Requisites</th>
<th>Audition</th>
<th>Registration Permission</th>
</tr>
</thead>
<tbody>
<tr>
<td>483</td>
<td>Guitar (1-3)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>484</td>
<td>Guitar (1-3)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>485</td>
<td>Harpsichord (1-3)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>486</td>
<td>Harpsichord (1-3)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>489</td>
<td>Organ (1-3)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>490</td>
<td>Organ (1-3)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>494</td>
<td>Composition (1-3)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>495</td>
<td>Composition (1-3)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>496</td>
<td>Composition with Electronic Media (1-3)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>499</td>
<td>Improvisation (1-2)</td>
<td>Repeatability: May be repeated. Maximum 4 times.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>503</td>
<td>Flute (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>505</td>
<td>Oboe (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>510</td>
<td>Bassoon (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>515</td>
<td>Clarinet (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>520</td>
<td>Saxophone (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>525</td>
<td>Horn (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>530</td>
<td>Trumpet (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>535</td>
<td>Trombone (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>540</td>
<td>Baritone (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>545</td>
<td>Tuba (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>550</td>
<td>Percussion (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>551</td>
<td>Accompanying and Coaching (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>555</td>
<td>Voice (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>560</td>
<td>Violin (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>565</td>
<td>Viola (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>570</td>
<td>Cello (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>572</td>
<td>Electric Bass (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>575</td>
<td>String Bass (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>580</td>
<td>Piano (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>583</td>
<td>Guitar (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
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<tr>
<td>585</td>
<td>Harpsichord (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>590</td>
<td>Organ (1-4)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
<tr>
<td>594</td>
<td>Composition (1-3)</td>
<td>Repeatability: May be repeated. Maximum 8 hours.</td>
<td></td>
<td>Consent of instructor.</td>
</tr>
</tbody>
</table>
595 Composition with Electronic Media (1-3)
Repeatability: May be repeated. Maximum 8 hours.
Comment(s): Requires audition.
Registration Permission: Consent of instructor.

599 Improvisation (1-4)
Repeatability: May be repeated. Maximum 8 hours.
Comment(s): Requires audition.
Registration Permission: Consent of instructor.

Music Technology (717)
540 Computer Music Transcription (3) Projects in notation, playback, and publication of music incorporating elements of word processing, graphic design, sequencing, and page layout. Study of MIDI protocol as applied to computer music workstation design.
Credit Restriction: May not be applied toward the concentration in music technology.
Registration Permission: Consent of instructor.

550 Computer Projects (3) High-level programming languages used to design and implement computer-managed instruction; Internet development tools; writing of documentation for computer projects.
(DE) Prerequisite(s): 540 or equivalent.

560 Technology in Music Research (3) Use of technology for research projects in music analysis or pedagogy: development and execution of research project.
(DE) Prerequisite(s): 550.

Music Theory (714)
430 Counterpoint I (3) Study of species counterpoint in modal and tonal styles with emphasis on works of Palestrina and J.S. Bach.
(DE) Prerequisite(s): 210 with a grade of C or higher.

440 Counterpoint II (3) Writing of contrapuntal forms of the 18th century and fugue analysis of works from the 18th through the 20th centuries.
(DE) Prerequisite(s): 430 with grade C or higher.

450 Choral Arranging (2) Analysis of scores and writing of arrangements for choruses.
(DE) Prerequisite(s): 210 and 240 with grade C or higher or consent of instructor.

520 Analytical Techniques (3) Analytical techniques, contemporary approaches. Tonal and neotonal music.
Registration Permission: Consent of instructor.

530 Music Theory Pedagogy (3) Techniques, methods, and materials involved in college-level theory programs. Use of technology and review of existing software.
Registration Permission: Consent of instructor.

593 Independent Study (1-15)
Repeatability: May be repeated. Maximum 15 hours.
Registration Permission: Consent of director.

Music Voice (715)
410 Song Literature I (2) German songs.
Credit Restriction: Graduate credit not available for students in vocal performance.

420 Song Literature II (2) French, Italian, Russian, Scandinavian, Czechoslovakian, British, and American art songs.
Credit Restriction: Graduate credit not available for students in vocal performance.

425 Functional Diction for Singers (3) Comprehensive survey of the pronunciation of six languages: English, French, German, Italian, Latin, and Spanish. Basic instruction in the International Phonetic Alphabet; development of basic diction skills; overview of diction styles and traditions in each language; survey of diction resources and reference materials.
Comment(s): Does not fulfill deficiency requirements for graduate students in voice or accompanying.

510 Vocal Literature Seminar (3) Topics vary.
Repeatability: May be repeated. Maximum 6 hours.

520 Performance Techniques for Singers (1) Improvisation, movement, and basic techniques for dramatic vocal performance.
Repeatability: May be repeated. Maximum 2 hours.
Comment(s): Restricted to students in a vocal concentration.

530 Opera Performance (1) For satisfaction of performance requirement. May be fulfilled by undertaking a major operatic role or by demonstrating a cumulative performance record which may include a project approved and supervised by the voice faculty.
Repeatability: May be repeated. Maximum 4 hours.
Registration Permission: Consent of instructor.

540 Opera Production (1-3)
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

550 Advanced Vocal Pedagogy I (2) Study of vocal production, examination of different methods.

560 Advanced Vocal Pedagogy II (2) Study of teaching materials, observation of studio teaching, analysis of vocal problems in selected students, and supervised teaching.

565 Special Projects in Vocal Pedagogy (3) Course is available only for graduate students majoring in vocal pedagogy.
Registration Permission: Consent of instructor.

570 Vocal Chamber Music Performance (1) For satisfaction of performance requirement. May be used to substitute for Music Voice 530 when approved and supervised by the voice faculty.
Registration Permission: Consent of instructor.

575 Internship in Vocal Pedagogy I (1) Opportunity for vocal pedagogy students to develop and improve applied teaching skills through a shared practicum experience in a seminar setting. Includes supervised instruction.
Repeatability: May be repeated. Maximum 2 hours.
Comment(s): Available only for graduate students majoring in vocal pedagogy.
Registration Permission: Consent of instructor.

580 Choral Literature I (2) A historical survey of the development of the major choral genre.

585 Choral Literature II (2) A survey by historical period of choral literature that is considered part of the standard choral repertoire.

590 Advanced Choral Conducting (2) Expansion and continued refinement of conducting techniques. Score reading and preparation, rehearsal techniques, and interpretation of styles and performance practices.
Repeatability: May be repeated. Maximum 8 hours.

594 Project in Choral Conducting Performance (1-3) Public performance, critical document; recording project.
Repeatability: May be repeated. Maximum 36 hours.
Registration Permission: Consent of instructor.

595 Choral Conducting Seminar (3) Topics vary.
Repeatability: May be repeated. Maximum 36 hours.
(DE) Prerequisite(s): 590 or consent of instructor.

Musicology (706)
410 Studies in Genre (3) Historical, cultural, analytical, and musicological issues related to a single musical genre, style, or repertory. Topics vary.
Repeatability: May be repeated. Maximum 6 hours.

420 History of Opera (3) The development of opera from its inception to the present. Readings and discussion focus on an understanding of the historical trajectory of opera, both as a musico-theatrical work and as a cultural practice.
Recommended Background: 100-level musicology course.
Registration Permission: Consent of instructor.

430 History of the Symphony (3) Overview of orchestral repertories from 1600 to the present.
Recommended Background: 100-level musicology course.
Registration Permission: Consent of instructor.

450 Composer Seminar (3) Biographical, historical, and cultural study of a composer, or a group of related composers. Topics vary.
Repeatability: May be repeated. Maximum 6 hours.

460 Music Aesthetics (3) Nature of music and musical experience, sense perception and emotions, music, and role of artist in society. Aesthetic viewpoint of individuals and historical eras through selected writings.

480 Music in Christian Worship (3) Hymnody, liturgies, and liturgical music.

540 Medieval and Renaissance Music (3) Musical phenomena from c. 900 to c. 1600, selected from chant, troubadour song, early polyphony, madrigal, mass, and motet. Genres considered against historical, cultural, analytical, and literary frameworks, including words-music relationships, the role of music in devotion, sacred and secular interchanges, oral and written transmissions.
(DE) Prerequisite(s): 400.
(DE) Corequisite(s): Music General 510.
Registration Permission: Consent of instructor.
550 Music in the Baroque Period (3) Aspects of western European art music, c. 1600 to c. 1750, from historical and cultural perspectives. Genre, national identities, the roles of voices and instruments, the emergence of tonality, issues of gender, and music's role in social, religious and performance practices.
(DE) Prerequisite(s): 400.
(DE) Corequisite(s): Music General 510.
Registration Permission: Consent of instructor.

560 Music in the Classic Period (3) The development of classical style from preclassic to the music of Haydn, Mozart and early Beethoven. Focus on aesthetic, cultural and social frameworks pertaining to various genres and composers. Selected vocal and orchestral works examined with respect to themes of appropriation, politics, narratives, and biographical references.
(DE) Prerequisite(s): 400.
(DE) Corequisite(s): Music General 510.
Registration Permission: Consent of instructor.

570 Music in the 19th Century (3) Music of the nineteenth century from Beethoven to the post-Romantics with a focus on aesthetic, cultural and social contexts. Opera, symphony, art song, piano works, and other examined against the frameworks of cultural theory, gender studies, orientalism, politics and philosophy.
(DE) Prerequisite(s): 400.
(DE) Corequisite(s): Music General 510.
Registration Permission: Consent of instructor.

580 Music in the 20th Century (3) Composers, repertories, and issues in twentieth-century art music of western Europe and the United States. New roles for composers and performers, confluences of "high" and "low" art forms, influences of technology, and music's place in the formation of national, political, and gendered identities.
(DE) Prerequisite(s): 400.
(DE) Corequisite(s): Music General 510.
Registration Permission: Consent of instructor.

585 Topics in Music of the Americas (3) Historical or cultural study of a topic concerned with music and musical practice in the Americas. Topics vary. Repeatability: May be repeated. Maximum 6 hours.

590 Introduction to Ethnomusicology (3) Ethnomusicology as scholarly discipline. History, theories, and methodologies as applied to study of music in culture.
(DE) Prerequisite(s): 400.
(DE) Corequisite(s): Music General 510.
Registration Permission: Consent of instructor.

595 Seminar in Ethnomusicology (3) Exploration of a methodological, theoretical, or ethnographic topic in ethnomusicology. Topics vary. Repeatability: May be repeated. Maximum 6 hours.

596 Seminar in Historical Musicology (3) Topics vary; specific musical genre, composer, or phenomenon. Repeatability: May be repeated. Maximum 6 hours.

Nuclear Engineering (716)

403 Nuclear and Radiological Engineering Laboratory II (3) Cross section measurements, diffusion properties of neutrons, shielding, dynamics and controls, alpha and beta spectroscopy, radiation fields and dosimetry.
(ND) Prerequisite(s): 404.

404 Nuclear Fuel Cycle (3) Topics include mining, milling, fabrication, in-core management, reprocessing, waste disposal, regulatory and radiation health issues and requirements.
(DE) Prerequisite(s): 470 or equivalent.

406 Radiation Shielding (3) Types of radiation sources, fundamentals of gamma ray and neutron attenuation, biological effects, approximate methods of shield design, discrete ordinates, and Monte Carlo.
(ND) Prerequisite(s): Physics 220.

421 Introduction to Nuclear Criticality Safety (3) Fundamentals of nuclear criticality safety; criticality accidents; safety standards; overview of experiments, computational methods, and applications.
(DE) Prerequisite(s): 301.

431 Radiation Protection (3) External and internal dosimetry, biological effects of radiation, radiation detection, radiation risk assessment.
(DE) Prerequisite(s): 301.

470 Nuclear Reactor Theory I (3) Fundamentals of reactor physics relative to cross sections, kinematics of elastic scattering, reactor kinetics, reactor systems and nuclear data. Analytical and numerical methods applicable to general criticality problems, eigenvalue searches, perturbation theory, and multigroup diffusion equations.
(DE) Prerequisite(s): 301.

483 Introduction to Reliability Engineering (3) Probabilistic failure models, parameter estimation (maximum likelihood, Bayes techniques), model identification and comparison, accelerated life tests, failure prediction, system reliability, preventive maintenance and warranties. (Same as Chemical Engineering 453; Industrial Engineering 483; Mechanical Engineering 483.)
Registration Permission: Consent of instructor.

484 Introduction to Maintainability Engineering (3) Principles of maintainability and reliability engineering, and maintenance management. Topics include information extraction from machinery measurements, rotating machinery diagnostics, nondestructive testing, life prediction, failure models, lubrication oil analysis, establishing predictive maintenance programs, and computerized maintenance management systems. (Same as Chemical Engineering 484; Industrial Engineering 484; Materials Science and Engineering 484; Mechanical Engineering 484.)
Registration Permission: Consent of instructor.

494 Special Topics in Nuclear Engineering (3) Problems related to recent developments and practice.
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

500 Thesis (1-15) Grading Restriction: P/NP only.
Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

509 Multidisciplinary Project (1) (See Industrial Engineering 509.)

511 Transport Processes in Nuclear Engineering (3) Rheology of Newtonian and non-Newtonian fluids; integral and system conservation equations for single and multi-component fluids; in-depth development of differential conservation equations for mass, energy, and momentum; exact and approximate solutions of equations of motion; boundary layer analysis; numerical analysis of fluid flow and heat transfer.

512 Transport Processes in Nuclear Engineering (3) Rheology of Newtonian and non-Newtonian fluids; integral and system conservation equations for single and multi-component fluids; in-depth development of differential conservation equations for mass, energy, and momentum; exact and approximate solutions of equations of motion; boundary layer analysis; numerical analysis of fluid flow and heat transfer.

521 Nuclear Systems Dynamics and Control (3) Introduction to state variable methods for system dynamics and control analysis and application of these methods to nuclear plant dynamics, simulation and control problems.

522 Experimental Methods in Reactor Dynamics (3) Introduction to time domain and frequency domain techniques. Measurement, analysis, and interpretation of process signals for reactor surveillance and diagnostics. Introduction to time-series modeling.
(ND) Prerequisite(s): 521.

541 Reactor Fuel Management (3) Topics relative to in-core fuel management. Applicable topics in reactor physics, fuel depletion, isotopic inventories, reactivity control, and numerical methods.
(ND) Prerequisite(s): 470 or consent of instructor.


543 Selected Topics in Nuclear Criticality Safety (3) Criticality safety computational and experimental methods for enrichment, fabrication, storage, reprocessing, and transport applications; overview of safety practices and regulatory requirements.
(ND) Prerequisite(s): 421 or consent of instructor.

550 Radiation Measurements Laboratory (3) Physics and electronics associated with radiation detection and measurement, methods of data analysis. Applicability of particular detector measurements and fundamentals of radiation detection instrumentation operation.
(ND) Prerequisite(s): 551.

552 Radiological Assessment and Dosimetry (3) Transport of radionuclides in environment, food chain pathways, internal dosimetry and personnel dosimetry.

553 Radiation Risk Analysis (3) Methods for radiation risk prediction, survival analysis, parameter estimation, real data analysis, extrapolation techniques.

557 Medical Physics I (3) Ionizing radiation use in radiation therapy to cause controlled biological effects in cancer patients. Physics of interaction of various radiation modalities with body equivalent materials and physical aspects of clinical applications.

568 Medical Physics II (3) Physics of ionizing radiation therapy with emphasis on quality assurance, treatment planning, radiation protection, and special treatment procedures.


572 Nuclear System Design (3) Design and analysis of a nuclear system, interface with non-nuclear aspects of system design: system reliability and economics; class project.

577 Neural Networks in Engineering (3) Neural network technology for use in intelligent systems; rationale for neural computing, structure of neural computing systems, programming. (Same as Biomedical Engineering 577; Engineering Science 577; Mechanical Engineering 577.)

578 Fuzzy Systems in Engineering (3) Fuzzy numbers, fuzzy environment, uncertainty and randomness, approximate reasoning, fuzzy models and structures, decision process in fuzzy environment, fuzzy computing, fuzzy logic controllers, fuzzy expert systems and other engineering applications. (Same as Engineering Science 578.)

592 Monte Carlo Analysis (3) General overview of the Monte Carlo Method for solving problems in physics and engineering. Random sampling, evaluation of integrals, analog particle transport, techniques of variance reduction, forward and adjoint modes of analysis, importance function biasing, splitting/weight window survival biasing and contribution theory. Particular emphasis on solving neutral particle radiation transport problems using the MCNP code system.

594 Culminating Integrated Project Report (3) (See Mechanical Engineering 594.)

597 Special Topics in Nuclear Engineering (3) Lectures and recitation on recent advances in nuclear engineering.

598 Nuclear Engineering Practice (3-9) Experience in solving and reporting on engineering problems.

600 Doctoral Research and Dissertation (3-15) Registration Restriction: P/N only. Repeatability: May be repeated.

611 Selected Topics in Reactor Theory (3) Transport theory, control rod theory, stochastic methods. Selected topics from literature.

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621 Selected Topics in Radiation Protection (3) Repeatability: May be repeated with consent of department.


671 Advanced Topics in Applied Artificial Intelligence (3) Recent advances in engineering applications of artificial intelligence. (Same as Engineering Science 671; Mechanical Engineering 671.)

697 Special Topics in Nuclear Engineering (3) Investigation of new developments.

Nursing (720)

400 Aging and Society (3) An examination of the health and social effects of longevity and the aging process including societal and personal attitudes about old age. Resources, trends, issues, and potentials of aging are explored. Volunteer community service, a service learning component, is required.

402 Gerontology Practicum (3) Off-campus supervised experience in gerontology. Offered as part of the undergraduate gerontology minor.

409 Genetic Disorders, Vulnerable Families and Health Advocacy (3) Examination of health and social implications of Human Genome Project, with emphasis on genetic disorders that result in chronic illness or disability. Strategies for building collaborative partnerships to effect health advocacy for vulnerable populations.

500 Thesis (1-15) Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated.

501 Nursing Research: Methods, Design, and Analysis (3) Basic principles of research process in application to clinical questions; critical evaluation of nursing and health-related research.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

504 Advanced Health/Physical Assessment (3) Development of advanced clinical reasoning and assessment skills to determine client health status and needs. Application of physiological, pathophysiological, and psychosocial concepts with implications for advanced practice nursing.

505 Advanced Clinical Pharmacology (3) Pharmaceutical agents utilized to treat common, recurrent health problems; indications, contraindications, side and interactive effects of commonly prescribed drugs.

506 Doctoral Research and Dissertation (3-15) Registration Restriction: P/N only. Repeatability: May be repeated.

511 Selected Topics in Reactor Theory (3) Transport theory, control rod theory, stochastic methods. Selected topics from literature.

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521 Selected Topics in Radiation Protection (3) Repeatability: May be repeated with consent of department.

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600 Doctoral Research and Dissertation (3-15) Registration Restriction: P/N only. Repeatability: May be repeated.

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506 Doctoral Research and Dissertation (3-15) Registration Restriction: P/N only. Repeatability: May be repeated.

600 Doctoral Research and Dissertation (3-15) Registration Restriction: P/N only. Repeatability: May be repeated.

(Re) Prerequisite(s): 505.
Registration Restriction(s): Master of Science in Nursing – nursing major/nurse anesthesia concentration.

507 Concepts for Advanced Practice Nursing: Health Promotion and Health Policy (4) Exploration of advanced nursing practitioners and their role in the dynamic health care system. Emphasis on health policy, health promotion and the organizational, social, ethical, political, economic, and technological factors that impact advanced practice nursing and the delivery/promotion of health care.

Contact Hour Distribution: 3 didactic and 1 seminar.
Registration Restriction(s): Master of Science in Nursing – nursing major.

509 Graduate Seminar in Public Health (1) (See Public Health 509.)

510 Theoretical Foundations of Nursing (3) Historical evolution of nursing science; nursing’s metaparadigm and selected philosophies, conceptual models and theories as structures which guide critical thinking in analysis, reasoning, and decision making for advanced practice nursing.

511 Statistical Applications to Nursing Research (3) Descriptive and inferential statistics; statistical concepts and applications to clinical settings and their applications to advanced practice nursing.

515 Advanced Pathophysiology for Nursing Practice (3) Advanced physiologic and pathophysiologic concepts, principles, and theories applied to deviations of human systems.

(De) Prerequisite(s): Undergraduate pathophysiology course.

516 Advanced Pathophysiology: Neurological/Cardiovascular with Anesthesia Implications (2) Review of anatomy and physiology and integration of pathophysiologic involvement in patients requiring anesthetic and care for cardiac surgical procedures (both children and adults) with and without cardiopulmonary bypass, intercranial surgical procedures for vascular and mass occupying lesions, patients requiring somatosensory evoked potential monitoring, and patients requiring anesthesia for non-cardiac and non-neurological procedures who present with either neurological and/or cardiovascular comorbidity.

(Re) Prerequisite(s): 524 and 525.
(De) Corequisite(s): 523.
Registration Restriction(s): Master of Science in Nursing – nursing major/nurse anesthesia concentration.

517 Advanced Pathophysiology: Respiratory/Renal with Anesthesia Implications (2) Review of anatomy and physiology and integration of pathophysiologic involvement in administration of anesthesia for patients who present with renal or respiratory pathology. Pathological implications of acute and chronic renal failure, renal transplantation, pulmonary disease states: obstructive and restrictive diseases, one lung ventilation, and acute pulmonary disease states and their management.

(Re) Prerequisite(s): 524 and 525.
(De) Corequisite(s): 523.
Registration Restriction(s): Master of Science in Nursing – nursing major/nurse anesthesia concentration.

518 Advanced Pathophysiology: Obstetrics/Regional Anesthesia (2) Review of anatomy and physiology and integration of pathophysiologic involved in administration of regional blockade of upper and lower extremities. Local anesthetic pharmacology, indication for regional anesthesia, contraindications to specific blockade, and techniques for clinical administration of regional blockade. Regional anesthetic considerations for obstetric patient.

(Re) Prerequisite(s): 524 and 525.
(De) Corequisite(s): 523.
Registration Restriction(s): Master of Science in Nursing – nursing major/nurse anesthesia concentration.

519 Psychopharmacology in Advanced Practice (3) Examination of the neurobiological basis of psychiatric illness and the use of psychopharmacological agents to modify symptoms and outcomes. Evaluation of the role of psychopharmacology in relation to the use of other psychotherapeutic interventions.

(De) Prerequisite(s): Undergraduate pharmacology course or consent of instructor.

522 Integrated Health Science for Anesthesia (3) Fundamental principles of chemistry and physics as related to practice of nurse anesthesia. Correlation of principles to clinical anesthesia practice.

(De) Prerequisite(s) or (De) Corequisite(s): 524.
Registration Restriction(s): Master of Science in Nursing – nursing major/nurse anesthesia concentration.

523 Advanced Principles of Nurse Anesthesia Practice (2) Advanced concepts/principles of anesthetic management and legal implications of nurse anesthesia practice.

Registration Restriction(s): Master of Science in Nursing – nursing major/nurse anesthesia concentration.

524 Basic Principles of Anesthesia I (3) An introduction to the scientific principles upon which anesthesia administration is based. The focus of this course (part one of a two-part series) is on the sound basic principles of safe anesthesia delivery for the beginning practitioner.

Registration Restriction(s): Master of Science in Nursing – nursing major/nurse anesthesia concentration.

525 Basic Principles of Anesthesia II (3) A continuation of 524 which builds upon the previous course to provide advanced elementary scientific principles upon which nurse anesthetists implement plans of care which have been developed. The focus of this course (part two of a two-part series) is on the sound basic principles of safe anesthesia management for the beginning practitioners.

Registration Restriction(s): Master of Science in Nursing – nursing major/nurse anesthesia concentration.

526 Professional Issues in Nurse Anesthesia (2) Exploration of historical and current issues surrounding nurse anesthesia education, practice, and the profession.

Registration Restriction(s): Master of Science in Nursing – nursing major/nurse anesthesia concentration.

527 Nursing of Women and Children: Clinical Experience in Children’s Health (1-5) Clinical experience in the role of pediatric nurse practitioner or clinical nurse specialist in variety of health care settings serving children.

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 15 hours.

(De) Corequisite(s): 550 or 551.

528 Well Child Care: Assessment of Growth, Development, and Behavior (2) Comprehensive and preventative care for the well child. Appropriate screening tools and related development theories. Focus is on the well child ages 0 to 21 years.

(De) Corequisite(s): 550 and 551.

530 Adult Health Nursing I (6) Advanced nursing practice for health promotion, restoration, and maintenance of young, middle-aged, and older adults. Theories and research to advanced practice with individual clients in variety of settings.

