University of Florida Academic Graduate Courses

Course Descriptions - All (unsorted)

ABE 5015: Empirical Models of Crop Growth and Yield Response
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Analytical models useful for engineering design and management decisions, including water reuse. Emphasis on analytical functions. Modeling strategy based on patterns of data, functional relationships, connections among various factors, consistency among data sets, and mathematical beauty.

ABE 5038: Recent Developments and Applications in Biosensors
Credits: 3 **Grading Scheme:** Letter
Prerequisite: At least senior status in engineering and background in biology including biomolecules.
Introduction to biosensors, design and performance analysis. Fundamental application of biosensor theory will be demonstrated, including recognition, transduction, signal acquisition, and post processing/data analysis.

ABE 5152: Electro-Hydraulic Circuits and Controls
Credits: 2 **Grading Scheme:** Letter
Prerequisite: EML 3100, EGM 3400, 3520.
Engineering analysis, design, and experimentation of electro-hydraulic circuits and systems. Design of hydraulic circuits, fluid power system components, hydraulic actuator analysis, servo and proportional valve performance, and electro-hydraulic control theory and applications.

ABE 5332: Advanced Agricultural Structures
Credits: 3 **Grading Scheme:** Letter
Design criteria for agricultural structures including steady and unsteady heat transfer analysis, environmental modification, plant and animal physiology, and structural systems analysis.

ABE 5442: Advanced Agricultural Process Engineering
Credits: 3 **Grading Scheme:** Letter
Engineering principles, processes, and techniques for using biological agents for production of chemicals, food, biofuels, and pharmaceuticals, and waste treatment.

ABE 5643C: Biological Systems Modeling
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAC 2312.
Introduction to concepts and methods of process-based modeling of biological systems; physiological, populational, and agricultural applications.

ABE 5646: Biological and Agricultural Systems Simulation
Credits: 3 **Grading Scheme:** Letter

Prerequisite: MAC 2312, STA 3032 or STA 4322. *Corequisite:* GCC approved 10/22/07 and forwarded to registrar.
Basic concepts of systems analysis, modeling, and computer simulation of dynamic biological and agricultural systems. Methods for working with models, including sensitivity analysis, parameter estimation, and model evaluation. Applications of models in agricultural and biological systems.

ABE 5653: Rheology and Mechanics of Agricultural and Biological Materials
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAC 2313, PHY 2048, CHM 2045, or consent of instructor.
Relation of biophysical and biochemical structure to rheological and mechanical behavior of biological materials in solid, liquid, and granular form; methods for measuring material properties governing these behaviors.

ABE 5663: Advanced Applied Microbial Biotechnology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: general biology and organic chemistry, or consent of instructor.
Principles of microbial biotechnology, emphasizing the application of microorganisms for industrial processes (e.g., energy, environmental, food, pharmaceutical, and chemical).

ABE 5707C: Agricultural Waste Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: 4 or higher classification.
Engineering analysis and design of systems for the collection, storage, treatment, transport, and utilization of livestock and other agricultural organic wastes and wastewaters. Field trips to operating systems and laboratory evaluation of materials and processes.

ABE 5815C: Food and Bioprocess Engineering Design
Credits: 4 **Grading Scheme:** Letter
Engineering design of unit process operations employed in agro/food, pharmaceutical, and biological industries including sterilization/pasteurization, radiation, freezing, drying, evaporation, fermentation, distillation.

ABE 6005: Applied Control for Automation and Robots
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 5311 .
Introduction to industrial controls, programmable logic controllers, and manipulator application programming in agricultural and biological engineering. Kinematics, dynamics, and control strategies for serial link manipulators in agricultural applications.

ABE 6031: Instrumentation in Agricultural Engineering Research
Credits: 3 **Grading Scheme:** Letter
Principles and application of measuring instruments and devices for obtaining experimental data in agricultural engineering research.

ABE 6035: Advanced Remote Sensing: Science and Sensors
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 2302.
Develops understanding of remote sensing theory and systems using information obtained from visible/near infrared, thermal infrared, and microwave regions of the EM spectrum.

ABE 6037C: Remote Sensing in Hydrology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ABE 6035.
Develops practical understanding of remote sensing applications to hydrology using observations in different regions of the EM spectrum. Seminar style with emphasis on literature review and presentation.

ABE 6252: Advanced Soil and Water Management Engineering
Credits: 3 **Grading Scheme:** Letter
Physical and mathematical analysis of problems in infiltration, drainage, and groundwater hydraulics.

ABE 6254: Simulation of Agricultural Watershed Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CWR 4111 and working knowledge of FORTRAN.

Characterization and simulation of agricultural watershed systems including land and channel phase hydrologic processes and pollutant transport processes. Investigation of the structure and capabilities of current agricultural watershed computer models.

ABE 6265: Vadose Zone Modeling
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Recommended basic use of high level computer language or numerical computing environment (i.e., Matlab, Mathematica, etc.) that allows the student to test algorithms and read existing modeling source code.
Unsaturated zone modeling of water flow and solute transport processes. Comparative analysis of alternative mechanistic modeling approaches of different complexity.

ABE 6266: Nanotechnology in Water Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Basic knowledge of hydrology, environmental engineering, and water chemistry.
Applications of environmental nanotechnology to water quality control. Fate and transport of nanomaterials in hydrologic pathways.

ABE 6615: Advanced Heat and Mass Transfer in Biological Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CGS 2425, ABE 3612C.
Analytical and numerical technique solutions to problems of heat and mass transfer in biological systems. Emphasis on nonhomogeneous, irregularly shaped products with respiration and transpiration.

ABE 6644: Agricultural Decision Systems
Credits: 3 **Grading Scheme:** Letter
Computerized decision systems for agriculture. Expert systems, decision support systems, simulations, and types of applications in agriculture.

ABE 6816: Food and Bioprocess Sterilization
Credits: 3 **Grading Scheme:** Letter
Analysis of available process technologies for sterilization in the food, pharmaceutical and biotechnology industries.

ABE 6905: Individual Work in Agricultural and Biological Engineering
Credits: 1-4 Max: 6 **Grading Scheme:** Letter
Special problems in agricultural engineering.

ABE 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

ABE 6931: Seminar
Credits: 1 Max: 2 **Grading Scheme:** S/U
Preparation and presentation of reports on specialized aspects of research in agricultural engineering and agricultural operations management.

ABE 6933: Special Topics in Agricultural and Biological Engineering
Credits: 1-4 Max: 6 **Grading Scheme:** Letter
Lectures, laboratory, and/or special projects.

ABE 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

ABE 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

ABE 6972: Research for Engineer's Thesis
Credits: 1-15 **Grading Scheme:** S/U

ABE 6974: Nonthesis Project
Credits: 1-6 Max: 6 **Grading Scheme:** S/U
In-depth project.

ABE 6986: Applied Mathematics in Agricultural and Biological Engineering
Credits: 3 **Grading Scheme:** Letter
Mathematical methods, including regression analysis, graphical techniques, and analytical and numerical solution of ordinary and partial differential equations, relevant to agricultural engineering.

ABE 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ABE 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

ACG 5005: Financial Accounting**
Credits: 2 **Grading Scheme:** Letter
Introduction for prospective managers. Primary emphasis on financial reporting and analysis.

ACG 5065: Financial and Managerial Accounting
Credits: 3 **Grading Scheme:** Letter
Prerequisite: designed for MBA students.
Financial statement analysis including techniques, cash flow, and impact of accounting principles. Management control systems: planning, budgeting, reporting, analysis, and performance evaluation.

ACG 5075: Managerial Accounting
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ACG 5005.
Introduction for prospective managers. Primary emphasis on management control systems.

ACG 5226: Mergers and Acquisitions and Consolidated Statements
Credits: 2 **Grading Scheme:** Letter
Prerequisite: 7AC Standing; ACG 4133C
Reporting of business combinations, equity method of accounting for investments in stocks, and issues concerning consolidated financial statements.

ACG 5505: Financial Reporting for Governmental and Not-for-Profit Organizations
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ACG 4133C, 7AC standing.
Reporting by state and local governmental organizations and not-for-profit entities.

ACG 5637: Auditing I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: C grade or better in ACG 4133C and in ACG 4352C; and AC standing.
Introduction to auditing and assurance services. Decision-making process, research, and auditing standards and procedures, with emphasis on ethics, legal liability, internal control, audit evidence, testing, and introduction to statistical sampling and EDP auditing.

ACG 5815: Accounting Institutions and Professional Literature
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ACG 4133C, ACG 5637 , 7AC standing.
Private and public sector accounting institutions and their respective professional literature. Research techniques for addressing accounting issues emphasized through case assignments.

ACG 6136: Accounting Concepts and Financial Reporting
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ACG 5815, 7AC standing.
Theoretical frameworks essential to explore structure, features, and limitations of accounting and financial reporting.

ACG 6207: Accounting Issues in Financial Risk Management

Credits: 2 **Grading Scheme:** Letter
Prerequisite: ACG 5815, ACG 5226, 7AC standing.
Overview of risk management, financial instruments used in risk management, and related accounting issues and practices.

ACG 6255: International Accounting Issues
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ACG 5815, ACG 5226, 7AC standing.
Overview of international accounting and financial reporting practices in foreign jurisdictions and comparisons of financial reporting requirements between United States and selected foreign countries.

ACG 6265: International Accounting and Taxation
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ACG 2021C or ACG 5005; not open to students majoring in accounting.
Introduction to international accounting and tax concepts from a financial statement user's perspective.

ACG 6387: Strategic Costing
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Graduate standing.
Strategic view of design and use of an organization's internal accounting system.

ACG 6635: Issues in Audit Practice
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ACG 5815, ACG 5226, 7AC standing.
In-depth discussion of fundamental concepts underlying audit practice, including introduction to current topics in auditing, advanced audit methods, and trends in auditing practice.

ACG 6657: Auditing and Corporate Governance
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ACG 5226, ACG 5815, 7AC standing.
Concepts of corporate governance including regulation and practice. Overview of corporate governance mechanisms and introduction to economic foundation for auditing; linkages among governance, risk management and assurance; and essential attributes of auditing such as independence.

ACG 6695: Computer Assurance and Control
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ACG 5637, 7AC standing.
Concepts of risk, control, and assurance in environments with advanced information technology. Technology based audit tools and techniques.

ACG 6888: Foundations of Measurement
Credits: 2 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Foundations of measurement: whether measure exists, uniqueness properties if it does exist, and implementation issues. Measures of income, of value, of preference, and of risk.

ACG 6905: Individual Work in Accounting
Credits: 1-4 **Max: 7** **Grading Scheme:** Letter
Prerequisite: approval of graduate coordinator.
Reading and research in areas of accounting.

ACG 6935: Special Topics in Accounting
Credits: 1-4 **Max: 8** **Grading Scheme:** Letter
Prerequisite: consent of associate director.

ACG 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

ACG 7885: Accounting Research I
Credits: 4 **Grading Scheme:** Letter

ACG 7886: Accounting Research II
Credits: 4 **Grading Scheme:** Letter
Theoretical constructs in accounting, valuation models, information asymmetry and production, and nonmarket information use.

ACG 7887: Research Analysis in Accounting
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ACG 7886.
Analysis of accounting research and presentation of student research project results. Financial accounting, managerial accounting, auditing, taxation, management information systems, and information economics.

ACG 7939: Theoretical Constructs in Accounting
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ACG 7886.
Emerging theoretical issues that directly impact research and development of thought in accounting. Theory construction and verification, information economics, and agency theory constitute subsets of this course.

ACG 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ACG 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

ADV 5005: Advertising Planning
Credits: 3 **Grading Scheme:** Letter
Introduction to the process of developing advertising strategy, emphasizing theory and research methods.

ADV 6006: Theories of Advertising
Credits: 3 **Grading Scheme:** Letter
Theories dealing with consumer responses to marketing communications: state-of-the-art advertising and marketing communications theory, academic articles examining consumer responses.

ADV 6305: Advanced Media Planning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ADV 4300, MMC 6421, or equivalents.
Media planning to meet advertising goals. Use of research findings. Computer models.

ADV 6325: Advertising and Social Media
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MMC 6XXX Digital Communication Theory
MMC 5427 Research Methods in Digital Communications
MMC 6XXX Introduction to Multimedia Communication
MMC 6XXX Introduction to Social Media
Students will learn to create, write and maintain a social advertising campaign for clients. Learn about transparency and how the advent of social media has changed advertising. Case studies will be examined and students will create several pieces for their portfolio.

ADV 6405: International Advertising
Credits: 3 **Grading Scheme:** Letter
Global competition and worldwide markets; technological revolutions; and branding products and services under different cultural, regulatory, and competitive conditions.

ADV 6503: Advertising Creative Strategy and Research
Credits: 3 **Grading Scheme:** Letter
Corequisite: MMC 6421 or equivalent.

Social science findings as guides for decisions. Use of consumer behavior concepts in shaping advertising message content and improving media selection.

ADV 6505: Advertising Research Methods
Credits: 3 **Grading Scheme:** Letter
Introduction to methods most commonly use in professional and scholarly research, including secondary, qualitative, survey, content analysis, and experimental methods.

ADV 6602: Advertising Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ADV 6305 and ADV 6503, or consent of instructor.
Application of management principles and practice to effective development of advertising/public relations plans. Case studies and discussion of current problems in research, planning, operations, administration, and evaluation.

AEB 5167: Economic Analysis in Small Farm Livelihood Systems
Credits: 3 **Grading Scheme:** Letter
General analysis techniques used to enhance economic analysis of small-scale, limited-resource family farm livelihood systems to evaluate impact of proposed technology, infrastructure, and policy changes on family welfare. Linear programming and regression. Emphasis on tropical agriculture.

AEB 5188: Economics of Agribusiness Decisions
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEB 3103 or ECO 2023.
Comprehensive treatment of microeconomic theory and its use in managerial decision making.

AEB 5326: Agribusiness Financial Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ACG 2021C.
Integration of finance and management decision-making tools to solve advanced financial and other management problems faced by agricultural firms and agribusinesses.

AEB 5516: Quantitative Methods in Agribusiness Decisions
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 2023.
Introduction to variety of quantitative methods with application to business decision-making contexts.

AEB 5757: Strategic Agribusiness Human Resource Management
Credits: 3 **Grading Scheme:** Letter
Issues involved in strategic and effective leadership and management in agribusiness sector of economy. Emphasis on human resource ideas and techniques that managers utilize to improve organizational teamwork, productivity, and performance.

AEB 6106: Microeconomic Principles and Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ECO 3101 and MAC 2311 or equivalents.
Economics as a behavioral science describing actions of consumers and producers interacting in the market process; welfare economics; property rights; competition and equilibrium. Institutional backdrop for market process. Problem solving using economic principles.

AEB 6139: Strategic Agribusiness Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEB 5188,AEB 5326, AEB 6225, AEB 5757, AEB 6675.
Core concepts of strategic decision-making and how strategy influences economic and financial value of food and agribusiness firms.

AEB 6145: Agricultural Finance
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEB 3144 or FIN 3403.
Principles of firm financial management, financial markets, financial institutions, capital markets, firm growth, and analysis. Emphasis on markets and application of financial principles.

AEB 6183: Agribusiness Risk Management
Credits: 3 **Grading Scheme:** Letter
Examine and develop the applied risk analysis skills useful for risk management decision-making by agricultural producers, agribusinesses, and researchers.

AEB 6225: Public Policy and the Agribusiness Firm
Credits: 3 **Grading Scheme:** Letter
Economic policy process at national and international levels. Issues include structure of food system, food safety, and environmental impacts.

AEB 6301: Food Wholesale and Retail Marketing
Credits: 3 **Grading Scheme:** Letter
Wholesale and retail issues that exist both in U.S. and world markets, such as brand management, supermarket management, and market research.

AEB 6363: Agricultural Marketing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ECO 3101.
Economic theory of markets and its use. Development of time, form, space, and vertical dimensions of market price and factors that facilitate market operation.

AEB 6385: Management Strategies for Agribusiness Firms
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ECO 3101.
Planning, organizing, implementing, and evaluating the agribusiness management functions of strategic planning, finance, marketing, and personnel.

AEB 6533: Static and Dynamic Optimization Models in Agriculture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ESI 4567.
Classical optimization models with emphasis on mathematical programming and applications. Introduction to dynamic optimization models.

AEB 6553: Elements of Econometrics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEB 3103, 4511; STA 3023.
Econometric problem solving and determining quantitative relationships among economic variables in agriculture and related industries.

AEB 6592: Mathematical Programming for Economic Analysis
Credits: 3 **Grading Scheme:** Letter
Simplex method and primal-dual relationships in linear programming. Application of modeling techniques, such as separable, multi-objective, quadratic, and integer programming, to economic problems.

AEB 6675: International Agribusiness Marketing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEB 5188.
Principles, issues, barriers, policies, strategies, and decisions involved in global marketing and trade of perishable and storable agricultural commodities and food products.

AEB 6815: Science and Research Methodology
Credits: 3 **Grading Scheme:** Letter
Role of science, philosophy, and scientific methods in food and resource economics research.

AEB 6817: Survey Research Methods for Economists
Credits: 3 **Grading Scheme:** Letter
Process of creating, validating, implementing, coding, and interpreting results from economic surveys.

AEB 6905: Problems in Food and Resource Economics

Credits: 1-3 Max: 8 Grading Scheme: Letter
Prerequisite: consent of instructor.
Individual study. Problems of interest to the student and agreeable to the instructor.

AEB 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

AEB 6921: Workshop in Food and Resource Economics I
Credits: 1 Grading Scheme: Letter
Prerequisite: AEB 6533.
Empirical applications of concepts developed in the microeconomic core.

AEB 6933: Special Topics
Credits: 1-6 Max: 6 Grading Scheme: Letter

AEB 6934: Workshop in Food and Resource Economics II
Credits: 1 Grading Scheme: Letter
Developing and understanding how to apply food and resource economic concepts to agricultural and resource related problems.

AEB 6942: Advanced Applications in Agribusiness Experience
Credits: 1-3 Max: 6 Grading Scheme: Letter
Applications of marketing, management, and finance principles to workplace station. Applications developed from approved internship.

AEB 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

AEB 7108: Microeconomic Theory II
Credits: 3 Grading Scheme: Letter
Prerequisite: ECO 7115.
Continuation of Microeconomic Theory I. Theory of the firm, market theory, market failure (externalities, market power, and asymmetric information). Game theory and applications. General equilibrium theory, welfare trade theory, and agricultural trade policy.

AEB 7174: Economic Coordination and Organizational Behavior in Agribusiness
Credits: 3 Grading Scheme: Letter
Analysis of the organization of economic activities across firms and markets, internal governance structures and the separation of ownership and control.

AEB 7182: Agricultural Risk Analysis and Decision Making
Credits: 3 Grading Scheme: Letter
Prerequisite: AEB 6106 or equivalent.
Review of conceptual framework and research methods for analysis of decision making by agricultural producers. Expected utility theory, risk programming, stochastic dominance, and dynamic decision models.

AEB 7184: Production Economics
Credits: 3 Grading Scheme: Letter
Prerequisite: AEB 7182.
Producer decisions including theoretical and empirical problems of multi-factor, multi-product, and poly-period cases. Input demand and product supply functions at the commodity and industry levels.

AEB 7240: Macroeconomic Theory in Open Economies II
Credits: 3 Grading Scheme: Letter
Essential elements of macroeconomic theory and policy in world of interdependent nations.

AEB 7373: Consumer Demand and Applied Analysis
Credits: 3 Grading Scheme: Letter
Theories of Consumer Behavior in Static and Dynamic Contexts; analysis of household expenditure and demand.

AEB 7453: Natural Resource and Environmental Economics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ECO 3101 and 3203, or consent of instructor.
Resource use, management, development, and conservation. Institutional and market performance in providing socially desired outcomes.

AEB 7483: Seminar in Natural Resource and Environmental Economics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEB 7453.
Application of economic methods to problems of environmental and regional development; input-output models, cost-benefit analysis, economic valuation, and development planning.

AEB 7571: Econometric Methods I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAS 2103, STA 4322.
Linear and nonlinear econometric models, serial correlation, heteroscedasticity, errors in variables, qualitative variables, specification errors, and simultaneous equation models.

AEB 7572: Econometric Methods II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEB 7571.
Topics in econometrics including single equation and multiple equation linear and nonlinear models.

AEB 7645: Economic Development and Agriculture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ECO 3101 or AEB 3103.
Relation of human, capital, and natural resources, technology, and institutions to income growth and distribution. Development strategies in low-income countries.

AEB 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

AEB 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

AEC 5032: Agricultural Media Writing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEC 5541.
Varied media writing assignments: feature stories, news releases, and video.

AEC 5037: Agricultural Media Production
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEC 5541.
Various agricultural media production assignments. Developing agricultural websites and publications.

AEC 5060: Public Opinion and Agricultural and Natural Resource Issues
Credits: 3 **Grading Scheme:** Letter
Public opinion measurement and agenda setting. Media treatment, public opinion, and public relations/public information activity on issues affecting agricultural production and trade.

AEC 5074: Agriculture, Resources, People, and the Environment: A Global Perspective
Credits: 3 **Grading Scheme:** Letter
Interdependence in the global context, and the need to cultivate a lifelong global perspective.

AEC 5201: Teaching in Colleges of Agricultural and Life Sciences
Credits: 3 **Grading Scheme:** Letter

Prerequisite: graduate standing.
Theories, principles, and practices associated with effective teaching and learning in higher education.

AEC 5203: Advanced Teaching in Colleges of Agricultural and Life Sciences
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEC 5201 or approval of the instructor.
Advanced theories, principles, and practices associated with effective teaching and learning in the agricultural and life sciences. Emphasis will be on selecting and implementing a variety of teaching methods.

AEC 5206: Teaching Methods in Agricultural Education
Credits: 3 **Grading Scheme:** Letter
Teaching methodology course that focuses on the selection and use of teaching strategies, methods/ approaches, and techniques; evaluating learning; managing learning environments; and classroom management for teaching agricultural subjects in formal educational settings.

AEC 5227: Teaching in Agricultural Education Laboratory Facilities
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Admission to state approved agriculture teacher certification program.
This course is designed to introduce pre-service agricultural education teachers to laboratory integration into the agricultural education curriculum at the middle school and secondary school level.

AEC 5302: Professional Skill Development in Agriscience Education I
Credits: 1-3 Max: 9 **Grading Scheme:** Letter
Prerequisite: Teaching experience.
Development and enhancement of technical agricultural and scientific knowledge and skills by professional agriscience teachers.

AEC 5324: Philosophy and Development of Agricultural Education
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Admission to AEC state-approved graduate-level teacher certification program.
An analysis of evolving concepts and philosophies of agricultural education programs with emphasis upon history, legislation, and principles underlying organization and practice.

AEC 5454: Leadership Development for Extension and Community Nonprofit Organizations
Credits: 3 **Grading Scheme:** Letter
Application of concepts related to developing leaders for organizing and maintaining extension and community nonprofit organizations.