Contact Hour Distribution: 2 didactic and 4 practicum.

(De) Prerequisite(s): 504 and 505.

Registration Restriction(s): Master of Science in Nursing – nursing major.

531 Adult Health Nursing II (7) Continuation of 530. Delivery, provision, and management of health care for adult groups and communities.

Contact Hour Distribution: 2 didactic and 5 practicum.

(De) Prerequisite(s): 530 and 501.

Registration Restriction(s): Master of Science in Nursing – nursing major.


533 Homeland Security I (5) Advanced planning and leadership in response to human-made and natural disasters, as well as mass casualties related to terrorism or breach of homeland security.

Contact Hour Distribution: 2 didactic and 3 practicum/field supervision.

(De) Corequisite(s): 532.

534 Homeland Security II (5) Continuation of Homeland Security I, providing emphasis on incident management, including ethical issues, and the impact of culture and psychology on the human response to terrorism, disaster, mass casualty events, and large population emergencies.

Contact Hour Distribution: 2 didactic and 3 practicum/field supervision.

(De) Prerequisite(s): 533.

535 Homeland Security III (7) Application of advanced practice knowledge and skills to assess preparedness for mass casualty and homeland security disasters, toxic exposures or terrorist activity; to mobility available resources; and effectively use communication to integrate local response into broader area, national, and international response.

Contact Hour Distribution: 2 didactic and 5 practicum/field supervision.

(De) Prerequisite(s): 534.

536 Homeland Security IV (8) Advanced care concepts provided to those affected by specific types of disasters, toxic exposures, terrorist events, or large population emergencies.

Contact Hour Distribution: 2 didactic and 6 practicum/field supervision.

(De) Prerequisite(s): 535.
Registration Restriction(s): Master of Science in Nursing – nursing major.
544 Clinical Nurse Anesthesia Practicum/Seminar I (2-11) Integration and application of theoretical foundations and development of clinical skills in nurse anesthesia practice under supervision of Certified Registered Nurse Anesthetist (CRNA) and/or anesthesiologist.

Comment(s): Admission to nurse anesthesia concentration required. The nurse anesthesia practicum/seminars must be taken in sequence.

545 Clinical Nurse Anesthesia Practicum/Seminar II (2-11) Integration and application of theoretical foundations and development of clinical skills in nurse anesthesia practice under supervision of Certified Registered Nurse Anesthetist (CRNA) and/or anesthesiologist.

546 Clinical Nurse Anesthesia Practicum/Seminar III (2-11) Integration and application of theoretical foundations and development of clinical skills in nurse anesthesia practice under supervision of Certified Registered Nurse Anesthetist (CRNA) and/or anesthesiologist.

547 Clinical Nurse Anesthesia Practicum/Seminar IV (2-11) Integration and application of theoretical foundations and development of clinical skills in nurse anesthesia practice under supervision of Certified Registered Nurse Anesthetist (CRNA) and/or anesthesiologist.

548 Clinical Nurse Anesthesia Practicum/Seminar V (2-11) Integration and application of theoretical foundations and development of clinical skills in nurse anesthesia practice under supervision of Certified Registered Nurse Anesthetist (CRNA) and/or anesthesiologist.

549 Clinical Nurse Anesthesia Practicum/Seminar VI (2-11) Integration and application of theoretical foundations and development of clinical skills in nurse anesthesia practice under supervision of Certified Registered Nurse Anesthetist (CRNA) and/or anesthesiologist.

550 Nursing of Women and Children I (2) Advanced practice nursing of women, infants and children; health promotion and nursing interventions for actual or potential health problems of women, children, and families.

551 Nursing of Women and Children II (2) Continuation of 550. Advanced practice nursing of women, infants and children; role refinement of nurse practitioner or clinical specialist in health maintenance and restoration for women, children, and families.

552 Care of the Critically-Ill Neonate (2) Advanced practice nursing of women, infants and children; health promotion and nursing interventions for actual or potential health problems of women, children, and families.

553 Nursing Care of Women and Children: Clinical Experience in Women's Health (1-5) Clinical experience in the role of women's health care nurse practitioner or clinical nurse specialist in a variety of health care settings serving women.

554 Care of the Well Woman and Minor Acute Illnesses (2) Comprehensive and preventative care for the well woman and the woman with minor acute conditions. Focus is on women of all ages.

555 Care of the Pregnant Woman (2) Physiology and pathophysiology of the pregnant woman. Recommended advanced nursing interventions in selected conditions. Focus is on the pregnant and newly delivered woman.

556 Care of Complex Health Problems in Women (2) Physiology and pathophysiology of the complex health problems common in women and the pregnant woman. Recommended advanced nursing interventions in selected health problems.

560 Mental Health Nursing I (6) Theories of advanced therapeutic interventions for clients experiencing actual and potential mental health problems: advanced practice nursing in specialty of mental health; clinical practice with clients of various ages in acute care and community settings.

561 Mental Health Nursing II (7) Continuation of 560. Advanced practice nursing in community settings for families and groups with actual and potential mental health problems.

562 Acute Illnesses in Children (2) Physiology and pathophysiology of acute minor illnesses in children and the recommended interventions in selected conditions for the APN. Focus is on ill children ages 0 to 21 years.

563 Care of the Child with a Chronic Condition (2) Physiology and pathophysiology of chronic illnesses in children and the recommended interventions in selected conditions for the APN. Focus is on chronically ill children ages 0 to 21 years.

564 Nursing of Women and Children: Clinical Experience in Infant's Health (1-5) Clinical experience in the role of neonatal nurse practitioner or clinical nurse specialist in a Level III intensive care nursery.

565 Teaching Practicum (1-6) Individually designed teaching experience in collegiate nursing program or nursing practice setting. Objectives to be developed collaboratively by student and faculty.

566 Educational Principles and Strategies (3) Exploration and analysis of selected education, curriculum; teaching-learning, measurement, and evaluation principles and theories as applied to instruction of undergraduate nursing students, staff development, and patient education.

567 Embryology and Neonatal Pathophysiology for Advanced Neonatal Nursing Practice (3) Pathophysiological challenges confronting infants born at preterm gestation and neonates with clinical disorders arising from alterations in embryogenesis. Emphasis on the role of neonatal advanced practice nurses in assessing subtle changes in the clinical condition in these infants.

568 Care of the Neonate (2) Physiology and pathophysiology of the neonate and the recommended interventions in selected conditions for the advanced practice nurse. Focus is on the well infant and health consequences of congenital conditions, prematurity and illness.

569 Care of the Ill Neonate (2) Physiology and pathophysiology of the neonate and the recommended interventions in selected conditions for the advanced practice nurse. Focus is on the ill neonate.

570 Family Nurse Practitioner I (6) Application of advanced health/physical assessment and diagnostic reasoning in nursing management and primary care and of individuals and their families with actual and potential acute health problems; clinical experience in role of family nurse practitioner in variety of settings.

571 Family Nurse Practitioner II (3) Continuation of 570. Emphasizes increasing advanced nursing competencies in the management and primary care of individuals and their families in all developmental life stages.

572 Family Nurse Practitioner II Clinical (2) Continuation of 571. Clinical experience in a variety of settings emphasizing advanced nursing competencies in the management and primary care of individuals and their families in all developmental life stages.
573 Family Nurse Practitioner III (8) Continuation of 572. Advanced nursing management of multiple/complex health problems of individuals and families in all developmental life stages; role refinement and exploration of major issues of the family nurse practitioner; clinical experience in a variety of settings.

Contact Hour Distribution: 2 didactic and 6 practicum.

(RE) Prerequisite(s): 501 and 572.
(DE) Prerequisite or (DE) Corequisite: 582.

577 Special Topics (1-3) Topic is determined by faculty and student interest.

Repeatability: May be repeated. Maximum 6 hours.

Registration Permission: Consent of instructor.

582 Scholarly Inquiry for Advanced Practice Nursing (3) Non-thesis option. Utilization of research process through experiential or critical evaluation of science in area of interest. Conducted under faculty guidance and culminating in scholarly product.

Repeatability: May be repeated. Maximum 6 hours.

Registration Requirement: Consent of instructor.

583 Directed Clinical Practice (1-10) Additional opportunities for advanced nursing practice. Objectives to be developed collaboratively by student and faculty.

Grading: Satisfactory/No Credit or letter grade.

Repeatability: May be repeated. Maximum 14 hours.

Comment(s): Enrollment or completion of graduate-level courses in clinical nursing required.

585 Seminar in Gerontology (1) (See Health 585.)

590 Nursing Administration: Macro-Analysis (6) Exploration, analysis, and application of selected organizational, management, and leadership theories and financial principles to delivery of nursing services. Structure, functions, organization, behaviors, and adaptive processes of health care organizations.

Contact Hour Distribution: 2 didactic and 4 practicum.

(RE) Prerequisite(s): 510.
(DE) Prerequisite or (DE) Corequisite: 501 and 507.

591 Nursing Administration: Micro-Analysis (6) Utilization of human and financial resources, conflict resolution, and organizational development with application to mid-level and top-level nursing administration positions.

Contact Hour Distribution: 2 didactic and 4 practicum.

(RE) Prerequisite(s): 510.
(DE) Prerequisite or (DE) Corequisite: 501 and 507.

593 Independent Study (1-3)

Repeatability: May be repeated. Maximum 6 hours.

Registration Requirement: Consent of instructor.

600 Doctoral Research and Dissertation (3-15)

Grading Restriction: P/INP only.

Repeatability: May be repeated.

Registration Restriction(s): Doctor of Philosophy – nursing major.

601 Philosophy and Theory for Nursing Science (3) Philosophical and historical context of knowledge for nursing science; in-depth analysis of health-related theories as frameworks for knowledge-building; concept development in theory building.

Registration Restriction(s): Doctor of Philosophy – nursing major.

603 Nursing Research and Inquiry (3) Philosophical, theoretical and methodological bases for nursing inquiry.

(RE) Prerequisite(s): 601.

605 Middle-Range Theoretical Formulations for Nursing Science Development (3) Extant and emerging middle-range theories instrumental in nursing science development.

(RE) Prerequisite(s): 603.

(DE) Corequisite: 608.

Recommended Background: Inferential statistics course.

606 Nursing Research Seminar (3) Selected topics pertaining to dissertation proposal process, research experience, and defense.

607 Qualitative Nursing Research (3) Critique and application of qualitative nursing research methods.

(RE) Prerequisite(s): 603.

608 Quantitative Nursing Research (3) Critique and application of quantitative nursing research methods.

(RE) Prerequisite(s): 603.

(DE) Prerequisite or (DE) Corequisite: Multivariate statistics course.

609 Research Practicum (1-3) Supervised individual or group research experience under guidance of faculty.

Repeatability: May be repeated. Maximum 12 hours.

Registration Permission: Consent of instructor.

610 Nursing Science Seminar (2) Critical Analysis and synthesis of literature in selected focus area within nursing science.

Registration Restriction(s): Doctor of Philosophy; nursing major.

612 Health and Nursing Policy/Planning (3) Policies affecting nursing education and practice; health policies and political processes; interactions between health professionals, consumer groups, and government in health policy development and health planning activities.

613 Nursing Leadership in Complex Systems (3) Analysis and evaluation of nursing leadership/management in complex professional, academic and health care systems.

614 Nursing Preceptorship (1-3) Individually-designed practicum, field, or internships experiences in variety of administrative, educational, research, or clinical practice settings.

Repeatability: May be repeated. Maximum 6 hours.

(RE) Prerequisite(s): 601.

Nutrition (726)

500 Thesis (1-15)

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated.

Credit Restriction: May not be used toward degree requirements.

509 Graduate Seminar in Public Health (1) (See Public Health 509.)

511 Advances in Carbohydrate, Lipid and Protein Metabolism (4) The physiological impact of dietary carbohydrates, lipids and proteins, with an emphasis on nutritional and hormonal regulation of intermediary metabolism, bioenergetics and gene regulation.

(DE) Prerequisite(s): Advanced nutrition course.

512 Advances in Vitamin and Mineral Metabolism (3) Advances in the regulations of nutrient metabolism and physiological impact of micronutrients with an emphasis on vitamins and minerals in the context of human nutrition.

(DE) Prerequisite(s): Advanced nutrition course.

513 Community Nutrition I (3) Orientation to community; assessment of nutrition problems, needs, and resources; functional roles of public health nutritionist. Concurrent field experiences.

(DE) Prerequisite(s): Advanced nutrition course or consent of instructor.

514 Community Nutrition II (3) Planning, implementation, and evaluation of public health nutrition programs. Concurrent field experiences.

(DE) Prerequisite(s): 513 or consent of instructor.

515 Field Study in Community Nutrition (1-12) Personal participation in and analysis of state or regional community nutrition program. Location of in-depth study to be selected in consultation with instructor.

Grading Restriction: Satisfactory/No Credit grading only.

(DE) Prerequisite(s): 513 and 514.

Registration Permission: Consent of instructor.

516 Maternal and Child Nutrition (3) Nutrition principles related to growth and development during pregnancy, infancy, and childhood to age 5, high risk conditions.

(DE) Prerequisite(s): Advanced nutrition course or consent of instructor.

517 Childhood and Adolescent Nutrition (3) Application of nutrition principles to school age children; effects of diseases on growth and health maintenance; nutritional assessment and counseling for nutrition.

(DE) Prerequisite(s): Advanced nutrition course or consent of instructor.

518 Nutrition and Aging (3) Nutritional problems of adults; nutritional requirements, dietary intakes; effects of nutrition on biological aging.

(DE) Prerequisite(s): Advanced nutrition course or consent of instructor.

521 Physiological Basis for Diet and Disease (3) Altered nutrient needs as result of metabolic changes that occur in selected disease states.

(DE) Prerequisite(s): Nutrition in disease course or consent of instructor.

522 Nutrition Counseling (2) Individual eating habits and disorders, evaluation strategies for effectiveness of helping process.

(DE) Prerequisite(s): Nutrition in disease course or consent of instructor.

530 Molecular Application in Nutrient-Gene Interaction I (1) Theories and applications of gene regulation methodologies. Experimentation with DNA and RNA, RNA and DNA isolation and analysis to illustrate nutrient regulation of gene expression.

Contact Hour Distribution: Combination or lab and lecture.

540 Seminar in Nutrition (1)

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated.
541 Research Methods (2) Basic principles of planning, conducting, and interpreting nutrition and foodservice systems administration research. (DE) Prerequisite(s): 6 graduate hours in nutrition and food system administration and statistics.

544 Survey Methods in Food and Nutrition (2) Application of survey research methods to nutrition projects: assessment of food consumption, nutrient intake, nutritional status, sociocultural-economic parameters, food production and service. (DE) Prerequisite or (DE) Corequisite: 541.

547 Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Grading Restriction: Satisfactory/No Credit grading only. Registration Permission: Consent of instructor.

548 Directed Study in Nutrition (1-3) Advanced study in nutrition. Repeatability: May be repeated. Maximum 6 hours. Registration Permission: Consent of instructor.

549 Special Topics (1-3) Recent advances in nutrition or food systems administration. Repeatability: May be repeated. Maximum 6 hours. Registration Permission: Consent of instructor.

600 Doctoral Research and Dissertation (3-15) Registration Permission: Consent of instructor. Repeatability: May be repeated.

602 Advanced Topics in Nutrition Science (1-3) Comprehensive individual study and group discussion of topics related to current problems in nutrition. Repeatability: May be repeated. (DE) Prerequisite(s): 512 or consent of instructor.

Operations and Management Science (738)

540 Statistics and Operations Management (3) Analysis of methods and models for understanding supply chain flows processes. Introduction to management strategies and techniques applicable to design of systems in logistics and operations processes. (Same as Logistics 510.) (DE) Prerequisite(s): Business Administration 511, 512, and 513 or consent of instructor.

541 Operations Management (3) Techniques applicable to design of systems in operations planning and control in manufacturing and service industries. Modeling real-world systems through problem definition, supporting data structure design, model design, solution, implementation, and maintenance. (DE) Prerequisite(s): 540 or Logistics 510 or consent of instructor.

Philosophy (745)

400 Special Topics (3) Repeatability: May be repeated if topic differs. Maximum 6 hours.

411 Modern Religious Philosophies (3) (See Religious Studies 411.)

419 Science as Method (3) (See Ecology and Evolutionary Biology 419.)

420 Topics in History of Philosophy (3) One or more figures or movements from antiquity through mid-20th century. Repeatability: May be repeated. Maximum 9 hours. (DE) Prerequisite(s): 6 hours of philosophy courses or consent of instructor.

435 Intermediate Formal Logic (3) Metatheory of formal logic and philosophy of logic. Registration Permission: Consent of instructor.

440 Contemporary Ethical Theory (3) Topics in meta-ethics or ethics. (DE) Prerequisite(s): 6 hours of philosophy courses or consent of instructor.

443 Advanced Business Ethics (3) Advanced topics in business ethics. Repeatability: May be repeated if topic differs. Maximum 6 hours. (DE) Prerequisite(s): One of the following – 241, 242, 243, 244, 245, 246, 340.

445 Advanced Environmental Ethics (3) Advanced topics in environmental ethics. Repeatability: May be repeated if topic differs. Maximum 6 hours. (DE) Prerequisite(s): One of the following – 241, 242, 243, 244, 245, 246, 340.

446 Advanced Bioethics (3) Advanced topics in bioethics. Repeatability: May be repeated if topic differs. Maximum 6 hours. (DE) Prerequisite(s): One of the following – 241, 242, 243, 244, 245, 246, 340.

462 Philosophy of Biology (3) An introduction to current issues in the philosophy of biology. Specific problems vary, but will likely include: the nature of natural selection, adaptation, and fitness; the level of selection debate; the nature of species; the interaction of environment and organism, and others. (DE) Prerequisite(s): Upper-division coursework in philosophy or biology or consent of instructor.

472 Philosophy of Language (3) Problems of meaning, reference and truth. What is the relation between words and the world? How do sentences manage to be about the world? What is it for something to be true? (DE) Prerequisite(s): 3 philosophy courses 200 level or above.

473 Philosophy of Mind (3) Problems of mind and body in relation to consciousness and personal identity. (DE) Prerequisite(s): 6 hours of philosophy courses or consent of instructor.

500 Thesis (1-15) Grading Restriction: P/NP only. Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

510 Philosophical Research (1-15) Paper workshop (writing, revising papers, getting papers ready to publish). Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 15 hours. Credit Restriction: May not be applied toward degree requirements.

520 Topics in Ancient or Medieval Philosophy (3) Intensive critical work on major philosopher or school. Repeatability: May be repeated. Maximum 9 hours.

522 Topics in Modern Philosophy (3) Intensive critical work on major philosopher or school. Repeatability: May be repeated. Maximum 9 hours.

524 Topics in 20th-Century Philosophy (3) Intensive critical work on major philosopher or school. Repeatability: May be repeated. Maximum 9 hours.

528 Topics in Contemporary Philosophy (3) Intensive critical work on themes in late 20th-century philosophy. Repeatability: May be repeated. Maximum 9 hours.

540 Topics in Ethics or Value Theory (3) Repeatability: May be repeated. Maximum 9 hours.

542 Topics in History of Ethics (3) Dominant movements in history of ethics. Repeatability: May be repeated. Maximum 9 hours.

543 Topics in Business Ethics (3) Content may vary. Repeatability: May be repeated if content differs. Maximum 9 hours.

544 Topics in Applied Ethics (3) Content may vary. Repeatability: May be repeated. Maximum 9 hours.

545 Topics in Environmental Ethics (3) Content may vary. Repeatability: May be repeated if content differs. Maximum 9 hours.

546 Topics in Bioethics (3) Content may vary. Repeatability: May be repeated if content varies. Maximum 9 hours.

549 Practicum in Applied Ethics (1-3) Repeatability: May be repeated if content differs. Maximum 9 hours. Credit Restriction: Does not count toward hours required for the degree.

575 Topics in Metaphysics and Epistemology (3) Repeatability: May be repeated. Maximum 9 hours.

577 Topics in Philosophy of Mind (3) Relation of mental to physical and of role of words in discourse for mental activities, thinking and feeling. Repeatability: May be repeated. Maximum 9 hours.

585 Special Topics (3) Repeatability: May be repeated. Maximum 9 hours.

589 PhD Practicum in Applied Ethics (1-15) Supervised experience in such settings as health care, business, legal, or environmental institutions. Repeatability: May be repeated. Maximum 30 hours. Credit Restriction: Does not count toward hours required for the degree. Comment(s): Open to PhD students in philosophy with consent of the Graduate Committee.

590 Topics in Social and Political Philosophy (3) Philosophical problems concerning social and political life: family, state, freedom, justice; major theoretical responses: anarchism, social contract, Marxism. Repeatability: May be repeated. Maximum 9 hours.

591 Foreign Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

592 Off-Campus Study (1-15) Repeatability: May be repeated. Maximum 15 hours.
502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

503 Physics Colloquium (1) Lectures and discussion on current research topics. Continuous registration required for current graduate students.
Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 6 hours.

505 Physics of Fluids (3) Fluid physics, overview of fluid mechanics and associated computational techniques; general description of laminar and turbulent flows; subsonic, supersonic and hypersonic flows; continuum, transitional and free-molecular flows; pipe flow, nozzle flow and sonic orifice expansion flows; reacting and nonreacting flowfields; shock-tube physics; and introduction to method of characteristics and Monte Carlo computational techniques.

506 Experimental Methods (3) Introduction to experimental methods of spectroscopy through hands on operation of FTIR, Raman, NMR, photoelectron, laser and mass spectrometers. Principles and hazards of cw and pulsed lasers, radiation detectors, photomultiplier tubes, image intensifiers, image converters; high-vacuum systems including cryogenic-based devices, data acquisition techniques including lock-in amplifiers, box-car integrators, digital electronics methods and micro-computer data acquisition.

507 Contemporary Optics (3) Topics in geometrical, physical, Fourier, and nonlinear optics and introductory laser physics. Extensive use of computer calculations and design of practical and sophisticated optical systems.

508 Laser Physics (3) Mode analysis, stable and unstable resonators; rate equations and population inversion, saturation, relaxation oscillations, fluctuations and noise, laser stability; quantum theory of laser, photon coherence; mode-locking, Q-switching and frequency stabilization; specific laser types: semiconductor and solid-state, excimer, copper vapor and dye lasers.

511 Theoretical Physics I (3) Concepts and applications in applied physics. Topics: one-body, two-body and rigid body dynamics, ideal fluid, small oscillations and waves, elements of special relativity, electrostatic and magneto-static problems, and other modern applications of current interest, in areas of biophysics and astrophysics.
Recommended background: Familiarity with computational methods.

512 Theoretical Physics II (3) Concepts and applications in applied physics. Topics: electrostatic and magneto-static problems, EM waves, duality and quantization, absorption and emission, statistical ensemble and thermal equilibrium, and other modern applications of current interest, in areas of quantum chemistry, biophysics, optics, spectroscopy, and astrophysics.
Recommended background: Familiarity with computational methods.

513 Problems in Theoretical Physics I (3) Fundamentals of physics: classical mechanics (Newtonian mechanics, Lagrangian and Hamiltonian dynamics) and electrodynamics and magnetostatics.

514 Problems in Theoretical Physics II (3) Fundamentals of physics: electrodynamics, relativity, and quantum mechanics.

521 Quantum Mechanics (3) Fundamental principles of quantum mechanics, angular momentum, electron spin, particles in electric and magnetic fields, perturbation theory, variational methods, scattering theory; second quantization, quantization of electromagnetic field, emission, absorption, and scattering of light, bremsstrahlung, pair creation and annihilation. Application of quantum mechanics to problems of atomic, molecular, nuclear, and solid state physics.

522 Quantum Mechanics (3) Fundamental principles of quantum mechanics, angular momentum, electron spin, particles in electric and magnetic fields, perturbation theory, variational methods, scattering theory; second quantization, quantization of electromagnetic field, emission, absorption, and scattering of light, bremsstrahlung, pair creation and annihilation. Application of quantum mechanics to problems of atomic, molecular, nuclear, and solid state physics.

531 Classical Mechanics (3) Variational formulation, Lagrange's and Hamilton's equations, constraints, canonical transformations, Hamilton-Jacobi theory and action-angle variables.

532 Advanced Classical Mechanics (3) Advanced topics in classical mechanics, KAM theorem and Hamiltonian chaos, dissipative chaos. Topics may vary according to interest of students and instructor.