AEC 5501: Professional Skill Development in Agriscience Education II
Credits: 1-3 Max: 9 **Grading Scheme:** Letter
Prerequisite: AEC 5302.
Advanced level of development and enhancement of technical agriculture and scientific knowledge and skills by professional agriscience educators.

AEC 5541: Communication and Instructional Technologies in Agricultural and Life Sciences
Credits: 3 **Grading Scheme:** Letter
Planning and producing written and visual instructional and communication materials for programs in the agricultural and life sciences. Requires a major instructional project or communication campaign.

AEC 5544: Curriculum Development and Assessment Techniques in Emerging Agricultural Technologies
Credits: 3 **Grading Scheme:** Letter
Principles and practices used in developing agricultural education curriculum from developing objectives through instructional plans. Assessing student learning and implementing curriculum.

AEC 5545: Special Methods in Teaching Agriculture
Credits: 3 **Grading Scheme:** Letter
Teaching methods for active learning, critical, creative and evaluative thinking in the agricultural education classroom. Strategies for managing student behavior, utilizing instructional technology and utilizing FFA and SAE as teaching tools.

AEC 5546: Program Planning in Agricultural Education
Credits: 3 **Grading Scheme:** Letter
Principles and practices used in designing agricultural education program plans for effective and total program development.

AEC 6205: Advanced Curriculum and Teaching Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEC 5206 or equivalent.
An in-depth analysis and application of curriculum development and teaching method theories applied in an agricultural and natural resources education setting.

AEC 6210: Designing Educational Programs in Agricultural Settings
Credits: 3 **Grading Scheme:** letter

AEC 6211: Delivering Educational Programs in Agricultural Settings
Credits: 4 **Grading Scheme:** Letter
This course will be focusing on delivering educational programs in formal and nonformal settings. Emphasis will be placed on balancing theoretical and practical development and delivery of educational programs.

AEC 6229: Laboratory Instruction: Theory and Practice
Credits: 3 **Grading Scheme:** Letter
Research and theoretical foundations underlying the aspects of planning, management, teaching, evaluation, safety, and facility design: discussed in the context of laboratory instruction.

AEC 6300: Methodology of Planned Change
Credits: 3 **Grading Scheme:** Letter
Processes by which professional change agents influence the introduction, adoption, and diffusion of technological changes. Applicable to those who are responsible for bringing about change.

AEC 6316: From America to Zimbabwe: An Overview of International Extension Systems
Credits: 3 **Grading Scheme:** Letter
Various extension models and delivery systems, extension partners; linkages and issues affecting extension internationally. Field trip.

AEC 6321: The Land Grant University and University Governance
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Implications of change and future pathways for teaching, research and extension, including global perspectives, and the role and philosophy of administrators in governing a complex university.

AEC 6325: History and Philosophy of Agricultural Education
Credits: 3 **Grading Scheme:** Letter
Analysis of evolving concepts and philosophies. Emphasis on history, legislation, and principles underlining organization and practice. Participation in field experience required.

AEC 6419: Communication and Competencies for Global Leadership
Credits: 3 **Grading Scheme:** Letter
Identifying and developing the personal and professional competencies required for effective leadership in an increasingly global society. International communication is included.

AEC 6426: Development of a Volunteer Leadership Program
Credits: 3 **Grading Scheme:** Letter
Identification, recruitment, training, retention, and supervision of volunteer leaders.

AEC 6512: Program Development in Extension Education
Credits: 3 **Grading Scheme:** Letter
Concepts and processes drawn from the social sciences that are relevant to the development of extension education programs.

AEC 6540: Agricultural and Natural Resources Communications Theory and Strategies
Credits: 3 **Grading Scheme:** Letter
Communication theory and concepts as they apply to important agricultural/natural resources issues.

AEC 6543: Teaching and Learning Theory: Applications in Agricultural Education
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AEC 5206
Contemporary and foundational theory and research on teaching and learning.

AEC 6552: Evaluating Programs in Extension Education
Credits: 3 **Grading Scheme:** Letter
Concepts and research drawn from the social sciences relevant to evaluating youth and adult extension programs.

AEC 6611: Agricultural and Extension Adult Education
Credits: 3 **Grading Scheme:** Letter
Concepts and principles related to design, implementation, and evaluation of education programs for adults.

AEC 6704: Extension Administration and Supervision
Credits: 3 **Grading Scheme:** Letter
Principles and practices for effective administration and supervision of the cooperative extension service program at the county and state levels.

AEC 6767: Research Strategies in Agricultural Education and Communication
Credits: 3 **Grading Scheme:** Letter
Application of principles, practices, and strategies for conducting behavioral research in agricultural and natural resource professions.

AEC 6905: Problems in Agricultural and Extension Education
Credits: 1-3 Max: 8 **Grading Scheme:** Letter
Prerequisite: consent of department chair.
For advanced students to select and study a problem related to agricultural and/or extension education.

AEC 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

AEC 6912: Nonthesis Research in Agricultural and Extension Education
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Library and workshop related to methods in agricultural and extension education, including study of research work, review of publications, development of written reports.

AEC 6933: Seminar in Agricultural Education and Communication
Credits: 1 Max: 3 **Grading Scheme:** Letter
Exploration of current topics and trends.

AEC 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

AEC 6945: Practicum in Agricultural Education and Communication
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Supervised experience appropriate to the student's professional and academic goals.

AEC 6947: Experiential Learning in Agricultural Education
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate standing or consent of instructor.
ocuses on applying experiential learning theory in agricultural education through classroom-based lessons, project-based learning, service learning, guided inquiry, field trips, internships/externships, study abroad and outdoor/adventure learning.

AEC 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

AEC 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U

Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

AEC 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

AFH 5297: History of African Agriculture
Credits: 3 **Grading Scheme:** Letter
Begins with the transition to agriculture and continues through an examination of African agriculture in the post-colonial period.

AFH 5348: History of West Africa
Credits: 3 **Grading Scheme:** Letter
Ghana empire to the contemporary period.

AFH 5458: Southern Africa
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
History of Africa south of the Zambezi River since 1800, especially the Republic of South Africa.

AFH 5934: Topics in African History
Credits: 3 Max: 9 **Grading Scheme:** Letter

AFH 6259: Seminar in Modern Africa
Credits: 3 Max: 6 **Grading Scheme:** Letter
In-depth reading and discussion of aspects of modern African history. Seminar focuses on specific themes, such as ethnicity, colonialism, violence, warfare, gender, religion, and nationalism.

AFH 6805: Theories and Methods of African History
Credits: 3 **Grading Scheme:** Letter
Theories and methods that underlie the study of African history and change as the field has evolved over the last four or more decades. Attention to changing frameworks for viewing the African past, with a focus on the historians' research methods and techniques.

AFH 6934: Africa
Credits: 3 **Grading Scheme:** Letter

AFH 6936: Readings in African History
Credits: 3 Max: 6 **Grading Scheme:** Letter

AFS 5061: Africana Bibliography
Credits: 1 **Grading Scheme:** Letter
Survey of advanced reference, specialized research tools (including variety of electronic databases, published paper indexes, and bibliographies), and methods for graduate-level research in all disciplines of African area studies.

AFS 6060: Research Problems in African Studies
Credits: 3 **Grading Scheme:** Letter
Interdisciplinary seminar on creating individual research designs and preparing funding proposals for research in Africa.

AFS 6305: Development Theory and Practice Intro
Credits: 3 **Grading Scheme:** Letter
Introducing the basic core competencies and practical skills required of a development practitioner. It differs from other development courses at UF by uniquely focusing on the inter-relationship between management, health, natural and social sciences in African development contexts and by emphasizing both theory and practice.

AFS 6307: Foundations of Economics for Sustainable Development
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.

Providing students with limited economics background with a foundation in development economics, with attention devoted to sustainable development. Students learn about the major theoretical debates within the discipline, the most current research topics and apply their knowledge to the comparative analysis of development in Africa and Latin America.

AFS 6357: Anthropology of Humanitarian Intervention
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate student standing.
Examination of the structure, networks, culture, morality, and actions of global humanitarian interventions in crisis settings.

AFS 6905: Individual Work in African Studies
Credits: 1-3 Max: 9 **Grading Scheme:** Letter

AGG 5504: Critical and Creative Thinking in Problem Solving and Decision Making
Credits: 3 **Grading Scheme:** Letter
Critical and creative thinking skills applied to agricultural, life sciences, and natural resources problem solving and decision making.

AGR 5215C: Integrated Field Crop Science
Credits: 3 **Grading Scheme:** Letter
Intensive introduction to practical field crop production and management of common, as well as under-exploited, field crops. Offered summer A term.

AGR 5230C: Florida Grassland Agroecosystems
Credits: 4 **Grading Scheme:** Letter
Comprehensive overview of planted and native grassland ecosystems in Florida emphasizing their growth, species diversity, management, and use by ruminant animals. Offered spring term.

AGR 5266C: Field Plot Techniques
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 3023.
Techniques and procedures used in design and analysis of field plot, greenhouse, and laboratory research experiments. Application of research methodology, the analysis and interpretation of research results. Offered fall term.

AGR 5277C: Tropical Crop Production
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Ecology and production practices of selected crops grown in the tropics. Offered spring term.

AGR 5307: Molecular Genetics for Crop Improvement
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AGR 3303.
Lectures and laboratory demonstrations for a thorough understanding of concepts and applied aspects of plant molecular and cellular biology. Discussion of current research in plant biotechnology and functional genomics. Offered spring term.

AGR 5321C: Genetic Improvement of Plants
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AGR 3303.
Genetic basis for crop improvement including methods for improving crop yield, pest resistance, and adaptability. Emphasis on manipulating genetic variability in self- and cross-pollinate, annual and perennial crop plants. Offered fall term.

AGR 5444: Ecophysiology of Crop Production
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AGR 3005 or equivalent.
Physiological, ecological, and environmental responses that impact growth, development, and yield formation of cultivated crops. Offered spring term.

AGR 5511: Crop Ecology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AGR 4210, BOT 3503, PCB 3043C, or equivalent.

Relationships of ecological factors and climatic classifications to agroecosystems, and crop modeling of the major crops. Offered fall term.

AGR 6233: Tropical Grassland Agroecosystems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AGR 4231C and ANS 5446 or consent of instructor.
Potential of natural grasslands of tropical and subtropical regions. Development of improved pastures and forages and their use in livestock production. Offered fall term in odd-numbered years.

AGR 6237C: Research Techniques in Forage Evaluation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6166. *Corequisite:* STA 6166.
Experimental techniques for field evaluation of forage plants. Design of grazing trials and procedures for estimating yield and botanical composition in the grazed and ungrazed pasture. Offered summer C term in odd-numbered years.

AGR 6311: Population Genetics
Credits: 2 **Grading Scheme:** Letter
Prerequisite: AGR 3303, STA 6166.
Application of statistical principles to biological populations in relation to gene frequency, zygotic frequency, mating systems, and the effects of selection, mutation, and migration on equilibrium populations. Offered spring term in even-numbered years.

AGR 6322: Advanced Plant Breeding
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AGR 3303, 4231, AGR 6311, and STA 6167.
Theory and use of biometrical genetic models for analytical evaluation of qualitative and quantitative characteristics, with procedures applicable to various types of plant species. Offered spring term in even-numbered years.

AGR 6325L: Plant Breeding Techniques
Credits: 1 Max: 2 **Grading Scheme:** Letter
Prerequisite: AGR 3303 or equivalent *Corequisite:* AGR 6322.
Examination of various breeding techniques used by agronomic and horticultural crop breeders in Florida. Field and lab visits to active plant breeding programs, with discussion led by a specific breeder each week. Hands-on experience in breeding programs. Offered spring term in odd-numbered years.

AGR 6353: Cytogenetics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AGR 3303.
Genetic variability with emphasis on interrelationships of cytologic and genetic concepts. Chromosome structure and number, chromosomal aberrations, apomixes, and application of cytogenetic principles. Offered fall term in odd-numbered years.

AGR 6422C: Environmental Crop Nutrition
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BOT 3503.
Design of cost-effective and environmentally sound crop nutrient management strategies. Diagnostic nutrient analysis, nutrient uptake, BMPs, and sustainable agriculture. Offered fall term.

AGR 6442C: Physiology of Agronomic Plants
Credits: 4 **Grading Scheme:** Letter
Prerequisite: BOT 3503.
Yield potentials of crops as influenced by photosynthetic efficiencies, respiration, translocation, drought, and canopy architecture. Plant response to environmental factors. Offered spring term.

AGR 6905: Agronomic Problems
Credits: 1-5 Max: 8 **Grading Scheme:** Letter
Special topics for classroom, library, laboratory, or field studies of agronomic plants.

AGR 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

AGR 6932: Topics in Agronomy
Credits: 1-3 Max: 8 Grading Scheme: Letter
Critical review of selected topics in specific agronomic areas.

AGR 6933: Graduate Agronomy Seminar
Credits: 1 Max: 3 Grading Scheme: Letter
Current literature and agronomic developments.

AGR 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

AGR 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

AGR 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

AGR 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

ALS 5027: Reusable Learning Objects
Credits: 1 Max: 2 Grading Scheme: Letter
Prerequisite: Department approval is required to ensure students have basic knowledge in Windows operating system; web browsing; Power Point; a robust/high-speed Internet connection; and basic knowledge in environmental sciences or agriculture and life sciences.
Developing online learning material using a variety of modern digital media, including audio recordings, videos, photographs, and graphics. Gain knowledge on how to organize material, present and describe learning content, and formulate effective assessment questions which reinforce learning.

ALS 5036: Contemporary Issues in Science
Credits: 2 Grading Scheme: S/U
Current issues in science as related to students pursuing scientific careers. Discussion topics focus on issues of graduate education, funding for science, job markets, scientific research ethics, publication, and job expectations. Offered spring term.

ALS 5106: Food and the Environment
Credits: 3 Grading Scheme: Letter
Relationship between food production and consumption and environmental quality. Scientific merits of controversies about impact of food production on environment and of different production strategies and practices. Biodiversity, water quality, soil resources, ecological economics, and energy use in food production. Taught interactively on Internet in even-numbered years.

ALS 5156: Agricultural Ecology Principles and Applications
Credits: 3 Grading Scheme: Letter
Introduction to agroecosystems. Ecological principles with examples and applications from agriculture.

ALS 5364C: Molecular Techniques Laboratory
Credits: 2 Grading Scheme: Letter
Current protocols in molecular biology techniques.

ALS 5905: Individual Study
Credits: 1-4 Max: 6 Grading Scheme: Letter
Supervised study or research not covered by other courses.

ALS 5932: Special Topics
Credits: 1-4 Max: 6 Grading Scheme: Letter

ALS 5934: Graduate Professional Development Seminar
Credits: 2 Grading Scheme: S/U

Presentations and group discussion of topics essential to enhance awareness, personal satisfaction, and professional success of graduate students

ALS 6046: Grant Writing
Credits: 2 **Grading Scheme:** Letter
Prerequisite: admitted to doctoral program.
Preparation, submission, and management of competitive grants, including operations of national review panels and finding sources of extramural funding.

ALS 6166: Exotic Species and Biosecurity Issues
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BSC2010, BSC2010L, BSC2011, BSC2011L, or equivalent.
U.S. policies and programs affecting agricultural biosecurity, Attention is devoted to current agricultural and extension and regulatory programs. Emphasizes policies and procedures in detecting and reporting non-indigenous species. Students will develop the analytical capabilities to assess the consequences of agricultural biosecurity threats.

ALS 6921: Colloquium on Plant Pests of Regulatory Significance
Credits: 1 Max: 3 **Grading Scheme:** S/U
Prerequisite: for students in PPRAM certificate program.
On-going colloquium series involving information on important emerging plant pests.

ALS 6925: Integrated Plant Medicine
Credits: 4 **Grading Scheme:** Letter
Prerequisite: all core courses for DPM degree.
Review and synthesis of the principles of plant-problem prevention, diagnosis, and management.

ALS 6930: Graduate Seminar
Credits: 1 Max: 4 **Grading Scheme:** Letter, S/U
Topics in agriculture and/or natural resources.

ALS 6931: Plant Medicine Program Seminar
Credits: 1 Max: 3 **Grading Scheme:** S/U
Prerequisite: DPM student or consent of instructor.
On-going seminar series involving presentations on plant-health management.

ALS 6935: Topics in Biological Invasions
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BSC2010/BSC2010L and BSC2011/BSC2011L or equivalent.
Non-native species invasions and environmental effects of these invaders. Students will develop analytical capabilities to assess the consequences of biological invasions.

ALS 6942: Principles of Plant Pest Risk Assessment and Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: for students in PPRAM certificate program.
Plant pest risk estimation and how mitigation strategies are developed and implemented.

ALS 6943: Internship in Plant Pest Risk Assessment and Management
Credits: 1-10 Max: 15 **Grading Scheme:** S/U
Prerequisite: for students in PPRAM certificate program.
Internships conducted with personnel involved in plant pest risk assessment and management.

AMH 5405: The South to 1860
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
History of the South from the Civil War to present, emphasizing the South as an integral region and its relationship to the rest of the nation. Not open to students who have taken AMH 4403 or equivalent.

AMH 5905: Special Studies
Credits: 3 Max: 12 including HIS 6905 **Grading Scheme:** Letter

AMH 5930: Topics in United States History
Credits: 3 Max: 15 Grading Scheme: Letter

AMH 6198: Early American Society
Credits: 3 Grading Scheme: Letter
Readings seminar focusing on a selected topic or topics in American history through the War of 1812.

AMH 6199: Nineteenth Century America
Credits: 3 Grading Scheme: Letter
Readings seminar focusing on a topic or topics in nineteenth century American history.

AMH 6290: Modern America
Credits: 3 Grading Scheme: Letter
Readings seminar focusing on topics in American history in the twentieth century.

AMH 6356: Research in U.S. History
Credits: 3 Grading Scheme: Letter
Reading and research to produce a paper demonstrating your ability to do research in primary sources and connect original work with existing historical literature.

AMH 6406: Readings in Southern History, 1607-1865
Credits: 3 Grading Scheme: Letter
An analysis of the major scholarly works and interpretations dealing with the development of a bi-racial society in the American South.

AMH 6465: Seminar in U.S. Urban History
Credits: 3 Grading Scheme: Letter
Historical development of American cities and ways in which the urbanization process has reshaped social life.

AMH 6506: Seminar in American Labor History
Credits: 4 Grading Scheme: Letter

AMH 6516: Seminar in American Foreign Relations and Expansion
Credits: 3 Grading Scheme: Letter
American foreign policy since 1945, the United States response to Third World nationalism, the changing historiographical debate over the nature of U.S. diplomacy, and other selected topics.

AMH 6557: Seminar in Constitutional or Legal History of the United States
Credits: 3 Max: 9 Grading Scheme: Letter
Chronological and thematic analysis of the evolution of American law, legal institutions, and constitutionalism from their English origins to present.

AMH 6677: Civil Rights Movement
Credits: 3 Grading Scheme: Letter
Origins and development of the southern civil rights movement that peaked between roughly 1954 and 1972.

AML 6017: Studies in American Literature Before 1900
Credits: 3 Max: 12 Grading Scheme: Letter

AML 6027: Studies in 20th-Century American Literature
Credits: 3 Max: 12 Grading Scheme: Letter

ANG 5012: Fantastic Anthropology and Fringe Science
Credits: 3 Grading Scheme: Letter
Examination of paranormal and pseudoscientific theories concerning human condition. Critical examination of fringe science claims and their perpetuation in contemporary society.

ANG 5126: Zooarcheology
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.

Human use of animal resources, emphasizing prehistoric hunting and fishing practices. Origins of animal domestication.

ANG 5158: Florida Archeology
Credits: 3 **Grading Scheme:** Letter
Survey of 12,000 years of human occupation of Florida, including early hunters and foragers, regional cultural developments, external relationships with the Southeast and Caribbean regions, peoples of historic period, and effects of European conquest. Not open to students who have taken ANT 3157.

ANG 5162: Maya Archeoastronomy and Ethnoastronomy
Credits: 3 **Grading Scheme:** Letter
Focus on Maya cosmology, past and present with emphasis on continuity of culture seen in specific astronomical concepts.

ANG 5164: The Inca and Their Ancestors
Credits: 3 **Grading Scheme:** Letter
Evolution of the Inca empire traced archeologically through earlier Andean states and societies to the beginning of native civilization. Not open to students who have taken ANT 3164.

ANG 5172: Historical Archeology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ANT 3141 or consent of instructor.
Methods and theoretical foundations of historical archeology as it relates to the disciplines of anthropology, history, historic preservation, and conservation. Introduction to pertinent aspects of material culture during the historic period.

ANG 5194: Principles of Archeology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: 1 course in anthropology.
Methods of archeological inquiry and interpretation, which include site identification and evaluation, dating techniques, environmental reconstructions, subsistence, technology, social and exchange systems, biological remains, and archeological ethics. Not open to students who have taken ANT 4185.

ANG 5255: Rural Peoples in the Modern World
Credits: 3 **Grading Scheme:** Letter
Historical background and comparative contemporary study of peasant and other rural societies. Unique characteristics, institutions, and problems of rural life stressing agriculture and rural-urban relationships in cross-cultural perspective. Not open to students who have taken ANT 4255.

ANG 5266: Economic Anthropology
Credits: 3 **Grading Scheme:** Letter
Anthropological perspectives on economic philosophies and their behavioral bases. Studies of production, distribution, and consumption; money, savings, credit, peasant markets; and development in a cross-cultural context from perspectives of cultural ecology, Marxism, formalism, and substantivism. Not open to students who have taken ANT 4266.

ANG 5303: Women and Development
Credits: 3 **Grading Scheme:** Letter
Influence of development on women in rural and urban areas. Women's participation in the new opportunities of modernization.

ANG 5310: The North American Indian
Credits: 3 **Grading Scheme:** Letter
The peopling of North America. The culture areas of North America. Unique characteristics, institutions, and problems. Not open to students who have taken ANT 4312.

ANG 5323: Peoples of Mexico and Central America
Credits: 3 **Grading Scheme:** Letter
Settlement and early cultures of the area, emphasizing the rise of the major culture centers. Impact of European civilization on surviving Indians. Not open to students who have taken ANT 4326.

ANG 5327: Maya and Aztec Civilizations
Credits: 3 **Grading Scheme:** Letter

Civilizations in Mesoamerica from the beginnings of agriculture to the time of the coming of Europeans. Maya and Aztec civilizations as well as the Olmec, Zapotec, and Teotihuacan cultures. Not open to students who have taken ANT 3325.

ANG 5330: The Tribal Peoples of Lowland South America
Credits: 3 **Grading Scheme:** Letter
Survey of marginal and tropical forest hunters and gatherers and horticulturalists of the Amazon Basin, Central Brazil, Paraguay, Argentina, and other areas of South America. Social organization, subsistence activities, ecological adaptations, and other aspects of tribal life. Not open to students who have taken ANT 4338.