(DE) Prerequisite(s): 521.
541 Electromagnetic Theory (3) Review of electrostatics, magnetostatics, and quasi-static problems; Maxwell’s field equations and their solutions in dielectric and conducting media; electrodynamics and relativity, retarded potentials and gauge transformations, radiation produced by accelerating charges.

(DE Prerequisite(s): 571.)

542 Electromagnetic Theory (3) Advanced treatment of Electrodynamics, collisions between charged particles, bremsstrahlung, multipole fields. Topics may vary according to interest of students and instructor.

(DE Prerequisite(s): 541.)

551 Statistical Mechanics (3) Ergodic theory, classical ensemble theory, quantum mechanical ensembles, relation of statistical mechanics to thermodynamics, transport theory and approach to equilibrium, phase transition, fluctuations and correlations.

(DE Prerequisite(s): 521, 531, and 571.)


561 The Theory of Relativity (3) Geometry of space-time, relativistic electrodynamics, particle mechanics and continuum mechanics, Einstein’s field equations, Schwarzschild solutions, the classical test of general relativity.

(DE Prerequisite or (DE Corequisite: 531 and 541.)


572 Mathematical Methods in Physics II (3) Advanced Problems. Topics may vary according to interests of students and instructor. (Same as Mathematics 518.)

(DE Prerequisite(s): 571.)


(DE Prerequisite(s): 571 or consent of instructor.)

591 Foreign Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

592 Off-Campus Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

593 Independent Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

594 Special Problems (3) Especially assigned theoretical or experimental work on problems not covered in other courses. Repeatability: May be repeated. Maximum 9 hours.

599 Seminars (1-3) (a) Mechanics; (b) Radiation; (c) Heat and Thermodynamics; (d) Electricity and Magnetism; (e) Modern Physics.

Repeatability: May be repeated with consent of department. Maximum 18 hours.

600 Doctoral Research and Dissertation (3-15) Grading Restriction: P/NP only. Repeatability: May be repeated.

601 Atomic Physics (3) Survey of research problems and methods. Topics of current interest.

Comment(s): Intended for all graduate students.

602 Atomic Physics (3) Advanced problems.

Comment(s): For students specializing in the field.

605 Laser Spectroscopy (3) Applications of lasers to spectroscopy of atomic and molecular systems; absorption, laser-induced fluorescence, and Raman spectroscopy; molecular and atomic coherence, quantum beats, resonance fluorescence, photon echoes, self-induced transparency; saturation and Doppler-free spectroscopy; laser cooling and trapping.

(DE Prerequisite(s): 521 and 541.)

606 Nonlinear Optics (3) Nonlinear optical susceptibilities, wave propagation in nonlinear media, sum-frequency and difference frequency generation, harmonic generation, parametric amplification and oscillation, stimulated Raman processes, two- and multi-photon processes, four-wave mixing and phase conjugation, transient coherent optical effects and free induction decay, optical breakdown and nonlinear effects in plasmas.

(DE Prerequisite(s): 522.)

610 Quantum Optics (3) Quantum theory of emission and absorption of radiation; frequency-dependent susceptibility; coherence theory; field quantization and coherent photon states; interaction of radiation with atoms; photon optics, counting and higher-order coherence; atomic scattering phenomena.

(DE Prerequisite(s): 521.)

611 Advanced Quantum Mechanics and Field Theory (3) Survey of problems and methods. Topics of current interest.

Comment(s): Intended for all graduate students.

612 Advanced Topics in Quantum Field Theory (3) Renormalization, Lamb shift, anomalous magnetic moments, gauge theories, electroweak theory, quantum chromodynamics, grand unified theories, and advanced topics in laser physics and quantum optics. Topics vary according to interest of students, instructor, and present state of physics.

(DE Prerequisite(s): 611 or consent of instructor.)

615 Astrophysics and Cosmology (3) Stellar evolution: hydrostatic equilibrium, energy production and transport, star birth, main sequence, red giants, variable stars, and stellar explosions. General relativity and gravitation, white dwarfs, neutron stars, pulsars, and black holes.

616 Astrophysics and Cosmology (3) Galaxies and the interstellar medium. Active galaxies, quasars, and supermassive black holes. Large-scale structure, the expanding Universe, cosmologies, big bang, cosmic background radiation, inflation, dark matter, formation of structure, and fate of the Universe. The Planck scale and quantum gravity.

621 Nuclear Physics (3) Survey of research problems and methods. Topics of current interest.

Comment(s): Intended for all graduate students.

622 Nuclear Physics (3) Advanced problems.

Comment(s): Intended for students specializing in the field.

626 Elementary Particle Physics (3) Survey of elementary particle physics: experimental methods, conservation laws, invariance principles, and models of interactions.

Comment(s): Intended for all graduate students.

627 Elementary Particle Physics (3) Advanced topics – quark models, electroweak interactions, and unification of elementary forces.

Comment(s): Intended for students specializing in the field.

642 Advanced Topics in Modern Physics (3) Advanced theoretical or experimental topics not covered in other courses.

Repeatability: May be repeated with consent of department. Maximum 9 hours.

643 Computational Physics (3) Developing computer algorithms for solving representative problems in various fields of physics, celestial dynamics in astrophysics, boundary value problems in electromagnetism, atomic and nuclear structures, band structure in solid state physics, transport problems in statistical mechanics, Monte Carlo simulation of liquids, fitting and interpolation of data, correlation analysis, or optimization strategy.

(DE Prerequisite(s): 521, 531, and 571.)

671 Advanced Solid State Physics (3) Survey of research problems and methods. Topics of current interest.

Comment(s): Intended for all graduate students.

672 Advanced Solid State Physics (3) Advanced problems.

Comment(s): Intended for students specializing in the field.

Plant Sciences (791)

410 Nursery Management and Production (3) Management methods as applied to retail and wholesale nurseries and landscape contracting firms. Methods of producing liners, container and field-grown woody ornamental plants.

Contact Hour Distribution: 2 hours and 1 lab.

(DE Prerequisite(s): 220, 330, and Environmental and Soil Sciences 210 or consent of instructor.)

427 Management and Administration of Public Horticulture Institutions (2) Management of resources in non-profit institutions, support organizations and communities. Theoretical framework and institutional management; marketing and publicity; legal issues; relationships between staff and governing boards; the use of information technology in management and governance systems; and conservation/preservation roles in community development.

(DE Prerequisite(s): 226.)

429 Field Study of Public Horticulture Institutions (2) Extended 10-12 day field study of various public horticulture institutions such as botanical gardens, arboreta, historical grounds, zoos, conservatories, cemeteries, and nature preserves. Application and travel fee required.

Contact Hour Distribution: 2 hours lecture and one 2-hour lab.

(DE Prerequisite(s): 120 and Biology 110 and 120.)
435 Field and Forage Crops (2) Agronomic principles of crop production and management. Crop improvement, cropping systems, tillage, fertilization, pest management, harvest and utilization of major field and forage crops.  
Contact Hour Distribution: 2 hours and 1 lab.  
(DE) Prerequisite(s): 335.

436 Plant and Garden Photography (2) Principles and techniques of photography as they relate to plants and gardens. Study of equipment options and field shooting under various weather conditions and in different seasons.  
Registration Permission: Consent of instructor.

437 Public Garden Operations and Management (2) Analysis of year-round operation and management of public gardens. Case studies involving time and labor management, budget development and management, implementation of volunteer programs, information dissemination methods for public outreach, management of grounds and facilities using the University of Tennessee Institute of Agriculture Gardens as a model.  
(DE) Prerequisite(s): 226.

441 Advanced Turfgrass Management (2) Principles and scientific basis of turfgrass culture; adaptation, ecology, physiology, climatic influences on grass culture; clipping and water management; design.  
Contact Hour Distribution: 1-hour lecture and one 1-hour lab.  
(DE) Prerequisite(s): 240.

442 Turf Root-zone Construction (2) Construction and management of root-zones for home lawns, golf courses and athletic fields.  
Contact Hour Distribution: 1-hour lecture and one 3-hour lab.  
(DE) Prerequisite(s): Communication Studies 210 or 240.

446 Horticultural Therapy (2) Introduction to the application of horticulture as therapy for treatment, rehabilitation and/or training of individuals with disabilities.

448 Horticultural Internet Technology (3) Creation and management of information resources for the internet, with a focus on development of visual and oral communications skills through a series of individual and team exercises in writing, graphics and public speaking.  
(DE) Prerequisite(s): Communication Studies 210 or 240.

450 Specialty Landscape Construction (3) Methods of design, materials, and construction techniques for specialized components of the landscape industry. Irrigation systems, outdoor lighting, garden ponds and water features.

451 Plant Tissue Culture (3) (See Entomology and Plant Pathology 451.)

454 Plant Biotechniques (3) Lectures will discuss recombinant DNA technology, molecular assisted breeding of economically important crops, gene cloning and transformation technologies. Examples will be given of food and ornamental crops, pharmaceuticals, and renewable energy sources produced using biotechnology as well as potential risks of this technology. Labs will include electrophoresis, tissue culture, plasmid preps, genomic DNA preps, PCR, plant transformation, genomic techniques.  
Contact Hour Distribution: 1-hour lecture and one 3-hour lab.  
(DE) Prerequisite(s): 353 or Biology 240.

457 Weed Management (2) Principles of weed interference, integrated management, herbicide selectivity and behavior, specific recommendations for various crop and non-crop situations.  
(DE) Prerequisite(s): Environmental and Soil Sciences 210.

458 Turf Weed Management Lab (1) Laboratory addressing practices and principles presented in 457, from the standpoint of turf.  
(DE) Prerequisite(s): Environmental and Soil Sciences 210.  
(DE) Prerequisite or (DE) Corequisite: 457.

459 Agronomy Weed Management Lab (1) Laboratory addressing practices and principles presented in 457, from the standpoint of agronomy.  
(DE) Prerequisite(s): Environmental and Soil Sciences 210.  
(DE) Prerequisite or (DE) Corequisite: 457.

480 Advanced Landscape Design (3) Comprehensive application of landscape design skills to a variety of project experiences with an emphasis on landscape planning and analysis, planting design, and materials estimating.  
Contact Hour Distribution: Two 3-hour labs.  
(DE) Prerequisite(s): 280 and 380.

485 Computer Aided Landscape Design (3) Overview of Computer Aided Design (CAD) as it relates to landscape design and construction. Emphasis on development of landscape design drawings through utilization of LANDCADD software.  
Contact Hour Distribution: Two 3-hour labs.  
(DE) Prerequisite(s): 280, 380, and Agriculture and Natural Resources 290 or Computer Sciences 100.

494 Professional Horticultural Communications (3) Communication for public horticulturists through written, oral and visual media. Emphasis on communication skills using proper writing techniques and grammar for print media, brochure design using desktop publishing, slide show development, oral presentations, and video use for educational and informational presentations in ornamental horticulture.  
(DE) Prerequisite(s): Agriculture and Natural Resources 290 or Computer Sciences 100.

500 Thesis (1-15)  
Grading Restriction: P/NP only.  
Repeatability: May be repeated. Maximum 15 hours.  
Registration Permission: Consent of instructor.

501 Special Topics in Plant Sciences (1-3) Topics to be assigned.  
Repeatability: May be repeated. Maximum 3 hours.  
Registration Permission: Consent of instructor.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.  
Grading Restriction: Satisfactory/No Credit grading only.  
Repeatability: May be repeated.  
Credit Restriction: May not be used toward degree requirements.

503 Non-Thesis Project (1-2) Library, field, or laboratory project under supervision of faculty member.  
Repeatability: May be repeated. Maximum 4 hours.  
Comment(s): For students in non-thesis option only.

504 Seminar (1) Presentations and discussion of topics.  
Repeatability: May be repeated. Maximum 2 hours.

505 Seminar Preparation (1) Application of speaking, writing, and organizational skills in preparation and presentation of scientific material to both scientific and general audiences. Preparation of abstracts for scientific presentations. Required of all entering graduate students during their first year of graduate study.

507 Professional Development Seminar (1) (See Agriculture and Natural Resources 507.)

513 Plant Pathogenic Fungi (2) (See Entomology and Plant Pathology 513.)

521 Flowering Physiology (1) General phenomenology, photoperiodism, thermoperiodism, interactions of external factors, juvenility, and hormonal regulation.  
Contact Hour Distribution: 3 hours weekly for 5 weeks.  
(DE) Prerequisite(s): Introductory plant physiology course.

522 Drought Physiology (1) Biophysical and biochemical aspects of plant water relations and drought physiology.  
Contact Hour Distribution: 3 hours weekly for 5 weeks.  
(DE) Prerequisite(s): Introductory plant physiology course.

530 Integrated Pest Management (3) (See Entomology and Plant Pathology 530.)

532 Environmental Crop Physiology and Ecology (3) General and specific relations among environmental factors, crop organisms, and agricultural systems. Interrelationships of atmospheric gases in photosynthesis, evapotranspiration and foliar injury. Relationships of temperature stress, vernalization and bud dormancy to crop production. Influences of maturation ripening and senescence on post-harvest quality of fruit, vegetable, grain and forage crops.  
Contact Hour Distribution: 2 hours and 1 lab.  
(DE) Prerequisite(s): Plant physiology course.

536 Ecology of Grazing Land Systems (3) Multi-university, field-oriented course. Components and functions of grazing lands and how these vary in different ecoregions; research needs, objectives and techniques in soil-plant-animal research; forage-livestock ecology and systems in grazing lands (cropland, pastureland, rangeland and forestland); role of forages in conservation practices, wildlife habitats, and sustainable agriculture; and industries involved with forages and livestock. Requires two-week field trip, inclusive report, and examination.  
Registration Permission: Consent of instructor.

544 Protein Gel Electrophoresis (1) (See Entomology and Plant Pathology 544.)

545 Plant Microtechnique (1) (See Entomology and Plant Pathology 545.)

551 Organismatic Plant Genetics (3) Discovery of genetics, polyploidy, extrachromosomal inheritance, apomixis, incompatibility systems, mutations, controlling elements, quantitative inheritance and heritability.  
(DE) Prerequisite(s): 561 and a general genetics course.
561 Statistics for Biological Research (3) Application of statistics to interpretation of biological research. Notation, descriptive statistics, probability, distributions, confidence intervals, t- and chi-square tests, analysis of variance, mean separation procedures, linear regression and correlation.
Credit Restriction: Students may not receive credit for both 561 and 461.
(De) Prerequisite(s): Mathematics 125 or 152.

571 Design and Analysis of Biological Research (3) (See Animal Science 571.)

592 Internship (1-2) Application of horticulture and design principles and practices in supervised, professional setting, approved by department.
Grading Restriction: Satisfactory/No Credit or letter grade.

593 Problems in Plant Sciences (1-3) Independent study. Current topic related to technology, science or design.
Repeatability: May be repeated. Maximum 6 hours.

600 Doctoral Research and Dissertation (3-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

603 Special Topics in Crop Physiology and Ecology (1-3) Microclimatology of agroecosystems, crop dormancy and responses to stress, physiology of crop growth and reproduction. Interactions of physiology and germplasm in crop production, theory and application of quantitative methods in crop physiology and ecology research.
Repeatability: May be repeated. Maximum 6 hours.

605 Special Topics in Plant Breeding and Genetics (1-3) Genotype by environment interactions, estimation of quantitative parameters, mutations, chromosome dynamics, polyploidy, genetic engineering, interspecific hybridization, linkage, screening methods, genome organization.
Repeatability: May be repeated.

633 Plant Metabolism (3) Metabolism of chemical compounds of economic importance in crop production; plant growth regulators, naturally occurring plant metabolites, and herbicides.
(De) Prerequisite(s): Botany 521 or 522 and an organic chemistry or biochemistry course.

643 DNA Analysis (2) (See Entomology and Plant Pathology 643.)

653 Advanced Plant Breeding (3) Principles and methodologies targeting genetic gain for crop improvement. Concepts of qualitative and quantitative trait improvement. Parental germplasm, hybridization, population formation, inbreeding, genetic variance, heritability, selection methods, molecular genetic markers, genetically engineered crops.
(De) Prerequisite(s): 571 and a general genetics course.

Political Science (801)


Credit Restriction: May not be applied toward requirements for the Master of Science in Planning.

425 Media and Politics (3) Examines the interrelationship between the political system and the media from a political science perspective.

430 United States Constitutional Law: Sources of Power and Restraint (3) Judicial review, constitutional powers of the President and Congress, federalism, sources of regulatory authority, and constitutional protection of political and economic rights. (Same as Legal Studies 430.)

431 United States Constitutional Law: Civil Rights and Liberties (3) Current issues in civil rights and liberties including: first amendment freedoms, equal protection, privacy and the rights of the accused. (Same as Legal Studies 431.)

435 Criminal Law and Procedure (3) An overview of substantive and procedural law in the criminal justice field with emphasis on constitutional questions and public policy issues. (Same as Legal Studies 435.)

441 Public Budgeting (3) The process, participants, and politics of government budgeting with emphasis on federal government budgeting. Includes an overview of budget reform measures and their effectiveness.

442 Administrative Law (3) Legal dimensions of administrative power and procedures, and constitutional controls over administrators. (Same as Legal Studies 442.)

445 Administration of Justice (3) Administration and processes of justice system, including judicial administration and decision making in trial and appellate courts. (Same as Legal Studies 445.)

446 Housing (3) Nature and demand for housing in the U.S. and abroad. U.S. experience. Private market processes and public influences. Problems of change in housing supply, impact of new technology, and governmental programs to increase supply and quality of housing.

451 Ethnic Conflict in Foreign Countries (3) Examines political and violent conflict among ethnic and national groups and the challenges these conflicts pose for democratic and democratizing states.

452 Black African Politics (3) Recent evolution and current political environment of black African nations. (Same as Africana Studies 452.)

454 Government and Politics of China and Japan (3) Political setting, structure and political processes in China and Japan.

456 Latin American Government and Politics (3) Introduction to the political development of Latin America with an emphasis on contemporary politics. (Same as Latin American Studies 456.)

459 Government and Politics of Russia and Eastern Europe (3) System transformation, political processes and governmental structure in Russia and Eastern European countries.

461 Policy Making in Democracies (3) Comparative approach to theory and process of making public policies.

463 Contemporary Middle East Politics (3) Governments and movements in the Middle East, their characteristics, bases, and interrelationships.

471 International Political Economy (3) The politics of international economics. Topics include globalization, development, trade, crime, the IMF, the WTO, the environment and challenges to the status quo.

473 Negotiation, Bargaining and Diplomacy (3) Diplomacy, negotiation, and foreign policy decision making. Theories of diplomacy and negotiation are applied in a simulation focusing on issues from international crime and global economic stability to world health and the environment.

474 International Organization (3) Constitutional framework and key functions of the United Nations. Topics include collective security, peacekeeping, human rights, development, regional organizations, and the role of the Secretary-General.

475 Ancient and Medieval Political Thought (3) Major western political thinkers from Socrates to Marsilio of Padua. (Same as Medieval Studies 475.)

476 Modern Political Thought (3) Major western political thinkers from Machiavelli to Marx.

500 Thesis (1-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

510 Scope and Methods in Political Science (3) Procedures of analysis in political science.

511 Research Design (3) Methods for planning and executing research, from case studies to experimental designs: development of research questions and hypotheses; measurement issues; and validity of inferences.

512 Quantitative Political Analysis (3) Methods and techniques in quantitative political analysis: univariate and bivariate statistics.

513 Quantitative Political Analysis (3) Methods and techniques in quantitative political analysis: multivariate model building.

514 Research and Methodology in Public Administration (3) Basic assumptions and techniques of research in public administration; measurement, analysis, and reporting of data.

520 Political Theory (3) Survey of major ideas, thinkers and works of Western political theory.

522 American Political Thought (3) Systematic examination of the normative and empirical theories of leading American political thinkers from the colonial period to the present.

530 American Government and Politics (3) Survey of literature, approaches to research and analysis, critical examination of major works, and overviews of research in various sub fields.
Repeatability: May be repeated with consent of department. Maximum 9 hours.

531 Theory of Planning (3) Analysis of nature and objectives of planning process: role of planners and planning function in public decision making.
532 Presidency (3) Systematic examination of the structure, functions and powers of the American presidency as they have evolved from the founding to the present.

533 Congress (3) Formal, empirical and theoretical approaches to and models of the institutional workings of Congress and the behavior of legislators.

535 Mass Political Behavior (3) Theoretical and empirical analyses of public opinion, political socialization, political attitudes and behavior, especially voting behavior.

537 Political Parties and Interest Groups (3) Theoretical and empirical examination of the structure, functions and operations of political parties and interest groups.

539 State and Local Government and Politics (3) Theoretical and empirical analysis of government, politics, policymaking and public administration at the state and local levels.

540 Public Law (3) Selective examination of published research and current approaches in sub fields of constitutional law, judicial process, and judicial behavior.

Repeatability: May be repeated with consent of department. Maximum 9 hours.

544 Information Systems and Networks in Planning (3) Use and impact of computer-based information systems and global networks in planning and public management. Development of practical skills in design of planning-decision support systems, databases, Internet-based tools and geographic information systems (GIS).

545 Planning Research Methods (3) Overall structuring of social science research in planning practice: familiarity with structure of planning literature information sources, decision processes and tools, practice in posing research questions relevant to planning, evaluation methods.

547 Planning Technology (3) Relationships between information technology, society and planning. Overview of other advanced technologies, economic development, and associated social and planning issues.

548 Public Policy Process (3) Theoretical, formal and empirical analysis of the roles, functions and decision-making processes of public policymakers, including legislative, executive and judicial actors.

549 Environmental Policy (3) Overview of contemporary environmental policy and its evolution. Examines the roles of values in the environmental arena. Provides a framework for policy analysis and analytical tools for selection and choosing among policy options.

550 Public Administration (3) Overview of public administration theory and function.

552 Organization Theory (3) Appraisal of major theories of organization and their applicability to public sector.

555 Planning and Transportation (3) (See Civil Engineering 558.)

556 Policy Analysis (3) Strategies and techniques for identification and analysis of public problems and policy solutions.

Repeatability: May be repeated with consent of department. Maximum 9 hours.

558 The Politics of Administration (3) Examination of public administration in context of American political system, policy making and political roles of public administrators and agencies.

Repeatability: May be repeated with consent of department. Maximum 9 hours.

560 Public Financial Administration (3) Principles and techniques of public finance at state and local levels: budget preparation, execution and audit, risk management, capital planning, major tax structures, economic forecasting, cash management, and debt administration.

562 Public Management (3) Interpersonal and leadership skills, techniques and methods for planning, decision making, and implementation of management strategies in public sector.

Repeatability: May be repeated with consent of department. Maximum 9 hours.


566 Ethics, Values, and Morality in Public Administration (3) Moral-ethical-value dilemmas confronting administrators in American political system.

569 Internship in Public Administration (3-9)

Grading Restriction: Satisfactory/No Credit grading only.

Repeatability: May be repeated with consent of department. Maximum 9 hours.

570 Comparative Government and Politics (3) Selected topics in modern governments.

Repeatability: May be repeated with consent of department. Maximum 9 hours.

572 The Politics of Development (3) Selected topics dealing with political problems of less developed countries.

Repeatability: May be repeated with consent of department. Maximum 9 hours.

574 Public Administration (3) Formal, empirical and theoretical approaches to and models of the institutional workings of Congress and the behavior of legislators.

575 Mass Political Behavior (3) Theoretical and empirical analyses of public opinion, political socialization, political attitudes and behavior, especially voting behavior.

577 Political Parties and Interest Groups (3) Theoretical and empirical examination of the structure, functions and operations of political parties and interest groups.

579 State and Local Government and Politics (3) Theoretical and empirical analysis of government, politics, policymaking and public administration at the state and local levels.

580 Public Law (3) Selective examination of published research and current approaches in sub fields of constitutional law, judicial process, and judicial behavior.

Repeatability: May be repeated with consent of department. Maximum 9 hours.


584 Environmental Planning (3) Role of planners and planning in maintenance of balance between natural and built environment.


587 Legal Aspects of Planning (3) Legal basis for planning and guiding community development. Legal tools of planning.

588 Sustainable Communities (3) Overview of sustainable communities. Project-based classroom exercises.


590 Practicum in Planning (3)

Registration Permission: Consent of instructor.

591 Foreign Study (1-15)

Repeatability: May be repeated. Maximum 15 hours.

592 Off-Campus Study (1-15)

Repeatability: May be repeated. Maximum 15 hours.

593 Independent Study (1-15)

Repeatability: May be repeated. Maximum 15 hours.

594 College Teaching in Political Science (1) Instructional effectiveness, techniques, organization, materials for teaching political science at college level.

Grading Restriction: Satisfactory/No Credit grading only.

Registration Permission: Consent of instructor.

595 Readings and Special Problems in Political Science (1-3)

Repeatability: May be repeated. Maximum 15 hours.

Registration Permission: Consent of instructor.

596 Workshops in Computer Applications (1) Training in software applications to support research and decision-making tasks in public service. Successful completion certifies proficiency of MPA students in use of software applications for personal computer.

Grading Restriction: Satisfactory/No Credit grading only.

597 Special Topics in Planning (1-3)

Repeatability: May be repeated. Maximum 6 hours.

Registration Permission: Consent of instructor.

598 Problems in Planning (1-3)

Repeatability: May be repeated. Maximum 6 hours.

Registration Permission: Consent of instructor.

600 Doctoral Research and Dissertation (3-15)

Grading Restriction: P/NP only.

Repeatability: May be repeated.

610 Special Topics in Empirical Theory and Methodology (3) Advanced methods and procedures of analysis in political science.

Repeatability: May be repeated with consent of department. Maximum 9 hours.

628 Topics in Political Theory (3) Selected issues and problems in normative political theory. Specific content determined by instructor.

Repeatability: May be repeated with consent of instructor. Maximum 9 hours.

639 Special Topics in American Government and Politics (3) Advanced study of selected topics.

Repeatability: May be repeated with consent of instructor. Maximum 9 hours.
640 Special Topics in U.S. Constitutional Law (3) Systematic analysis of published research and judicial decision: development of constitutional law as major component of public policy.
Repeatability: May be repeated with consent of department. Maximum 9 hours.

654 Contemporary Public Policies (3) Problems in one or more public policy areas from political and administrative perspectives. Topics selected by instructor.
Repeatability: May be repeated with consent of department. Maximum 9 hours.

660 Contemporary Perspectives on Public Administration (3) Development of theory in public administration: contemporary critiques and alternatives.
Repeatability: May be repeated with consent of instructor. Maximum 9 hours.

668 Special Topics in Public Administration (3) Analysis of selected issues and problems in public administration.
Repeatability: May be repeated. Maximum 9 hours.

670 Special Topics in Comparative Government and Politics (3) Research into selected topics.
Repeatability: May be repeated with consent of department. Maximum 9 hours.

682 Theory and Analysis of U.S. Foreign Policy Processes (3) Theoretical approaches to decision making in foreign policy area and analysis of policy-making process.
Repeatability: May be repeated with consent of department. Maximum 9 hours.

684 International Law (3) Provides the analytical tools necessary to evaluate the legality of events under international law. Presents the law relevant to politics, such as the use of force, human rights, war crimes, international courts, principles of jurisdiction, and air, space and sea law.

688 Special Topics in International Politics (3) Selected issues and problems in international politics. Specific content determined by instructor.
Repeatability: May be repeated with consent of instructor. Maximum 9 hours.

Portuguese (811)

400 Portuguese for Speakers of Another Romance Language (3) Accelerated class for beginning students of Portuguese with strong background in another Romance language. Introduction to grammar, reading, and culture of Portugal and Brazil.
(DE) Prerequisite(s): 3 hours at the 300-level in another Romance language.

431 Topics in the Literature and Language of Portuguese-speaking World (3) Outstanding works of literature and culture from the countries where Portuguese is spoken. Topics may vary. (Same as Latin American Studies 431.)
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): At least one course at the 300-level.

432 Topics in the Literature and Language of Portuguese-speaking World (3) Outstanding works of literature and culture from the countries where Portuguese is spoken. Topics may vary. (Same as Latin American Studies 432.)
Repeatability: May be repeated. Maximum 12 hours.
(DE) Prerequisite(s): At least one course at the 300-level.

591 Foreign Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

592 Off-Campus Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

593 Independent Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

Psychology (830)

(DE) Prerequisite(s): 110 or consent of instructor.

409 Group Facilitation (3) Study of theory and technique through supervised experience in small groups.
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): General psychology course or consent of instructor.

410 Sensory Processes and Perception (3) Physiological and psychological theories of perception. Emphasis on audition and vision.
(DE) Prerequisite(s): 385 or Mathematics 115 or Statistics 201 or graduate standing.

415 Psychology of Religion (3) History of psychology of religion with an examination of various philosophical and empirical orientations. Exploration of the psychological function of religion for individuals and society. (Same as Religious Studies 415.)
(DE) Prerequisite(s): 110 or consent of instructor.

420 History and Systems of Psychology (3) History of psychological thought. Classical approaches and recent developments.
(DE) Prerequisite(s): 110 or consent of instructor or graduate standing.

424 Psychology and the Law (3) Psychological aspects of legal systems.
(DE) Prerequisite(s): 110 or consent of instructor.

430 Health Psychology (3) Psychological factors related to health and illness, including stress, personality, and environment. Applications of psychological treatments to physical illness.
(DE) Prerequisite(s): 110 or consent of instructor.


434 Psychology of Gender (3) Biological, psychological, and social factors in gender. Importance of gender roles and stereotypes for behavior and experience. (Same as Women’s Studies 434.)
(DE) Prerequisite(s): 110 or consent of instructor.

440 Organizational Psychology (3) Social-psychological analysis of organizations, emphasizing role-theory and systems theory. (Same as Management 440.)
(DE) Prerequisite(s): 110 and 360 or consent of instructor.

(DE) Prerequisite(s): 110 and 385 or Statistics 201 or consent of instructor.

446 Advanced Measurement and Testing (3) Emphasis on mental test theories including classical test and item response theories.
(DE) Prerequisite(s): 445.

450 Comparative Animal Behavior (3) (See Ecology and Evolutionary Biology 450.)

459 Comparative Animal Behavior Laboratory (3) (See Ecology and Evolutionary Biology 459.)

461 Physiological Psychology (3) Nervous system and physiological correlates of behavior. Biological basis of emotion, learning, memory and stress.
(DE) Prerequisite(s): 110 or consent of instructor and one of the following sequences – Biology 101 and 102, Biology 130 and 140, or Anthropology 110 and 210.

470 Theories of Personality (3) Major theories of human personality and their development.
(DE) Prerequisite(s): 110 or consent of instructor.

475 Adolescent Development (3) Theoretical perspectives and empirical research findings pertinent to adolescent development.
(DE) Prerequisite(s): 110 or consent of instructor.

480 Theories of Learning (3) Classical and current approaches to learning and cognition.
(DE) Prerequisite(s): 110 or consent of instructor.

482 Topics in Psychology (3) Intensive analysis of special topics, such as African-American psychology or evaluation of programs in the community.
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): 110 or consent of instructor.

489 Supervised Research (1-9) Repeatability: May be repeated. Maximum 12 hours.
Registration Permission: Consent of instructor.

500 Thesis (1-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

505 Research Design (3) Techniques for planning and conducting research in controlled and natural settings: experiments, quasi-experiments, observational studies, surveys, and program-evaluations. Development of questions and hypotheses for study. Design of studies to maximize validity.
Registration Permission: Consent of instructor.

507 Foundations of Applied Psychology (3) Fundamental methods for application of psychology principles and techniques in community, organizational, and industrial settings, and related ethical and theoretical issues.
(DE) Prerequisite(s): 505 and consent of instructor.
508 Readings and Special Issues in Psychology (1-3)
Repeatability: May be repeated. Maximum 9 hours.
Registration Permission: Consent of instructor.

509 Research Practicum (1-3)
Required of first-year graduate students in psychology.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 9 hours.

510 Topics in Psychology (3)
Intensive examination of selected issues in psychology.
Repeatability: May be repeated. Maximum 9 hours.
Registration Permission: Consent of instructor.

511 Developmental Psychology (3)
Normal processes of human socialization; physical, cognitive, and emotional development from conception through infancy, childhood, and adolescence.
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

512 Life-Span Development (3)
Theories and research concerning normal human development throughout life, adulthood and old age.
Registration Permission: Consent of instructor.

513 Foundations of Psychology: Biological Factors, Perception, Learning, Thinking, Motivation (3)
Intensive survey.
Registration Permission: Consent of instructor.

515 Colloquium in Experimental Psychology (1)
Research and practical issues in experimental psychology.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 4 hours.
Registration Permission: Consent of instructor.

517 Foundations of Counseling Psychology (3)
History, theory, research and practice of counseling psychology.
Repeatability: May be repeated. Maximum 6 hours.

521 Analysis of Variance for Social Sciences (3)
Analysis of variance and statistical theory: application within social science framework. Contrasts among means, trend analysis, analysis of covariance, analysis of factorial designs, and multivariate approaches to analysis of within subjects data.

522 Multiple Regression for Social Sciences (3)
Complexities of regression analyses and theory: application within social science framework. Bivariate correlation and regression, multiple regression, analysis of variable sets, interactions among continuous predictors, reducing collinearity between main effects and application of multiple regression to testing procedures of mediation and moderation.

526 General Vertebrate Neuroanatomy (3)
Lecture and laboratory. Structure and functioning of central and peripheral nervous system.
(PE) Prerequisite(s): 451 or equivalent.
Registration Permission: Consent of instructor.

527 Behavioral Neurology (3)
Disorders of nervous system, organic brain dysfunctions. Diagnosis and treatment.
Registration Permission: Consent of instructor.

528 College Teaching in Psychology (3)
Concepts, techniques, and materials for teaching psychology at college and/or university level. Supervised practice.
Grading Restriction: Satisfactory/No Credit grading only.
Registration Permission: Consent of instructor.

543 Cognitive Science (3)
Theories and research.
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

545 Advanced Animal Behavior (3)
(See Ecology and Evolutionary Biology 545.)

546 Ethological Psychology (3)
Basic ethology and comparative psychology: Implications for human behavior. (Same as Ecology and Evolutionary Biology 546.)
Registration Permission: Consent of instructor.

547 Conceptual Foundations of Evolution and Behavior (3)
Critical evaluation of seminal writings on theory and methods in comparative analysis of behavior. (Same as Ecology and Evolutionary Biology 547.)

550 Social Psychology (3)
Survey of theory and research concerning interpersonal interaction and individual behavior in social context.
Registration Permission: Consent of instructor.

554 Laboratory in Psychometrics (3)
Further learning about psychometrics theories: item response theory (modern mental test theory), factor analysis, and applications of those methods using computer programs to simulated or empirical data.
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: 555.

555 Psychometrics (3)
Basic concepts: factor analysis, scaling, test theories, probability models and their applications, computerized adaptive testing and other topics.
(DE) Prerequisite(s): Statistics 537 and 538.
Repeatability: May be repeated. Maximum 6 hours.

556 Interviewing and Observation (3)
Sensitizing students to own feelings and beliefs and to feelings of interviewee, and analysis of language content, style, and body language. Exploration of various important aspects of interviewee’s life.
(DE) Corequisite(s): 559.
Comment(s): Admission to doctoral program in clinical psychology or consent of instructor required.

559 Laboratory in Interviewing and Observation (1)
(DE) Corequisite(s): 558.
Comment(s): Admission to doctoral program in clinical psychology or consent of instructor.

560 Psychology of Learning (3)
Review of current evidence from research involving human and/or non-human animals.
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): 400.
Registration Permission: Consent of instructor.

565 History and Systems of Psychology (3)
History of philosophy concerning psychology. Major systems of psychology which emerged during 20th century.
Comment(s): Graduate standing required.

567 Group Dynamics and Methods (3)
(See Counselor Education 554.)

568 Prepracticum in Career Development (3)
Didactic instruction and practice in counseling and career exploration.
Comment(s): Admission to doctoral concentration in counseling psychology required.

569 Practicum in Counseling (3)
(See Counselor Education 555.)

570 Personality: Theory and Research I (3)
Advanced survey of psychoanalytic and neo-Freudian approaches to personality; related research.
Comment(s): Admission to clinical psychology concentration or consent of instructor required.

571 Personality: Theory and Research II (3)
Advanced survey of behavioral and humanistic approaches to personality; related research.
Comment(s): Admission to clinical psychology concentration or consent of instructor required.

572 Individual Cognitive Assessment in Counseling (3)
Basic concepts and applications in individual assessment of intelligence; proficiency in administrative scoring, interpretation for Wechsler, adults and children, Stanford-Binet.
Grading Restriction: Satisfactory/No Credit grading only.
(DE) Prerequisite(s): 445 and Counselor Education 525.

573 Descriptive and Theoretical Psychopathology (3)
Current psychiatric taxonomic system. Theories of etiology for various diagnostic categories. Examples from written case vignettes and recorded interviews.
Comment(s): Admission to clinical psychology concentration or consent of instructor required.

574 Cross-Cultural Counseling: Theory and Research (3)
(See Counselor Education 570.)

576 Object Relations (3)
European and American conceptions of normal and psychopathological development of object relations. Significance for psychotherapy, psychoanalysis, and psychoanalytic theory.
Comment(s): Admission to clinical psychology concentration or consent of instructor required.

580 Research Questions and Designs (3)
Question-asking process in research and strategies or designs through which answers might be derived.
Comment(s): Admission to clinical psychology concentration or consent of instructor required.

593 Independent, Off-campus, or Foreign Study (1-15)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 9 hours.
Registration Permission: Consent of instructor.

594 Psychological Assessment I (3)
Basic concepts and techniques of adult assessment: intelligence testing and personality tests.
Comment(s): Admission to clinical psychology concentration or consent of instructor required.

595 Psychological Assessment II (3)
Basic concepts and techniques of adult assessment, intelligence tests and personality tests.
(DE) Prerequisite(s): 594 or consent of instructor.
Comment(s): Admission to doctoral concentration in clinical psychology or consent of instructor required.
596 Laboratory in Psychological Assessment (1)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 4 hours.
(DE Corequisite(s): 594 or 595.
Comment(s): Admission to doctoral concentration in clinical psychology or consent of instructor required.

597 Developmental Psychopathology (3) Research and theory on pathways to psychological disorders and personal adjustment.
(DE Prerequisite(s): 571 or consent of instructor.

598 Ethical Issues in Professional Psychology (3) Conceptual and practical applications in human services and research.
Registration Permission: Consent of instructor.

599 Clinical Psychopathology (3) Formal use of descriptive categories used in the diagnosis of abnormal behavior.
(DE Prerequisite(s): 597 or consent of instructor.

600 Doctoral Research and Dissertation (3-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.
601 Seminar in Psychology (3)
Repeatability: May be repeated. Maximum 12 hours.
Registration Permission: Consent of instructor.

602 Seminar in Applied Psychometrics (3)
Repeatability: May be repeated. Maximum 9 hours.
(DE Prerequisite(s): 555 and 557.
Registration Permission: Consent of instructor.

603 Seminar in Applied Psychology (3)
Repeatability: May be repeated. Maximum 12 hours.
Registration Permission: Consent of instructor.

604 Seminar in Existential-Phenomenological Psychology (3)
Repeatability: May be repeated. Maximum 12 hours.
Registration Permission: Consent of instructor.

617 Seminar in Cognitive Science (3)
Repeatability: May be repeated. Maximum 12 hours.
(DE Prerequisite(s): 543.
Registration Permission: Consent of instructor.

623 Seminar in Methods of Naturalistic Research (3)
Repeatability: May be repeated. Maximum 12 hours.
(DE Prerequisite(s): 546 or consent of instructor.

625 Advanced Study in Personality (3) Theory, research and conceptual analysis of studies with application to education and counseling. (Same as Counselor Education 625.)
(DE Prerequisite(s): 470 or equivalent.

635 Ethical, Legal, and Professional Issues Psychology (3) Research, human services, teaching, and public policy. (Same as Counselor Education 635; Educational Psychology 635.)
Grading Restriction: Satisfactory/No Credit grading only.
Comment(s): Admission to doctoral program in psychology or consent of instructor required.

661 Education Implications of Neuropsychology (3) Theory and assessment. Common syndromes and their behavioral and cognitive manifestations.
(DE Prerequisite(s): 461 or consent of instructor.

667 Personality and Vocational Assessment (3) Use and interpretation of personality and vocational measures in assessment of clients. (Same as Counselor Education 671.)
(DE Prerequisite(s): 445 or Counselor Education 525 or consent of instructor.

670 Psychotherapy I (3) Theories and principles.
Comment(s): Admission to doctoral concentration in clinical psychology or consent of instructor required.

671 Psychotherapy II (3) Theories and principles.
(DE Prerequisite(s): 670.
Comment(s): Admission to doctoral concentration in clinical psychology or consent of instructor required.

672 Psychological Dysfunction (3) Classification methods, dynamics and treatment of dysfunctional individuals in counseling.
(DE Prerequisite(s): 625 and a course in abnormal psychology or consent of instructor.

673 Laboratory in Psychotherapy (2)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 6 hours.
Corequisite(s): 670 or 671.
Comment(s): Admission to doctoral concentration in clinical psychology or consent of instructor required.

674 Practicum in Counseling Psychology (3) Supervised practice of individual counseling. Minimum 135 clock hours required each semester.
Repeatability: May be repeated. Maximum 6 hours.
(DE Prerequisite(s): 445 or equivalent and 569.
Comment(s): Admission to doctoral concentration in counseling required.
Registration Permission: Consent of instructor.

675 Advanced Theory and Practice in Group Counseling (3) Theories and supervised practice.
(DE Prerequisite(s): 567.

676 Field Placement in Counseling Psychology (3)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 12 hours.
(DE Prerequisite(s): 674.
Comment(s): Admission to the doctoral concentration in counseling psychology required.

678 Theory and Practice of Counseling Supervision (3) Theory and practice of supervision in counseling.
Grading Restriction: Satisfactory/No Credit grading only.
(DE Prerequisite(s): 674 or consent of instructor.

679 Internship in Counseling Psychology (1-6) Supervised employment in departmentally approved counseling psychology internship sites.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 12 hours.
Comment(s): Admission to the doctoral concentration in counseling psychology required.
Registration Permission: Consent of instructor.

683 Seminar in Behavioral Medicine (3) Current research and theory concerning relationships between behavior and health.
Repeatability: May be repeated. Maximum 12 hours.
Registration Permission: Consent of instructor.

695 Field Placement in Clinical Psychology (3)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 24 hours.
Comment(s): Admission to the doctoral concentration in clinical psychology required.
Registration Permission: Consent of instructor.

696 Advanced Psychology Clinic Placement (1-3)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 24 hours.
Comment(s): Admission to the doctoral concentration in clinical psychology or consent of instructor required.
Registration Permission: Consent of instructor.

697 Supervised Field Work in Applied Psychology (1-6) Guided practice in applying psychological principles and techniques in industrial, organizational, and community settings.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 12 hours.
(DE Prerequisite(s): 505, 507, 555, and 557.
Registration Permission: Consent of instructor.

Public Health (839)

400 Consumer Health (3) (See Health 400.)

493 Directed Independent Study (1-3) Individual study of selected issues.
Repeatability: May be repeated. Maximum 6 hours.
Registration Permission: Consent of instructor.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

509 Graduate Seminar in Public Health (1) In-depth discussion of timely topics reflecting scope of public health as discipline and its interrelation with many other academic and professional disciplines. Speakers both internal and external. (Same as Exercise Science 509; Nursing 509; Nutrition 509; Social Work 509.)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 4 hours.

510 Environmental and Occupational Health (3) Health risks and complexities of personal and community environments impacting individual’s health and response to a diverse and dynamic world. Principles of occupational safety and health. Survey of contemporary environmental issues and their implications for healthful living.
Comment(s): Admission to MPH or public health nutrition (MS) programs or consent of instructor required.

520 Public Health Policy and Administration (3) Administrative considerations of community-based health care programs and public health practice. Health policy formulation, political environment and governmental involvement in health, legal responsibilities, and managerial concepts/techniques/process.

521 Organization Theory and Health Care Delivery (3) Administrative and Organization theory related to health facilities; operation and management of health care facilities. Case discussions and problem-solving exercises; managerial functions and skills.


523 Management in Extended Care Settings (3) Managerial concepts and theoretical foundations essential to supervision and administration of domiciliary health services programs. Management and operation of health services programs for patients and clients in settings which provide activities of daily living and special psychosocial environmental needs. Programs for home health services, comprehensive medical rehabilitation, nursing homes, congregate living centers and similar type health programs.

525 Financial Management of Health Programs (3) Financial management concepts and practices applied to health services programs. Fundamentals of budgeting; costing, financing, rate setting, financial reporting and control. Opportunities to apply techniques.

530 Biostatistics (3) Application of descriptive and inferential statistical methods to health-related problems and programs. Microcomputer applications, use and interpretation of vital statistics and introductory research methodology preparatory for first course in epidemiology.

540 Principles of Epidemiology (3) Distribution and determinants of health-related outcomes in specified populations, with application to control of public health problems. Historical origins of discipline, hypothesis formulation, research design, data and error sources, measures of frequency and association, etiologic reasoning, disease screening, and injury control.


544 Statistical Software for the Health Professional (3) An intermediate level, survey of three software packages used by public health professionals, including MicrosExcel, Excel, Epi Info, and SAS. For students in the applied epidemiology graduate certificate program, data management and analysis using the software packages are explored. As a continuation of biostatistics and the introduction and advanced courses in epidemiology, this capstone course emphasizes application.

550 Principles and Practices of Community Health Education (3) Theoretical foundations for community health education; opportunities for skill development in variety of educational processes; and introduction to community health analysis.

552 Community Health Problem Solving (4) Dynamics of community organization, community needs assessment, educational interventions, and application of program planning and evaluation techniques. Opportunity to practice skills in realistic setting.

555 Health and Society (3) Understanding of social and behavioral factors which influence health status and care in America. Application to behavior in health-related organization. Social and psychological aspects of disease; sociocultural aspects of health care delivery systems, political economy of health and illness, impact of social movements on health, and social consequences of health legislation.

560 Theories and Techniques in Health Planning (4) Overview of health planning concepts and methodologies; systems-oriented planning process. Major elements of planning: formulation and conceptualization of problem, plan design, evaluation and implementation. Health problems of institutions, communities and selected population groups, appropriate diagnoses, and programs for addressing needs.

580 Special Topics (3) Repeatability: May be repeated if topic differs. Maximum 6 hours.

585 Seminar in Gerontology (1) (See Health 585.)

587 Internship (3) Internship (community health education, gerontology, or health planning/administration) in either approved organization or research setting under supervision of designated preceptor.

588 Internship (3) Internship (community health education, gerontology, or health planning/administration) in either approved organization or research setting under supervision of designated preceptor.

589 Internship (3) Internship (community health education, gerontology, or health planning/administration) in either approved organization or research setting under supervision of designated preceptor.

590 Research Methods in Health (3) (See Health 590.)

593 Directed Independent Study (1-3) Repeatability: May be repeated. Maximum 6 hours.

595 Physical Activity and Positive Health (3) (See Exercise Science 635.)

650 Health Aspects of Gerontology (3) (See Health 650.)

655 Seminar in Nation’s Health (3) (See Health 655.)

660 International Health (3) (See Health 660.)

Public Relations (841)

470 Public Relations Campaigns (3) Research, planning and communication, and evaluation of major public relations campaigns. Oral and written presentation of a public relations project from inception to completion. Requires extensive out-of-class work.

490 Special Topics (3) Topics vary. Repeatability: May be repeated. Maximum 6 hours.

500 Thesis (1-15) Graduation Restriction: P/NP only. Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when the student uses university facilities and/or faculty time before degree is completed. Graduation Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

516 Seminar in Public Relations Issues (3) Topics vary. Repeatability: May be repeated. Maximum 6 hours.

525 Public Opinion (3) (See Journalism and Electronic Media 525.)

540 Public Relations Management (3) Theories of leadership and management and organizational structure and functions of public relations agencies and departments in public, private, and non-profit sectors. Analysis and management of problems in communication between organizations and their publics with emphasis on ethics and standards of the profession.

550 Public Relations Strategies (3) Strategic communication planning to achieve overall goals of organizations. Emphasis on decision making, the budgeting process, including cost-benefit analysis of tactics, and managerial execution of public relations plans. Measurement and evaluation of effectiveness of communication programs.

561 Fund Raising and Proposal Writing (3) History, philosophy and practice of philanthropy in U.S. Sources of funds from foundations, corporations, and public agencies. Research and preparation of fund-raising proposals.

590 Project (3) Capstone project under guidance of faculty. Application of principles from previous coursework. Graduation Restriction: Satisfactory/No Credit grading only.

597 Independent Study (3) Repeatability: May be repeated. Maximum 6 hours. Registration Permission: Consent of instructor.
598 Internship (3) Professional work in public relations supervised by communications manager with faculty approval. No retroactive credit for previous work experience.

(DE) Prerequisite(s): Completion of core curriculum.