ANG 5331: Peoples of the Andes
Credits: 3 **Grading Scheme:** Letter
The area-cotradition. The Spanish Conquest and shaping and persistence of colonial culture. Twentieth-century communities–their social land tenure, religious, and value systems. Modernization, cultural pluralism, and problems of integration. Not open to students who have taken ANT 4337.

ANG 5336: The Peoples of Brazil
Credits: 3 **Grading Scheme:** Letter
Ethnology of Brazil. Historical, geographic, and socioeconomic materials and representative monographs from the various regions of Brazil as well as the contribution of the Indian, Portuguese, and African to modern Brazilian culture. Not open to students who have taken ANT 4336.

ANG 5341: Anthropology of the Caribbean
Credits: 3 **Grading Scheme:** Letter
Transformation of area through slavery, colonialism, and independence movements. Contemporary political, economic, familial, folk-religious, and folk-healing systems. Migration strategies and future options. Not open to students who have taken ANT 4346.

ANG 5352: Peoples of Africa
Credits: 3 **Grading Scheme:** Letter
Survey of the culture, history, and ethnographic background of the peoples of Africa. A basis for appreciation of current problems of acculturation, nationalism, and cultural survival and change among African peoples. Not open to students who have taken ANT 4352.

ANG 5354: Anthropology of Modern Africa
Credits: 3 **Grading Scheme:** Letter
Continuity and change in contemporary African societies, with special reference to cultural and ethnic factors in modern nations. Not open to students who have taken ANT 4354.

ANG 5395: Visual Anthropology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: basic knowledge of photography, or consent of instructor.
Photography and film as tools and products of social science. Ways of describing, analyzing, and presenting behavior and cultural ideas through visual means, student projects, and laboratory work with visual anthropology. Not open to students who have taken ANT 3390.

ANG 5420: Social Network Analysis in Cultural Anthropology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate status or permission of instructor
Social network analysis is a set of theories and methods to analyze social structure. Participants will learn about whole network analysis (relations within groups) and personal network analysis (relations surrounding individuals). This is an introductory hands-on course, employing examples germane to anthropological research, using software such as Ucinet and Egonet.

ANG 5426: Kinship and Social Organization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ANT 2402 or 2410.
Property concepts, forms, and complexes. Tribal patterns of government and social control. Not open to students who have taken ANT 4426.

ANG 5464: Culture and Aging

Credits: 3 **Grading Scheme:** Letter
Prerequisite: two of following: ANT 2410, SYG 2000, or introductory psychology course.
Cross-cultural perspectives of adult development and aging in traditional and industrial society. Comparative assessment of culturally mediated, life-cycle transformations into old age and health related and human service policy issues. Not open to students who have taken ANT 4464.

ANG 5485: Research Design in Anthropology
Credits: 3 **Grading Scheme:** Letter
Examination of empirical and logical basis of anthropological inquiry. Analysis of theory construction. Research design. Problems of data collection, processing, and evaluation.

ANG 5486: Computing for Anthropologists
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ANG 5485 or consent of instructor.
Practical introduction to the computer. Collecting, organizing, processing, and interpreting numerical data on a microcomputer. Data sets used correspond to participants' subfields.

ANG 5488: Geospatial Analysis in Cultural Anthropology
Credits: 4 **Grading Scheme:** Letter
Geospatial analysis and their integration and application in anthropology including remote sensing, geographic information systems, and global positioning systems. Covering concepts necessary to work with geospatial data including research set-up and design and the use of specialized software, such as ArcGIS, Erdas Imagine, and Multispec.

ANG 5525: Human Osteology and Osteometry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ANT 3514 and consent of instructor.
Human skeletal identification for the physical anthropologist and archeologist. Techniques for estimating age at death, race, and sex from human skeletal remains. Measurement of human skeleton for comparative purposes. Not open to students who have taken ANT 4525.

ANG 5531: Culture and Nutrition
Credits: 3 **Grading Scheme:** Letter
Prerequisite: HUN 3221.
Theory, methodology, and substantive material of nutritional anthropology. Emphasizes cross-cultural bio-behavioral patterns.

ANG 5546: Seminar: Human Biology and Behavior
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Social behavior among animals from the ethological-biological viewpoint; the evolution of animal societies; the relevance of the ethological approach for the study of human development.

ANG 5620: Language and Culture
Credits: 3 **Grading Scheme:** Letter
Principles and problems of anthropological linguistics. The cross-cultural and comparative study of language. Primarily concerned with the study of non-Indo-European linguistic problems.

ANG 5621: Proseminar in Cultural and Linguistic Anthropology
Credits: 3 **Grading Scheme:** Letter
History and theory of subfields of cultural and linguistic anthropology and their conceptual relationship to each other. Emphasis on current issues and their historical foundations.

ANG 5700: Applied Anthropology
Credits: 3 **Grading Scheme:** Letter
Survey of history, theory and practice of applying cultural anthropology to human issues and problems. Applications to international development, peace studies, health, education, agriculture, ethnic minority and human rights issues. Case review, including aspects of planning, consultancy work, evaluation research, and ethics.

ANG 5702: Anthropology and Development
Credits: 3 **Grading Scheme:** Letter

Examination of theories and development and their relevance to the Third World, particularly Africa or Latin America. After this microanalysis, microlevel development will be examined with special reference to rural areas.

ANG 5711: Culture and International Business
Credits: 3 **Grading Scheme:** Letter
Anthropological and business concepts and literature in local and global economies. Value, wealth, communication, business practices, marketing, advertising, corporate organization, entrepreneurship, multinationals, etc.

ANG 5743: Human Rights Missions in Forensic Anthropology
Credits: 3 **Grading Scheme:** Letter
Preparation for fieldwork in forensic investigation of human rights abuses and war crimes. Topics include review of current targeted ethnic conflicts, logistics of fieldwork, consulting with human rights groups, and scientific procedure.

ANG 5744: International Forensic Fieldwork in Human Rights
Credits: 3-6 **Grading Scheme:** S/U
Fieldwork in forensic investigation of human rights abuses, ethnic cleansing, and war crimes. Excavation of mass gravesites, lab work in human identification and trauma analysis, and logistical support for team members.

ANG 5824L: Field Sessions in Archeology
Credits: 6 **Grading Scheme:** Letter
Prerequisite: 6 hours of anthropology, or consent of instructor.
Excavating archeological sites, recording data, laboratory handling and analysis of specimens, and studying theoretical principles that underlie field methods and artifact analysis. Not open to students who have taken ANT 4124 or equivalent.

ANG 6034: Seminar in Anthropological History and Theory
Credits: 3 **Grading Scheme:** Letter
Theoretical principles and background of anthropology and its subfields.

ANG 6086: Historical Ecology
Credits: 3 **Grading Scheme:** Letter
Relationship between human social and physical environments over long time spans. Theoretical and methodological relationships of cultural ecology to biology, geographical, and historical issues.

ANG 6091: Research Strategies in Anthropology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Survey of techniques for preparing research proposals and strategies for securing extramural funding for thesis. Review of scientific epistemology, hypothesis specification, and ethics. Proposal and curriculum vitae preparation.

ANG 6110: Archaeological Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Proseminar in archaeology or consent of instructor; not open to students who have taken ANG 5110.
Theoretical approaches in social sciences and philosophies, developed and applied in anthropological archaeology through the 20th century and into the 21st. Relationship of archaeology to anthropology.

ANG 6112: Critical Archaeology of Time
Credits: 3 **Grading Scheme:** Letter
Case-based approach to problems at the intersection of measured time in archaeology, and the practice and reckoning of time, in mostly non-Western societies.

ANG 6113: Ideology and Symbolic Approaches in Archaeology
Credits: 3 **Grading Scheme:** Letter
Critical examination of the development of thought in archaeology extending beyond a materialist interpretation of culture. Explores causality and the role of mind and culture as mediators between the environment and political, economic, and social structures.

ANG 6120C: Environmental Archaeology
Credits: 3 **Grading Scheme:** Letter

Theory and case studies integrating zooarchaeology, archaeobotany, and geoarchaeology to interpret past human interactions with the natural environment.

ANG 6122C: Archaeological Ceramics
Credits: 3 **Grading Scheme:** Letter
Technofunctional analysis and interpretation of archaeological ceramics. Emphasizes the life cycle of pottery.

ANG 6128: Lithic Technology
Credits: 3 **Grading Scheme:** Letter
Flintworking techniques and uses of stone implements for two million years. Emphasis on stoneworking technology in prehistoric Florida.

ANG 6146: Archaeology of Maritime Adaptations
Credits: 3 **Grading Scheme:** Letter
Archaeological and ethnographic cross-cultural examination of the nature of coastal adaptations.

ANG 6155: Southeastern U.S. Prehistory
Credits: 3 **Grading Scheme:** Letter
Prehistory of the southeastern United States, emphasizing problem-oriented research of broad anthropological significance.

ANG 6161: Problems in Caribbean Prehistory
Credits: 3 **Grading Scheme:** Letter
Theories and methods for study of prehistoric human societies. Case studies drawn primarily from Caribbean islands.

ANG 6165: Problems in South American Archaeology
Credits: 3-6 Max: 9 **Grading Scheme:** Letter
Problems and issues raised by new research on cultural evolution in South America. Topics vary significantly by professor, and students may take one or all of the topics in any sequence.

ANG 6183: Laboratory Training in Archeology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: an introductory level archeology course.
Processing of data recovered in field excavations; cleaning, identification, cataloging, classification, drawing, analysis, responsibilities of data reporting. Not open to students who have taken ANT 4123 or equivalent.

ANG 6185: Ethnoarchaeology
Credits: 3 **Grading Scheme:** Letter
Case studies examining theoretical and methodological approaches to ethnoarchaeology, with applications to field exercises.

ANG 6186: Seminar in Archeology
Credits: 3 Max: 10 **Grading Scheme:** Letter
Selected topic.

ANG 6187: Experimental Archaeology
Credits: 3 **Grading Scheme:** Letter
Principles and applications of experimental archaeology. Draws on a broad range of case studies to show the numerous experimental methods archaeologists have used to solve analytic or interpretive problems.

ANG 6190: Seminar in Contemporary Methods
Credits: 3 Max: 9 **Grading Scheme:** Letter
Collecting and analyzing research data. Focus on one method or set of methods in any semester.

ANG 6191: Archaeology of Death
Credits: 3 **Grading Scheme:** Letter
Archaeological literature on mortuary data. History, cultural anthropology, and ethnography offer insights into the origin of religion, the nature of society, and the structure of ritual.

ANG 6224: Painted Books of Ancient Mexico: Codices of Aztecs, Mixtecs, and Mayas
Credits: 3 **Grading Scheme:** Letter

Colonial period and Precolumbian Codices of Mexico, with emphasis on painted books recording history and calendars of Mixtecs, Aztecs, and Mayas.

ANG 6241: Special Topics in Ecology of Religion
Credits: 3 Max: 6 Grading Scheme: Letter
Cross-cultural examination of development of religious practices and their relationship to the environment.

ANG 6267: Anthropology, Geographic Information System, and Human Ecosystems
Credits: 3 Grading Scheme: Letter
Sociocultural processes and interactions in large scale spatial/ecosystems context.

ANG 6273: Legal Anthropology
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate standing.
Interrelationships between aspects of traditional and modern legal systems and sociocultural, economic, and political forces that impinge upon them. Methods of analysis, legal reasoning crossculturally, pre-industrial and modern sociolegal systems.

ANG 6274: Principles of Political Anthropology
Credits: 3 Grading Scheme: Letter
Problems of identifying political behavior. Natural leadership in tribal societies. Acephalous societies and republican structures. Kingship and early despotic states. Theories of bureaucracy. Not open to students who have taken ANT 4274.

ANG 6286: Seminar in Contemporary Theory
Credits: 3 Max: 10 Grading Scheme: Letter
Areas treated are North America, Central America, South America, Africa, Oceania.

ANG 6304: Seminar in Gender and International Development
Credits: 3 Grading Scheme: Letter
Prerequisite: ANG 5303 recommended.
Analyses of academic and development concepts and projects in relation to gender. Multi-, bilateral, and NGO agencies considered by sector (health, agriculture, environment, education, political empowerment, etc.). RRA, PRA, GAF methods.

ANG 6314: Peoples of the Arctic
Credits: 3 Grading Scheme: Letter
Survey of the culture, history, and ethnographic background of circumpolar Arctic. Examines problems of acculturation, human ecology, cultural survival, and self-determination of northern indigenous peoples.

ANG 6351: Peoples and Culture in Southern Africa
Credits: 3 Grading Scheme: Letter
Prehistoric times through first contacts by explorers to settlers; the contact situation between European, Khoisan, and Bantu-speaking; empirical data dealing with present political, economic, social, and religious conditions.

ANG 6360: Ethnicity in China
Credits: 3 Grading Scheme: Letter
Ethnic diversity and ethnic relations in China. Multi-ethnic history of China; theories on nationality and ethnicity; state and ethnicity; ethnic conflict and political economy; gender and ethnic hierarchy.

ANG 6366: Family, Gender, and Population in China
Credits: 3 Grading Scheme: Letter
Examines the processes by which the family system, gender relations, and population interact to become powerful forces in shaping contemporary China's political, social, and economic conditions.

ANG 6407: Sickness and Power
Credits: 3 Grading Scheme: Letter
Prerequisite: Students must have graduate standing.
Exploring the problems of culture, power, networks and circulation, and authority as underlying issues of global health. Emphasizing the use of culture histories, illness experiences, and multiscalar processes and structures to interrogate how macro processes, institutions, and forces intersect with the micro-worlds of families, localities, and individual experiences.

ANG 6421: Landscape, Place, Dwelling

Credits: 3 **Grading Scheme:** Letter
Contemporary theoretical approaches and applications to the social construction of place and space from the macro-scale of landscape to the micro-scale of dwelling. Emphasis on materiality of experience of inhabiting space.

ANG 6452: Race and Racism in Anthropological Theory
Credits: 3 **Grading Scheme:** Letter
Critical anthropological approaches to race. Historically contingent material and ideological contexts in which various peoples become racialized in culturally diverse ways.

ANG 6453: Human Rights in Cross-Cultural Perspective
Credits: 3 **Grading Scheme:** Letter
Anthropological perspectives on the discourses and practices of international human rights.

ANG 6478: Evolution of Culture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ANT 3141.
Theories of culture growth and evolution from cultural beginnings to dawn of history. Major inventions of man and their significance.

ANG 6481: Research Methods in Cognitive Anthropology
Credits: 3 **Grading Scheme:** Letter
Data collection including free lists, pile sorts, triad tests, paired comparisons, rankings, and ratings. Consensus analysis, cluster analysis, and multidimensional scaling.

ANG 6483L: Anthropology of Science
Credits: 3 **Grading Scheme:** Letter
Production of scientific knowledge, expertise, and authority through ethnographies of scientific practice. Major schools of thought from social studies to scientific knowledge to the Bath School to Actor-Network Theory, and beyond.

ANG 6511: Seminar in Physical Anthropology
Credits: 3 **Max: 10** **Grading Scheme:** Letter
Selected topic.

ANG 6514: Human Origins
Credits: 3 **Grading Scheme:** Letter
Review of fossil record of human evolution from Miocene to present. "Hands-on" seminar in basics of hominid fossil record.

ANG 6524: Skeletal Mechanics in Biological Anthropology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ANG 5525, and either ANG 5683 or ANG 6740.
Mechanobiology of the primate skeleton. Material and structural basis for the functional behavior of bone. Analytical approaches to functional, allometric, and evolutionary adaptation.

ANG 6532: Molecular Genetics of Disease
Credits: 3 **Grading Scheme:** Letter
Examines the molecular genetics of human disease. Discusses a range of diseases from single-gene recessive defects (such as cystic fibrosis) to complex diseases (such as alcoholism and diabetes). Also discusses detection and treatment.

ANG 6547: Human Adaptation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ANT 2511 or consent of instructor.
An examination of adaptive processes (cultural, physiological, genetic) in past and contemporary populations.

ANG 6552: Primate Behavior
Credits: 3 **Grading Scheme:** Letter
Prerequisite: one course in either physical anthropology or biology.
Taxonomy, distribution, and ecology of primates. Range of primate behavior for each major taxonomic group explored.

ANG 6553: Primate Cognition
Credits: 3 **Grading Scheme:** Letter

Evolution of cognition in primate lineages. Behavioral, social, and phylogenetic influences on cognitive processes. Theories of learning and imitation and their impact on analysis of ecological and social decisions.

ANG 6555: Issues in Evolutionary Anthropology
Credits: 3 **Grading Scheme:** Letter
Current controversies in biological anthropology. Role of evolutionary theory in addressing problems of taxonomy, speciation, systematics, selection, development, and adaptation in primate and human evolution.

ANG 6583: Primate Functional Morphology
Credits: 3 **Grading Scheme:** Letter
Practical and theoretical approaches to functional morphology in living and fossil primates. Biomechanical techniques. Problems of functional inference in paleontological and archeological records.

ANG 6589: Behavioral Decisions Among Human and Nonhuman Primates
Credits: 3 **Grading Scheme:** Letter
Survey and synthesis of literature of human and animal behavioral ecology to address theoretical problems in social and behavioral decision-making. Strategies for data collections and analysis.

ANG 6591L: Advanced Molecular Anthropology Laboratory
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Research design, experimentation, discussion, and presentation of findings of individual laboratory-based projects.

ANG 6592: Seminar in Molecular Anthropology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Current applications of molecular data to questions of human evolution and genetics, based on most recent journal articles. Possible topics: emergence of modern Homo sapiens and population movements.

ANG 6593L: Biological Anthropology Laboratory
Credits: 4 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Hands-on experience with latest molecular and stable isotope techniques as applied to questions of anthropologic interest.

ANG 6701: Seminar on Applied Anthropology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ANG 5700 or consent of instructor.
Consideration of planned socio-cultural and technological change and development in the United States and abroad; special and cultural problems in the transferral of technologies; community development and aid programs. Comparative program evaluation.

ANG 6737: Medical Anthropology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Theory of anthropology as applied to nursing, medicine, hospital organization, and the therapeutic environment. Instrument design and techniques of material collection.

ANG 6740: Advanced Techniques in Forensic Anthropology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: human osteology and forensic anthropology introduction.
Hands on analysis and clinical diagnoses of human skeletal remains. Analysis of human trauma and other demographic techniques.

ANG 6801: Ethnographic Field Methods
Credits: 3 **Grading Scheme:** Letter
Methods of collecting ethnographic data. Entry into the field; role and image conflict. Participant observation, interviewing, content analysis, photography and documents, data retrieval, analysis of data.

ANG 6905: Individual Work

Credits: 1-3 Max: 10 Grading Scheme: Letter
Guided readings on research in anthropology based on library, laboratory, or field work.

ANG 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

ANG 6915: Research Projects in Social, Cultural, and Applied Anthropology
Credits: 1-3 Max: 10 Grading Scheme: Letter
Prerequisite: consent of instructor.
For students undertaking directed research in supplement to regular course work.

ANG 6917: Professions of Anthropology
Credits: 3 Grading Scheme: Letter
Prerequisite: required of all graduate students.
Organizations of the anthropological profession in teaching and research. Relationship between subfields and related disciplines; the anthropological experience; ethics.

ANG 6930: Special Topics in Anthropology
Credits: 1-3 Max: 9 Grading Scheme: Letter
Prerequisite: consent of instructor.

ANG 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

ANG 6945: Internship in Anthropology
Credits: 1-8 Max: 8 Grading Scheme: Letter
Prerequisite: permission of graduate coordinator.
Required of all students registered in programs of applied anthropology. Students are expected to complete 4-8 hours.

ANG 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

ANG 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ANG 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

ANS 5312C: Applied Ruminant Reproductive Management
Credits: 3 Grading Scheme: Letter
Prerequisite: ANS 3319C
In-depth review of applied bovine reproductive management; factors that affect the efficiency of reproduction (managerial, biological, and economical). Offered fall term.

ANS 5446: Animal Nutrition
Credits: 3 Grading Scheme: Letter
Prerequisite: ANS 3440, BCH 4024, or consent of instructor.
Carbohydrates, fats, proteins, minerals, and vitamins and their functions in the animal body. Offered fall term.

ANS 5935: Reproductive Biology Seminar and Research Studies
Credits: 1 Max: 4 Grading Scheme: S/U
Prerequisite: ANS 3319C or equivalent.
Invited speakers on a wide range of topics. Student-faculty participation in research projects.

ANS 6288: Experimental Techniques and Analytical Procedures in Meat Research
Credits: 3 Grading Scheme: Letter

Experimental design, analytical procedures; techniques; carcass measurements and analyses as related to livestock production and meats studies. Offered spring term in even-numbered years.

ANS 6313: Current Concepts in Reproductive Biology
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ANS 3319C or equivalent; consent of instructor.
Lectures prepared by students and discussion of current review articles. Offered spring term in odd-numbered years.

ANS 6449: Vitamins
Credits: 3 **Grading Scheme:** Letter
Prerequisite: organic chemistry.
Historical development, properties, assays, and physiological effects.

ANS 6452: Principles of Forage Quality Evaluation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ANS 5446, AGR 4231C.
Definition of forage quality in terms of animal performance, methodology used in forage evaluation, and proper interpretation of forage evaluation data. Offered spring term in even-numbered years.

ANS 6458: Advanced Methods in Nutrition Technology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: for graduate students but open to seniors by special permission.
Demonstrations and limited performance of procedures used in nutrition research. Offered fall term in even-numbered years.

ANS 6636: Meat Technology
Credits: 3 **Grading Scheme:** Letter
Chemistry, physics, histology, bacteriology, and engineering involved in the handling, processing, manufacturing, preservation, storage, distribution, and utilization of meat. Offered fall term in odd-numbered years.

ANS 6666L: Molecular and Cellular Research Methods
Credits: 2 **Grading Scheme:** Letter
Prerequisite: enrollment in AMCB concentration.
Diversity of research topics and laboratory techniques demonstrated. Short laboratory rotations (3 to 6 weeks) with 3 scientists.

ANS 6702: Lactation Physiology of Farm Animals
Credits: 1 **Grading Scheme:** Letter
Prerequisite: ANS 6704 or permission of instructor
A comprehensive overview of the physiological, biochemical, cellular, and molecular processes controlling the process of milk formation and secretion, with emphasis on livestock species.

ANS 6704: Mammalian Endocrinology
Credits: 2 **Grading Scheme:** Letter
Prerequisite: BCH 4024 or BCH 3025, or equivalent.
Physiologic systems of farm animals. Emphasizes the impact of endocrinology and cell biology on animal physiology, development and performance.

ANS 6706: Environmental Physiology of Domestic Animals
Credits: 3 **Grading Scheme:** Letter
Offered spring term in even-numbered years.