Reading Education (847)

454 Topics in Reading Education (1-6)
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): Course in reading education. 
Comment(s): Admission to teacher education required.

461 Developing Reading Skills in Content Fields (3) Teaching reading and study skills in content areas of school program. Extensive assessment of textbooks. Emphasis on middle school and high school.

530 Teaching Reading in Elementary and Middle Schools (3) Trends in methods, materials, basic approaches, skill development and assessment procedures for teaching reading at elementary school level.

(DE) Prerequisite(s): Course in teaching of reading or consent of instructor.

533 Reading in Community College: Research and Theory (3) Analysis of components of effective community college reading programs. Attention to research bases.

(DE) Prerequisite(s): Course in reading education or consent of instructor.

534 Seminar in Reading Education (1-6)
Repeatability: May be repeated. Maximum 6 hours.

536 Psychology of Reading (3) Reading act, relationship between learning theory and reading, role or reading in child’s overall intellectual development. Affective and cultural factors.

(DE) Prerequisite(s): 500-level course in reading education or consent of instructor.

537 Diagnosis and Correction of Classroom Reading Problems (3) Procedures, methodologies and materials for diagnosing and correcting classroom reading problems.

(DE) Prerequisite(s): Course in reading education or equivalent teaching experience or consent of instructor.

538 Practicum in Diagnosis of Reading Problems (3) Theoretical and practical applications of specific reading diagnostic instruments; testing of elementary and/or secondary school students, preparing case study reports, and conducting parent conferences.

(DE) Prerequisite(s): Course in diagnosis and correction of classroom reading problems or consent of instructor.

539 Practicum in Remediation of Reading Problems (3) Application of learning and teaching methodology in working with elementary and/or secondary school students on one-to-one or small-group basis.

540 Teaching the Struggling Adolescent Reader (3) Methods of teaching middle and high school students who do not have sufficient reading skill to successfully engage in required reading.

(DE) Prerequisite(s): Course in reading education, or equivalent teaching experience, or consent of instructor.

543 Literacy and Literature in the Middle Grades (3) Problems and issues particular to teaching reading in the middle grades including teaching reading in an integrated curriculum, dealing with students reading below grade level, and teaching concept vocabulary. The literature base for early adolescents will be explored and analyzed.

554 Developmental Reading Practicum (3) Diagnosing and teaching children having developmental and corrective reading needs in regular classroom.

(DE) Prerequisite(s): Course in diagnosis and correction of reading problems or consent of instructor.

602 Seminar in Reading Education (1-6)
Repeatability: May be repeated. Maximum 6 hours.

603 Advanced Studies and Theoretical Models of Reading (3) Research on reading processes. Current theoretical models related to how learners process print.

(DE) Prerequisite(s): 500-level courses in reading education or consent of instructor.

605 Organizing and Administering Reading Programs (3) Diagnosing and teaching children having developmental and corrective reading needs in the regular classroom.

(DE) Prerequisite(s): Course in diagnosis and correction of reading problems or consent of instructor.

Recreation and Leisure Studies (853)

415 Development of Recreation, Leisure, and Athletic Facilities (3) Principles of designing, planning, equipping, and operating various facilities. Elements of risk management and safety are incorporated into the design process.

(DE) Prerequisite(s): 310 and Sport Management 350 or consent of instructor.

430 Organization and Administration of Leisure Services (3) Principles of administration applied to provision of leisure services offered by public, private, non-profit, and/or commercial enterprises. Organizational structures, human resource management, development, evaluation, legal authority, introduction to budgeting and fiscal procedures, professional responsibility, and career management.

(DE) Prerequisite(s): 310 or Sport Management 350.

440 Dimensions of Commercial Recreation and Leisure Enterprises (3) Organizational structures, delivery systems, financing private enterprises and operating selected profit centers in a variety of settings. Special attention is given to market performance and economic impact.

(DE) Prerequisite(s): 201 or consent of instructor.

450 Special Topics in Recreation and Leisure Studies (1-6) Development of special topics in recreation/therapeutic recreation and leisure.
Repeatability: May be repeated. Maximum 6 hours.

470 Tourism and Leisure Industries (3) An examination of the symbiotic relationship between tourism and various sectors of the leisure industry. Use of resources, both natural and developed, and the economic impacts of these ventures. Sociocultural impacts upon the venue and how the venue impacts the local population.

500 Thesis (1-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.

Registration Restriction: Recreation and leisure studies major.
Registration Permission: Consent of instructor.

511 Perspectives and Trends in Leisure Studies and Services (3) Basic role of leisure delivery systems in today’s society, scope of leisure behavior, developmental features of leisure and recreation. Current trends, problems, laws, and issues affected by and/or affecting delivery of leisure services.

Registration Permission: Consent of instructor.

515 Philosophical and Conceptual Foundations of Leisure (3) Philosophy of leisure and recreation; nature of philosophy, concepts of leisure, recreation, play, work, and other factors, history of field, and relationship of ideas to contemporary society and to professional practice.

520 Program Design and Evaluation in Therapeutic Recreation (3) History, philosophy, nature, purpose, special populations served, programming process, professional aspects of therapeutic recreation. Basic overview of aspects of leisure delivery systems.

521 Facilitation Techniques in Therapeutic Recreation (3) Role of therapeutic recreation in clinical and non-clinical settings; application of life-style planning, self-awareness, values clarification and assertiveness training in therapeutic recreation, relationship of leisure education to therapeutic recreation.

(DE) Prerequisite(s): 520 or consent of instructor.

522 Clinical Aspects in Therapeutic Recreation (3) Concepts and techniques utilized by experienced and advanced therapeutic recreation specialist: clinical issues, comprehensive program concerns, administrative funding and trends in practice of therapeutic recreation services.

540 Fiscal Policies for Recreation and Sports Related Organizations and Facilities (3) Application of fiscal policies and procedures to operation of recreation and sports related organizations and facilities. Finance, revenue generating strategies, cash and inventory control, commercial/public cooperative ventures and microcomputer applications.

(DE) Prerequisite(s): 430 or consent of instructor.

541 Management and Operation of Recreation and Sport Related Facilities (3) Research for making program and management decision, process of cost analysis, and basic design and maintenance of recreation and sport related facilities.

Registration Permission: Consent of instructor.
### 590 Graduate Internship (3-6)
Required of all graduate students. Application of previous theoretical and applied knowledge and skills in an appropriate recreation/leisure setting. The internship is intended to simulate a full time professional level work experience during the entire semester. Therapeutic recreation internship must meet NCTRC national guidelines.

**Grading Restriction:** Satisfactory/No Credit grading only.

**Repeatability:** May be repeated. Maximum 6 hours.

(De) Prerequisite(s): Completion of 24 graduate hours.

**Comment(s):** 3.0 GPA required.

**Registration Permission:** Consent of instructor.

### 591 Directed Study in Leisure and Recreation (1-6)
Detailed study of theme, issue, or concern. Designed to meet needs of individual students.

**Repeatability:** May be repeated. Maximum 6 hours.

### 592 Special Topics in Recreation and Leisure Studies (1-6)

**Repeatability:** May be repeated. Maximum 6 hours.

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### Rehabilitation Counseling (852)

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>530 Orientation to Rehabilitation (3)</td>
<td></td>
</tr>
<tr>
<td>History, philosophy, legal and economic bases, current issues, and practices in public and private rehabilitation programs. Qualifications of service providers. Assessment, plan development, and provision of services to people who have disabilities and vocational handicaps. Identification, mobilization, and utilization of rehabilitation resources.</td>
<td></td>
</tr>
<tr>
<td>532 Caseload Management in Rehabilitation (3)</td>
<td></td>
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<tr>
<td>Techniques and procedures involved in management of caseloads in Federal-State vocational rehabilitation agencies, private rehabilitation companies, and public or private rehabilitation facilities. Analysis of appropriate industrial management models related to rehabilitation programs.</td>
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<tr>
<td>533 Job Analysis, Development, and Placement (3)</td>
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<tr>
<td>Determining employment-readiness of people with disabilities, identifying appropriate jobs for selected clients, and assisting clients in seeking, obtaining, and retaining employment. Job analysis, job modification and re-engineering, marketing, and employer-serving techniques; legislation impacting job placement; supported work; and use of occupational information.</td>
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<tr>
<td>537 Vocational Evaluation: Clinical Methods (3)</td>
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<tr>
<td>Process, principles, and techniques used to assist individuals in determining and understanding their own work behavior and vocational potential. Selection and use of occupational exploration programs and work samples; application of situational tasks, job tryouts, and simulated work experiences in vocational evaluation. Clinical interpretation of data through formal staff conference, vocational counseling, and report writing.</td>
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<tr>
<td>538 Disability Management (3) Return-to-work issues in disability management programs: early intervention, quality services, and cost containment; standards and procedures for rehabilitation counselors/case managers in private sector rehabilitation.</td>
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<tr>
<td>541 Psychosocial Aspects of Disability (3)</td>
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<tr>
<td>Psychosocial impact of disability on person and family. Reaction to loss, coping with disability, and societal rehabilitation.</td>
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<tr>
<td>543 Medical Aspects of Disability (3)</td>
<td></td>
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<tr>
<td>Etiology and clinical symptoms related to disabling conditions served by special education and rehabilitation personnel. Restrictive measures to eliminate or minimize resulting handicaps. Skills necessary to communicate with lay and professional persons.</td>
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<tr>
<td>545 The Rehabilitation Interview (3)</td>
<td></td>
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<tr>
<td>Interview as used in assessment and planning with people who have disabilities and vocational handicaps.</td>
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<tr>
<td>547 Practicum in Rehabilitation (3)</td>
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<tr>
<td>Supervised experience in area of rehabilitation; application of concepts, principles, and skills.</td>
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<tr>
<td><strong>Registration Permission:</strong> Consent of instructor.</td>
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<tr>
<td>549 Internship in Rehabilitation Counseling (12)</td>
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<tr>
<td>Supervised practice in rehabilitation counseling. Full time clinical experience for second-year students. Requires 600 clock-hours.</td>
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<tr>
<td>579 Special Topics (1-3)</td>
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<td><strong>Grading Restriction:</strong> Satisfactory/No Credit or letter grade.</td>
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<td><strong>Repeatability:</strong> May be repeated. Maximum 9 hours.</td>
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<tr>
<td><strong>Comment(s):</strong> Admission to graduate program required.</td>
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<tr>
<td>591 Research Project in Rehabilitation Counseling (3)</td>
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<tr>
<td>Explore and research rehabilitation counseling issues directly related to employment, counselor functions, and/or treatment variables.</td>
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<tr>
<td>592 Assistive Technology in Rehabilitation (3)</td>
<td></td>
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<tr>
<td>Technology as applied to needs of school age and post-secondary age students/clients. Delivery of assistive technology services; software programs and assistive devices; delivery systems, interdisciplinary evaluation/planning, and funding issues.</td>
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<tr>
<td>593 Independent Study (1-3)</td>
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<tr>
<td><strong>Grading Restriction:</strong> Satisfactory/No Credit or letter grade.</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
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</tbody>
</table>

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### Religious Studies (863)

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>401 Texts and the Study of Texts (3)</td>
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<tr>
<td>Systematic introduction to the nature and function of (primarily, but not exclusively, oral and written) texts and textual traditions in the study of religion. How texts are made and used historically, how they are recovered and created by scholars, how they are interpreted by religious communities and scholars.</td>
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<tr>
<td>405 Modern Jewish Thought (3)</td>
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<tr>
<td>History, culture, and geography of the now Israeli portion of the Levant from 1850 to present. The founding of the modern state of Israel in 1948 and the political complexities of the Middle East. Israeli culture and literature.</td>
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<tr>
<td>411 Modern Religious Philosophies (3)</td>
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<tr>
<td>Religious implications of major Western thinkers and movements from Nicolas of Cusa to the 19th-century German Idealists.</td>
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<tr>
<td>415 Psychology of Religion (3)</td>
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<tr>
<td>(See Psychology 415.)</td>
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<tr>
<td>425 Seminar in Western Religions (3)</td>
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<tr>
<td>Selected figures, themes, movements, and problems.</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
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<tr>
<td><strong>Registration Permission:</strong> Consent of instructor.</td>
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<tr>
<td>430 Seminar in American Religion (3)</td>
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<tr>
<td>Selected figures, themes, movements, and problems.</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
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<tr>
<td><strong>Registration Permission:</strong> Consent of instructor.</td>
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<tr>
<td>440 Seminar in Comparative Religion (3)</td>
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<tr>
<td>Selected figures, themes, movements, and problems.</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
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<tr>
<td><strong>Registration Permission:</strong> Consent of instructor.</td>
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</tr>
<tr>
<td>490 Readings and Research in Religious Studies (3)</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
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<tr>
<td><strong>Registration Permission:</strong> Consent of instructor.</td>
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<tr>
<td>499 Proseminar in Religious Studies (3)</td>
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<tr>
<td>For advanced students in religious studies, required for majors. Selected topics, e.g., nature and function of myth in religion, problem of evil, transcendence, theories of religion, hermeneutics, integrating various disciplines involved in study of religion.</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
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<tr>
<td><strong>Registration Permission:</strong> Consent of instructor.</td>
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<tr>
<td>503 Theory and Method in the Study of Religion (3)</td>
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<tr>
<td>Classical, modern, and post-modern approaches. Required for MA students in philosophy major/religious studies concentration.</td>
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<tr>
<td><strong>Registration Permission:</strong> Consent of instructor.</td>
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<tr>
<td>505 Religious Texts and Contexts (3)</td>
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<tr>
<td>Critical study of texts and their interpretations: sacred texts, canons, commentaries, religious autobiographies, and religious themes in literature.</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
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<tr>
<td><strong>Registration Permission:</strong> Consent of instructor.</td>
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<tr>
<td>506 Historical Study of Religions (3)</td>
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<tr>
<td>Description and analysis of religious traditions, phenomena, and themes.</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
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<tr>
<td>507 Religion, Power and Society (3)</td>
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<tr>
<td>Studies of religions in relation to social structure and political institutions: issues of gender, race, class, ethnicity, caste, slavery, religion and the state, globalization and human rights.</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
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<tr>
<td>510 Introduction to Pedagogy of Religious Studies (3)</td>
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<tr>
<td>Conceptualization, methodology, and practice of teaching about religion and religions in the public university context.</td>
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<tr>
<td>(De) Prerequisite(s): 503.</td>
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<tr>
<td><strong>Registration Permission:</strong> Consent of instructor.</td>
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<tr>
<td>513 Religion, the Arts, and the Media (3)</td>
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<tr>
<td>Material and expressive culture, religion and journalism, mass communication technologies, popular culture, issues of representation, cultural studies methodologies.</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
<td></td>
</tr>
<tr>
<td>514 Religion and Healing (3)</td>
<td></td>
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<tr>
<td>Ecology of religion, nature, shamanism, healing of body and mind, spirituality, religious dimensions of medical ethics.</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
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<tr>
<td>515 Critical Reflection on Religion (3)</td>
<td></td>
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<tr>
<td>Analytical and constructive thought by scholars of religion and religious thinkers: philosophy of religion, modern and post-modern religious thought, Advaita, Vedanta, neo-Confucianism, and scholastic theology.</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 6 hours.</td>
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<tr>
<td>520 Readings in the Study of Religion (1-6)</td>
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<tr>
<td><strong>Repeatability:</strong> May be repeated. Maximum 12 hours.</td>
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<tr>
<td>532 Topics in the History of Religions (3)</td>
<td></td>
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<tr>
<td><strong>Registration Permission:</strong> Consent of instructor.</td>
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<tr>
<td>533 Topics in Religious Thought (3)</td>
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<tr>
<td><strong>Registration Permission:</strong> Consent of instructor.</td>
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</tbody>
</table>
550 Critical Explorations in Religious Studies (3) Critical examination of selected phenomena of religion from contemporary theoretical or thematic perspectives. Required for MA students in philosophy major/religious studies concentration.  
Repeatability: May be repeated. Maximum 6 hours.  
(DE) Prerequisite(s): 503.

551 Comparative Historical Explorations in Religious Studies (3) Critical examination of parallel or contrasting historical phenomena from two or more religious traditions. Required for MA students in philosophy major/religious studies concentration.  
Repeatability: May be repeated. Maximum 6 hours.  
(DE) Prerequisite(s): 503.

591 Foreign Study (1-15)  
Repeatability: May be repeated. Maximum 15 hours.

592 Off-Campus Study (1-15)  
Repeatability: May be repeated. Maximum 15 hours.

593 Independent Study (1-15)  
Repeatability: May be repeated. Maximum 15 hours.

Retail and Consumer Sciences (865)  

412 Direct Retail Methods (3) Issues concerning the use of direct selling methods to sell goods and services. Emphasizes analysis of consumers and product/service types for integrated direct retail methods. The direct retailing methods in this course include direct mail, catalogs, telemarketing, infomercials, and electronic commerce (internet).  
(DE) Prerequisite(s): 210, 341, and Marketing 300.

415 Retail Promotion (3) In-store promotional activities; development of retail promotion strategies; evaluation of retail promotions; supplementary focus on advertising and other methods to communicate in-store promotions.  
(DE) Prerequisite(s): 210, and Marketing 300.

500 Thesis (1-15)  
Grading Restriction: P/NP only.  
Repeatability: May be repeated.

501 Professional Project (3-6) Application-oriented, capstone project to show competence in major academic area.  
Grading Restriction: Satisfactory/No Credit grading only.  
Repeatability: May be repeated. Maximum 6 hours.  
Comment(s): Enrollment limited to students in retail and consumer sciences concentration/non-thesis option.  
Registration Permission: Consent of instructor.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.  
Grading Restriction: Satisfactory/No Credit grading only.  
Repeatability: May be repeated.

511 International Trade and Retail Analysis (3) International trade and marketing concepts with implications for retail, services, and consumer. Theoretical and applied analysis. International retailing, Current issues.

538 Consumer Product and Service Development (3) Critical analysis of consumer product and service development process in services industry. Strategies for developing consumer products, services, programs, and service processes from conception to implementation and evaluation.

541 Consumer Analysis in Services Management (3) Analysis of consumer behavior in consumer products and services industry. Development of knowledge to positively impact services marketing organizations through marketing, environmental and product/services strategies based upon consumer behavior knowledge. Investigations of qualitative and quantitative methodologies to conduct elementary consumer research.

562 Research Methods (3) Fundamentals of science method, advancement of science, methodology and method of research. Issues and concepts of basic and applied research.  
(DE) Prerequisite(s): Statistics 531 or equivalent.

590 Research Seminar (1) Research topics in retail and consumer sciences.  
Grading Restriction: Satisfactory/No Credit grading only.  
Repeatability: May be repeated.

593 Directed Study (1-3) Individual problems in retailing and consumer sciences.  
Repeatability: May be repeated. Maximum 9 hours.  
(DE) Prerequisite(s): 9 hours of graduate coursework in retail and consumer sciences.

595 Special Topics in Retail and Consumer Sciences (1-3) Lecture, group discussion on specialized topics; retail industry structure, international trade, international retailing, consumer affairs, entrepreneurship, small business management, issues in retail management, issues in retail strategy, quality perception by consumers, product and service value, retailing to children, retailing and special populations, special research methods.  
Repeatability: May be repeated. Maximum 9 hours.  
(DE) Prerequisite(s): 9 hours of graduate coursework.

600 Doctoral Research and Dissertation (3-15)  
Grading Restriction: P/NP only.  
Repeatability: May be repeated.

614 Theory in Retail Environment (3) Analysis and evaluation of theory in retail environment and its application to research in retailing.  
(DE) Prerequisite(s): 562 or equivalent.

615 Retail and Consumer Sciences Literature and Thought (3) Evaluation of retail and consumer sciences literature with emphasis upon research literature, development of scholarly thought, and identification of potential areas of further study.  
(DE) Prerequisite(s): 562 or equivalent.

616 Research Methods, Models and Measurement in Retail and Consumer Sciences (3) Quantitative and qualitative methods and analytical concepts in the research process. Formulation of models and measurement of consumer sciences constructs.  
(DE) Prerequisite(s): 562 and Statistics 538.

625 Strategic Managerial Retailing (3) Decision-making orientation that integrates strategic framework components with preparation and analysis of specific retail case situations.  
(DE) Prerequisite(s): 510 or equivalent.

641 Retail Consumer Behavior (3) Theories and concepts from social science in relation to ultimate consumer's behavior.  
(DE) Prerequisite(s): 541 or equivalent.

695 Advanced Topics in Retail and Consumer Sciences (3) Lecture, group discussion, individual research on advanced topics and research areas of current significance to retail and consumer sciences.  
Repeatability: May be repeated. Maximum 9 hours.  
(DE) Prerequisite(s): 9 graduate hours in consumer sciences.

Russian (886)  

401 Advanced Grammar, Conversation, and Composition (3)  
(DE) Prerequisite(s): 312 or equivalent.

402 Advanced Grammar, Conversation, and Composition (3)  
(DE) Prerequisite(s): 312 or equivalent.

425 Introduction to Descriptive Linguistics (3) (See French 425.)  

426 Methods of Historical Linguistics (3) (See German 426.)  

430 Selected Topics in Russian Literature (3)  
Repeatability: May be repeated if topic differs. Maximum 9 hours.

451 Senior Seminar (3) Intensive study of language, literary style, and literary criticism based on selected major novels.  
Comment(s): For majors in Russian; minors admitted at discretion of instructor.

452 Senior Seminar (3) Intensive study of language, literary style, and literary criticism based on selected major novels.  
Comment(s): For majors in Russian; minors admitted at discretion of instructor.

510 Russian Phonetics and Advanced Grammar (3) Phonetics, pronunciation, stylistics, and selected topics in Russian grammar. For teachers and prospective teachers.  
Registration Permission: Consent of instructor.

550 Studies in Russian Literature (3) Content varies.  
Repeatability: May be repeated. Maximum 9 hours.

591 Foreign Study (1-15)  
Repeatability: May be repeated. Maximum 15 hours.

592 Off-Campus Study (1-15)  
Repeatability: May be repeated. Maximum 15 hours.

593 Independent Study (1-15)  
Repeatability: May be repeated. Maximum 15 hours.
COURSES OF INSTRUCTION

Safety (890)
443 Sports and Recreational Safety (3) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and interrelationship in sports injury and control; risk-taking and decision solution strategies; and contributions of sports medicine to safety.

Contact Hour Distribution: 3 hours and 2 labs.

452 Safety Principles and Practices (3) An introduction to the general principles, practices, and procedures in occupational and community safety. A survey of historical and present safety issues, problems, and practices addressing safety of individuals and groups in work-site, school, community, transportation, and industrial settings.

500 Thesis (1-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

532 Behavioral Problems in Safety Education and Accident Prevention (3) Problems of behavior, causes of accidents, and application of principles of psychology in development of safe behavior in all segments of environment.

533 Problems and Research in Accident Prevention (3) Safety problems found in wide variety of accidents that occur in community; findings of current research in behavioral sciences as related to variation incidence of accidents.

534 Organization, Administration and Supervision of Safety Programs (3) National, state and local level programs; administrative, instructional, and supervisory aspects. Implementation of relevant programs.

535 Emergency Management (3) Civil and defense problems: tornadoes, floods, fires, mass civil disorders, and nuclear and personnel attack by alien countries.

536 Safety Instrumentation (3) Selection, calibration, maintenance, and use of sampling instruments available to safety practitioner for evaluating exposures of workers to physical stresses and airborne contaminants.

537 Advanced Emergency Management (3) Advanced study in emergency and hazard mitigation, planning, response and recovery. Theory and practice in identification of appropriate emergency warning systems, hazard assessment, facility inspection, plan development and implementation.

(DE) Prerequisite(s): 535.

560 Fire Risk Management (3) Development, implementation, and management of comprehensive fire safety program. Basic fire risk management concepts, interpretation of codes and exposure to basic fire analysis techniques.

564 Personnel Policies in Safety Management (3) Contemporary practices in the organization and operation of safety and health programs.

572 Graduate Workshop in Safety (3) Special safety education problems. For advanced graduate students, teachers, supervisors, and administrators.

Repeatability: May be repeated. Maximum 12 hours.

590 Special Topics (1-3) Advanced study in selected disciplinary or professional area of safety education/management.

Repeatability: May be repeated. Maximum 12 hours.

592 Research Methods in Health (3) (See Health 590.)

593 Directed Independent Study (1-3) Individual identification and study of problem/issue in safety. Extensive reading and critical analysis of safety literature. Requires specific proposal to instructor before registration.

Repeatability: May be repeated. Maximum 12 hours.