ANS 6707: Growth Physiology in Farm Animals
Credits: 1 **Grading Scheme:** Letter
Prerequisite: ANS 6704
Biological regulation of muscle, cartilage and bone formation and function in farm animals with integration of physiological systems to livestock tissue growth.

ANS 6711: Current Topics in Equine Nutrition and Exercise Physiology
Credits: 2 **Grading Scheme:** Letter
Equine science with emphasis on current topics of interest. Offered fall term in odd-numbered years.

ANS 6715: The Rumen and Its Microbes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ANS 5446.
Review and correlation of fundamental biochemical, physiological, and bacteriological research upon which feeding of ruminants is based. Experimental methodology of rumen physiology and metabolism.

ANS 6716: Physiology in Farm Animals
Credits: 1 **Grading Scheme:** Letter
Prerequisite: ANS 6704
Physiology and function of the gastrointestinal system in monogastrics and ruminants.

ANS 6718: Nutritional Physiology of Domestic Animals
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ANS 5446; introductory biochemistry course.
Physiological, biochemical and molecular control of nutritional processes in monogastrics and ruminants.

ANS 6723: Mineral Nutrition and Metabolism
Credits: 3 **Grading Scheme:** Letter
Physiological effect of macro- and micro-elements, and mineral interrelationships.

ANS 6745: Introduction to Statistical Genetics
Credits: 2 **Grading Scheme:** Letter
Prerequisite: PCB 6555, STA 6167.
Development and application of statistical and quantitative genetics theory to selection and estimation of genetic parameters.

ANS 6750: Reproductive Physiology in Farm Animals
Credits: 1 **Grading Scheme:** Letter
Prerequisite: ANS 6704 and ANS 3319C or equivalent.
Physiology and function of the reproductive system in farm animals.

ANS 6751: Physiology of Reproduction
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCH 5045 or equivalent.
Conceptual relationship of the hypothalamus, pituitary, and reproductive organs during the estrous cycle and pregnancy. Influence of exteroceptive factors and seasonal reproduction. Offered fall term in even-numbered years.

ANS 6767: Molecular Endocrinology
Credits: 2 **Grading Scheme:** Letter
Prerequisite: BCH4024 or BCH 5045; ANS 6704 ; or equivalent, or consent of instructor.
Molecular basis of hormone action and regulation, and emerging techniques in endocrine system study; emphasis on molecular mechanisms of growth, development, and reproduction.

ANS 6905: Problems in Animal Science
Credits: 1-4 Max: 8 **Grading Scheme:** Letter, H

ANS 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

ANS 6932: Special Topics in Animal Science
Credits: 1-3 Max: 9 **Grading Scheme:** Letter
New developments in animal nutrition and livestock feeding, animal genetics, animal physiology, and livestock management.

ANS 6933: Graduate Seminar in Animal Science
Credits: 1 Max: 8 **Grading Scheme:** Letter

ANS 6936: Graduate Seminar in Animal Molecular and Cell Biology
Credits: 1 Max: 2 **Grading Scheme:** Letter
Seminar attendance and 1-hour presentation on graduate research project.

ANS 6939: Animal Molecular and Cellular Biology Journal Colloquy

Credits: 1 Max: 5 Grading Scheme: S/U
Critical evaluation, presentation and discussion of recent scientific journal articles on a specified topic in cellular and/or molecular biology.

ANS 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

ANS 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

ANS 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ANS 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

AOM 5334C: Agricultural Chemical Application Technology
Credits: 3 Grading Scheme: Letter
Equipment and methods used to apply pesticides in agriculture. Emphasis on techniques to avoid misapplication and pesticide drift.

AOM 5431: GIS and Remote Sensing in Agriculture and Natural Resources
Credits: 3 Grading Scheme: Letter
Prerequisite: working knowledge of computer or consent of instructor.
Principles and applications of geographic information systems (GIS) and global positioning system (GPS) technologies supporting land use/cover assessment, agricultural production, and natural resource conservation.

AOM 5435: Advanced Precision Agriculture
Credits: 3 Grading Scheme: Letter
Principles and applications of technologies supporting precision farming and natural resource data management planning. Global positioning systems (GPS), geographic information systems (GIS), variable rate technologies (VRT), data layering of independent variables, automated guidance, Internet information access, computer software management.

AOM 6905: Individual Work in Agricultural Operations Management
Credits: 1-6 Max: 6 Grading Scheme: Letter
Special problems.

AOM 6932: Special Topics in Agricultural Operations Management
Credits: 1-6 Max: 6 Grading Scheme: Letter
Lectures, laboratory, and /or special projects.

APK 5127: Assessment in Exercise Science
Credits: 3 Grading Scheme: Letter
Prerequisite: PET 3351C or equivalent.
Techniques and methodologies to assess health and physical fitness.

APK 5404: Sport Psychology
Credits: 3 Grading Scheme: Letter
Prerequisite: Consent of instructor.
Survey of current research, learning processes, motivation, performance intervention, strategies, group dynamics, history of sport psychology, and other topics.

APK 6111L: Practicum in Exercise Physiology
Credits: 3 Grading Scheme: Letter
Prerequisite: APK 6110C.
Applied and experimental work emphasizing practical problems.

APK 6116C: Physiological Bases of Exercise and Sport Sciences
Credits: 3 **Grading Scheme:** Letter
Applying fundamental concepts of human physiology to programs of physical education and sports. Recent research developments in sports physiology.

APK 6118: Neuromuscular Adaptation to Exercise
Credits: 3 **Grading Scheme:** Letter
Prerequisite: APK 6110C.
Research developments; and describing neural and muscular function and adaptation to acute and chronic exercise.

APK 6126: Cardiopulmonary Pathologies
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PET 3350C, 3351C or equivalent.
Lecture and laboratory study of anatomy, physiology, and pathophysiology of cardiac and pulmonary systems. Attention to cardiopulmonary function in diseased and stressed states. Emphasizes dysfunction, clinical assessment, and rehabilitation of cardiopulmonary patients.

APK 6128: EKG Interpretation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PET 2350C and 3351C.
Basic and intermediate electrocardiography including cardiac function, lead systems, rate, axis, infarction, ischemia, hypertrophy, and effects of cardiovascular drugs and exercise on EKG. Particular attention to EKGs of diseased populations during exercise.

APK 6205C: Nature and Bases of Motor Performance
Credits: 3 **Grading Scheme:** Letter
Principles of motor skill development, and conditions affecting motor skill development and retention in physical education activities.

APK 6206: Planning Motor Actions
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Processes and mechanisms involved in planning voluntary human motor actions. Variables that influence movement planning and initiation.

APK 6210: Controlling Motor Actions
Credits: 3 **Grading Scheme:** Letter
Analyzing human voluntary motor actions, including the mechanisms and systems involved in motor control.

APK 6225: Biomechanical Instrumentation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: APK 6220C.
Overview of data collection and analysis tools. Hands-on experience conducting projects using EMG, videography, and force transducer technology.

APK 6226C: Biomechanics of Human Motion
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PET 2320C; MGF 1202 or MAC 1142.
Applying the principles of statics, kinematics, and kinetics to kinesiological systems of the human body in movement and sports skills.

APK 6406: Exercise Psychology
Credits: 3 **Grading Scheme:** Letter
Overview, examining research evidence on psychological factors associated with adapting and maintaining an exercise program.

APK 6408: Performance Enhancement
Credits: 3 **Grading Scheme:** Letter
Prerequisite: APK 5400.
Mental and psychological techniques and strategies to improve performance and achievement in sport and exercise.

APK 6410: Seminar in Exercise Psychology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: APK 6405 or consent of instructor.
Critical review of the literature. Students design group research projects and pilot test.

APK 6415: Seminar in Sport Psychology: Current Topics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: sport psychology course or consent of instructor.
Discussion of research topics, including contemporary issues and interests. In-depth exploration of research and theory. Citation of practical sport setting applications where appropriate.

APK 6900: Directed Independent Study
Credits: 1-5 Max: 12 **Grading Scheme:** Letter
Individual research projects under faculty guidance.

APK 6940: Advanced Practicum in Exercise and Sport Science
Credits: 1-5 Max: 5 **Grading Scheme:** Letter
On-site practical experience in exercise and sport science.

APK 7107: Cardiovascular Exercise Physiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: APK 6110C/6356L or equivalent.
Basic mechanisms of cardiovascular dynamics at rest and in response to exercise.

APK 7108: Environmental Stress Exercise Physiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: APK 6110C/6356L or equivalent.
Energetics of environmental stress on cardiovascular, respiratory, metabolic, and muscle physiology as they pertain to physical performance.

APK 7117: Exercise Metabolism
Credits: 3 **Grading Scheme:** Letter
Prerequisite: APK 6110C or equivalent.
Principles of metabolic regulation during exercise; effects of chronic exercise on muscle metabolism.

APK 7124: Free Radicals in Aging, Exercise and Disease
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 2040, APK 6110C or consent of instructor.
Free radical biology and biochemistry dealing with aging, exercise, antioxidants, and diseases of aging, such as atherosclerosis, diabetes, and neurodegenerative diseases.

APK 7129: Pulmonary Function during Exercise
Credits: 3 **Grading Scheme:** Letter
Prerequisite: APK 6110C or equivalent.
Regulation of pulmonary gas exchange during exercise; acute and experimental procedures during exercise.

ARC 5791: Topics in Architectural History
Credits: 3 **Grading Scheme:** Letter

ARC 5800: Survey of Architectural Preservation, Restoration, and Reconstruction
Credits: 3 **Grading Scheme:** Letter

ARC 5810: Techniques of Architectural Documentation
Credits: 3 **Grading Scheme:** Letter
Documentation, interpretation, and maintenance issues relating to historic structures.

ARC 6116: Drawing toward Architecture
Credits: 1-2 Max: 2 **Grading Scheme:** Letter
Freehand drawing skills as generative and analytical architectural methodologies.

ARC 6176: Advanced Computer-Aided Design
Credits: 3 Max: 6 Grading Scheme: Letter
Available hardware and software and their current and potential usefulness to the profession. Future directions in hardware and software development.

ARC 6212: Topics in Phenomena and Architecture
Credits: 3 Max: 9 Grading Scheme: Letter
Relationships between the philosophy of phenomenology and specific phenomena and architecture studied. Current and historic examples of theoretical and design applications considered.

ARC 6226: Intercultural Perspectives in Architecture
Credits: 3 Max: 9 Grading Scheme: Letter
Studies on the impact of differing cultural practices displayed through politics, tourism, the arts and mass media on architectural thought and production.

ARC 6228: Film and Architecture
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor or DCP majors.
Survey of the representation of architecture and urbanism in cinema and an investigation of how discourses of cinema construct urbanism and architecture.

ARC 6241: Advanced Studio I
Credits: 1-9 Max: 9 Grading Scheme: Letter
An investigation of architecture as a systematic integration of program, space and tectonic systems to make public places in specific cultural and climatic contexts, culminating in a highly resolved spatial order and material resolution.

ARC 6242: Research Methods
Credits: 2 Grading Scheme: Letter
Prerequisite: required of all graduate students as preparation for thesis.

ARC 6280: Advanced Topics in Architectural Practice
Credits: 3 Max: 6 Grading Scheme: Letter
Analyzing contemporary practice models.

ARC 6281: Professional Practice
Credits: 3 Grading Scheme: Letter
Principles and processes of office practice management, investment and financing, project phases, building cost estimation, contracts.

ARC 6311C: Building Information Modeling
Credits: 3 Grading Scheme: Letter
Prerequisite: ARC2180
Building information modeling (BIM) in the context of advanced architectural design development and documentation.

ARC 6355: Advanced Studio II
Credits: 6 Grading Scheme: Letter
Emphasis on architecture, program the experience of place. Introduces emergent paradigms for practice and the built environment as well as speculative methods and procedures.

ARC 6356: Advanced Studio III
Credits: 6 Grading Scheme: Letter
Developing design methods for synthesizing special aspects of architectural practice: human behavior and space programming, environmental control and energy use, construction materials and structures, project management, preserving and reusing historic structures, and theoretical and philosophical areas of inquiry.

ARC 6357: Advanced Topics in Architectural Design
Credits: 3 Max: 6 Grading Scheme: Letter
Expanding familiar concepts in the conception and production of architecture. Examines the potential for a program to generate architectonic form, bringing a multidisciplinary approach to historical manifestations.

ARC 6383: St. Augustine Interdisciplinary Design Studio
Credits: 2-6 Max: 6 Grading Scheme: Letter
Advanced-level design, construction, and planning in St. Augustine, Florida with attention to cultural heritage and interpretation.

ARC 6391: Architecture, Energy, and Ecology
Credits: 3 Grading Scheme: Letter
Integration of energetic and environmental influences on architectural design.

ARC 6393: Advanced Architectural Connections
Credits: 3 Grading Scheme: Letter
Analyzing architectural connections and details relative to selected space, form, and structural systems.

ARC 6399: Advanced Topics in Urban Design
Credits: 3 Max: 9 Grading Scheme: Letter
Transformations of historic urban form and newly developed urban areas and their cultural, sociological, economic, and technological impact.

ARC 6505: Architectural Structural Systems: Wood, Steel, and Concrete
Credits: 4 Grading Scheme: Letter
Prerequisite: ARC 3503 or equivalent.
Structural components as part of building system. Introduction to typical building components.

ARC 6512: Structural Modeling
Credits: 3 Grading Scheme: Letter
Prerequisite: ARC 3503
Fundamentals of structural information modeling. Develops the conceptual and theoretical understanding of building information modeling (bim), digital design, and approximate systems analysis and detailing for building structures. Students will learn how to efficiently implement bim to organize, coordinate and communicate information in order to convey data necessary for structural analysis and design. Incorporated are applied projects and case studies related to building design and detailing.

ARC 6576: Architectural Structures
Credits: 3 Grading Scheme: Letter
Analysis and behavior of reinforced concrete, prestress, masonry, foundations, steel, and suspension systems.

ARC 6611: Advanced Topics in Architectural Technology
Credits: 3 Max: 6 Grading Scheme: Letter
Structures, materials, construction systems, or environmental technology. Determining architectural form by available technologies and inventions throughout history.

ARC 6621: Graduate Environmental Technology 2
Credits: 3 Grading Scheme: Letter
Prerequisite: ARC 3610.
Fundamentals of architectural lighting, acoustics, electrical power distribution, and building communications.

ARC 6642: Architectural Acoustic Design Laboratory
Credits: 3 Grading Scheme: Letter
Prerequisite: ARC3610 and ARC 4620 or Equivalents
Theories and sciences of architectural acoustics as integral components of an architectural design problem.

ARC 6643: Architectural Acoustics
Credits: 3 Grading Scheme: Letter
Theory, practice, and application of acoustics in architecture.

ARC 6670: Lighting Design Seminar
Credits: 3 Max: 6 Grading Scheme: Letter
Design problems investigating theoretical, conceptual, and practical applications of illumination systems through speculative and analytical inquiry.

ARC 6685: Life Safety, Sanitation, and Plumbing Systems
Credits: 3 **Grading Scheme:** Letter
Design problems investigating the theory, practice, and applications of fire safety, movement, sanitation, and plumbing systems in architecture.

ARC 6705: Graduate Architectural History 3
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ARC 1702.
Examination of key built works from early civilizations, their cultural context, and construction technologies.

ARC 6711: Architecture of the Ancient World
Credits: 3 **Grading Scheme:** Letter
Examination of key built works from early civilizations, their cultural context, and construction technologies.

ARC 6750: Architectural History: America
Credits: 3 **Grading Scheme:** Letter
Development of American architecture and the determinants affecting its function, form, and expression.

ARC 6773: Strains of Modernism
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Examinations of the origins, development and transformations of modernism as known through publications and built work of varying scales.

ARC 6793: Advanced Topics in Regional Architecture
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Critical studies of local, regional, and vernacular buildings and built environments.

ARC 6805: Architectural Conservation
Credits: 3 **Grading Scheme:** Letter
A multidisciplinary study, supervised by an architectural professor and another professor from an appropriate second discipline, in the science of preserving historic architecture, utilizing individual projects.

ARC 6821: Preservation Problems and Processes
Credits: 3 **Grading Scheme:** Letter
Preservation in the larger context. Establishing historic districts; procedures and architectural guidelines for their protection.

ARC 6822: Preservation Programming and Design
Credits: 3 **Grading Scheme:** Letter
Architectural design focusing on compatibility within the fabric of historic districts and settings.

ARC 6851: Technology of Preservation: Materials and Methods I
Credits: 3 **Grading Scheme:** Letter
Materials, elements, tools, and personnel of traditional building.

ARC 6852: Technology of Preservation: Materials and Methods II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ARC 6851.
Preservation of twentieth-century structures.

ARC 6883: Vernacular Architecture & Sustainablility
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor or DCP major.
Investigation of vernacular architecture in the discourse of architectural sustainability, with an emphasis on the way that vernacular architecture has been constructed, represented, and consumed in the environmental histories of architecture.

ARC 6911: Architectural Research
Credits: 1-6 **Max: 9** **Grading Scheme:** Letter, H
Special studies adjusted to individual needs.

ARC 6912: Architectural Research II

Credits: 1-6 Max: 9 Grading Scheme: Letter, H
Special studies adjusted to individual needs.

ARC 6913: Architectural Research III
Credits: 1-6 Max: 9 Grading Scheme: Letter, H
Special studies adjusted to individual needs.

ARC 6932: Advanced Topics in Architectural Methods
Credits: 3 Max: 9 Grading Scheme: Letter
Exploration of interconnection between architectural design and research methodology.

ARC 6933: Sustainable Site Design
Credits: 3 Grading Scheme: Letter
Prerequisite: must be a graduate student in the College of Design, Construction, and Planning.
Architecture's relationship to landscape environments. Focuses on architecture's interrelationship with the diverse fields of landscape architecture, ecology, and civil engineering.

ARC 6934: European Approach to Sustainable Design
Credits: 3 Grading Scheme: Letter
Ideas and design strategies used in Europe that might be considered for the United States. Focuses on several countries in Europe that are leaders in sustainable design.

ARC 6935: Seminar in Sustainable Design
Credits: 3 Grading Scheme: Letter
Overview of principles and practices of sustainable architecture design, including weekly reading, use studies of excellent design practices, local field trip, and on-campus practice.

ARC 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

ARC 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

ARC 6979: Master's Research Project
Credits: 1-10 Grading Scheme: Letter, H

ARE 6049: History of Teaching Art
Credits: 3 Grading Scheme: Letter
History of the theory and practice of teaching art.

ARE 6148: Curriculum in Teaching Art
Credits: 3 Grading Scheme: Letter
Contemporary theories for developing art teaching curricula.

ARE 6246C: Principles of Teaching Art
Credits: 3 Grading Scheme: Letter
Social and theoretical foundations of contemporary art education practice.

ARE 6247C: Teaching Art: The Study of Practice
Credits: 3 Grading Scheme: Letter
Art teaching practices in the public schools. Emphasizes art curriculum planning, motivational strategies, art room management and alternative assessment in art.

ARE 6386: Teaching Art in Higher Education
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate standing in art history, or consent of instructor.
Study of teaching art at the post secondary level.

ARE 6641: Issues in Art Education
Credits: 3 Grading Scheme: Letter

Exploration of contemporary issues in art, general education, and society that affect teaching of art in public schools.

ARE 6746: Methods of Research in Art Education
Credits: 3 **Grading Scheme:** Letter
Study of qualitative and quantitative research methods. Review of research literature.

ARE 6905: Individual Study
Credits: 1-5 Max: 12 **Grading Scheme:** Letter

ARE 6910: Capstone Project
Credits: 3 **Grading Scheme:** S/U
Prerequisite: Advanced standing in the graduate program, ARE 6705, and consent of Instructor.
Completion of an original research project that addresses an identified issue or need with the field of art education.

ARE 6933: Special Topics in Art Education
Credits: 1-3 Max: 6 **Grading Scheme:** Letter

ARE 6944: Internship in Teaching Art
Credits: 3 **Grading Scheme:** S/U
Prerequisite: student must be accepted into the MA Program in Art Education w/ EPI, have passed his/her first-year review, and have completed ARE 6X42 and ARE 6X43.
Develops pedagogical knowledge and skills in a school classroom, under the guidance of a K-12 art teacher.

ARE 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

ARE 6973: Individual Project
Credits: 1-10 Max: 10 **Grading Scheme:** S/U
Project in lieu of thesis.

ARH 5357: French Art of the Ancien Regime: 1680-1780
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing in the Art History program, or consent of instructor.
Major artists, artistic movements, works and issues in art theory, and criticism in Europe from the late 17th century to the 1780s. Emphasizes painting in France and the reaction against Rococo.

ARH 5420: Art in the Age of Revolution
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate standing in the Art History program, or consent of instructor.
Late-18th and early-19th century European art, including Neo-Classicism and Romanticism. Works are considered in the cultural, political, social, and aesthetic contexts in which they were created. Emphasizes the politics of style during the period of revolution and reaction.

ARH 5440: Beginnings of Modernism
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate standing in the Art History program, or consent of instructor.
Visual arts in Europe in the second half of the 19th century, focusing on the emergence of avant-garde and the formulation of the modern aesthetic in industrialized, urban culture, especially in Paris. Realism, Impressionism, and Post-Impressionism.

ARH 5527: Arts of Central Africa
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing in art history or consent of instructor.
Traditional arts of the equatorial forests, the savannahs to the south of them, and portions of eastern and southern Africa.

ARH 5528: Art of West Africa
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing in art history or consent of instructor.
Traditional arts of western Sudan and the Guinea coast.

ARH 5529: Clothing and Textiles in Africa

Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate Student standing
This class will be focusing on techniques, styles, and uses of textiles and elements of African dress. Course exploration reveals information about culture and history, particularly regarding movements of textiles and technologies between regions and preservation of styles of traditional dress. Readings will vary from technical analyses to artists' biographies.

ARH 5655: Indigenous American Art
Credits: 3 Max: 9 **Grading Scheme:** Letter
Prerequisite: ARH 2518 or consent of instructor.
Native arts of the Americas (North, Central, or South) from pre-European times.

ARH 5667: Colonial Andean Art
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing in Art and Art History or Latin American Studies, or consent of instructor.
Examination of the colonial art of Peru, Ecuador, Bolivia, and other territories within the Spanish Viceroyalty of Peru.

ARH 5816: Methods of Research and Bibliography
Credits: 3 **Grading Scheme:** Letter

ARH 5877: Gender, Representation, and the Visual Arts: 1600-1900
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate standing in the Art History program, or consent of instructor.
Historical and theoretical issues posed for visual media by attention to issues of gender, with particular emphasis on women artists.

ARH 5905: Individual Study
Credits: 1-6 Max: 12 including ART 5905C **Grading Scheme:** Letter

ARH 6141: Greek Art Seminar
Credits: 3 Max: 12 **Grading Scheme:** Letter
Prerequisite: graduate standing in art history or consent of instructor.
Topics in Greek art history.