601 Internship/Research in Safety and Health (3-6) Field experience. Significant problem identified, researched, and reported in acceptable form. (Same as Health 601.)

Repeatability: May be repeated. Maximum 6 hours.

School Psychology (901)
540 Seminar in School Psychology (3) Essentials of theory and practice of school psychology as professional specialty. Consideration of history and current issues in school psychology.

541 Psychoeducational Assessment (3) Direct, psychometric and naturalistic assessment methods in learning environments.

Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): Counselor Education 525 or equivalent.
Comment(s): Requires admission to school psychology major or consent of instructor.

542 Practicum in Psychoeducational Assessment (3) Application of assessment skills to clients in learning environments.

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 6 hours.
(DE) Corequisite(s): 541.
Comment(s): Requires admission to school psychology major or consent of instructor.

545 Psychoeducational Consultation (3) Use of two and three-person models of consultation in educational and therapeutic settings based on behavioral, ecological, social learning and cognitive-behavioral theories.

546 Practicum in Consultation and Intervention (3) Application of consultation and intervention skills to educational settings.

Grading Restriction: Satisfactory/No Credit grading only.
(DE) Prerequisite(s): 545.
Comment(s): Requires admission to the school psychology major or consent of instructor.

549 Internship in School Psychology (1-6) Supervised employment in unit approved school psychology internship sites.

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 12 hours.
Comment(s): Requires admission to school psychology major.
Registration Permission: Consent of instructor.

649 Advanced Internship in School Psychology (1-9) Supervised experience as school psychologist in unit-approved internship site for doctoral level students.

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 9 hours.
Comment(s): Admission to doctoral school psychology concentration required.

650 Professional Practice in School Psychology (1) Field setting to facilitate academic, social and interpersonal development of children and adults. School and mental health settings for intervention, consultation, prevention, and assessment services.

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 9 hours.

690 Psychopathology of Childhood (3) Descriptive and critical study of psychopathology of childhood and of systems of nomenclature applied to individuals with mental disorders: nomenclature provided in State Department of Education’s Student Evaluation Manual and Diagnostic and Statistical Manual of Mental Disorders of American Psychiatric Association.

Science Education (899)
496 Teaching Science Grades 7-12 (3) Methods, materials, recent trends in science and environmental education programs for secondary schools.

Comment(s): Admission to teacher education required.


Repeatability: May be repeated. Maximum 9 hours.

509 Education for Sustainable Development: Making Connections (3) Holistic and interdisciplinary approach that encourages educators and learners to engage in dialogue in order to acquire through experiences and creativity skills and knowledge needed to maintain a balance between socio-economic, political and environmental goals.

510 Theoretical Foundations of Environmental Education (3) Study of history and philosophy of environmental education, pedagogical approaches, and current status, including model programs and standards for environmental education. Addresses implementation of environmental education in formal and non-formal educational settings. A technology-enhanced course with both online and fieldwork components.

531 Teaching Science to Young Children: K-4 (3) Recent trends in methods, materials and content in teaching science to students in grades K-4.
543 Teaching Science in the Middle Grades (3) Activities in this class are intended to promote the professional growth of pre-service and in-service science teachers by studying science curriculum and instructional strategies. In particular, methods of teaching contemporary science content in grades 4-8 will be explored.

565 Instructional Trends and Issues in Science Education (3) Analysis of current trends in science instruction, instructional issues facing elementary, secondary, and community college science teachers, and application of learning theory to teaching biological, physical, and environmental sciences.

572 Nature of Mathematics and Science Education (3) Teaching and assessment of mathematics and science based upon student conceptions of nature of mathematics and science.


628 Advanced Studies in Science Education (3) Analysis of current research in science education and implications of research for classroom practice.

696 Research Trends in Science Education (3) Analysis of current research trends in science education and relationship of such trends within broader educational community.

Social Science Education (900)

454 Teaching Strategies and Issues in Social Studies Education (3) Goals, objectives, techniques, materials, and evaluation; directed observation in public schools, preparation of teaching plans and materials; simulated teaching experiences.

521 Teaching Social Studies in Elementary and Middle Schools (3) Planning and techniques. Trends in curriculum, development of concepts and generalizations, integration of social sciences.

525 Strategies, Programs and Materials for Teaching Elementary Social Studies (3) Analysis of new and innovative social studies program materials and techniques. Exploration of current trends in social studies education.

543 Teaching Social Studies in the Middle Grades (3) Activities in this class are intended to promote the professional growth of pre-service and in-service social studies teachers through study, design, and implementation of social studies curriculum and instructional strategies. In particular, methods of teaching contemporary social science content in grades 4-8 will be explored.

585 Teaching Secondary School Social Studies (3) Strategies, projects, materials, and programs in social studies.

599 Seminar in Social Studies Education (3) Research, trends, and issues in secondary social studies.

621 Seminar in Social Studies Research and Theory (3) Status of research and theory. Needed research, related research from other fields, and application of research.

Social Work (905)

Graduate students majoring in fields other than social work are admitted to certain social work courses with the approval of the College of Social Work and the student’s major professor.

500 Thesis (1-15)

Graduation Restrictions: P/NP only. Repeatability: May be repeated.

501 Foundations of Social Work Practice I (3) Survey of history, mission, and identity of profession. Basic theory, professional values and ethics, and methods generic to social work practice at various systems levels. Assessment, planning, communication, intervention, and evaluation skills.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

503 Foundations of Social Work Practice II (3) Generalist practice with family and small group systems. Ecological theory to frame understanding of such systems and their adaptation to environments. Various social work roles and intervention strategies pertaining to client systems.

504 Foundations of Social Work Practice III (3) Basic theory, methods, problems, and strategies in implementing planned change within and among larger social systems; task groups, human service organizations, and community systems. Related theories and practice roles. Needed research, related research from other fields, sources, dynamics, and impact of oppression in U.S. society as manifested in both social/ecological/ economic systems and personal experience. Connections among various forms of oppression: racism, sexism, classism, and heterosexism, and forces that perpetuate such conditions.

521 Clinical Social Work Practice with Individuals (3) Theories, knowledge, and skills for clinical practice with individuals from ecological perspective. Therapeutic process and intervention strategies, incorporating content from psychodynamic and cognitive practice models, and specific client problems.

523 Clinical Social Work Practice with Families (3) Concepts related to understanding and analyzing family dynamics and interactive patterns from perspective of major family therapy models. Techniques of intervention in terms of application to families with varied system and individual problems and to families from varied social and cultural backgrounds.

524 Psychopathology and Social Deviance (3) Assessment of psycho social functioning of individuals. Examination of mental disorders: clinical presentation problems, causes, and processes. Ecological perspective.

525 Clinical Social Work Practice with Groups (3) Theoretical and historical approaches to social work with groups and clinical principles supporting specific types of group work used in clinical practice and associated leader interventions.

526 Evaluating Clinical Practice (3) History and philosophies, conceptual approaches, techniques and methods in the practice and use of practice research, and techniques of evaluating and reporting research findings.

530 Seminar in Clinical Social Work (2-3) Topics in theory and practice of clinical social work with individuals, couples, families and groups. Repeatability: May be repeated. Maximum 6 hours.
532 Short-Term Interventions (3) Theory and practice of planned short term, emergency, and crisis interventions.

534 Social Work Interventions with Children and Adolescents (3) Various practice modalities for assessing and intervening with children and adolescents.

535 School Social Work (3) Place of school as community institution and resource. Methods, processes, and techniques employed in school social work.

540 General Topics in Social Work (3) Current topics in advanced social work. 
Repeatability: May be repeated. Maximum 6 hours.

541 Leadership and Management in Human Services (3) Management practices and leadership skills required in development and management of human services delivery systems. Issues regarding human resources management, resource allocation, strategic planning, and organizational dynamics.

543 Financial Management and Resource Development (3) Administrative decision making related to financial planning and resource allocation in human service organizations. Knowledge and skills in budgeting, allocating, expenditure control, fundraising, grant writing, marketing, and evaluation.

547 Evaluation Research (3) History and philosophies, conceptual approaches, techniques and methods, and issues in practice and utilization of evaluation research as applied to development and evaluation of social work programs and policies. Issues pertaining to strengths and limitations of various evaluation methods, microcomputer application of data, and measurement of program goals and objectives.

550 Seminar in Management and Community Practice (2-3) Topics in theory and practice of management and community practice. 
Repeatability: May be repeated. Maximum 6 hours.

Repeatability: May be repeated. Maximum 6 hours.

552 Community Organization (3) Locality development, social planning and social action as practice models for development of resources to meet human needs.

564 Substance Abuse (3) Survey and analysis of social, cultural, medical and psychological factors underlying alcoholism and drug abuse and addiction; recent research and practice innovations.

566 Social Gerontology (3) Physical, psychological and social aspects of aging, and major social policies and programs.

580 Field Practice (3) Instruction and supervision in social work practice. 
Grading Restriction: Satisfactory/No Credit grading only.

581 Field Practice (3) Instruction and supervision in social work practice. 
Grading Restriction: Satisfactory/No Credit grading only.

582 Field Practice (2-6) Advanced field practice in clinical social work or management and community practice. Full-time students must enroll for six credit hours. 
Grading Restriction: Satisfactory/No Credit grading only. 
Repeatability: May be repeated. Maximum 6 hours.

583 Field Practice (2-6) Advanced field practice in clinical social work or management and community practice. Full-time students must enroll for six credit hours. 
Grading Restriction: Satisfactory/No Credit grading only. 
Repeatability: May be repeated. Maximum 6 hours.

584 Field Practice (3) Field practice for summer session advanced standing students only. 
Grading Restriction: Satisfactory/No Credit grading only.

585 Seminar in Gerontology (1) (See Health 585.)

593 Independent Study (1-6) Individualized study, student selects, designs, and completes examination of special issue or problem. 
Repeatability: May be repeated. Maximum 6 hours.

600 Doctoral Research and Dissertation (3-15) 
Grading Restriction: P/NP only. 
Repeatability: May be repeated.

601 Research for Social Work Practice I (3) Epistemological and methodological considerations for both quantitative and qualitative research for social work practice.

602 Research for Social Work Practice II (3) Epistemological and methodological considerations for both quantitative and qualitative research for social work practice.

604 Research in Social Service Settings (3) Advanced research, under faculty supervision, of practice issues in community agency. 
Repeatability: May be repeated. Maximum 9 hours. 
(DE) Prerequisite(s): First-year required PhD courses or consent of instructor.

605 Analysis of Social Work Data I (3) Techniques for quantitative analysis of social work data: unique data analysis problems encountered in social work research.

606 Analysis of Social Work Data II (3) Techniques for quantitative analysis of social work data: unique data analysis problems encountered in social work research.


640 History of American Social Work (3) Social, cultural, economic and political contexts for development of social work profession, development of education for profession, and modern welfare system.

650 Programs and Legislation for Children and Families (3) Background, purposes, and current issues surrounding major social welfare and health programs serving disadvantaged children and their families: Social Security Act (Title IV, Child Welfare and AFDC; Title V, the Maternal and Child Health Block Grant; Title XIX, Medicaid), Head Start, WIC and other nutrition programs, and Healthy Start. Current issues and controversy; legislative changes.

Repeatability: May be repeated. Maximum 9 hours.

(DE) Prerequisite(s): First-year required PhD courses or consent of instructor.

693 Directed Study in Social Work Research (3) Advanced individual study, under faculty guidance, of social work practice issues. 
Repeatability: May be repeated. Maximum 9 hours. 
(DE) Prerequisite(s): First-year required PhD courses or consent of instructor.

Sociology (915)

446 The Modern World System (3) Critical examination of the capitalist world-system as a social system, its coherence, boundaries, regions, member groups, cleavages, and patterns of conflict. Analysis of who gets what, why, and how in global political economy.

451 Criminal Justice (3) A critical assessment of the criminal justice apparatus and its components. Brief examination of the police, with emphasis on the criminal courts and institutions and programs such as the prison, probation, and parole. Analysis of their operation and impacts. 
(See as Legal Studies 451.)

Recommended Background: 350.

452 Minorities, Crime and Criminal Justice (3) Examines racial/ethnic disparities in criminal offending and victimization, as well as different experiences with law enforcement, judicial and correctional agencies. Emphasis on social justice.

453 Gender and Crime (3) Probes the gendered nature of offending, victimization and criminal justice. Examines the different experiences of males and females, and theories that attempt to explain these differences.

455 Society and Law (3) How laws and legal processes are affected by social change, the social impact of legal sanctions, relations between law and social justice. (Same as Legal Studies 455.)

459 White-Collar Crime (3) The distinctive nature and dynamics of white-collar crime, victims and costs of white-collar crime, organizations as white-collar offenders, causal theories, and dynamics of responses to white-collar crime by private and public parties.

462 Population (3) Demographic factors and social structure; trends in fertility, mortality, population growth, migration, distribution, and composition; population policy.

464 Urban Ecology (3) The relation of humans to their urban environment with emphasis on conservation and use of appropriate technology.

465 Social Values and the Environment (3) Human dimensions of ecosystem management and public policy. An applied focus on how social values are activated within specific biophysical and social settings. 
(DE) Prerequisite(s): 110 or 120 or consent of instructor.

500 Thesis (1-15) 
Grading Restriction: P/NP only. 
Repeatability: May be repeated.
502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

504 Sociological Foundations of Political Economy (3) Survey of contemporary sociological theories of political economy, sources of political and economic power and conflict.

505 Foundations of Criminology (3) Critical overview of contemporary developments in criminology, theories of crime causation and theories of responses to crime.

506 Social Justice and Public Policy (3) Examines the formulation and consequences of public policy, analyzing: the general public policy process; the model-specific applications to criminal justice policy, environmental policy, and economic and political policies; and techniques of policy evaluation research.

507 Foundations of Social Psychology (3) Current and classical theoretical perspectives in social psychology.

510 Professional Preparation (1) A variety of one-credit seminars that offer training in specific aspects of professional socialization. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 6 hours.

512 Sociological Theory I (3) Assessment of what sociological theory is; its major figures and their approaches to understanding society.

531 Research Methods in Sociology (3) Research design, measurement, sampling, quantitative and qualitative data collection techniques, data, reduction, and analysis.

534 Advanced Sociological Analysis (3) Underlying assumptions and logical procedures used by sociologists in formulating explanations; foundations of sociological research strategies and techniques.

541 Collective Behavior, Social Movements, Social Change (3) Basic theory and research on conditions of social unrest in human collectivities and efforts of collectives to change existing society.

543 Sociology of Development (3) Sociological theories and studies of development, modernization, colonialism, dependency; comparative impact of various development paths upon selected aspects of social structure and change.

551 Juvenile Delinquency and the Social Structure (3) This course examines how juvenile delinquency policies are shaped by social structures and changes in social perceptions of childhood, crime, and punishment.

560 Environmental Sociology (3) Systematic treatment of current research in environmental sociology. Social impact analysis and conflicts over environmental issues.

562 Sociology of Environmental Policy (3) Examines the history of environmental use and environmental protection; the policy process; the institutional and cultural barriers to improved environmental policies; and potential policies for sustainability.

585 Seminar in Gerontology (1) (See Health 585.)

591 Foreign Study (1-15) Individual instruction. Repeatability: May be repeated. Maximum 15 hours.

592 Off-Campus Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

593 Independent Study (1-15) Repeatability: May be repeated. Maximum 15 hours.

599 Readings (3) Selected topics. Repeatability: May be repeated. Maximum 6 hours.

600 Doctoral Research and Dissertation (3-15) Grading Restriction: P/NP only. Repeatability: May be repeated.

622 Sociological Theory II (3) Distinct schools of sociological theory and contributions of their principal exponents. (DE) Prerequisite(s): 521 or consent of instructor.

629 Supplementary Readings in Sociological Theory (3) Individual guidance. Preparation for comprehensive examination. Grading Restriction: Satisfactory/No Credit grading only. Registration Permission: Consent of instructor.

633 Survey Design and Analysis (3) Systematic exploration of survey problems through student participation in design and analysis of survey. (Same as Child and Family Studies 633.) (DE) Prerequisite(s): 531 or consent of instructor.

636 Field Research (3) Research experience in selected field sites using techniques of interviewing, participant observation, and other methods of field research. (DE) Prerequisite(s): 531 or consent of instructor.

639 Supplementary Readings in Methodology (3) Individual guidance. Preparation for comprehensive examination. Grading Restriction: Satisfactory/No Credit grading only. Registration Permission: Consent of department.

644 Political Sociology (3) Critical examination of theories of state and political processes.

645 Advanced Studies in Political Economy (3) Topical seminar. (DE) Prerequisite(s): 504 or consent of instructor. Repeatability: May be repeated. Maximum 6 hours.

649 Supplementary Readings (3) Grading Restriction: Satisfactory/No Credit grading only. Registration Permission: Consent of instructor.

653 Sociology of Law (3) Intensive examination of selected topics in sociology of law. (DE) Prerequisite(s): 505 or consent of instructor.

655 Advanced Studies in Criminology (3) Intensive examination of selected topics in criminology. Repeatability: May be repeated. Maximum 6 hours. (DE) Prerequisite(s): 505 or consent of instructor.

661 Environmental Theory (3) Historical and contemporary studies of interaction between humans and their environment. Registration Permission: Consent of instructor.

665 Advanced Studies in Environmental Sociology (3) Topical seminar covering particular lines of research and theory within area. Repeatability: May be repeated. Maximum 6 hours. (DE) Prerequisite(s): 541 or consent of instructor.

675 Advanced Studies in Social Psychology (3) Selected contemporary research issues related to social psychological theories. Repeatability: May be repeated. Maximum 6 hours. (DE) Prerequisite(s): 541 or consent of instructor.

695 Advanced Special Topics (3) Topic of special interest or student-initiated courses that will not be regularly offered. Registration Permission: Consent of instructor.


Spanish (924)

421 Phonetics (3) (DE) Prerequisite(s): 323 or consent of instructor.

422 Advanced Grammar and Translation (3) Structure of the grammatical system of Spanish. In-depth analysis of selected syntactic phenomena with practical illustration/application and exercise in Spanish-English and English-Spanish translation. Emphasis on finer points of grammatical structures. (DE) Prerequisite(s): 323. Comment(s): Not available to native or bilingual students of Spanish without consent of department.

423 Advanced Composition and Conversation (3) Develops writing and speaking skills to the advanced level, covering a wide range of topics and situations and including a variety of in-class and extra-class activities. (DE) Prerequisite(s): 323 or consent of department. Comment(s): Not available for credit for students whose level of proficiency in Spanish is superior as defined by the ACTFL.

425 Introduction to Descriptive Linguistics (3) (See French 425.)

426 Methods of Historical Linguistics (3) (See German 426.)

429 Romance Linguistics (3) (See French 429.)

430 Topics in Hispanic Linguistics (3) Introduction to the study of the Spanish language through different areas of linguistics such as phonology, morphology, syntax, semantics, sociolinguistics, dialectology, and second language acquisition. (Same as Linguistics 431.) Repeatability: May be repeated with consent of department. Maximum 6 hours. (DE) Prerequisite(s): 323.
433 Images of Woman in Hispanic Literature (3) Examines major Hispanic texts (and/or women authors) in light of the relation of female individuality to a particular social context, the role of women in society, patriarchal tradition, woman as cultural and as aesthetic value (the feminine symbolic), and feminist theoretical issues.

(DE) Prerequisite(s): 323, 330, and completion of 9 additional hours of upper-division Spanish.

434 Hispanic Culture through Film (3) Analysis of selected films on subjects concerning life, culture, and artistic traditions in the Hispanic world; exploration of ideological, philosophical, social, and political implications of films and a comparison of them with treatments of related subjects in other types of artistic production. Taught in Spanish. (Same as Cinema Studies 434.)

Repeatability: May be repeated with consent of department. Maximum 6 hours.

(DE) Prerequisite(s): 323, 330, and completion of 9 additional hours of upper-division Spanish.

461 Special Topics (3) Focus on aspects of Hispanic culture, literature, linguistics, or foreign language pedagogy. Topics vary.

Repeatability: May be repeated with consent of department. Maximum 6 hours.

465 Latin American Film and Culture (3) Explores Latin American and Latin/o films and videos from 1900s to present as works of art and in light of political, cultural, and social contexts. Taught in English. (Same as Cinema Studies 465; Latin American Studies 465.)

Contact Hour Distribution: 1 hour lecture, 2 hours screening, and 1 hour discussion.

479 Disenchanched Texts in Hispanic Literature (3) Texts representing trends and periods of renewal in Spain and Latin American countries. Selected topics on traditions in crisis. Content will vary. (Same as Latin American Studies 479.)

Repeatability: May be repeated with consent of department. Maximum 6 hours.

(DE) Prerequisite(s): 323, 330, and completion of 9 additional hours of upper-division Spanish.

480 Social Forces in Hispanic Literary Expression (3) Analysis of major Hispanic texts that address factors and events that influenced and/or continue to influence social and cultural evolution of the Hispanic world, including literature itself.

Repeatability: May be repeated with consent of department. Maximum 6 hours.

(DE) Prerequisite(s): 323, 330, and completion of 9 additional hours of upper-division Spanish.

482 Trends in Hispanic Thought (3) Intellectual/philosophical currents represented in literary works, selected thinkers, or movements from historical periods of Spain and Latin American countries.

Repeatability: May be repeated with consent of department. Maximum 6 hours.

(DE) Prerequisite(s): 323, 330, and completion of 9 additional hours of upper-division Spanish.

484 Race, Ethnicity, and Nation in Hispanic Literature (3) Close reading and analysis of literary texts that deal with issues of race and ethnicity in the Hispanic world, with regard to identity and concepts of nationality. Possible course topics: mestizaje; conceptual distinctions between race and ethnicity in Latin America; indigenismo; africentrism; issues of monarchy and empire; relationship between Jews, Christians, and Moors in Spain.

Repeatability: May be repeated with consent of department. Maximum 6 hours.

(DE) Prerequisite(s): 323, 330, and completion of 9 additional hours of upper-division Spanish.

486 Literary and Artistic Movements in the Hispanic World (3) Examination of relationships (thematic, cultural, socio-political, aesthetic, philosophical, etc.) between specific trends in literature and other artistic media, in light of historical contexts in which those relationships emerged.

Repeatability: May be repeated with consent of department. Maximum 6 hours.

(DE) Prerequisite(s): 323, 330, and completion of 9 additional hours of upper-division Spanish.

489 Topics in Hispanic Civilization (3) Analysis of major trends, issues and/or movements in the civilizations of Spain and Spanish America. Political, literary, and cultural perspectives dealing with topics from the Middle Ages to present day may be explored.

Repeatability: May be repeated with consent of department. Maximum 6 hours.

(DE) Prerequisite(s): 323, 330, and completion of 9 additional hours of upper-division Spanish.

500 Thesis (1-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree completion.

Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

512 Teaching a Foreign Language (3) Practical application of methods for teaching and evaluating basic language skills and cultural aspects through seminars, demonstrations, peer teaching, and observation of foreign language classes. Required of all MA and PhD students holding Graduate Teaching Assistantships, except those whose previous training or experience warrants their being excused by the department.

530 Old Spanish (3) Evolution of Spanish language from its origins through the 15th century.

532 Medieval Spanish Literature (3) Literary works of the 11th through 15th century. Application of literary theories to understanding of literature, nature and evolution of major literary genres during Spanish Middle Ages, and socio-historical contexts of medieval works.

Repeatability: May be repeated with consent of department. Maximum 6 hours.

533 Golden Age Prose (3) Wide range of prose fiction in Spain during the 16th and 17th centuries: Moorish, picareque, sentimental, pastoral and/or historical, comedy, exemplary novels, and dialogues.

534 Don Quijote (3) Cervantes’ masterpiece in socio-cultural and literary context of its time: study of thematic, structural, and stylistic issues: crisis of aristocracy, Quixotic madness, discrepant cognitive and ethical perspectives, satiric irony, culture of sentiment, and Cervantes’ legacy to subsequent literary periods. Content varies.

Repeatability: May be repeated with consent of department. Maximum 6 hours.

535 Golden Age Poetry (3) Garcilaso, Fray Luis de León, San Juan de la Cruz, Lope de Vega, Quevedo, and Góngora.

537 Golden Age Drama (3) Major dramatists of period: Lope de Vega, Tirso de Molina, Ruiz de Alarcón, Guillén de Castro, Calderón de la Barca, Moreto, and Rojas Zorrilla.


Repeatability: May be repeated with consent of department. Maximum 6 hours.

541 19th-Century Spanish Prose (3) Costumbrism, realism, and naturalism in the novel, short story, and essay as represented in major authors: Larra, Mesonero Romanos, Fernán Caballero, Alarcón, Valera, Palacio Valdés, Pereda, Galdós, Pardo Bazán. Content varies.

Repeatability: May be repeated with consent of department. Maximum 6 hours.

542 20th-Century Spanish Literature: Generation of '98 through Civil War (3) Principal achievements and representative directions in literature of Spain from Civil War years through civil war.

543 20th-Century Spanish Literature: Post-Civil War through Present (3) Principal achievements and representative directions in literature of Spain from Post-Civil War period to present.

550 Techniques of Literary Analysis and Research Methods (3) Theoretical and critical essays on various techniques of literary analysis. Exploration of bibliographical and research materials.

551 Special Topics in Hispanic Literature or Linguistics (3) Repeatability: May be repeated. Maximum 6 hours.

552 Directed Readings (3)

561 Spanish American Colonial Literature (3) From the pre-Columbian era through the 18th century. Reading and analysis of selected works from the Colonial Spanish American period and their Continental sources. Indigenous texts and authors. Content varies.

Repeatability: May be repeated with consent of department. Maximum 6 hours.


Repeatability: May be repeated with consent of department. Maximum 6 hours.

571 Spanish American Narrative: Criollismo to 1950 (3) Critical study of major trends and movements that shaped Spanish American narrative during the first half of 20th century. Content varies.

Repeatability: May be repeated with consent of department. Maximum 6 hours.

572 Spanish American Narrative: Boom to Present (3) Critical study of major trends and movements that established Spanish American narrative as influential force in world literature during the second half of the 20th century. Content varies.

Repeatability: May be repeated with consent of department. Maximum 6 hours.

573 Regional Approaches to Interpreting Spanish American Literature (3) Interpretation of Spanish-American literature taking into consideration regional differences attributable to such factors as race, geography, immigration, and economic development. Key regions include Mexico and Central America, Caribbean, Andean countries, and the Southern Cone. Course readings vary between specific regional perspective and transregional one. Content varies.

Repeatability: May be repeated with consent of department. Maximum 6 hours.
575 Spanish American Modernismo and Vanguardismo (3) Critical study of principal writers and literary works associated with Spanish American modernismo and vanguardismo published between 1880 and 1950. Concepts and expressions of modernity as reflected in literature of period. Content varies. (DE) Prerequisite(s): 402. Repeatable: May be repeated with consent of department. Maximum 6 hours.

576 Contemporary Spanish American Poetry (3) Critical study of major poets in Spanish America from 1950 to present. Content varies. (DE) Prerequisite(s): 402. Repeatable: May be repeated with consent of department. Maximum 6 hours.

577 Contemporary Spanish American Theater (3) Reading and analysis of Spanish America’s major dramatic works published and performed since 1950. Content varies. (DE) Prerequisite(s): 402. Repeatable: May be repeated with consent of department. Maximum 6 hours.


579 Spanish American Literary Criticism (3) Major works in which Spanish Americans have developed strategies to define, organize, and catalog literature published throughout continent. Critical approaches that surpass European and other non-Spanish American critical perspectives. Content varies. (DE) Prerequisite(s): 402. Repeatable: May be repeated with consent of department. Maximum 6 hours.

591 Foreign Study (1-15) Repeatable: May be repeated. Maximum 15 hours.

592 Off-Campus Study (1-15) Repeatable: May be repeated. Maximum 15 hours.

593 Independent Study (1-15) Grading: Satisfactory/No Credit or letter grade. Repeatable: May be repeated. Maximum 15 hours.

600 Doctoral Research and Dissertation (3-15) Grading Restriction: P/NP only. Repeatable: May be repeated.

621 Seminar in Spanish Literature (3) Topics vary in field of Peninsular literature. Repeatable: May be repeated with consent of department. Maximum 9 hours.

631 Seminar in Spanish American Literature (3) Topics vary. Repeatable: May be repeated with consent of department. Maximum 9 hours.

Special Education (932)

410 Early Childhood Special Education Foundations (3) Introduction to the field of early childhood special education including the nature of disabling conditions; theoretical perspectives in the field; legislation; policies and procedures used in the field.

419 Psychology and Education of Students with Mild Disabilities (6) Nature and characteristics of persons with mild handicaps and educational strategies appropriate for these persons. (DE) Prerequisite(s): 402. (DE) Corequisite(s): 420. Comment(s): Admission to teacher education required.

420 Field Experience in Special Education Programs (3) Practicum in teaching special education programs: planning, developing, implementing and evaluating instruction. Grading Restriction: Satisfactory/No Credit grading only. (DE) Prerequisite(s): 402. (DE) Corequisite(s): 419 and/or 471. Comment(s): Admission to teacher education required.

431 Field Experience in Comprehensive Programs (3) On-site teaching experience with moderately and severely handicapped children and youth. Grading Restriction: Satisfactory/No Credit grading only. (DE) Prerequisite(s): 402. (DE) Corequisite(s): 419 and/or 471. Comment(s): Admission to teacher education required.

432 Psychology and Education of Students with Moderate/Severe Disabilities (6) Nature and characteristics of persons with moderate/severe disabilities and educational strategies appropriate for those persons. (DE) Prerequisite(s): 402. (DE) Corequisite(s): 431. Comment(s): Admission to teacher education required.

454 Education of the Gifted and Talented Children (3) Psychometric and behavioral studies of giftedness. Analysis of past and present school practices in reference to curriculum and program implementation. Comment(s): Admission to teacher education required.

456 Speech and Language Basis of Learning Disabilities in the Classroom (3) Normal communication development; understanding of speech and language impairments in school-age students; integration of oral/written communication skills into existing curriculum, especially for high incidence special education students.

470 Psychology of the Exceptional Child (3) General characteristics and educational needs of exceptional children. Implications of developmental variations for functioning as adults.

471 Early Childhood Special Education (3) Assessment, curriculum planning and development and teaching approaches used in early childhood special education.

504 Clinical Experience in Teaching and Supervision of Exceptional Children (3-9) (See Education of the Deaf and Hard of Hearing 504.)

506 Internships in Teaching in Special Education and Rehabilitation (3-15) Placement in professional settings in public schools or agencies under supervision of master practitioners. Grading Restriction: Satisfactory/No Credit grading only. Repeatable: May be repeated. Maximum 15 hours.

553 Assessment of Exceptional Students (3) Current issues related to assessment; advanced study of evaluation models for special education; dynamic and other innovative assessment approaches; advanced study of application to educational programming; basic statistics and application in assessment.

554 Assessment in Early Childhood Special Education (3) Development of knowledge and skills in appropriate formal and informal assessment of handicapped infants and young children; screening, identification, diagnosis, placement and programming assessment issues.

555 Characteristics of Affective/Motivational Functioning in Children with Disabilities (3) Definition, methods, identification and symptoms of children with affective/motivational development in disabled youngsters. Comparison to normal development and that of children labeled disturbed or behavior disordered.

556 Instructional Systems for Affective/Motivational Education for Children with Disabilities (3) Educational strategies and models of instruction; simulation, demonstration, and media. Teaching techniques, materials, and teacher/pupil/family interactions. Therapeutic forms of education through art, music, role play, puppy, bibliotherapy, and group interactions. (DE) Prerequisite or (DE) Corequisite: 555 or consent of instructor.

557 Positive Preventive Discipline (3) Instructional, classroom and preventive/proactive strategies for use in classroom which positively affects efficiency of classroom. Research on how curriculum can encourage appropriate interactions of children and youth.

558 Neuromuscular and Health Disorders: Educational Implications (3) Neurological impairments, physical disabilities and special health conditions, autism. Investigation of instructional techniques and adaptations.


565 Instructional Systems for the Gifted and Talented (3) Instructional methods and systems evaluated in terms of effectiveness in various educational environments. (DE) Prerequisite or (DE) Corequisite: 564 or consent of instructor.

568 Early Childhood Special Education: Theories and Interventions (3) Theoretical perspectives of early childhood special education; exploration of programmatic models, family-focused concepts and curriculum development.

575 Creative Problem-Solving Strategies for Special Educators (3) Techniques for solving problems encountered by special educators in any setting.

586 Seminar in Research Techniques in Special Education (3) Evaluation of appropriate research methodologies with handicapped populations.

Application of Microcomputer Technology in Special Education and Vocational Rehabilitation (3) Application of microcomputer technology with all categories of exceptionalities and across all chronological and functioning age ranges. Microcomputer adaptive software, special switch access, authoring systems, telecommunication, and strategies for cognitive development.

Internship in Research in Special Education and Rehabilitation (3-9) Placement with professional engaged in theoretically-based research: public school, institutions, agencies or university settings. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 9 hours.

Internship in Institutional Leadership in Special Education and Rehabilitation (3-9) Advanced level field experiences under supervision of practitioner. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 9 hours. Registration Permission: Consent of instructor.

Sport Management (957)

Sport Marketing (3) Application of fundamental marketing concepts to the sport industry. Marketing research, promotions, fund raising, advertising, and assessment of marketing programs specific to sport will be covered. The historical development of sport marketing will be included.

Sport and Media Issues (3) Gender and race issues within context of media and sport. Development of sport media and media influence on sport.

Research Techniques in Sport (3) Evaluate, compare, and contrast research techniques in sport with consideration for and experiences in appropriate review, design, analysis procedures, and proposal development.

Ethics in Sport Management (3) Development of analytical skills and knowledge desirable of middle and upper level managers in sport business/organizations. Social issues and ethics in sport administration.

Sport Economics and Finance (3) Principles of economics and finance as applied to sport organizations. Market structures of sport finance and political economics that form those structures.

Theories of Leadership and Leader Behavior in Sport (3) Integration of various theoretical approaches to leadership styles in sport administration within cultural contexts, research, and field experiences.

Case Studies in Sport Management (3) Current issues and problems in sport administration at all levels of amateur and professional sport. Repeatability: May be repeated if topic differs. Maximum 9 hours.

Readings in Sport Management (3) Survey of pertinent literature in refereed and applied journals and texts.

Evaluation Techniques for Sport Managers (3) Review and application of techniques of evaluation appropriate for sport programs, facilities, and personnel.

Sport Governance (3) Principles of organizational governance theories as applied to sport organizations. Review of history, mission, and structure, administrative and legislative processes of amateur and professional governing bodies in sport.

Event Management (3) Review of current research related to theory and practice in event management and involvement in management capacity with one or more special events.

Seminar in Sport Management (1) Selected topics in sport management. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated with consent of instructor. Maximum 3 hours.

Special Topics (1-3) Advanced study in selected disciplinary or professional areas of physical education and/or sport. Repeatability: May be repeated. Maximum 6 hours.

Practicum (3) Practical experience in areas of major interest. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 6 hours.

Independent Study (1-3) Repeatability: May be repeated. Maximum 6 hours.

Internship (3) Full-time application of previous theoretical and applied knowledge and skills in appropriate sport setting. Grading Restriction: Satisfactory/No Credit grading only.

Sport Studies (959)

Thesis (1-15) Grading Restriction: P/InP only. Repeatability: May be repeated. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated.

Special Project (3) Research study suitable for publication, or practicum requiring special written work. (DE) Prerequisite(s): 532.

Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Credit Restriction: May not be used toward degree requirements.

Problems in Lieu of Thesis (2-3) Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 9 hours.

Administrative/Supervisory in Sport (3) Development of knowledge and analytic skills desirable for managers/administrators in sport business/organization: organizational, administrative, and supervisory strategies related to sport in profit and non-profit settings.

Application of Legal Concepts to Sport Settings (3) Application of contract law, breach of contract, and monetary damages within sport settings: risk assessment and development of effective risk management strategies; development of contracts in sports; and analysis of cases involving discrimination based upon gender, race, and age as well as protection of rights at amateur and professional levels of sport.

Sport and Media Issues (3) Gender and race issues within context of media and sport. Development of sport media and media influence on sport.

Research Techniques in Sport (3) Evaluate, compare, and contrast research techniques in sport with consideration for and experiences in appropriate review, design, analysis procedures, and proposal development.

Ethics in Sport Management (3) Development of analytical skills and knowledge desirable of middle and upper level managers in sport business/organizations. Social issues and ethics in sport administration.

Sport Economics and Finance (3) Principles of economics and finance as applied to sport organizations. Market structures of sport finance and political economics that form those structures.

Theories of Leadership and Leader Behavior in Sport (3) Integration of various theoretical approaches to leadership styles in sport administration within cultural contexts, research, and field experiences.

Case Studies in Sport Management (3) Current issues and problems in sport administration at all levels of amateur and professional sport. Repeatability: May be repeated if topic differs. Maximum 9 hours.
536 Expert Performance in Sports (3) Examines expertise in athletic performance with a primary focus on the development and maintenance of expertise. Special emphasis is placed on theoretical and practical perspectives on the study of sport expertise as they intersect with issues regarding sport psychology, race, aging, gender, or other socio-cultural factors.
Comment(s): Requires admission to the sport studies major or consent of instructor.

538 Professional Practice Issues in Sport Studies (3) Study and cultural critique of various aspects of professional practice in sport studies.
Comment(s): Requires admission to the sport studies major or consent of instructor.

539 Research Development in Sport Psychology: Idea Formation To Data Collection (3) First of a two-semester sequence designed to familiarize students with research process in applied sport psychology. Includes idea formation, critical review of related literature, development of a research question and methodology, and data collection.
Comment(s): Requires admission to the sport studies major or consent of instructor.

540 Research Development in Sport Psychology: Data Analysis to Manuscript Submission (3) Second of a two-semester sequence designed to familiarize students with research process in applied sport psychology. Includes data analysis, manuscript preparation and manuscript submission.
Comment(s): Requires admission to the sport studies major or consent of instructor.

542 Sociological Aspects of Sport (3) Social and cultural factors influencing sport and physical education. Pertinent issues and research applications.
Comment(s): Requires admission to the sport studies major or consent of instructor.
Registration Permission: Consent of instructor.

543 Women, Sport, and Culture (3) Critical examination of experiences of girls/women in American sports from a socio-cultural perspective with particular emphasis on the constructs of gender, race, class, and sexuality. Explores theories from sport, feminist, race, and cultural studies.
(Same as Women’s Studies 543.)

593 Independent Study (1-3)
Grading: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 6 hours.

594 Supervised Readings (1-3)
Grading: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 6 hours.

595 Special Topics (1-3) Advanced study in selected aspects of sport studies.
Grading: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 9 hours.
Comment(s): Requires admission to the sport studies major or consent of instructor.

600 Doctoral Research and Dissertation (3-15)
Grading: P/NP only.
Repeatability: May be repeated.

601 Research Seminar (1) (See Exercise Science 601.)

633 Advanced Sport Psychology (3) Analysis, synthesis, and discussion of contemporary theory and topics; research development and production in sport psychology.
Repeatability: May be repeated. Maximum 9 hours.
Comment(s): Requires admission to the sport studies major or consent of instructor.

681 Practicum (1-3) Intern experience in areas of major interest.
Repeatability: May be repeated. Maximum 6 hours.
Comment(s): Requires admission to the sport studies major or consent of instructor.

693 Independent Study (1-3)
Grading: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 6 hours.

694 Supervised Reading (1-3)
Grading: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 6 hours.

695 Special Topics (1-3) Study for doctoral students in selected aspects of sport studies.
Grading: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 9 hours.

Statistics (962)

(DE) Prerequisite(s): 320.

(DE) Prerequisite(s): 330.

500 Thesis (1-15)
Grading: P/IP only.
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.
Credit Restriction: May not be used toward degree requirements.

531 Survey of Statistical Methods I (3) Univariate and bivariate data collection and organization, statistical estimation and hypothesis testing; analysis of relationships for categorical and numerical data, including Chi-square tests and simple linear and quadratic regression. Use of computing facilities required.
(DE) Prerequisite(s): 531.
Credit Restriction(s): Students may not receive credit for both 531 and 537.
(De) Prerequisite(s): 1 year of college mathematics.

532 Survey of Statistical Methods II (3) Multiple linear regression, including use of dummy variables; single and multiple factor analysis of variance and covariance; issues in experimental design and analysis. Use of computing facilities required.
(De) Prerequisite(s): 531.

537 Statistics for Research I (3) Principles and application of statistical methodology, integrated with considerable use of major statistical computing system. Probability and probability distributions, forming and testing hypotheses using parametric and nonparametric inference methods. Matrix-based simple linear regression and correlation.
(De) Prerequisite(s): 531.
Credit Restriction(s): May not be used toward degree requirements.

538 Statistics for Research II (3) General linear model as applied to multiple regression and analysis of variance. Diagnostic and influence techniques. One-way, factorial, blocking, and nested designs, preplanned versus post-hoc contrasts. Random factors and repeated measures.
(De) Prerequisite(s): 537 or 532.

561 Introduction to Computing for Data Management and Analysis (1) The University of Tennessee, Knoxville, computing environment for beginning statistics graduate students. Use of operating system commands, system editor, utility programs and SAS statistical package for data entry and editing, file management and statistical analysis. Use of UTCC computing facilities required.
(De) Prerequisite(s): 531 and 537 or 571 or consent of instructor.

563 Introduction to Mathematical Statistics (3) Basic probability models and theory of distributions of random variables.
(De) Prerequisite(s): Mathematics 241.

564 Theory of Statistical Inference (3) Introductory theory underlying common statistical procedures of hypothesis testing and estimation.
(De) Prerequisite(s): 563.

566 Statistical Techniques in Industrial Processes (3) Applications of control charts and other statistical techniques in industrial setting. Attributes and variables control charts, process capability analysis, aspects of sampling, statistical tolerancing, estimation of variance components, problems of measurement, special industrial applications.
(De) Prerequisite(s): 571 or equivalent.

(De) Prerequisite(s): 563 or Mathematics 425.

571 Statistical Methods (3) Data collection strategies. Descriptive statistics. Probability distributions, simulation of random variables, sampling distributions. Estimation and hypothesis testing, regression, Chi-Square test for categorical data, simple design of experiments, nonparametric methods. Use of statistical software.
(De) Prerequisite(s): 1 year of calculus and a statistics course.

(DE) Prerequisite(s): 571 and matrix algebra.


(DE) Corequisite: 572.

574 Data Mining Methods and Applications (3) Understanding and application of data mining methods. Data preparation; exploratory data analysis and visualization; cluster analysis; logistic regression; decision trees; neural networks; association rules; model assessment; and other topics. Applications to real world data. Use of standard computer packages.

(DE) Prerequisite(s): 532 or 538 or 571 or consent of instructor.

575 Applied Time Series (3) Fundamental concepts of time series analysis: Box-Jenkins approach, stationary and nonstationary models, forecasting model identification, seasonal models, transfer function models, and spectral theory.

(DE) Prerequisite(s): 538 or 572 or consent of instructor.


(DE) Prerequisite(s): 1 year of graduate-level statistics and regression analysis and analysis of variance or consent of instructor.


(DE) Prerequisite(s): 538 or knowledge of regression and analysis of variance.

583 Special Topics in Applied Statistics (1-3)

Repeatability: May be repeated. Maximum 9 hours.

585 Principles of Statistical Process Management (1-3) Statistical and other techniques applied to management of organizational processes.

Repeatability: Not repeatable. May be taken once for 1-3 hours.

587 Graduate Seminar (1) Directed readings and active participation in colloquium program of Department of Statistics and of student's minor program.

Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 2 hours. Registration Permission: Consent of departmental director of graduate studies.

592 Internship (1-6) Supervised off-campus experience in application of statistical principles and methods in business, industry, or government. Written and oral report required.

Grading Restriction: Satisfactory/No Credit grading only. Repeatability: May be repeated. Maximum 6 hours. (DE) Prerequisite(s): 4 courses in graduate-level statistics or consent of departmental director of graduate studies.

593 Independent Study (2-6) Faculty directed readings and investigation of specified topic in probability or statistics. Written report and oral presentation required.

Grading: Satisfactory/No Credit or letter grade. Repeatability: May be repeated. Maximum 6 hours. (DE) Prerequisite(s): 2 courses in statistics. Registration Permission: Consent of the departmental director of graduate studies.

595 Statistical Consulting Practicum (1-6) Supervised experience helping on-campus researchers plan, manage data, and develop and perform analyses specific to designs and hypotheses. Discussion of activities in regular seminar meetings. Final written reports and/or detailed diaries required.

Repeatability: May be repeated. Maximum 6 hours. (DE) Prerequisite(s): 572 or 538.

600 Doctoral Research and Dissertation (3-15)

Grading Restriction: P/NP only. Repeatability: May be repeated.

662 Computational Methods in Statistics (3) Up-to-date computational methods in statistics: open architecture interactive computational languages supplemented by other statistical packages with graphical capabilities. Statistical computing, numerical methods for linear models and generalized linear models, nonlinear statistical methods, matrix computations and special matrices, essentials of Monte Carlo simulation, and re-sampling techniques.

(DE) Prerequisite(s): Knowledge of programming language and 572 or consent of instructor.


(DE) Prerequisite(s): 564 and Mathematics 445.

664 Advanced Statistics Theory II (3) Testing statistical hypotheses, Bayesian methods and estimation, linear model theory and model selection.

(DE) Prerequisite(s): 663.


(DE) Prerequisite(s): 564 and 566.

673 Advanced Topics in Design of Experiments and Linear Models (3) Experimental for product and process improvement: response surface methodology and robust design methods; mixture experiments; optimal design topics; distribution theory and inference for linear models.

(DE) Prerequisite(s): 573 or consent of instructor.


(DE) Prerequisite(s): 564, 579 and knowledge of programming language or consent of instructor.

677 Statistical Modeling (3) Modern techniques of statistical modeling: predictive, likelihood, Bayesian, and information-based model selection and evaluation paradigms. Application of techniques in various types of models for both continuous and discrete data modeling problems. Interactive computational tools.

(DE) Prerequisite(s): 564 and 572 or 538 or consent of instructor.

679 Multivariate Statistical Modeling (3) Modern information based techniques and model selection in multivariate analysis, informational tests of significance with multivariate data, multivariate analysis of variance, multivariate regression and variable selection, multisample cluster analysis, common principal component model, factor analysis model, covariance structural models with latent variables, mixture-model cluster analysis.

(DE) Prerequisite(s): Matrix algebra and 564 or matrix-based linear models with experience in interactive computing or consent of instructor.

683 Special Topics in Statistics (1-3) Presentation of specialized topics in statistics.

Repeatability: May be repeated. Maximum 6 hours.

691 Graduate Seminar in Applied Statistics (3) Reading of literature and discussion of open problems of importance to industry; design of experiments, modeling, process control, regression, and reliability.

Grading Restriction: Satisfactory/No Credit or letter grade. Registration Permission: Consent of instructor.

693 Independent Study (1-6) Directed research on subject of mutual interest to student and faculty member.

Repeatability: May be repeated. Maximum 6 hours.

Theatre (976)

420 Special Studies in Acting (3) Content varies. Exercises in selected concentrated areas such as styles, techniques, approaches, e.g., Shakespeare, movement, humor.

Repeatability: May be repeated. Maximum 9 hours. (DE) Prerequisite(s): 320. Registration Permission: Consent of instructor.

425 Advanced Musical Theatre (3) Study and practice of musical theatre material, including dance and vocal work.

(DE) Prerequisite(s): 325.

430 Principles of Play Directing (3) Problems in composition, picturization, rhythm, movement.

(De) Prerequisite(s): 220. Comment(s): 430 and 431 must be taken in sequence.
431 Principles of Play Directing (3) Problems in composition, picturization, rhythm, movement. 
   (DE) Prerequisite(s): 220. 
   Comment(s): 430 and 431 must be taken in sequence. 

446 Costume Patterning (3) Draping patterns for period costumes. Includes corsetry and study of historic patterns 1500-1900. 
   (DE) Prerequisite(s): 345 or consent of instructor. 

450 Special Studies in Entertainment Technology (1-3) Content varies. 
   Repeatability: May be repeated. Maximum 9 hours. 
   Registration Permission: Consent of instructor. 

452 Entertainment Technology II (3) Automation systems in live entertainment, including advanced rigging and flying for stage and film. 
   (DE) Prerequisite(s): 352 or consent of instructor. 

454 Scenery Painting (2) Introduction to materials, techniques, and principles of craft. Emphasis on gaining skill and understanding through studio experience. 
   Registration Permission: Consent of instructor. 

456 Scenic Design II (3) Advanced studies in set design. 
   (DE) Prerequisite(s): 355 or consent of instructor. 

462 Lighting Design II (3) Advanced lighting design theory and practice. Lab and project intensive. 
   (DE) Prerequisite(s): 362 or consent of instructor. 