ARH 6292: Medieval Art Seminar
Credits: 3 Max: 12 **Grading Scheme:** Letter
Prerequisite: graduate standing in art history or consent of instructor.
Topics in medieval art.

ARH 6394: Renaissance Art Seminar
Credits: 3 Max: 12 **Grading Scheme:** Letter
Prerequisite: graduate standing in art history or consent of instructor.
Special topics in the art and visual culture of the 14th through 16th centuries.

ARH 6422: Beginnings of Modernism. Realism to Post-Impressionism 1848-1890
Credits: 3 **Grading Scheme:** Letter
This topic of this course is the history of European painting (French, actually) during the second half of the nineteenth century, considered within the social and political context provided by the Second Republic, Second Empire, the Commune and Third Republic. Major themes to be traced in lectures and readings will include: formation of the avant garde, the shifting social organization of industrial society, and changing structures of artistic personality, practice and consumption. The city of Paris will be our focus, as nearly all the artists we shall study -whether French, Dutch, or Scandinavian spent significant time there.

ARH 6477: Eighteenth-Century European Art Seminar
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing in the Art History program, or consent of instructor.
Intersecting ideologies of gender and representation in French art.

ARH 6481: Contemporary Art Seminar
Credits: 3 Max: 12 **Grading Scheme:** Letter
Prerequisite: graduate standing in art history or consent of instructor.

Topics in contemporary art.

ARH 6496: Modern Art Seminar
Credits: 3 Max: 12 Grading Scheme: Letter
Prerequisite: graduate standing in art history or consent of instructor.
Topics in modern art.

ARH 6596: Chinese Art Seminar
Credits: 3 Max: 12 Grading Scheme: Letter
Prerequisite: graduate standing in art history or consent of instructor.
Research seminar focusing on a topic or topics in the study of Chinese art.

ARH 6597: African Art Seminar
Credits: 3 Max: 12 Grading Scheme: Letter
Prerequisite: graduate standing in art history or consent of instructor.
Research seminar focusing on a topic or topics in the study of African art.

ARH 6654: Pre-Columbian Art Seminar
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Rotating topics include topics pertaining to the study of Pre-Columbian art.

ARH 6666: Colonial Latin American Art Seminar
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Rotating topics include issues pertaining to the study of colonial Latin American art.

ARH 6694: Nineteenth-Century Art–Seminar
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate standing in the Art History program, or consent of instructor.

ARH 6696: American Art Seminar
Credits: 3 Max: 12 Grading Scheme: Letter
Prerequisite: graduate standing in art history or consent of instructor.
Topics in American art.

ARH 6797: Museum Education
Credits: 3 Max: 9 Grading Scheme: Letter
Issues and content related to education in museums and other nontraditional education settings.

ARH 6836: Exhibitions Seminar
Credits: 3 Max: 6 Grading Scheme: Letter
Basic information needed by the museum curator. Exhibition research, planning, interpreting, installing, and organizing and designing museum space.

ARH 6895: Collections Management Seminar
Credits: 3 Grading Scheme: Letter
Information needed to access and conserve objects. Risk management, preparing objects for travel, and legal issues in collections management.

ARH 6900: Independent Study in Museology
Credits: 1-6 Max: 9 Grading Scheme: Letter
Independent research topics under faculty guidance.

ARH 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

ARH 6911: Advanced Study
Credits: 3-4 Max: 16 Grading Scheme: Letter
Prerequisite: major in art.

ARH 6914: Independent Study in Ancient Art History
Credits: 3-4 Max: 12 Grading Scheme: Letter
Prerequisite: major in art; consent of instructor and graduate program adviser.
Egyptian, Near Eastern, Aegean, Greek, Etruscan, Roman.

ARH 6915: Independent Study in Medieval Art History
Credits: 3-4 Max: 12 Grading Scheme: Letter
Prerequisite: major in art; consent of instructor and graduate program adviser.
Early Christian, Byzantine, Early Medieval, Romanesque, Gothic.

ARH 6916: Independent Study in Renaissance and Baroque Art History
Credits: 3-4 Max: 12 Grading Scheme: Letter
Prerequisite: major in art; consent of instructor and graduate program adviser.
Renaissance, High Renaissance, Mannerism, Baroque, Eighteenth Century art.

ARH 6917: Independent Study in Modern Art History
Credits: 3-4 Max: 12 Grading Scheme: Letter
Prerequisite: major in art; consent of instructor and graduate program adviser.
Major art movements of the 19th and 20th centuries.

ARH 6918: Independent Study in Non-Western Art History
Credits: 3-4 Max: 12 Grading Scheme: Letter
Prerequisite: major in art; consent of instructor and graduate program adviser.
African, Latin American, American Indian, Asian, and Oceanic.

ARH 6930: Special Topics in Museology
Credits: 3-9 Max: 9 Grading Scheme: Letter
Contemporary issues pertaining to museums and their social and cultural functions.

ARH 6938: Seminar in Museum Studies
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
History, purposes, and functions of museums in general, and art museums in particular.

ARH 6941: Supervised Internship
Credits: 1-6 Max: 9 Grading Scheme: S/U
Training in an approved regional or national museum, arts organization, institution, or facility. On-site supervision, with periodic reports filed with the instructor of record.

ARH 6946: Museum Practicum
Credits: 1-6 Max: 9 Grading Scheme: Letter
Prerequisite: consent of graduate program adviser and prior arrangements with professors.
Work under museum professionals. Readings and periodic discussions with the coordinating professor.

ARH 6948: Gallery Practicum
Credits: 3-6 Max: 6 Grading Scheme: Letter
Prerequisite: Consent of graduate program adviser and prior arrangements with coordinating professor.
Work under the supervision of gallery professionals. Readings and periodic discussions with the coordinating professor.

ARH 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

ARH 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ARH 7980: Research for Doctoral Dissertation
Credits: 1/15 Grading Scheme: S/U

ART 5674C: Digital Fabrication
Credits: 03 **Grading Scheme:** Letter
Prerequisite: consent of instructor. Familiarity with 2-D and 3-D software recommended.
Interdisciplinary studio combines in-depth analysis of the role of the physical object in diverse conceptual art practices with project-based experimentation using rapid prototyping and manufacturing technologies.

ART 5905C: Individual Study
Credits: 1-5 Max: 24 including ARH 5905 **Grading Scheme:** Letter

ART 5930C: Special Topics
Credits: 3 Max: 15 **Grading Scheme:** Letter
Rotating topics in studio art and studio practice.

ART 6410C: Printmaking Seminar: Mastering Process and Content
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: graduate standing in studio art or consent of instructor
Complex ideation, approaches, and material handling to orchestrate a unified series of images that equally support concept and methods.

ART 6411C: Printmaking Seminar: Transformation and Change
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: graduate standing in studio art or consent of instructor
Explorations of methodologies toward conceptual and perceptual image transformations.

ART 6412C: Printmaking Seminar: Ideation, Studies, and Completed Works
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: graduate standing in studio art or consent of instructor
In-depth investigation of process, form, and content to strengthen previous visual philosophies.

ART 6413C: Printmaking Seminar: Interdisciplinary Studio
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: Graduate standing in studio art or consent of instructor.
Explores diverse media and idea development as a way to develop innovative visual philosophies.

ART 6671C: Advanced Experiments in Digital Art
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: graduate student in Art and Art History or consent of instructor.
Rotating topics include electronic art forms, with an emphasis on creative and expressive use of emergent digital media, trends in digital media art.

ART 6672: Hypermedia
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate level in School of Art and Art History or consent of instructor.
Practical and theoretical issues related to the Internet as a medium for making art rather than as tool for delivering information. Emphasizes creation of dynamic and interactive experiences that utilize the Internet incuding video, graphics, animation, sound, image and typography.

ART 6673C: Video Art
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: graduate level in School of Art and Art History or consent of instructor.
Studio intensive course explores digital video through lectures, demonstrations, screenings and reading with a specific overview of concepts and techniques integral to video. Emphasizes conceptual and experimental forms, rather than on conventional narrative.

ART 6675C: Digital Art and Animation
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: graduate level in SAAH or consent of instructor.

Rotating topics explore principles and concepts of animation using traditional methods, digital imaging, and contemporary 2D and 3D software applications. Lectures, demonstrations, screenings and readings provide students with the opportunity to integrate concept, form and technology to explore the possibilities of animation.

ART 6691: Digital Art Studio
Credits: 4 Max: 12 Grading Scheme: Letter
Prerequisite: graduate standing in art, or consent of instructor.
Investigation of digital art practices in one or more of the following areas: bit-mapped and object-oriented graphics, 3-D modeling, computer animation, hypermedia and interactivity, and image-processing.

ART 6794C: Vessel Aesthetic 1
Credits: 3 Grading Scheme: Letter
Prerequisite: None.
Further study of high-fire reduction methods, in throwing and handbuilding practice, and in the formal use of the vessel as an artistic means of expression. This course is for graduate students with basic background in handbuilding and throwing.

ART 6795C: Vessel Aesthetic 2
Credits: 3 Grading Scheme: Letter
Prerequisite: None.
Learning how to do intermediate study of in the development and use of ceramic color, forming techniques, and use of the vessel surface as an artistic means of expression. This course is for graduate students with basic background in handbuilding and throwing.

ART 6797C: Ceramic Sculpture 2
Credits: 3 Grading Scheme: Letter
Prerequisite: Prior experience in hand building processes for Ceramics.
Learning sculpture forming techniques, plaster mold-making, as well as glaze testing to develop color and surface for sculpture. As a graduate class, this course is intended for graduate elective students with a background in hand building who are seeking to do further study sculpting methods and mold making (an original three dimensional duplication technique).

ART 6835C: Research in Methods and Materials of the Artist
Credits: 3-4 Max: 8 Grading Scheme: Letter

ART 6849C: Installation Using Digital Processes
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: graduate level in School of Art and Art History or consent of instructor.
Explores site specificity and intervention in three-dimensional space through installation, using digital media, producing artworks expanding current body of work, intersecting with course theme.

ART 6897: Professional Practices for the Visual Artist
Credits: 3 Grading Scheme: Letter

ART 6910C: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

ART 6925C: Digital Media Workshop
Credits: 3 Max: 6 Grading Scheme: Letter
Examines the conceptual ramifications of new technologies, allowing the artist to experiment with new forms, in the context of a projects-based course, producing artworks, expanding their current body of work, as it intersects with the course theme.

ART 6926C: Advanced Study I
Credits: 2-4 Max: 12 Grading Scheme: Letter
Prerequisite: major in art; consent of instructor and graduate program adviser.
Applying the basic principles of studio art in one of the following areas: ceramics, creative photography, drawing, painting, printmaking, sculpture, graphic design, or multi-media.

ART 6927C: Advanced Study II
Credits: 2-4 Max: 12 Grading Scheme: Letter
Prerequisite: major in art; consent of instructor and graduate program adviser.

Investigating selected problems in one of the following areas: ceramics, creative photography, drawing, painting, printmaking, sculpture, graphic design, and multi-media.

ART 6928C: Advanced Study III
Credits: 2-4 Max: 12 Grading Scheme: Letter
Prerequisite: major in art; consent of instructor and graduate program adviser.
Experimentation in nontraditional approaches to studio art in one of the following areas: ceramics, creative photography, drawing, painting, printmaking, sculpture, graphic design, and multi-media.

ART 6929C: Advanced Study IV
Credits: 2-4 Max: 12 Grading Scheme: Letter
Prerequisite: major in art; consent of instructor and graduate program adviser.
Stylistic and technical analysis of contemporary studio practices in one of the following areas: ceramics, creative photography, drawing, painting, printmaking, sculpture, graphic design, and multi-media.

ART 6933: Area Methods: Rotating Topics
Credits: 1-4 Max: 27 Grading Scheme: Letter
Prerequisite: Consent of instructor and graduate program adviser.
Readings, discussions, and/or studio exploration of various art issues.

ART 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

ART 6973C: Individual Project
Credits: 1-10 Max: 10 Grading Scheme: S/U
Creative project in lieu of written thesis.

ASH 5388: Topics in East Asian History
Credits: 3 Max: 9 Grading Scheme: Letter

ASL 5406: Manual Communication with the Hearing Impaired
Credits: 1 Max: 3 Grading Scheme: Letter
Overview of signing systems, including ASL, Signed English, and Signing Exact English. Emphasis on signing skills most useful to audiologist.

AST 5113: Solar System Astrophysics I
Credits: 3 Grading Scheme: Letter
Prerequisite: 2 years of college physics.
Survey of the solar system, including its origin and laws of planetary motion. The earth as a planet: geophysics, aeronomy, geomagnetism, and the radiation belts. Solar physics and the influence of the sun on the earth.

AST 5114: Solar System Astrophysics II
Credits: 3 Grading Scheme: Letter
Prerequisite: AST 5113.
The moon and planets; exploration by ground-based and spacecraft techniques. The lesser bodies of the solar system, including satellites, asteroids, meteoroids, comets; the interplanetary medium.

AST 6112: Solar System Astrophysics
Credits: 3 Grading Scheme: Letter
Systematic examination of the formation and current state of the solar system.

AST 6215: Stellar Structure and Function
Credits: 3 Grading Scheme: Letter
Stars as constituents of galaxies, with discussion of both the theoretical and observational aspects of the topic.

AST 6245: Stellar Atmospheres and Radiative Processes
Credits: 3 Grading Scheme: Letter
Radiative transfer, spectral line formation and broadening, and other topics applicable to stellar atmospheres and photoionized nebulae.

AST 6309: Galactic and Extragalactic Astronomy
Credits: 3 **Grading Scheme:** Letter
Observations and interpretations of the kinematics, dynamics, and structure of the Milky Way Galaxy, extragalactic objects, and galaxy clusters.

AST 6336: Interstellar Matter
Credits: 3 **Grading Scheme:** Letter
Complex interplay of physical processes that determine the structure of the interstellar medium in our galaxy; compares observational data with theoretical prediction.

AST 6415: Observational Cosmology
Credits: 3 **Grading Scheme:** Letter
Basic science and observations that underlie modern cosmology.

AST 6416: Physical Cosmology
Credits: 3 **Grading Scheme:** Letter
Introduction to the observational background and to the theory of cosmology.

AST 6506: Celestial Mechanics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AST 3019.
Dynamics of the solar system, emphasizing the role of dissipative forces and resonant gravitational forces in determining the structure of the system.

AST 6725C: Observational Techniques
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate student in astronomy.
Overview of techniques associated with observational astronomy.

AST 6905: Individual Work
Credits: 1-6 **Max: 12** **Grading Scheme:** Letter
Supervised study or research in areas not covered by other courses.

AST 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

AST 6925: Departmental Colloquium
Credits: 1 **Grading Scheme:** S/U

AST 6935: Frontiers in Astronomy
Credits: 1 **Grading Scheme:** S/U

AST 6936: Astronomy Journal Club
Credits: 1 **Grading Scheme:** S/U

AST 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

AST 7939: Special Topics
Credits: 2-4 **Max: 12** **Grading Scheme:** Letter
Assigned reading, programs, seminar, or lecture series in a new field of advanced astronomy.

AST 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

AST 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

ATR 6124: Clinical Anatomy for the Exercise Sciences
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PET 2320C, 2350C, 3351C.
Cadaver dissection and lectures. Appreciation of clinical applications of anatomical knowledge for those pursuing careers in exercise science fields.

ATR 6145: Human Pathophysiology for the Exercise Sciences
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PET 2320C, 2350C, 3351C.
Macrotraumatic and microtraumatic inflammatory processes, factors affecting inflammation and healing, and the role of exercise in controlling the onset or course of an inflammatory response.

ATR 6215: Evidence-Based Orthopedic Exam I: Upper-Extremity
Credits: 3 **Grading Scheme:** Letter
Prerequisite: for students who are BOC-certified athletic trainers.
Identifying, evaluating, and managing acute athletic injuries.

ATR 6216: Evidence-Based Orthopedic Exam II: Lower-Extremity
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ATR 6215
Orthopedic and biomechanical assessment of lower-extremity function and dysfunction. Students develop skills and study the principles and procedures used in advanced evaluation techniques. Students examine components of lower-extremity function from biomechanical, neuromuscular and anatomical perspectives. Topics include advanced orthopedic special tests, 3-dimensional kinematics, interpreting contemporary diagnostic tests and treatment of lower-extremity pathology/dysfunction and critical reviews of related research.

ATR 6304: Rehabilitation and Modalities of Athletic Injuries
Credits: 3 **Grading Scheme:** Letter
Rehabilitation and therapeutic modalities in the field of athletic training.

ATR 6624: Athletic Training Research and Technology I
Credits: 3 **Grading Scheme:** Letter
Current theory and practical application of techniques (cardiovascular testing, isokinetic strength testing, and EMG testing) for understanding and designing research projects related to athletic training and sports medicine.

ATR 6625: Athletic Training Research and Technology II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NATA certified or eligible, or related degree or certification.
Current theory and practical application of techniques (modalities in research, proprioception testing, and force plate and balance testing) for understanding and designing research projects related to athletic training and sports medicine.

ATR 6934: Seminar in Athletic Training
Credits: 1-5 **Max: 5** **Grading Scheme:** Letter
Prerequisite: NATA certification.
Research topics or contemporary issues in athletic training.

BCH 5045: Graduate Survey of Biochemistry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: inorganic chemistry, organic chemistry, biology.
Introduction to plant, animal, and microbial biochemistry for graduate students who have not had biochemistry. Integration and regulation of biochemical processes stressed; limited discussion of some biochemical techniques.

BCH 5413: Mammalian Molecular Biology and Genetics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCH 3025, 4014, CHM 3218, 4207, MCB 4303, or PCB 3063 or consent of instructor.
Biochemical and genetic approaches to understanding vertebrate and particularly mammalian molecular biology, moving from basic processes of replication, transcription, and protein synthesis to signal transduction, cell cycle, cancer, genomics, and developmental genetics.

BCH 6040: Research Discussion in Biochemistry and Molecular Biology
Credits: 1 **Grading Scheme:** S/U
Prerequisite: Required as students in Biochemistry and Molecular Biology. Open to students in other fields with permission of the instructor.
Current research in biochemistry and molecular biology will be presented by departmental faculty and invited speakers.

BCH 6107: Biophysical Techniques in Proteomics and Protein Science
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor. *Corequisite:* BCH 6740 or consent of instructor.
Theory and application of modern biophysical techniques relevant to proteomics and protein science.

BCH 6206: Advanced Metabolism
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCH 4024, CHM 4207, or consent of instructor. One of three core biochemistry courses.
Reactions of intermediary metabolism, emphasizing their integrations, mechanisms, and control. Extensive examples from current literature.

BCH 6207: Advanced Metabolism: Role of Membranes in Signal Transduction and Metabolic Control
Credits: 1 **Grading Scheme:** Letter
Prerequisite: BCH 3025, 4024, CHM 3218, 4207, GMS 6001, or consent of instructor.
Fundamentals of membrane biochemistry. Discussions of membrane structure, nutrient and ion transport, protein targeting, and signal transduction. Experimental methods and techniques used to gather and analyze data related to membrane biochemistry and its regulation.

BCH 6208: Advanced Metabolism: Regulation of Key Reactions in Carbohydrate and Lipid Metabolism
Credits: 1 **Grading Scheme:** Letter
Prerequisite: BCH 3025, 4024, CHM 3218, 4207, GMS 6001, or consent of instructor.
Key reactions in metabolic pathways of carbohydrate and lipid metabolism. Explores the experimental basis for current understanding of these processes. Understanding the interactions between major metabolic pathways and control of these pathways under different physiological conditions.

BCH 6209: Advanced Metabolism: Regulation of Key Reactions in Amino Acid and Nucleotide Metabolism
Credits: 1 **Grading Scheme:** Letter
Prerequisite: BCH 3025, 4024, CHM 3218, 4207, GMS 6001, or consent of instructor.
Understanding interactions among major metabolic pathways and control of these pathways under different physiological conditions. Structural basis of enzyme function and regulation.

BCH 6296: Advanced Topics in Metabolic Control
Credits: 1 Max: 6 **Grading Scheme:** Letter
Corequisite: BCH 6206 or consent of instructor.
Thermodynamic, allosteric, hormonal, and genetic control of metabolic reactions.

BCH 6415: Advanced Molecular and Cell Biology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCH 4024, CHM 4207, MCB 4303, or consent of instructor. PCB 3063 or a similar course in genetics recommended. One of three core biochemistry courses.
Molecular biology of pro- and eukaryotic organisms. Emphasizes understanding the experimental approaches that led to recent developments. Chromosome structure and organization, advances in recombinant DNA technology, DNA replication, RNA transcription and protein synthesis, and selected aspects of molecular regulation of gene expression.

BCH 6740: Physical Biochemistry/Structural Biology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCH 4024, CHM 4207, or consent of instructor. Course in physical chemistry recommended. One of three core biochemistry courses.
Physical chemistry of biological molecules and techniques to study their properties. Approaches to structure determination.

BCH 6741C: Magnetic Resonance Imaging and Spectroscopy in Living Systems
Credits: 1-3 Max: 3 **Grading Scheme:** Letter
Prerequisite: BCH 6740 or equivalent or consent of instructor.

MR imaging methods used to study the structure of cells, tissues, and whole animals. MR spectroscopy methods for monitoring biochemistry in living animals. Preparing samples, operating the instruments, and analyzing the data.

BCH 6743: Biochemical Energetics
Credits: 1 **Grading Scheme:** S/U
Prerequisite: BCH 3025, CHM 3216, 4207, or consent of instructor.
Molecular and structural interpretation of energy transformation in biological systems including protein-protein interaction, protein self-assembly, and protein-nucleic acid interaction.

BCH 6744: Molecular Structure Determination by X-ray Crystallography
Credits: 1 Max: 2 **Grading Scheme:** Letter
Prerequisite: BCH 6740 or equivalent or consent of instructor.
Detailed theoretical and practical instruction on technique of x-ray crystallography used for three-dimensional structure determination of macromolecules in studies aimed at structure-function elucidation.

BCH 6744L: Molecular Structure Determination by X-Ray Crystallography Laboratory
Credits: 1 **Grading Scheme:** Letter
Prerequisite: or coreq: BCH 6744: Molecular Structure Determination by X-ray Crystallography . *Corequisite:* BCH 6744: Molecular Structure Determination by X-ray Crystallography
Complement to BCH 744 lectures. Practical experience in sample preparation, operation of instrumentation, data acquisition analysis, phasing and refinement. Hands-on approach reinforces applicability of this methodology in analysis of functional properties of biological macromolecule.

BCH 6745: Molecular Structure and Dynamics of NMR Spectroscopy
Credits: 1 Max: 2 **Grading Scheme:** Letter
Prerequisite: BCH 6740 or equivalent or consent of instructor.
Theoretical and practical introduction to macromolecular NMR spectroscopy. Basics of multidimensional NMR for structure and dynamics measurements. Hands-on training in modern NMR.