464 Computer Aided Drafting for the Theatre (3) Introduction to entertainment drafting. Emphasis on 2-D graphical standards, drafting techniques, drawing layout and presentation. 

470 Playwriting (3) Advanced instruction in writing of plays. 
   Registration Permission: Consent of instructor. 

491 Foreign Study (1-15) 
   Repeatability: May be repeated. Maximum 15 hours. 

492 Off-Campus Study (1-15) 
   Repeatability: May be repeated. Maximum 15 hours. 

493 Independent Study (1-15) 
   Repeatability: May be repeated. Maximum 15 hours. 

501 Introduction to Graduate Research in Theatre (3) Research tools and methods for theatre artist and scholar. 

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed. 
   Grading Restriction: Satisfactory/No Credit grading only. 
   Repeatability: May be repeated. 
   Credit Restriction: May not be used toward degree requirements. 

503 Elements of Design for the Theatre (3) Analysis of the principles of design through visual, structural, and emotional relationships. 

510 Studies in Theatre History (3) Intensive study of selected topics in theatre history. 
   Repeatability: May be repeated. Maximum 9 hours. 

512 Dramatic Literature Analysis (3) Dramaturgical strategies of major playwrights, using variety of analytical approaches from Aristotelian to deconstruction. 

520 Master Class in Performance: Acting (3) Master class in acting techniques. 
   Repeatability: May be repeated. Maximum 18 hours. 
   Comment(s): Theatre MFA students only. 

523 Master Class in Performance: Movement (3) Master class in movement techniques. 
   Repeatability: May be repeated. Maximum 18 hours. 
   Comment(s): Theatre MFA students only. 

525 Master Class in Performance: Voice (3) Master class in voice and speech techniques. 
   Repeatability: May be repeated. Maximum 18 hours. 
   Comment(s): Theatre MFA students only. 

536 Projects in Play Directing (3) Practical work in play direction involving various lengths and kinds of scripts. 
   Repeatability: May be repeated. Maximum 9 hours. 

542 The Social History of Costume (3) Study and analysis of costume as related to society’s manners and mores, architecture and furniture. 

   Repeatability: May be repeated. Maximum 9 hours. 
   Registration Permission: Consent of department. 

545 Millinery for the Stage (2) Pattern making and construction techniques for hats from antiquity to present. 
   Registration Permission: Consent of instructor. 

546 Advanced Costume Patterning (3) Advanced studies in patterning period costume. Development of historic patterns through flat pattern method. 
   (DE) Prerequisite(s): 446. 

547 Painting and Dyeing for the Theatre (3) Fibers, dyes and dye processes; color matching and distressing. 

549 Projects in Costume Technology (1-3) Individualized studies in costume technology in theatre production. 
   Repeatability: May be repeated. Maximum 6 hours. 
   Registration Permission: Consent of instructor. 

550 Special Studies in Entertainment Technology (1-3) Content varies. 
   Repeatability: May be repeated. Maximum 9 hours. 
   Registration Permission: Consent of instructor. 

551 Structural Design for Stage (3) Application of advanced theatre technology and analysis of common building materials to design of safe stage scenery. 
   Comment(s): Theatre MFA students only. 

554 Lighting Design I (3) Introduction to lighting design techniques. 
   (DE) Prerequisite(s): 365 and 1 semester of 550. 
   Comment(s): Theatre MFA students only. 

556 Model Building (3) Techniques of model building for scenic designer. 
   (DE) Prerequisite(s): 401 and 1 semester of 580. 
   Comment(s): Theatre MFA students only. 

558 Drafting (3) Drafting techniques for scenic designer. 

560 Lab Analysis of Realized Lighting Design (3) Realized lighting design projects from concept meeting through opening night. 
   Repeatability: May be repeated. Maximum 18 hours. 
   Registration Permission: Consent of instructor. 

564 Advanced Computer Aided Drafting for the Theatre (3) Advanced drafting techniques. Emphasis on 3-D solid modeling, rendering, and publication. 
   (DE) Prerequisite(s): 464 or consent of instructor. 

570 Photography for the Theatre (3) Photographic techniques for shooting live performance events under challenging lighting environments. 
   Registration Permission: Consent of instructor. 

575 Production Workshops (1-6) Directed experience in production collaborations. 
   Repeatability: May be repeated. Maximum 12 hours. 
   Registration Permission: Consent of instructor. 

587 Computer Aided Rendering for the Theatre (3) Computer rendering programs and their use by theatrical designers. 
   Registration Permission: Consent of instructor. 

593 Independent Study (1-3) Individual or group projects. 
   Repeatability: May be repeated. Maximum 15 hours. 
   Comment(s): Theatre MFA students only. 
   Registration Permission: Consent of instructor. 

599 Project in Lieu of Thesis (1-6) 
   Repeatability: May be repeated. Maximum 9 hours. 
   (DE) Prerequisite(s): Minimum of 30 hours toward the MFA. 
   Registration Permission: Consent of advisor.
Theory and Practice in Teacher Education (978)

500 Thesis (1-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.

502 Registration for Use of Facilities (1-15)
Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated.

505 Problems in Lieu of Thesis (2-3)
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 9 hours.

517 Trends and Issues in Education (3)
Examination of contemporary trends and issues in education.

518 Educational Specialist Research and Thesis (3)
Grading Restriction: P/NP only.
Repeatability: May be repeated. Maximum 15 hours.

526 Drama and Story Telling in Teaching (3)
Use of techniques of drama and storytelling to improve impact of teaching and to teach more effectively.
(CE) Prerequisite(s): Classroom experience or admission to teacher education.

535 Inquiry Teaching and Learning (3)
Use of children's and adolescent literature. Exploration of ways to create setting that invite learners to engage in inquiry learning and teaching.

540 Topics in Improvement of Instruction (1-3)
Special conferences, workshops, and in-service programs.
Grading: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 6 hours.

542 Integrated Middle Grades Methods (3)
Activities in this class are intended to promote the professional growth of pre-service and in-service middle grades teachers through study, design, and implementation of curriculum, instruction, and assessment strategies. In particular, methods of integrating language arts, mathematics, science, and social science content in grades 4-8 will be explored. The use of technology in supporting learning of middle grades content will also be an emphasis throughout.

543 Middle Grades: Concepts and Practices (3)
Designed as the introductory course for students pursuing middle-level teacher licensure. Attention is focused on the decline of the junior high and rise of the middle school (typically grades 6-8), the programmatic components that characterize exemplary middle schools, and the philosophy that forms the foundation for this movement. Looks at the theories, research, and exemplary practice concerning the components of middle schools. Helps to prepare middle school professionals who understand the rationale for and the role of teachers in interdisciplinary teams, teacher-based advisory, flexible scheduling and grouping, and working with colleagues, families, resource persons, and community groups.

550 Action Research and Practical Inquiry in Education (3)
Principles of action research and practical inquiry for practitioners in early childhood and school settings and methods for conducting such inquiries in professional role.
Comment(s): Admission to graduate program required.

593 Independent Study (1-3)
Grading Restriction: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 12 hours.

594 Supervised Readings (1-3)
Grading Restriction: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 12 hours.

595 Special Topics (1-3)
Grading Restriction: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 12 hours.

596 Clinical Experience in Assessment and Instruction (3)
Academic remediation applied in lab/field setting; tasks related to teaching: assessment, preparation of lessons, and delivery of instruction.
Grading: Satisfactory/No Credit or letter grade.
(CE) Corequisite(s): 555.

600 Doctoral Research and Dissertation (3-15)
Grading Restriction: P/NP only.
Repeatability: May be repeated.
Comment(s): Admission to candidacy required.

604 Trans-Departmental Seminar I (1)
Introduction to doctoral programs in education: research requirements, academic integrity, the meaning of scholarship in academic and issues/problems in education.
Grading Restriction: Satisfactory/No Credit grading only.
Credit Restriction: May not be used to meet 600-level requirement.
Comment(s): Admission to a doctoral program or consent of the doctoral program coordinator required.

605 Trans-Departmental Seminar II (1)
Seminar to prepare doctoral students for the final steps in completing a terminal degree including preparing for and completing qualifying exams, preparing a prospectus, and completing a dissertation.
Credit Restriction: May not be used to meet 600-level requirement.
(CE) Prerequisite(s): 604.

610 Internship in College Teaching and Supervision (3-9)
Supervised practice in college teaching and supervision.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 9 hours.
Comment(s): Admission to doctoral program or consent of instructor required.

617 Advanced Studies in Education — An Interdisciplinary Perspective (3)
Educational trends, issues, and policies related to curriculum and instruction, assessment, the organization and administration of schools, and preparation of educators for both K-12 and higher education settings.
Comment(s): Admission to doctoral program or consent of instructor required.

620 Research in Literacy, Language, and ESL Education (3)
Recent trends and historical traditions in language and literacy research: analysis of nature of research methods used, questions asked and topics studied.
Comment(s): Admission to doctoral program or consent of instructor required.

640 Theoretical Analysis and Theory Construction (3)
Critical analysis of paradigm, and theories relevant to educational research. Principles of theory construction with grounded, inductive and deductive modes. Construction of mid-range theories.
Comment(s): Admission to doctoral program required.

689 Internship (1-3)
Experiences in application of principles and practices of curriculum development and instructional improvement.
Grading Restriction: Satisfactory/No Credit grading only.
Repeatability: May be repeated. Maximum 9 hours.
(CE) Prerequisite(s): Program prerequisites.
Registration Permission: Consent of instructor.

693 Independent Study (1-3)
Grading: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 12 hours.

694 Supervised Reading (1-3)
Grading: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 12 hours.

695 Special Topics (1-3)
Grading: Satisfactory/No Credit or letter grade.
Repeatability: May be repeated. Maximum 12 hours.

Veterinary Medicine (987)

801 Application Based Learning Exercise (ABLE) I (1)
Small group, student-centered learning sessions with faculty facilitator for self discovery of new information. Week-long sessions based on specific clinical case or problem, and integration of basic science and clinical material.
Grading Restriction: Satisfactory/No Credit grading only.

802 Application Based Learning Exercise (ABLE) II (2)
Small group, student-centered learning sessions with faculty facilitator for self discovery of new information. Week-long sessions based on specific clinical case or problem, and integration of basic science and clinical material.
Grading Restriction: Satisfactory/No Credit grading only.

804 Application Based Learning Exercise (ABLE) and Clinical Exposure I (2)
Week-long small group, student-centered learning sessions with faculty facilitator for self discovery of new information; based on specific clinical case or problem; integration of basic science and clinical material. One week of clinical experience through participation in specific clinical rotations in Veterinary Teaching Hospital.
Grading Restriction: Satisfactory/No Credit grading only.

805 Application Based Learning Exercise (ABLE) and Clinical Exposure II (2)
Week-long small group, student-centered learning sessions with faculty facilitator for self discovery of new information; based on specific clinical case or problem; integration of basic science and clinical material. One week of clinical experience through participation in specific clinical rotations in Veterinary Teaching Hospital.
Grading Restriction: Satisfactory/No Credit grading only.
806 Application Based Learning Exercise (ABLE) and Clinical Exposure III (2) Week-long small group, student-centered learning sessions with faculty facilitator for self discovery of new information; based on specific clinical case or problem; integration of basic science and clinical material. One week of clinical experience through participation in specific clinical rotations in Veterinary Teaching Hospital.

810 Infection and Immunity II – Bacteriology and Mycology (3) Fundamental aspects of microbiology and cell biology relative to pathogenesis of bacterial and fungal diseases of animals: antimicrobial actions and mechanisms of bacterial resistance. General approaches to diagnosis, treatment and prevention.

813 Infection and Immunity I – Immunology (2) Basic biology and practical aspects of immunology: cells of immune system, immune function and dysfunction, immunoprophylaxis, diagnostic testing and specific diseases involving immune system.

814 Clinical Correlations and Ethics I (1) Correlations between basic science material from concurrent courses and practice of veterinary medicine. Thoughts on wide spectrum of current veterinary ethical issues.


816 Clinical Correlations and Ethics II (2) Correlations between basic science material from concurrent courses and practice of veterinary medicine. Thoughts on wide spectrum of current veterinary ethical issues. Student-led discussions follow faculty presentations.

821 Veterinary Anatomy I (4) Lectures, laboratories, and demonstrations are used in an integrated approach to the study of macroscopic (gross) clinically relevant anatomy, including neuroanatomy, and embryology of domestic animals. Dissections of embalmed specimens, prosections, plastinated specimens, and radiographs of common domestic species are examined for comparative purposes.

822 Veterinary Anatomy II (4) Lectures, laboratories, and demonstrations are used in an integrated approach to the study of macroscopic (gross) clinically relevant anatomy, including neuroanatomy, and embryology of common domestic animals. Dissections of embalmed specimens, prosections, plastinated specimens, and radiographs of common domestic species are examined for comparative purposes.

823 Physiology I (4) Introduction to concepts and problems in physiology which form basis for clinical applications and for formal training in pharmacology, medicine, pathobiology, medicine, and surgery. Cellular, neural, cardiovascular, renal, respiratory, digestive, endocrine, and reproductive physiology.

824 Physiology II (4) Introduction to concepts and problems in physiology which form basis for clinical applications and for formal training in pharmacology, medicine, pathobiology, medicine, and surgery. Cellular, neural, cardiovascular, renal, respiratory, digestive, endocrine, and reproductive physiology.

825 Veterinary Microscopic Anatomy I (2) Lectures, laboratories, and demonstrations are used in the study of the cell, embryology, and microscopic anatomy of organs systems in common domestic animals to relate structure with function.

826 Veterinary Microscopic Anatomy II (2) Lectures, laboratories, and demonstrations are used in the study of the cell, embryology, and microscopic anatomy of organs systems in common domestic animals to relate structure with function.

827 Special Problems in Animal Science (1-8) Extramural and specially designed study for students interested in select topics in anatomy, histology, and physiology.

831 Physical Diagnosis I (1) Basic care, feeding, restraint, and handling domestic animals. Introduction to physical examination and diagnostic techniques used by veterinarian.

832 Anesthesia (2) Principles of anesthesiology: pharmacology of anesthetic agents, and introduction to anesthetic techniques in veterinary medicine.

833 Epidemiology and Evidence Based Medicine (2) Study of distribution and determinants of disease in animal populations. Use of knowledge (evidence) gained from management of clinical patients in past to improve future clinical decision-making processes.

834 Hematopoietic System (2) Pathophysiology and diagnosis of disorders involving bone marrow and blood cells, platelets, and blood coagulation in domestic animals; interpretation of laboratory test results using illustrative clinical cases.


836 Toxicology (2) Principles of toxicology, molecular mechanisms, pharmacokinetic properties and clinical features of animal diseases caused by common toxic agents.

837 Food Hygiene and Zoonoses (2) Host-agent relationships, public health aspects of veterinary medicine and role of veterinarians in ecology and food hygiene.

838 Clinical Rotation in Pathology I (2) Clinical training and interpretation in post-mortem examination and laboratory diagnostics: clinical pathology and introductory histopathology of biopsy specimens.

839 Clinical Rotation in Pathology II (2) Clinical training and interpretation in post-mortem examination and laboratory diagnostics: clinical pathology and introductory histopathology of biopsy specimens.

840 Integumentary System (3) Pathophysiology, special pathology, medicine and surgery of diseases of integumentary system. Laboratory examination, pathology, diagnosis and treatment.

841 Reproductive System (3) Pathophysiology, special pathology, medicine and surgery of diseases of male and female reproductive systems and mammary glands.

842 Alimentary System (4) Pathophysiology, special pathology, medicine and surgery of diseases of alimentary systems.

843 Musculoskeletal System I (3) Pathophysiology, clinical description and basic treatment modalities of common diseases and conditions of skeletal systems of small animals: development of basic diagnostic and treatment skills.

844 Musculoskeletal System II (3) Pathophysiology, special pathology, medicine and surgery of diseases of muscular and skeletal systems. Advanced principles, radiographic interpretation and surgical procedures.

845 Veterinary Nutrition (2) Principles of nutrition, and nutrition of animals in health and disease. Applied nutrition relating to individual small or large animal patient or to herd situations.

846 Multispecies Medicine (3) Anatomy, pathophysiology, medicine, and surgery of avian species, laboratory and zoo animals and reptiles. Species and diseases seen by practicing veterinarian. Current topics on foreign animal diseases.

847 Clinical Rotation in Radiology I (2) Clinical training in radiographic techniques and interpretation, including ultrasonography.

849 Clinical Rotation in Radiology II (2) Clinical training in radiographic techniques and interpretation, including ultrasonography.

851 Urinary System (3) Pathophysiology, special pathology, medicine and surgery of diseases of urinary system. Urinary system in health and disease.

852 Cardiovascular System (2) Pathophysiology, special pathology, medicine and surgery of diseases of cardiovascular system. Anatomic, physiologic and pharmacologic principles which provide basis for treatment.


854 Respiratory System (3) Pathophysiology, special pathology, medicine and surgery of diseases of respiratory system. Upper and lower respiratory systems: infectious and noninfectious diseases.

855 Radiology (3) Basic, advanced and special techniques in radiology with interpretation and use of radiologic and related techniques in diagnosis and treatment of animal diseases.

856 Special Senses (2) Pathophysiology, special pathology, medicine and surgery of diseases of visual and auditory systems.

857 Nervous System (3) Pathophysiology, special pathology, medicine and surgery of diseases of nervous system: clinical neurology and neuropathology.

858 Neurology/Ophthalmology (4) Clinical training in specialty services: ophthalmology and neurology. Direct responsibility for diagnosis, patient care, and treatment of patients in both Large Animal and Small Animal Clinical Sciences.

861 Pharmacology I (2) Principles of pharmacokinetics and pharmacodynamic properties of veterinary drugs; mode of action and pharmacologic effects including important metabolic aspects, chemical and physical properties, side effects (toxicities) and clinical application.
Clinically-trained veterinarians play a crucial role in the diagnosis, care, and treatment of companion animals, food animals and horses. Direct responsibility for the diagnosis, care, and treatment of clinical patients in medicine, surgery, and specialty disciplines is a core component of veterinary training. This includes small animal, large animal, and companion animal medicine, as well as avian medicine, laboratory animal medicine, and zoo animal medicine.

Clinical training in sedation and anesthesia of companion animals, food animals, and horses is also a critical skill for veterinarians. It involves direct responsibility for diagnosis, care, and treatment of clinical patients.

General Pathology (3) focuses on the principles of pathobiology, which are the causes of disease, disturbances of cell growth and inflammation. This course aims to provide students with a comprehensive understanding of disease processes in animals.

Infection and Immunity IV – Parasitology (3) covers principles of parasitology, protozoology, helminthology, and entomology and their relationship to diseases in animals. Students will learn about the life cycles, identification, and management of parasitic diseases.

Oncology (2) is a fundamental aspect of veterinary pathology that focuses on the etiology and natural behavior of various neoplasms of animals. The course covers the principles of pathobiology and the pathogenesis of cancer.

Special Problems in Pathology (1-8) provides extramural and specially designed study for students interested in select topics in veterinary pathology. This course offers a deep dive into specific disease processes and their management.

Clinical rotation options include:
- Clinical Rotations in Small Animal Clinical Sciences I (4) offers clinical training in medicine, surgery, and specialty disciplines for companion animals. Students will develop skills in diagnosis, care, and treatment of clinical patients.
- Clinical Rotations in Small Animal Clinical Sciences II (4) and III (4) provide additional clinical training in various specialties.
- Clinical Rotations in Large Animal Clinical Sciences I (4) and II (4) offer specialized training in veterinary medicine for larger species.
- Clinical Rotation in Comparative Medicine (2) provides educational experiences in private practice, research facility, zoological preserve, aquarium, or other veterinary-related facility. This course may be available in large referral veterinary teaching hospitals.
- Extraclinical Electives (1-8) are available for students to pursue their interests in various fields.

Additional courses in veterinary medicine include:
- Anesthesiology (4) focuses on sedation and anesthesia, providing students with the skills to manage pain and immobilize animals for diagnostic and therapeutic procedures.
- Comparative Medicine and Pathology (3) explores the biology and pathogenesis of diseases in animals, with a focus on disease processes and diagnostic approaches.
- Infectious Diseases (2) covers the pathogenesis and clinical findings of major infectious diseases, providing students with a foundation in disease transmission and prevention.

Wildlife and Fisheries Science courses are designed to provide students with a comprehensive understanding of wildlife and fisheries science, covering a range of topics from population ecology to management practices.

Wildlife Techniques (3) and Fisheries Techniques (3) offer hands-on experience with wildlife and fisheries management, including field trips and practical applications.

Ecology and Management of Wild Mammals (3) and Ecology and Management of Wild Birds (3) provide students with a deep understanding of wild mammal and bird management, including population estimation methods and wildlife capturing techniques.

Endangered Species Management and Conservation of Biodiversity (2) focuses on the conservation of endangered species, providing students with the skills to manage and conserve biodiversity.

Extramural and specially designed study in various fields enables students to explore specific interests in depth, providing a unique educational experience.
531 Wildlife Physiology and Nutrition (2) Introduction and overview of endocrine and physiological mechanisms regulating wild animal populations (primarily wild birds and mammals): the importance of wildlife physiology and nutrition in monitoring and managing wildlife. 
Comment(s): Requires senior or graduate standing in the life sciences.

535 Floodplain Ecosystems (3) Ecology, restoration and management of floodplain ecosystems: biotic and abiotic processes, social considerations, and wildlife and forest management; Lower Mississippi River Alluvial Valley.
Registration Permission: Consent of instructor.

536 Advanced Wetland Ecology (3) A comprehensive examination of wetland delineation and classification, wetland communities and hydrogeomorphic processes, wetland values, human impacts on wetlands, and the management and conservation of wetland communities.
Comments: Day or overnight field trips may be required.

545 Advanced Population Analysis (2) Detail characteristics, assumptions, goals, methods, and current technologies for fish and wildlife population analysis. Use of computers.
(RE) Prerequisite(s): Animal Science 571 or Statistics 538.

546 Advanced Habitat Analysis (2) Habitat analysis as tool to evaluate habitat use and predict occurrences of animal and plant species: principles and goals of modeling, habitat analysis theory, GIS and statistical techniques. Use of computer programs.
Recommended Background: Undergraduate course in GIS.

550 Fish Physiology (3) Mechanisms of gas transfer, circulation, excretion, osmoregulation, locomotion, and neural/hormonal control of these systems in fishes. Comparisons and contrasts with physiology of terrestrial animals. Practical applications of fish physiology to aquaculture, pollution assessment, and fisheries management.
Comment(s): Requires senior or graduate standing in the life sciences.

555 Fish Culture (3) Principles, concepts and techniques of culturing economically important fish and shellfish species.
Contact Hour Distribution: 2 hours and 1 lab.
(DE) Prerequisite(s): 443 or consent of instructor.

556 Recirculating Aquaculture (3) Growing fish in intensive, indoor systems with reconditioned water. Techniques of solids removal, nitrification, and gas balance. Practical experience with operating system.
Recommended Background: Upper-division undergraduate course in fisheries science.

560 Advanced Topics in Wildlife and Fisheries Science (1-3) Recent advances and concepts, research techniques and analysis of current problems.
Repeatability: May be repeated. Maximum 6 hours.
(DE) Prerequisite(s): 443, 444, and 445 or consent of instructor.

593 Independent Study in Wildlife and Fisheries Science (1-4)
Repeatability: May be repeated. Maximum 6 hours.

Women's Studies (994)

400 Topics in Women's Studies (3) Content varies. Repeatability: May be repeated. Maximum 6 hours.

410 Sex Role Development: Implications for Education and Counseling (3) (See Counselor Education 410.)

422 Women Writers in Britain (3) (See English 422.)

425 Women's Health (3) (See Health 425.)

434 Psychology of Gender (3) (See Psychology 434.)

469 Sexuality and Cinema (4) Explores issues surrounding sexuality, gender and cinema from points of view of feminist film criticism. (Same as Cinema Studies 469.)

484 African-American Women in American Society (3) (See Africana Studies 484.)

510 Special Topics (3)
Repeatability: May be repeated. Maximum 6 hours.

512 History of Women's Education (3) (See Cultural Studies in Education 512.)

543 Women, Sport, and Culture (3) (See Sport Studies 543.)

548 Transforming Critical Thinking: Constructive Thinking and Educational Implications (3) (See Cultural Studies in Education 548.)

593 Independent Study (1-6)
Repeatability: May be repeated. Maximum 8 hours.
Registration Permission: Consent of Chair of Women's Studies.

609 Feminist Theories and Education (3) (See Cultural Studies in Education 609.)
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