BCH 6745L: Molecular Structure and Dynamics by NMR Spectroscopy Laboratory
Credits: 1 **Grading Scheme:** Letter
Prerequisite: or coreq: BCH 6745.
Complement to BCH 6745 lectures. Emphasizes practical applications of molecular structure and dynamics determination. Extensive use of computer software packages. Training in modern NMR instrumentation, data processing, and data analysis. Completed training sufficient for use of NMR instrumentation in Advanced Magnetic Resonance Imaging and Spectroscopy facility.

BCH 6746: Structural Biology: Macromolecular Structure Determination
Credits: 1 Max: 3 **Grading Scheme:** Letter
Prerequisite: BCH 3025, 4024, CHM 3218, 4207, GMS 6001 or consent of instructor.
Experimental approaches to biological macromolecular structure determination. Emphasizes current understanding of protein-protein and protein-nucleic acid structure motifs.

BCH 6747: Structural Biology/Advanced Physical Biochemistry: Spectroscopy and Hydrodynamics
Credits: 1 **Grading Scheme:** Letter
Prerequisite: BCH 3025, 4024, CHM 3218, 4207, GMS 6001, or consent of instructor.
Applying spectroscopic techniques (circular dichroism, fluorescence, nuclear magnetic resonance) to determine the structure of biological macromolecules. Hydrodynamic approaches including light scattering, molecular diffusion, viscosity, and ultracentrifugation.

BCH 6749C: Numerical Methods in Structural Biology
Credits: 1 **Grading Scheme:** Letter
Prerequisite: BCH 6740 or equivalent or consent of instructor.
Introduction to mathematical and computational methods needed to understand current structural models, biophysical processes, data acquisition methods, and analysis of data acquired with current techniques.

BCH 6875: Crystallography and Cryo-Electron Microscopy
Credits: 1 Max: 4 **Grading Scheme:** S/U
Prerequisite: BCH 6740 or equivalent, or consent of instructor.

Journal club covering current literature on methodologies, applications, and discoveries in crystallography and cryo-electron miscroscopy.

BCH 6876: Recent Advances in Membrane Biology
Credits: 1 **Grading Scheme:** S/U
Prerequisite: general biochemistry or consent of instructor.
Literature presented by students and faculty, discussed in depth. Emphasizes current developments, data, interpretation, and critical analysis.

BCH 6877: Recent Advances in Structural Biology
Credits: 1 Max: 8 **Grading Scheme:** S/U
Prerequisite: general biochemistry or consent of instructor.
Literature on structural biology presented by students and faculty, discussed in depth. Current developments, data interpretation, and critical analysis.

BCH 6878: Recent Advances in Cytoskeletal Processes
Credits: 1 Max: 8 **Grading Scheme:** S/U
Prerequisite: general biochemistry or consent of instructor.
Literature on cytoskeletal processes presented by students and faculty, discussed in depth. Current developments, data interpretation, and critical analysis.

BCH 6905: Independent Studies in Biochemistry and Molecular Biology
Credits: 1-5 Max: 12 **Grading Scheme:** Letter
Prerequisite: permission of instructor.
Individual literature-based or experimental research problem.

BCH 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U
Prerequisite: consent of instructor.

BCH 6936: Biochemistry Seminar
Credits: 1 Max: 20 **Grading Scheme:** Letter
Prerequisite: required of graduate students in biochemistry; open to others by special arrangement.
Research reports and discussions of current research literature given by graduate students, departmental faculty, and invited speakers.

BCH 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U
Prerequisite: consent of instructor.

BCH 7410: Advanced Gene Regulation
Credits: 1 Max: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.
Literature-based assessment of the most recent advances in factors governing eukaryotic gene regulation.

BCH 7412: Epigenetics of Human Disease and Development
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001.
BCH 6415 recommended. In-depth assessment of epigenetic mechanisms of mammalian gene regulation: DNA methylation, histone modifications, genomic imprinting, inherited genetic diseases, viral gene regulation, and epigenetic reprogramming in embryonic stem cells and cloning.

BCH 7414: Advanced Chromatin Structure
Credits: 1 **Grading Scheme:** Letter
Prerequisite: BCH 5413, GMS 6001, or consent of instructor.
Lecture and literature-based assessment of chromatin structure.

BCH 7515: Structural Biology/Advanced Physical Biochemistry: Kinetics and Thermodynamics
Credits: 1 **Grading Scheme:** Letter

Prerequisite: BCH 4024, CHM 3218, 4207, GMS 6001, or consent of instructor.
Fundamentals of chemical kinetics and thermodynamic analysis of equilibria. Emphasizes applying this knowledge to understand basic enzyme kinetics, pulse-chase kinetics, protein polymerization, DNA dynamics, protein-nucleic acid interactions, and cooperative ligand binding.

BCH 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

BCH 7980: BioChem Doctoral Research
Credits: 1-15 **Grading Scheme:** S/U

BCN 5470: Construction Methods Improvements
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Methods of analyzing and evaluating construction techniques to improve project time and cost control. Work sampling, productivity ratings, crew balance studies, time lapse photography, and time management.

BCN 5618C: Comprehensive Estimating
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Classification of work and quantity survey techniques. Analysis and determination of costs of construction operations including direct and overhead costs, cost analysis, and preparation of bid proposals.

BCN 5625: Construction Cost Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCN 4612C/BCN 5618C, 4720/BCN 5722 graduate standing.
Study of cost engineering and cost distribution and comparative analysis of actual and estimated cost as used for project control.

BCN 5705C: Project Management for Construction
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCN 5618C, BCN 6748, non-BCN graduate.
Project organization, site planning, and implementation.

BCN 5715: Advanced Construction Labor Problems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Labor problems in the construction industry and associated legislation. How to work effectively with unionized labor on construction projects.

BCN 5722: Advanced Construction Planning and Control
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCN 4720, graduate standing.
Time-cost relationships for various construction operations.

BCN 5729: Design-Build Delivery Methods
Credits: 3 **Grading Scheme:** Letter
This course will be focusing on an in depth examination of teh advantages and disadvantages of design-build, the methedology of the design-build delivery process and implementation of this process. The class will be featuring inter-disciplinary instructors, industry speakers, and a design-build team competition with industry and faculty judges.

BCN 5737: Advanced Issues in Construction Safety and Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCN 4735, graduate standing.
Current construction safety and health issues. Development of specific methodology to provide hazard reduction on job sites.

BCN 5754C: Site Development
Credits: 3 **Grading Scheme:** Letter
Principles and practices of land development including market analysis, site analysis, project programming, and financial feasibility.

BCN 5776: International Construction Business Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCN 6748, graduate standing.
Construction contracting, emphasis on international economics, marketing, contracts, design, and specifications.

BCN 5778: Facilities Operation and Maintenance
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Facilities management as a specialized professional career; study of how a facility, its people, equipment, and operations are served and maintained.

BCN 5789C: Construction Project Delivery
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCN 5618C, 4720, BCN 6748, non-BCN graduate.
Designing, developing, estimating, scheduling, contracting, and administering small construction project, including extensive site and feasibility analysis.

BCN 5905: Special Studies in Construction
Credits: 1-5 **Max: 12** **Grading Scheme:** Letter
Prerequisite: graduate standing.
For students requiring supplemental work in the building construction area.

BCN 5949: Graduate Construction Management Internship
Credits: 1-3 **Max: 6** **Grading Scheme:** S/U
Prerequisite: approval of graduate coordinator.
Two-term employment in construction management position.

BCN 5957: Advanced International Studies in Construction
Credits: 1-4 **Max: 6** **Grading Scheme:** S/U
Prerequisite: graduate standing or supervising instructor's approval; admission to approved study abroad program.
Issues of local construction techniques, construction marketing, international construction, sustainability, global economics, and influence on construction of local culture, traditions, architecture, history, and political climate.

BCN 6036: Research Methods in Construction
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Research proposal development process and statistical, computational, visualization, and presentation tools available to researcher.

BCN 6580: High-Performance Green Building Delivery Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing, BCN 6585/ICM 6680, or consent of instructor.
High-performance green buildings; emerging delivery systems, evaluating their sustainability, and details on LEED criteria.

BCN 6585: Sustainable Construction
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Sustainability principles applied to planning, design, operation, renovation, and deconstruction of built environment. Emphasis on resource efficiency, environmental protection, and waste minimization.

BCN 6586: Construction Ecology and Metabolism
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.

Sustainability principles and concepts related to reducing environmental impacts of creating, operating, and deconstruction built environment.

BCN 6621: Bidding Strategy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCN 3700/6748C, 4612C/BCN 5618C, graduate standing.
Strategy of contracting to maximize profit through overhead distribution, breakeven analysis, probability and statistical technique, a realistic risk and uncertainty objective, and bid analysis both in theory and in practice.

BCN 6641: Construction Value Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCN 4612C/BCN 5618C, graduate standing.
Principles and applications of value engineering in construction industry.

BCN 6748: Construction Law
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Formation of a company, licensing, bid process, contracts, plans and specifications, mechanics liens, insurance bonds, and remedies as they relate to the building constructor and construction manager. Case studies.

BCN 6755: Construction Financial Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ACG 2021C, graduate standing.
Financial management of construction company using and analyzing income statements and balance sheets, budgeting, cash flow, and cost reporting systems.

BCN 6756: Housing Economics and Policy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Concepts, terminology, and issues in affordable housing.

BCN 6771: Construction Work Acquisition
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCN 5618C, MAR 3023, and graduate standing.
Importance of successful strategy to remain competitive in industry. Marketing strategy developed for commercial construction company in private sector.

BCN 6777: Construction Management Processes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Existing and emerging systems for designing, planning, and construction of projects. Changing roles, relationships, and responsibilities of the parties involved.

BCN 6785: Construction Information Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CGS 2531 or equivalent, graduate standing.
Potential applications of computer and information systems in construction industry.

BCN 6905: Directed Independent Study in Construction
Credits: 1-3 **Max: 3** **Grading Scheme:** Letter
Prerequisite: graduate standing.

BCN 6910: Supervised Research
Credits: 1-3 **Max: 3** **Grading Scheme:** S/U
Prerequisite: graduate standing.

BCN 6933: Advanced Construction Management
Credits: 1-5 **Max: 12** **Grading Scheme:** Letter, H
Prerequisite: graduate standing.

Financial and technological changes affecting construction and the management of construction projects.

BCN 6934: Construction Research
Credits: 1-6 Max: 12 Grading Scheme: S/U
Prerequisite: graduate standing.
Research for master's report option.

BCN 6940: Supervised Teaching
Credits: 1-3 Max: 3 Grading Scheme: S/U
Prerequisite: graduate standing.

BCN 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U
Prerequisite: graduate standing.

BME 5052L: Biomedical Engineering Laboratory
Credits: 3 Grading Scheme: Letter
Integrates state-of-the-art technologies with a hands-on approach to education in a flexible system of academic topics tailored for specific disciplines within biomedical engineering, by teaching primary laboratory skills, experimental design, interpretation of data, and technical writing relevant to laboratory work.

BME 5085: Patents, Product Development, and Technology Transfer
Credits: 2 Grading Scheme: Letter
For engineers and scientists. Product discovery and development; patents and trade secrets; copyright and trademark law; international intellectual property considerations; regulatory issues; business planning and market research; and licensing, marketing, negotiation, and technology transfer.

BME 5401: Biomedical Engineering and Physiology I
Credits: 3 Grading Scheme: Letter
Physiology of cells, bones, and the circulatory system from a biomaterials, biomechanics, cellular, and tissue engineering perspective. Intellectual property and technology transfer included.

BME 5402: Biomedical Engineering and Physiology II
Credits: 3 Grading Scheme: Letter
Physiology of the human body, imaging techniques, and subsequent processing. Discusses various imaging modalities and appropriate processing methods for revealing the details of physiology and diagnosis.

BME 5407: Molecular Biomedical Engineering
Credits: 3 Grading Scheme: Letter
Fundamentals of molecular biology for biomedical engineers.

BME 5500: Biomedical Instrumentation
Credits: 3 Grading Scheme: Letter
Prerequisite: basic knowledge of physics and calculus, consent of instructor.
Engineering and medical aspects of measuring and processing signals from living systems. Discusses biomedical transducers for measuring movement, biopotentials, pressure, flow, concentrations, and temperature; and treatment devices like ventilators and infusion pumps. Whenever possible, devices actually used in clinical practice are used in class.

BME 5580: Introduction to Microfluidics and BioMEMS
Credits: 3 Grading Scheme: Letter
Prerequisite: EGN 3353C or consent of instructor.
Introduction to concepts of miniaturization, materials and methods for microfabrication, principles of microfluidics, and biological applications of microfluidic devices and biomedical microelectromechanical systems.

BME 5703: Statistical Methods for Biomedical Engineering
Credits: 3 Grading Scheme: Letter
Prerequisite: Knowledge of calculus, linear algebra and basic statistics.

Computational methods needed for biomedical engineering research. Students will be acquainted with a variety of techniques for analyzing and modeling experimental data arising in molecular, cellular, physiological, and pathological systems encountered in typical laboratory and clinical settings.

BME 5704: Advanced Computational Methods for Biomedical Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: A basic knowledge of physics and calculus is required. This can be met by PHY2053 and MAC2311.
Covering advanced computational methods from a biomedical engineering perspective. Linear and nonlinear systems, partial differential equations, optimization and inverse problems will be discussed. This course is geared towards the applications of the advanced computational techniques to various biomedical engineering problems.

BME 5937: Special Topics
Credits: 1-4 Max: 6 **Grading Scheme:** Letter

BME 6010: Clinical Preceptorship
Credits: 3 Max: 6 **Grading Scheme:** Letter
Students observe clinical faculty and work with engineering faculty to examine current clinical practice and restraints with goal to propose jointly possible improvements.

BME 6088: BME Problem Based Learning II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: BME 6087. For graduate-level students only.
Team-based interdisciplinary advanced problem-solving. Students devise solutions and approaches to topical and real-world biomedical engineering problems and technologies.

BME 6221: Biomolecular Cell Mechanics
Credits: 3 **Grading Scheme:** Letter
Biomolecular basis of cell mechanics and cell motility, emphasizing quantitative models and systems-biology approaches.

BME 6322: Dynamics of Cellular Processes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: a course on kinetics and/or transport, or consent of instructor.
Develops research skills, including generation of questions, hypotheses testing, reporting, interpretation, and discussion of findings.

BME 6330: Cell and Tissue Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6421, BME 5001, or consent of instructor.
Applying engineering principles, combined with molecular cell biology, to developing a fundamental understanding of property-function relationships in cells and tissues. Exploiting this understanding to manipulate cell and tissue properties rationally to alter, restore, maintain, or improve cell and tissue functions; and to design bioartificial tissue substitutes.

BME 6360: Neural Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Applying engineering to neuroscience including such diverse areas as neural tissue engineering, models of neural function, and neural interface technology. Focuses mainly in the context of neural interfaces and prosthetics, from basic neural physiology and models of neural mechanisms to advanced neural interfaces currently in development or produced commercially.

BME 6502: Introduction to Medical Imaging
Credits: 3 **Grading Scheme:** Letter
Modern medical imaging technologies from a biomedical engineering perspective. The physics, mathematics, instrumentation and clinical applications of all common medical imaging modalities including x-ray radiography, computed tomography (CT), ultrasound imaging, positron emission tomography (PET), and magnetic resonance imaging (MRI) with a focus on non-ionizing radiation will be discussed. Emerging imaging modalities including diffuse optical tomography (DOT), Fluorescence Molecular Tomography (FMT), and photoacoustic tomography (PAT) will also be introduced.

BME 6505: Advanced Diagnostic Radiological Physics
Credits: 3 **Grading Scheme:** Letter

Prerequisite: ENU 6657
Physics of diagnostic methodologies like ultrasound, NMR, MRI, CT, Electronic imaging systems.

BME 6522: Biomedical Multivariate Signal Processing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: multivariate calculus and a basic knowledge of probability and statistics.
Statistical analysis of biomedical signals, emphasizing multivariate time series. Introduces analysis concepts and methods in the time domain and the spectral domain. Uses actual recordings from biomedical applications to demonstrate the methods.

BME 6533: Radiologic Anatomy
Credits: 3 **Grading Scheme:** Letter
Corequisite: BME 6590 Medical Physics
Imaging techniques as they relate to human anatomy and physiology.

BME 6534: Advanced Therapeutic Radiological Physics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENU 6627: Therapeutic Radiological Physics
Advanced course in therapeutic radiation therapy physics covering special topics targeted to those pursuing careers in radiation therapy physics.

BME 6535: Radiological Physics, Measurements and Dosimetry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Upper level college physics
Interacting and measuring techniques for x-rays, gamma rays, neutrons and charged particles with matter; radioactive decay processes ion chamber measurements, scintillation detectors, and dosimetry techniques. Applications of cavity theory and dosimetry measurement in medical physics.

BME 6590: Medical Physics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BME 6534
(Radiological Physics) or permission of instructor.

Introducing students to the physical basis and clinical practice of medical physics. Fundamentals of imaging physics and techniques including radiographic, CT, ultrasound, MRI and nuclear medicine procedures. Image quality metrics are introduced and the fundamental strategies of radiation therapy, treatment planning and components of professional development are studied.

BME 6591: Therapeutic Radiological Physics I
Credits: 3 **Grading Scheme:** letter
Prerequisite: BME 6534 (Radiological Physics) or permission of instructor.
Introducing students to the principles of therapeutic radiological physics including the measurement and calculation of absorbed dose and dosimetric calculations. Studying external beam radiation therapy including dose distributions within patients and the treatment planning techniques used to produce desired isodose distributions.

BME 6592: Therapeutic Radiological Physics II
Credits: 3 **Grading Scheme:** letter
Prerequisite: BME 6591 (Therapeutic Radiological Physics I) or permission of instructor.
Building upon the basic principles of radiation therapy studying more advanced radiation treatment planning, electron beam and brachytherapy techniques. Topics of clinical and regulatory significance including radiation shielding and quality assurance.

BME 6593: Therapeutic Radiological Physics III
Credits: 3 **Grading Scheme:** letter
Prerequisite: BME 6592 (Therapeutic Radiological Physics II) or permission of instructor.
Exploring state-of-the-art radiation therapy techniques in clinical practice. Examining the physical principles and clinical implementation of three-dimensional conformal therapy, Intensity modulated radiation therapy, stereotactic radiosurgery, high dose rate brachytherapy, image guided radiation therapy, proton beam therapy, and other techniques as they become integrated into clinical practice.

BME 6644: Pharmacokinetics

Credits: 3 **Grading Scheme:** Letter
Basic pharmacokinetic and pharmacodynamic concepts and models. Use of these concepts in the drug discovery process.

BME 6705: Mathematical Modeling of Biological and Physiological Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: calculus, linear algebra, and passing knowledge of differential equations.
Mathematical modeling of biological and physiological phenomena. Starting from basic theory of linear systems, introduces qualitative analysis of nonlinear ordinary differential equations and maps. Examples from biomedical applications show concepts and methods.

BME 6905: Individual Work in Biomedical Engineering
Credits: 1-4 Max: 8 **Grading Scheme:** Letter

BME 6907: BME Project
Credits: 1-9 Max: 12 **Grading Scheme:** Letter
Prerequisite: BME MS non-thesis status.

BME 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

BME 6936: Biomedical Engineering Seminar
Credits: 1 Max: 4 **Grading Scheme:** S/U

BME 6938: Special Topics in Biomedical Engineering
Credits: 1-4 Max: 6 **Grading Scheme:** Letter

BME 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

BME 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

BME 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

BME 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

BOT 5225C: Plant Anatomy
Credits: 4 **Grading Scheme:** Letter
Prerequisite: BOT 2011C or 3303C; or consent of instructor.
Origin, structure, and function of principal cells, tissues, and vegetative and reproductive organs of seed plants. Offered fall term.

BOT 5305: Paleobotany
Credits: 3 **Grading Scheme:** Letter
Prerequisite: upper-level course in botany or geology; or consent of instructor.
Comparative study of plants through geologic time with attention to morphology and evolution of major groups of land plants, based on the fossil record. Offered spring term in odd-numbered years.

BOT 5505C: Intermediate Plant Physiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BOT 3503/3503L and CHM 2200/2200L or equivalent.
Fundamental processes underlying water relations, metabolism, growth, and reproduction of plants. Overview of plant physiological and biochemical processes for plant science students. Basic information about plant processes integrated with agronomical and environmental considerations.

BOT 5625: Plant Geography
Credits: 2 **Grading Scheme:** Letter
Prerequisite: BOT 3151C or BOT 5725C.
Geography of the floras and types of vegetation throughout the world, with emphasis on problems in the distribution of taxa, and the main factors influencing types of vegetation. Offered fall term in even-numbered years.

BOT 5655C: Physiological Plant Ecology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: basic plant physiology or consent of instructor.
Traits affecting success in different environments (emphasizing energy balance, carbon balance, water relations, and nutrient relations). Introduction to ecophysiological methods and instrumentation. Offered fall term in even-numbered years.

BOT 5685C: Tropical Botany
Credits: 5 **Grading Scheme:** Letter
Prerequisite: elementary biology/botany; consent of instructor.
Study of tropical plants using the diverse habitats of South Florida (emphasizing uses, anatomy and morphology, physiology and ecology, and systematics of these plants). Field trips and the Fairchild Tropical Garden supplement laboratory experiences. Offered summer term.

BOT 5695C: Ecosystems of Florida
Credits: 3-4 **Grading Scheme:** Letter
Prerequisite: basic ecology; and consent of instructor.
Major ecosystems of Florida in relation to environmental factors and human effects. Emphasis on field trips (Saturdays and some overnights). Offered spring term in odd-numbered years.

BOT 5725C: Taxonomy of Vascular Plants
Credits: 4 **Grading Scheme:** Letter
Prerequisite: BOT 2011C and 3303C or equivalent.
Introduction to systematic principles and techniques used in classification; field and herbarium methods. Survey of vascular plants, their classification, morphology, and evolutionary relationships. Offered spring term in odd-numbered years.

BOT 6516: Plant Metabolism
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BOT 5505C, BCH 4024.
Metabolism of carbohydrates, fats, and nitrogen compounds in higher plants; cell structures as related to metabolism; metabolic control mechanisms. Offered fall term.

BOT 6566: Plant Growth and Development
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BOT 5505C.
Fundamental concepts of plant growth and development with emphasis on the molecular biological approach. Offered fall term in even-numbered years.

BOT 6716C: Advanced Taxonomy
Credits: 2 **Grading Scheme:** Letter
Prerequisite: BOT 5725C or equivalent.
Survey of vascular plant families of limited distribution and/or of phylogenetic significance not covered in BOT 5725C. Discuss their classification, morphology, and evolutionary relationships. Review published studies to demonstrate principles and methods involved in classification. Offered on demand.

BOT 6726C: Principles of Systematic Biology
Credits: 4 **Grading Scheme:** Letter
Theory of biological classification and taxonomic practice. Laboratory experience in taxonomic procedures and techniques, including computer methods. Offered spring term in even-numbered years.

BOT 6905: Individual Studies in Botany
Credits: 1-9 **Max: 9** **Grading Scheme:** Letter

All credits in excess of 3 must be approved by department chair or graduate coordinator. Individual nonthesis, research problem in one of the following areas of botany: ecology, physiology and biochemistry, cryptogamic botany, morphology and anatomy of vascular plants, systematics, cytology, genetics, and ultrastructure. Topics selected to meet the interests and needs of students.

BOT 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

BOT 6927: Advances in Botany
Credits: 1-3 Max: 9 Grading Scheme: Letter
Supervised study in specific areas.

BOT 6935: Special Topics
Credits: 1-4 Max: 9 Grading Scheme: Letter

BOT 6936: Graduate Student Seminar
Credits: 1-2 Max: 9 Grading Scheme: S/U
Readings and oral presentation on general topics in botany.

BOT 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

BOT 6943: Internship in College Teaching
Credits: 1-6 Max: 6 Grading Scheme: Letter
Required for Master of Science in Teaching candidates but available for students needing additional practice and direction in college-level teaching.

BOT 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

BOT 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

BOT 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

BUL 5445: Ethical Role of the Manager
Credits: 1 Grading Scheme: Letter
Meeting the responsibilities of being entrusted with resources to manage.

BUL 5810: Legal Environment of Business
Credits: 3 Grading Scheme: Letter
American legal system, sources of law, adjudication, legal nature of corporation, major areas of state and federal corporate law, state and federal regulation of business, legal aspects of ethical and social responsibility of business; intellectual property, employment law, torts and contracts.

BUL 5811: Managers and Legal Environment of Business
Credits: 2 Grading Scheme: Letter
Designed for M.B.A. students. Law governing relationships with corporation and between corporation and social, political, and ethical environment. Business and the Constitution, litigation and dispute resolution, agency and forms of business organization, state and federal regulation of corporations and securities.

BUL 5831: Commercial Law
Credits: 3 Grading Scheme: Letter
Prerequisite: BUL 4310.Primarily for students in M.Acc. program.

Contracts for sale of goods and services, documents of title, secured transactions, negotiable instruments, commercial paper, payment systems, bankruptcy, and related subjects. Emphasis on Uniform Commercial Code, federal bankruptcy act, and other federal and uniform state laws.

BUL 5832: Commercial Law for Accountants
Credits: 2 **Grading Scheme:** Letter
Prerequisite: level 5—M.Acc.
Legal ramifications of business transactions. Basic transactional areas to be studied include contracts, sales, and secured transactions. Brief review of accountants' legal liability.

BUL 6440: Business Ethics and Corporation Social Responsibility
Credits: 3 **Grading Scheme:** Letter
Practical issues of managers in addressing ethical and moral problems; emphasis on critical thinking skills and developing an analytical framework for thinking about business ethical problems.

BUL 6441: Business Ethics and Corporate Social Responsibility
Credits: 2 **Grading Scheme:** Letter
Designed for advanced master's students in business administration. Ethical issues managers face in business organizations.

BUL 6516: Law of Real Estate Transactions
Credits: 2 **Grading Scheme:** Letter
Introduction to legal aspects, including basic concepts or real estate law, landlord-tenant relations, commercial leasing, multi-unit real estate interests, real estate finance, and sale of real estate. Analysis of legal aspects of real estate development, including impact of zoning and environmental laws, land improvement, and real estate syndication.

BUL 6652: Law and Ethics of Corporate Governance
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BUL 5810 or BUL 5811.
Law and ethics underlying and governing the structure and operation of business corporations in the U.S. and other industrial countries.

BUL 6821: Cyberlaw and Ethics
Credits: 2 **Grading Scheme:** Letter
Critical legal and ethical underpinnings of electronic commerce and electronic business on the internet. Governmental approach to content control; commercial and personal information rights; access; jurisdiction; digital property; national and international issues in securities law, antitrust, fraud, financial crime, negligence, and encryption areas.

BUL 6841: Employment Law
Credits: 2 **Grading Scheme:** Letter
Designed for master's students in business. Law related to employment and employees in business organizations.

BUL 6851: International Business Law
Credits: 3 **Grading Scheme:** Letter
Designed for M.B.A. students. Legal aspects of managing the international business environment.

BUL 6852: International Business Law
Credits: 2 **Grading Scheme:** Letter
Designed for M.B.A. students. Legal aspects of managing the international business environment.

BUL 6891: Legal Aspects of Technology Management
Credits: 2 **Grading Scheme:** Letter
Designed primarily for advanced master's students in business administration.> Legal aspects of managing and trading technology, especially law that governs development, protection, and transfer of firm's intellectual assets. Topics include patents, copyrights, trademarks, trade secrets, and other forms of intellectual property with applications to high technology and internet.

BUL 6905: Individual Work
Credits: 1-5 **Max: 10** **Grading Scheme:** Letter
Prerequisite: consent of instructor.

Reading and/or research in business law.

BUL 6930: Special Topics
Credits: 1-3 Max: 9 Grading Scheme: Letter
Prerequisite: consent of instructor.
Topics not offered in other courses and of special current significance.

CAP 5100: Human-Computer Interaction
Credits: 3 Grading Scheme: Letter
Prerequisite: COP 3530, and any one programming course (CGS 2414, CGS 3460, or CGS 3464).
Topics related to interaction with technology, including interface design, software tools, 3-D interaction, virtual environments, interaction devices, collaboration, and visualization.

CAP 5416: Computer Vision
Credits: 3 Grading Scheme: Letter
Prerequisite: MAC 2312, CGN 3421 or C-language.
Introduction to image formation and analysis. Monocular imaging system projections, camera model calibration, and binocular imaging. Low-level vision techniques, segmentation and representation techniques, and high-level vision.

CAP 5510: Bioinformatics
Credits: 3 Grading Scheme: Letter
Prerequisite: CIS 3020 or equivalent.
Basic concepts of molecular biology and computer science. Sequence comparison and assembly, physical mapping of DNA, phylogenetic trees, genome rearrangements, gene identification, biomolecular cryptology, and molecular structure prediction.

CAP 5515: Computational Molecular Biology
Credits: 3 Grading Scheme: Letter
Algorithms related to molecular biology. Sequence comparisons, pattern matching, pattern extraction, graph techniques in phylogeny construction, secondary structure prediction, multiple sequence alignment, contig search, DNA computing, computational learning theory, and genetic algorithms.

CAP 5635: Artificial Intelligence Concepts
Credits: 3 Grading Scheme: Letter
Prerequisite: COP 3530.
Heuristic search, game theory, knowledge representation, logic, machine learning, AI languages and tools. Applications such as planning, natural language understanding, expert systems, and computer vision.

CAP 5705: Computer Graphics
Credits: 3 Grading Scheme: Letter
Prerequisite: COP 3530.
Display device characteristics; system considerations, display algorithms. Curve and surface generation. Lighting models and image rendering.

CAP 5805: Computer Simulation Concepts
Credits: 3 Grading Scheme: Letter
Prerequisite: COP 3530.
Introduction to concepts in continuous and discrete simulation. Emphasizes fundamental concepts and methodology, using practical examples from a wide variety of disciplines.

CAP 6402: Aesthetic Computing
Credits: 3 Grading Scheme: Letter
Prerequisite: CAP 5705, CAP 5805
Principles of artistically motivated, personalized representations of formal model structures in computing and mathematics.

CAP 6516: Medical Image Analysis
Credits: 3 Grading Scheme: Letter
Prerequisite: expertise in image proc./comp. vision, proficiency in C language or MATLAB.

Image formation, reconstruction mathematics (Fourier slice theorem, Abel, Hankel and Radon transforms), PDE-based denoising and segmentation, multidimensional clustering algorithms, iso-surface extraction, basic differential geometry of curves and surfaces, multidimensional splines, active 2D/3D models, image matching/registration with application to multimodal co-registration.

CAP 6610: Machine Learning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Mathematics for Intelligent Systems.
Concepts in developing computer programs that learn and improve with experience. Emphasis on methods based on probability, statistics, and optimization.

CAP 6615: Neural Networks for Computing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CAP 5635.
Neural network models and algorithms. Adaptive behavior, associative learning, competitive dynamics and biological mechanisms. Applications include computer vision, cognitive information processing, control, and signal analysis.

CAP 6617: Advanced Machine Learning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CAP 6610.
Advanced concepts in developing computer programs that learn and improve with experience. Emphasis on methods based on probability, statistics, and optimization.

CAP 6685: Expert Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CAP 5635.
Production systems, meta-knowledge, heuristic discovery, indepth examination of several expert systems including TEIRESIAS, AM, DENDRAL, MYCIN, IRIS, CASNET, INTERNIST, BACON, PROSPECTOR.

CAP 6701: Advanced Computer Graphics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CAP 4730 or CAP 5705or consent of instructor.
Curved surface representations, representation and visualization of higher-dimensional fields, advanced rendering, collision detection and collision response, and scene navigation in context of high-level graphics environments.

CBH 6056: Comparative Psychology
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Survey of literature.

CCE 5035: Construction Planning and Scheduling
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CCE 4204.
Planning, scheduling, organizing, and control of civil engineering projects with CPM and PERT. Application of optimization techniques.

CCE 5405: Construction Equipment and Procedures
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CCE 4204 or consent of instructor.
Design and optimization of equipment systems for heavy construction.

CCE 6037: Civil Engineering Operations I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: graduate status.
Advanced construction engineering and management procedures at the project level to support quantitative decision making.

CCE 6038: Innovative Construction Techniques
Credits: 2 **Grading Scheme:** Letter
Prerequisite: CCE 4204 or consent of instructor.

Advanced construction engineering techniques and management coordination procedures for civil engineering projects.

CCE 6505: Computer Applications in Construction Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CGS 2425, CCE 5035, or consent of instructor.
Application of computer solutions to construction engineering/civil engineering management problems; microcomputer use.

CCE 6507: Computer Applications in Construction Engineering II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CGS 4161, CCE 6505 or consent of instructor.
Applications of advanced computer solutions to construction engineering/civil engineering management problems.

CCE 6516: Topics in Airborne Laser Mapping Technology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SUR 6381.
Laser mapping technology, current status of technology, data collection methodologies and requirements, data processing, calibration, errors, conversion to local datums, data base management, filtering techniques and bare earth DTM, product generation and application.

CCJ 5934: Contemporary Issues in Criminology and Law
Credits: 3 **Max: 12** **Grading Scheme:** Letter
Policy, theory, and research issues in crime, criminal justice, and law.

CCJ 6063: Communities and Crime
Credits: 3 **Grading Scheme:** Letter
Overview of issues in the study of communities and crime. Theories used to study neighborhood crime levels. Critical analysis of existing empirical research. Factors that influence neighborhood-level crime rates. Effects of neighborhood characteristics on behavior and outcomes of individuals.

CCJ 6285: Criminal Justice Process
Credits: 3 **Grading Scheme:** Letter
Police, courts, and the correction system.

CCJ 6619: Crime and the Life Course
Credits: 3 **Grading Scheme:** Letter
Intensive examination of crime and the life course. How criminal activity is patterned over time.

CCJ 6643: White Collar Crime
Credits: 3 **Grading Scheme:** Letter
White collar and corporate crime.

CCJ 6657: Alcohol, Drugs, and Crime
Credits: 3 **Grading Scheme:** Letter
Research and perspectives on drug and alcohol use.

CCJ 6658: Drugs, Crime, and Policy
Credits: 3 **Grading Scheme:** Letter
Interdisciplinary introduction to the study of drugs, drug use, and drug control.

CCJ 6705: Research Methods in Crime, Law, and Justice
Credits: 3 **Grading Scheme:** Letter
Research issues (qualitative, quantitative, and historical) associated with crime, law, and justice, including skills to become consumers and producers of research.

CCJ 6708: Research Issues in Crime and Deviance
Credits: 3 **Grading Scheme:** Letter
Overview of data sources and research methods used to study delinquency, crime, and deviance.

CCJ 6712: Evaluation Research
Credits: 3 **Grading Scheme:** Letter

Provides skills for evaluating criminology and criminal justice programs.

CCJ 6905: Independent Study
Credits: 1-3 Max: 6 Grading Scheme: Letter
Reading or research areas in criminology, law, and society. Topics not available in current courses.

CCJ 6910: Supervised Research
Credits: 1-3 Max: 3 Grading Scheme: S/U

CCJ 6920: Seminar in Criminological Theory
Credits: 3 Grading Scheme: Letter
Classic and contemporary explanations of criminal activity.

CCJ 6936: Proseminar in Crime, Law, and Justice
Credits: 3 Grading Scheme: Letter
Interdisciplinary examination of the relationship between legal and social orders. Focuses on various functions of law, different forms of legal thought, development of law, and the impact of law/sanctions on society.

CCJ 6971: Research for Master's Thesis
Credits: 1-9 Grading Scheme: S/U

CCJ 7742: Research Methods in Crime, Law, and Justice II
Credits: 3 Grading Scheme: Letter
Prerequisite: CCJ 6705.
Quantitative and qualitative methods.

CCJ 7921: Professional Development in Criminology, Law, and Society
Credits: 3 Grading Scheme: S/U
Professional aspects of research, teaching, and service activities in the areas of crime, justice, law, and society.

CCJ 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

CCJ 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

CDA 5155: Computer Architecture Principles
Credits: 3 Grading Scheme: Letter
Prerequisite: CDA 3101, COP 3530, and COP 4600.
Fundamental design issues of processor and computer architecture, a variety of design approaches for CPU, memory, and system structure.

CDA 5636: Embedded Systems
Credits: 3 Grading Scheme: Letter
Prerequisite: CDA 3101, COP 3530, and any one programming course (CGS 2414, CGS 3460, or CGS 3464).
Design and verification of embedded systems including system level modeling/specification, design space exploration, hardware-software partitioning, architecture synthesis, compilation for area/power/performance code compression, real-time operating systems/databases, and functional validation of embedded systems.

CDA 6156: High Performance Computer Architecture
Credits: 3 Grading Scheme: Letter
Prerequisite: CDA 5155, COP 5615.
Design and evaluation of instruction-level (superscalar, superpipeline) and task-level (fine and coarse-grained) parallel architecture. Language and operating system support for instruction and task scheduling and task synchronization.

CEG 5105: Geotechnical Engineering
Credits: 3 Grading Scheme: Letter

Prerequisite: consent of instructor.
Shallow foundations, bearing capacity, settlements, deep foundations, pile testing, earth pressures, excavations, retaining structures, dewatering.

CEG 5114: Advanced Geotechnical Aspects of Landfill Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CEG 4012 or consent of instructor.
Settlement analysis, slope stability, liner design, and LCRS design.

CEG 5115: Foundation Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CEG 4012, CES 4702, or consent of instructor.
Investigations, bearing capacity, and the analysis and design of shallow footings, walls, and deep pile foundations.

CEG 5205C: Insitu Measurement of Soil Properties
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CEG 4012.
Methods of soil exploration; techniques of soil sampling and insitu testing; field performance of insitu testing.

CEG 5206: Geosensing I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
History of geodetic science as applied to earth's shape, local and world reference frames, gravity and anomalies, geoid, satellite geodesy and GPS, geodetic positioning, and navigation by satellite technology.

CEG 5805: Ground Modification Design
Credits: 2 **Grading Scheme:** Letter
Prerequisite: CEG 4012, CGS 2425.
Introduction to design of ground modification techniques for improvement of marginal construction sites.

CEG 6015: Advanced Soil Mechanics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CEG 4011, 4012, or consent of instructor.
Nature and origin of soil. Stresses within a soil body. Stress-strain behavior and shear strength of dry, saturated no flow, saturated transient flow soils.

CEG 6116: Advanced Shallow Foundation Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CEG 6015, CES 4702.
Application of soil mechanics to design and analysis of shallow foundations.

CEG 6117: Advanced Deep Foundation Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CEG 6015.
Application of soil mechanics to design and analysis of deep foundations.

CEG 6201: Experimental Determination of Soil Properties
Credits: 3 **Grading Scheme:** Letter, H
Prerequisite: CEG 4012 or consent of instructor.
Advanced laboratory tests, constant rate of strain consolidation, factors influencing stress-deformation response, elastic-plastic constitutive relationships, failure criteria.

CEG 6207: Geosensing II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CCE 5206.
Introduction to satellite positioning technologies; advancement in global positioning system, reference frames, orbits, and GPS observables; errors and positioning with GPS; static and phase-differenced kinematic GPS for precise aircraft trajectory.

CEG 6405: Seepage and Drainage Problems in Geotechnical Engineering

Credits: 2 **Grading Scheme:** Letter
Prerequisite: CEG 4011, 4012, or consent of instructor.
Darcy's law, coefficient of permeability, flownets, seepage forces. Engineering applications-dewatering systems, slope stability, filter design, earth dams, drainage.

CEG 6505: Numerical Methods of Geomechanics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CGN 3421, CEG 6015 or consent of instructor.
Application of computer solutions to geotechnical engineering problems.

CEG 6515: Earth Retaining Systems and Slope Stability
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CEG 6015
Applications of soil mechanics to design and analysis of earth retaining systems and slope stability.

CEN 5035: Software Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CIS 3020 and COT 3100.
Topics in projects organization, specification techniques, reliability measurement, documentation.

CEN 6070: Software Testing and Verification
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CEN 5035.
Concepts, principles, and methods for software testing and verification. Topics include human and machine-based testing strategies, formal proofs of correctness, and software reliability.

CEN 6075: Software Specification
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CEN 5035.
Concepts, principles, and methods for practical specification. System modeling, requirements exploration, validation and prototyping, and documentation techniques.

CES 5010: Probabilistic and Stochastic Methods in Civil Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 3102 or equivalent.
Fundamental aspects of uncertainty and their roles in determining system reliability. Probability and statistics, stochastic processes, random data analysis, and reliability methods.

CES 5116: Finite Elements in Civil Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 4141.
Introduction to finite elements, use of finite element concepts for structural analysis. Application of 1-, 2-, and 3-D elements of structural problems.

CES 5325: Design of Highway Bridges
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 4605, 4702.
Analysis by influence lines, slab and girder bridges, composite design, prestressed concrete, continuity, arch bridges, design details, highway specifications.

CES 5606: Topics in Steel Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 4605.
Plate girders, torsion, biaxial bending, frame design, composite beams and columns, fatigue, monosymmetric members, and moment connections.

CES 5607: Behavior of Steel Structures
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 4605.

Plastic analysis and designs of beams and frames. Buckling and stability problems. Shear and torsion.

CES 5715: Prestressed Concrete
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 4702.
Analysis and design of prestressed concrete flexural members; pre- and post-tensioned construction, allowable stress, strength evaluation; design for bending moments and shear; evaluation of serviceability requirements; design of simple bridges.

CES 5726: Design of Concrete Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 4141 and 4702.
Strength design of building systems (frames and shear walls), torsion floor systems, biaxial moment in columns, load systems.

CES 5801: Design and Construction in Timber
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Analysis and design of beams, columns, connections, and diaphragm/shearwall structures using sawn timber, laminated timber, and plywood and including a comprehensive design project.

CES 5835: Design of Reinforced Masonry Structures
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 4702.
Properties, specifications, and construction requirements for structures incorporating clay brick, concrete block, and mortar; analysis and design of masonry structures including a comprehensive diaphragm/shearwall masonry structure design project.

CES 6106: Advanced Structural Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 4605, 4702.
Traditional methods of analyses for forces and deformations; modern matrix methods including the direct stiffness method.

CES 6108: Structural Dynamics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 3400, CES 6106.
Evaluating structural response to the effect of dynamic loads for single-degree and multidegree of freedom systems. Considers seismic and wind effects, modal analysis, numerical methods, structural idealization, response spectra, and design codes.

CES 6165: Computer Methods in Structural Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CGS 2425, 6106.
Modern program development techniques for structural analysis. Efficiency, databases, modularity, equation solving, and substructure programming concepts.

CES 6551: Design of Folded Plates and Shells
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 4605, 4702.
Bending of systems of plates. Analysis for membrane stresses; pressure vessels, secondary bending stresses. Design of shell systems and folded plates. Design details.

CES 6571: Design of Temporary Structures
Credits: 3 **Grading Scheme:** Letter
Introduction to structural engineering principles in the design of temporary structures and operations used in the construction of permanent structures.

CES 6585: Wind Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 3102 and CWR 3201 or equivalent.
The nature of wind related to wind-structure interaction and design loads for extreme winds, tornadoes and hurricanes.

CES 6706: Advanced Reinforced Concrete

Credits: 3 **Grading Scheme:** Letter
Prerequisite: CES 4704, 5726C.
Torsion in structural members. Ultimate load theories and application to design. Columns and beam columns. Shear walls, combined shear walls and frames. Research topics.

CES 6855: Condition Assessment of Structures
Credits: 3 **Grading Scheme:** Letter
Testing techniques for assessing the condition of existing structures. Focuses on material damage and durability.

CGN 5125: Legal Aspects of Civil Engineering
Credits: 3 **Grading Scheme:** Letter
Engineer's view of contracts for design and construction. Legislation and policy affecting labor-management relationships in construction.

CGN 5135: Project Optimization Using Value Engineering and TQM
Credits: 3 **Grading Scheme:** Letter
Total quality management methods applied to traditional value engineering theory for optimization of engineering projects. Function analysis systems techniques (FAST), constructability, front-end-planning, agreement matrix, life cycle costing, and statistical methods for process control.

CGN 5315: Civil Engineering Systems
Credits: 3 **Grading Scheme:** Letter
Civil engineering applications of operations research techniques, models of scheduling, linear programming, queuing theory, and simulation.

CGN 5605: Public Works Planning
Credits: 3 **Grading Scheme:** Letter
Functional approach to planning and implementing public works needs with emphasis on role of engineer.

CGN 5606: Public Works Management
Credits: 3 **Grading Scheme:** Letter
Nature of profession, duties, and administrative responsibilities. Organization and management of operating divisions with emphasis on role of engineer.

CGN 5715: Experimentation and Instrumentation in Civil Engineering Materials Research
Credits: 3 **Grading Scheme:** Letter
Fundamentals and applications of testing and measuring systems commonly used; constitutive models, testing methods, instrumentation, and error analysis.

CGN 6150: Engineering Project Management
Credits: 3 **Grading Scheme:** Letter
Engineering project management skills and procedures in support of engineering project development and management.

CGN 6155: Civil Engineering Practice I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate status.
Advanced construction engineering management skills and procedures in support of design and construction practice at the project level.

CGN 6156: Construction Engineering II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CCE 4204 or consent of instructor.
Advanced construction engineering management skills and procedures in support of design and construction practice above the project level.

CGN 6505: Properties, Design and Control of Concrete
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CGN 3501.

Portland cement and aggregate properties relating to design, control, and performance of concrete. Concrete forming and construction methods. Laboratory testing and analysis.

CGN 6506: Bituminous Materials
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TTE 4811.
Analysis of strength and deformation mechanism for asphalt concrete, properties, and their effect on flexible pavement performance. Pavement construction and quality assurance methods, testing and evaluation of asphalts and mixture.

CGN 6905: Special Problems in Civil Engineering
Credits: 1-6 Max: 10 **Grading Scheme:** Letter
Studies in areas not covered by other graduate courses.

CGN 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U
Credits do not apply to any graduate degree.

CGN 6936: Civil Engineering Graduate Seminar
Credits: 1 Max: 6 **Grading Scheme:** S/U
Lectures by graduate students, faculty members, and invited speakers.

CGN 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U
Credits do not apply to any graduate degree.

CGN 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

CGN 6972: Research for Engineer's Thesis
Credits: 1-15 **Grading Scheme:** S/U

CGN 6974: Master of Engineering or Engineer Degree Report
Credits: 1-6 Max: 6 **Grading Scheme:** S/U
Individual work culminating in a professional practice-oriented report suitable for the requirements of the Master of Engineering or Engineer degree. Three credits only are applicable toward the requirements of each degree.

CGN 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

CGN 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

CHM 5224: Basic Principles for Organic Chemistry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: one year of undergraduate organic chemistry.
A review for those students intending to enroll in the Advanced Organic Sequence CHM 6225, CHM 6226.

CHM 5235: Organic Spectroscopy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 2211.
Advanced study of characterization and structure proof of organic compounds by special methods, including IR, UV, NMR, and mass spectrometry.

CHM 5275: The Organic Chemistry of Polymers
Credits: 2 **Grading Scheme:** Letter
Prerequisite: CHM 2200, 2210, or equivalent.

Classification of polymerization types and mechanisms from a mechanistic organic point of view. The structure of synthetic and natural polymers and polyelectrolytes. Reaction of polymers. Practical synthetic methods of polymer preparation.

CHM 5305: Chemistry of Biological Molecules
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 2211 and 4412.
Mechanistic organic biochemistry. Emphasis on model systems, enzyme active sites, and physical and organic chemistry of biomacromolecules.

CHM 5413L: Advanced Physical Chemistry Laboratory
Credits: 2 **Grading Scheme:** Letter
Prerequisite: CHM 4411L.
Techniques used in experimental research; techniques of design and fabrication of scientific apparatus. Advanced experiments involving optical, electronic, and high vacuum equipment.

CHM 5511: Physical Chemistry of Polymers
Credits: 2 **Grading Scheme:** Letter
Prerequisite: CHM 4411 or equivalent.
Structure, configuration, conformation, and thermodynamics of polymer solutions, gels, and solids. Thermal, mechanical, optical, and rheological properties of plastics and rubbers.

CHM 6036: Chemical Biology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Admission to the graduate program and CHM 5305 (Bioorganic Chemistry), or permission of the professor.
In depth examination of current research directions in the field of chemical biology. Topics covered include aptamers, chemical synthesis of proteins, in vitro incorporation of unnatural amino acids into proteins, directed evolution of enzymes, natural product discovery and their biosynthesis mechanisms, chemically synthesized small-molecule libraries, chemical genetics, chemical screening, and target identification.

CHM 6037: Chemical Biology and Biochemistry Seminar
Credits: 1 Max: 12 **Grading Scheme:** S/U
Prerequisite: Admission into the graduate program
Weekly seminar series from graduate students and outside speakers in chemical biology/biochemistry areas. Attendance and participation of graduate students required.

CHM 6153: Electrochemical Processes
Credits: 3 **Grading Scheme:** Letter
Principles of electrochemical methods, ionic solutions, and electrochemical kinetics.

CHM 6154: Chemical Separations
Credits: 3 **Grading Scheme:** Letter
Theory and practice of modern separation methods with emphasis on gas and liquid chromatographic techniques.

CHM 6155: Spectrochemical Methods
Credits: 3 **Grading Scheme:** Letter
Principles of atomic and molecular spectrometric methods; discussion of instrumentation, methodology, applications.

CHM 6158C: Electronics and Instrumentation
Credits: 1-4 Max: 6 **Grading Scheme:** Letter
Principles of operation of instruments, optimization of instrumental conditions, and interpretation of instrumental data for qualitative and quantitative analysis.

CHM 6159: Mass Spectrometric Methods
Credits: 3 **Grading Scheme:** Letter
Modern spectrometry including fundamentals, instrumentation, and analytical applications.

CHM 6165: Chemometrics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.

Analytical method, information theory, and chemometrics, including statistical data analysis, heuristic and non-heuristic data analysis (pattern recognition and artificial intelligence), and experimental design and optimization.

CHM 6180: Special Topics in Analytical Chemistry
Credits: 1-3 Max: 9 Grading Scheme: Letter
Prerequisite: two courses of graduate level analytical chemistry.
Lectures or conferences covering selected topics of current interest in analytical chemistry.

CHM 6190: Analytical Chemistry Seminar
Credits: 1 Max: 20 Grading Scheme: Letter, S/U
Attendance required of graduate majors in the analytical area. graduate course in analytical chemistry. Presentation of one seminar.

CHM 6225: Advanced Principles of Organic Chemistry
Credits: 4 Grading Scheme: Letter
Prerequisite: CHM 2211.
Principles of organic chemistry and their application to reaction mechanisms.

CHM 6226: Advanced Synthetic Organic Chemistry
Credits: 3 Grading Scheme: Letter
Prerequisite: CHM 6225.
Discussion and application of synthetic methodology.

CHM 6227: Topics in Synthetic Organic Chemistry
Credits: 2 Grading Scheme: Letter
Prerequisite: CHM 6226.
Synthesis of complex organic molecules, with emphasis on recent developments in approaches and methods.

CHM 6251: Organometallic Compounds
Credits: 3 Grading Scheme: Letter
Properties of organometallic compounds, the nature of the carbon-metal bond, compounds of metals in groups 1, 2, 3, and 4, and transition metals.

CHM 6271: The Chemistry of High Polymers
Credits: 2 Grading Scheme: Letter
Fundamental polymer chemistry, with emphasis on the mechanisms of polymerization reactions and the relationship of physical properties to chemical constitution.

CHM 6301: Enzyme Mechanisms
Credits: 3 Grading Scheme: Letter
Principles of enzyme structure; isolation and purification; physical chemistry of enzyme/substrate interactions; general overview of classes; transition state theory and catalysis; types of chemical catalysis; survey of cofactors; example mechanisms; catalytic antibodies; ribozyme structure and catalysis.

CHM 6302: Chemistry and Biology of Nucleic Acids
Credits: 3 Grading Scheme: Letter
Principles of nucleic acid structure and function; protein/nucleic acid interactions with particular emphasis on transcriptional regulators and DNA and RNA polymerases; chemistry of phosphate hydrolysis and its application to enzyme mechanisms; evolution of novel RNA molecules capable of specific binding and catalysis.

CHM 6303: Methods in Computational Biochemistry and Structural Biology
Credits: 3 Grading Scheme: Letter
Modeling and protein structures enzyme reaction mechanisms using empirical as well as quantum-mechanical methods.

CHM 6306: Special Topics in Biological Chemistry Mechanisms
Credits: 3-6 Max: 9 Grading Scheme: Letter
Molecular evolution, bioinformatics and protein structure prediction, principles of molecular recognition, rational protein design, biotechnology, reengineered organisms, advanced biophysical techniques, and computational biology.

CHM 6381: Special Topics in Organic Chemistry

Credits: 1-3 Max: 9 Grading Scheme: Letter
Prerequisite: CHM 6225, CHM 6226.
Chemistry of selected types of organic compounds, such as alkaloids, carbohydrates, natural products, steroids.

CHM 6390: Organic Chemistry Seminar Presentation
Credits: 1 Max: 20 Grading Scheme: Letter
Attendance required of graduate majors in the organic area. Presentation of one seminar.

CHM 6391: Organic Chemistry Seminar Discussion
Credits: 1 Max: 10 Grading Scheme: S/U
Prerequisite: graduate standing.
Attendance at weekly seminars reporting current advances in organic chemistry.

CHM 6430: Chemical Thermodynamics
Credits: 3 Grading Scheme: Letter
Energetics, properties of ideal and nonideal systems primarily from the standpoint of classical thermodynamics.

CHM 6461: Statistical Thermodynamics
Credits: 3 Grading Scheme: Letter
Prerequisite: CHM 6430.
Fundamental principles with applications to systems of chemical interest.

CHM 6470: Chemical Bonding and Spectra I
Credits: 3 Grading Scheme: Letter
Basic methods and applications of quantum chemistry; atomic structure; chemical bonding in diatomic and polyatomic molecules. Brief introduction to molecular spectroscopy.

CHM 6471: Chemical Bonding and Spectra II
Credits: 3 Grading Scheme: Letter
Prerequisite: CHM 6470.
Theory of symmetry and its chemical applications; semi-empirical molecular orbital treatment of simple inorganic and organic molecules; further applications to inorganic and organic chemistry.

CHM 6480: Elements of Quantum Chemistry
Credits: 3 Grading Scheme: Letter
Prerequisite: CHM 6471.
Brief treatment of the Schrodinger equation, followed by a survey of applications to chemical problems.

CHM 6490: Theory of Molecular Spectroscopy
Credits: 3 Grading Scheme: Letter
Coreq: CHM 6471. Molecular energy levels, spectroscopic selection rules; rotational, vibrational, electronic, and magnetic resonance spectra of diatomic and polyatomic molecules.

CHM 6520: Chemical Physics
Credits: 3 Grading Scheme: Letter
Prerequisite: CHM 6470 or consent of instructor. Identical to PHZ 6247.
Topics from the following: intermolecular forces; molecular dynamics; electromagnetic properties of molecular systems; solid surfaces; theoretical and computational methods.

CHM 6580: Special Topics in Physical Chemistry
Credits: 1-3 Max: 12 Grading Scheme: Letter
Lecture or conferences covering selected topics of current interest in physical chemistry.

CHM 6586: Computational Chemistry
Credits: 3 Grading Scheme: Letter
Prerequisite: undergraduate physical chemistry.
Software for computational chemistry; model building and molecular mechanics; molecular orbitals and electronic structure; optical, infrared, and magnetic resonance spectra; solvation effects and molecular dynamics; building large systems.

CHM 6590: Physical Chemistry Seminar

Credits: 1 Max: 20 Grading Scheme: S/U
Attendance required of graduate majors in physical chemistry. graduate course in physical chemistry. Presentation of one seminar.

CHM 6620: Advanced Inorganic Chemistry I
Credits: 3 Grading Scheme: Letter
Crystalline state; covalent bonding; acids, bases, and solvents, nonmetallic compounds of Groups II through VII with emphasis on structure and reactivity.

CHM 6621: Advanced Inorganic Chemistry II
Credits: 3 Grading Scheme: Letter
Prerequisite: CHM 6620.
Electronic structure of metals and transition metal complexes; solution chemistry and reaction mechanisms at metal centers; redox reactions; introduction to organometallic and bioinorganic chemistry.

CHM 6626: Applications of Physical Methods in Inorganic Chemistry
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate standing or consent of instructor.
Principles and applications of spectroscopic methods to the solution of inorganic problems. Those techniques used most extensively in current inorganic research are treated.

CHM 6628: Chemistry of Solid Materials
Credits: 3 Grading Scheme: Letter
Structure and properties of solids; semiconductors and superconductors.

CHM 6670: Inorganic Biochemistry
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate standing or consent of instructor.
Role of elements in biology. Modern spectroscopic and physical methods for study of Group I and II metals, metalloenzymes, metal ion transport and storage, functions of nonmetals in biochemical systems, and biomedical/biotechnical applications of metals.

CHM 6680: Special Topics in Inorganic Chemistry
Credits: 1-3 Max: 12 Grading Scheme: Letter
Lectures or conferences on selected topics of current research interest in inorganic chemistry.

CHM 6690: Inorganic Chemistry Seminar
Credits: 1 Max: 20 Grading Scheme: Letter, S/U
Attendance required of graduate majors in inorganic chemistry. graduate course in inorganic chemistry. Presentation of one seminar.

CHM 6720: Chemical Dynamics
Credits: 3 Grading Scheme: Letter
Basic concepts of rate laws, collision theory, and transition state theory; an introduction to reaction dynamics, structural dynamics, and quantitative structure-reactivity correlations.

CHM 6905: Individual Problems, Advanced
Credits: 1-5 Max: 10 Grading Scheme: Letter, S/U
Prerequisite: consent of faculty member supervising the work.
Double registration permitted. Assigned reading program or development of assigned experimental problem.

CHM 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

CHM 6934: Advanced Topics in Chemistry
Credits: 1 Max: 8 Grading Scheme: S/U
Prerequisite: consent of instructor.
Discussion and evaluation of chemical research advances reported in current chemical literature. S/U

CHM 6935: Chemistry Colloquium

Credits: 1 Max: 7 Grading Scheme: S/U
Topics presented by visiting scientists and local staff members.

CHM 6943: Internship in College Teaching
Credits: 2, 4, 6 Max: 6 Grading Scheme: Letter
Prerequisite: graduate standing.
Required for Master of Science in Teaching students but available for students needing additional practice and direction in college-level teaching.

CHM 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

CHM 7485: Special Topics in Theory of Atomic and Molecular Structure
Credits: 1-3 Max: 9 Grading Scheme: Letter
Prerequisite: PHZ 6426 or equivalent.
Mathematical techniques used in atomic, molecular, and solid-state theory. The one-electron approximation and the general quantum-mechanical manybody problems. Selected advanced topics.

CHM 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

CHM 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

CHS 5110L: Radiochemistry Laboratory
Credits: 3 Grading Scheme: Letter
Prerequisite: CHM 3120 and 3400 or 4412, or consent of instructor.
Radioactivity detection, radiochemical separations and analyses, radiochemistry laboratory techniques, the practice of radiological safety, and tracer applications of radioisotopes in chemistry and other fields.

CIS 6905: Individual Study
Credits: 1-3 Max: 6 Grading Scheme: Letter, S/U
Prerequisite: consent of faculty member supervising the study.

CIS 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: graduate status in CIS.

CIS 6930: Special Topics in CIS
Credits: 3 Max: 9 Grading Scheme: Letter
Prerequisite: vary depending on topics.

CIS 6935: Graduate Seminar
Credits: 1 Max: 12 Grading Scheme: S/U
Presentations by visiting researchers, faculty members, and graduate students.

CIS 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: graduate status in CIS.

CIS 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

CIS 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U

Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

CIS 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

CJC 6120: Corrections and Public Policy
Credits: 3 **Grading Scheme:** Letter
Issues associated with corrections and public policy. Incarceration, community corrections, and probation.

CJL 6039: Law and Society
Credits: 3 **Grading Scheme:** Letter
Interdisciplinary examination of relationship between legal and social orders. Focuses on various functions of law, different forms of legal thought, development of law, and the impact of law/sanctions on society.

CJL 6089: Humanitarian Law
Credits: 3 **Grading Scheme:** Letter
Concepts and rules dealing with human rights law of armed conflict.

CJL 6090: Law and Social Science
Credits: 3 **Grading Scheme:** Letter
The interface between law and knowledge from various social scientific disciplines, including psychology, sociology, history, and anthropology.

CJL 6091: Anthropology of Law
Credits: 3 **Grading Scheme:** Letter
The nature of law cross-culturally and cross-nationally. Relationships with various forms of socioeconomic and political organization.

CJL 6095: Human Rights in Cultural Context
Credits: 3 **Grading Scheme:** Letter
The nature of human rights cross-culturally. History of the concept, its development, universalism vs. cultural particularism, religion, gender, and human rights in peace and in war.

CLA 6125: Augustan Age
Credits: 3 **Grading Scheme:** Letter
Prerequisite: B.A. in classics.
In-depth investigation of history, political organization, literature, and society of Augustan Rome.

CLA 6515: Roman Dynasty: Nero and the Julio-Claudians
Credits: 3 **Grading Scheme:** Letter
Prerequisite: B.A. in classics or Latin.
In-depth investigation of the history, political organization, literature, social customs, and architecture of early Imperial Rome (14-68 A.D.).

CLA 6795: Greek and Roman Archeology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: B.A. in classics or related field.
Grounding in monuments of ancient Greece and Roman, and history and methodology of classical archeology.

CLA 6805: The Classical Research Tradition
Credits: 3 **Grading Scheme:** Letter
Research methods in the classics.

CLA 6885: Roman Law and Society
Credits: 3 **Grading Scheme:** Letter
Survey of Roman law with special attention to constitutional history and judicial practice in context of conceptual development of civil law (person, property, succession, contract, delict).

CLA 6895: Athenian Law and Society
Credits: 3 **Grading Scheme:** Letter
Prerequisite: B.A. in classics or related field.
Comprehensive assessment of structures of classical Athens, offering detailed study of Athenian law, constitution, society, gender relations, and culture. Ancient life linked with modern debate on similar issues.

CLA 6905: Individual Work
Credits: 2-4 Max: 10 **Grading Scheme:** Letter
Readings and reports in Classical civilization.

CLA 6930: Greece and the Near East
Credits: 3 Max: 9 **Grading Scheme:** Letter
Rotating topics concerning political, economic, diplomatic, and cultural interaction between Greek world and its neighbors in the East.

CLP 5316: Health Psychology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PSY 2013.
Examines relationships among health and behavior in the assessment, treatment, prevention, and rehabilitation of health problems. Review of clinical health psychology with implications for other disciplines.

CLP 5426: Introduction to Neuropsychology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PSY 2013, CLP 3144.
Overview of clinical and experimental data on brain-cognition relationships in humans.

CLP 6169: Seminar: Psychology and Deviant Behavior
Credits: 3 Max: 6 **Grading Scheme:** Letter
Analysis of specific deviant behaviors, with emphasis on theory and research related to diagnosis and clinical management.

CLP 6304: Psychological Foundations of Clinical Psychology I
Credits: 2-3 Max: 3 **Grading Scheme:** Letter
History and systems of psychology, social psychology, developmental psychology, and cognitive psychology foundations of clinical psychology.

CLP 6307: Human Higher Cortical Functioning
Credits: 3 **Grading Scheme:** Letter
Models that explain linkages between brain and behavior. Focus on both functions and dysfunctions.

CLP 6308: Psychological Foundations of Clinical Psychology II
Credits: 2-3 Max: 3 **Grading Scheme:** Letter
Prerequisite: CLP 6304.
Continuation of CLP 6304.

CLP 6309: Psychological Foundations of Clinical Psychology III
Credits: 2-3 Max: 3 **Grading Scheme:** Letter
Prerequisite: CLP 6308.
Continuation of CLP 6308.

CLP 6344C: Lifespan Foundations of Behavioral Health and Illness I
Credits: 4 **Grading Scheme:** Letter
Prerequisite: admission to CLP.
Theoretical and research foundations of behavioral health and illness using lifespan perspective. Integration of topics of personality, stress and coping, psychopathology, and fundamentals of health psychology.

CLP 6345: Lifespan Foundations of Behavioral Health and Illness II
Credits: 4 **Grading Scheme:** Letter
Prerequisite: CLP 6344C.
Continuation of CLP 6344C.

CLP 6375: Introduction to Clinical Psychology
Credits: 1-3 Max: 3 Grading Scheme: Letter
Prerequisite: admission to CLP.
Seminar on issues and concepts concurrent with field observation and participation.

CLP 6407: Psychological Treatment I
Credits: 3 Grading Scheme: Letter
Prerequisite: admission to CLP or consent of instructor.
Current dynamic and personality theories, practices, and related research in psychotherapy.

CLP 6417: Psychological Treatment II
Credits: 3 Grading Scheme: Letter
Prerequisite: admission to CLP or consent of instructor.
Current behavioral theories, practices, and related research.

CLP 6425: Seminar in Clinical Neuropsychology
Credits: 1 Max: 6 Grading Scheme: Letter
Prerequisite: graduate students only and permission of director.
Basic issues and recent advances. Presentation of research topics, clinical cases, and discussion of professional issues.

CLP 6430: Clinical Psychological Assessment
Credits: 4 Grading Scheme: Letter
Prerequisite: admission to the Clinical Psychology doctoral program.
Introduction to concepts, theory, and practices in clinical psychological assessment across the lifespan.

CLP 6434C: Clinical Psychology Assessment I
Credits: 4 Grading Scheme: Letter
Prerequisite: CLP 6345.
Lifespan approach to assessment with special focus on cognitive functioning.

CLP 6435C: Clinical Psychology Assessment II
Credits: 4 Grading Scheme: Letter
Prerequisite: CLP 6345.
Lifespan approach to assessment with special focus on personality and behavior.

CLP 6446C: Psychological Assessment of Children
Credits: 3 Grading Scheme: Letter
Prerequisite: admission to CLP or consent of instructor.
Developmental, intellectual, visual-motor, achievement, and personality assessment of children.

CLP 6447C: Psychological Assessment of Adults
Credits: 3 Grading Scheme: Letter
Prerequisite: admission to CLP or consent of instructor.
Basic theories, procedures and administration experience in assessment of adult intellect and personality factors.

CLP 6476: Lifespan Psychopathology
Credits: 4 Grading Scheme: Letter
Prerequisite: admission to Clinical Psychology doctoral program.
Diagnostic issues, theoretical formulas, clinical manifestations, and research related to child and adult psychopathology across the lifespan.

CLP 6497: Psychopathological Disturbances
Credits: 3 Grading Scheme: Letter
Prerequisite: admission to CLP or PSY or consent of instructor.
Theories and related research to etiology, clinical description, and diagnosis with implications for treatment.

CLP 6527C: Measurement, Research Design, and Statistical Analysis in Clinical Psychology I
Credits: 3-4 Grading Scheme: Letter
Prerequisite: admission to CLP.

Integration and interaction among research design, tests and measurements, and statistics.

CLP 6528C: Measurement, Research Design, and Statistical Analysis in Clinical Psychology II
Credits: 3-4 **Grading Scheme:** Letter
Prerequisite: CLP 6527C.
Continuation of CLP 6527C.

CLP 6529: Applied Multivariate Methods in Psychology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CLP 6528C or equivalent
Application of multivariate methods (MANOVA, discriminant functions, factor analysis, SEM) to research problems in psychology.

CLP 6905: Individual Work
Credits: 1-4 Max: 12 **Grading Scheme:** Letter
Reading or research in areas in clinical psychology.

CLP 6910: Supervised Research
Credits: 1-4 Max: 5 **Grading Scheme:** S/U

CLP 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

CLP 6943: Core Practicum in Clinical Psychology
Credits: 1-4 Max: 8 **Grading Scheme:** S/U
Prerequisite: consent of program director.
Supervised training in appropriate work settings.

CLP 6945: Advanced Practicum in Neuropsychology
Credits: 1-3 Max: 3 **Grading Scheme:** S/U
Prerequisite: CLP 7427C, consent of area head and program director.
Supervised clinical experience in neuropsychological assessment and cognitive rehabilitation of patients with neurologic impairments.

CLP 6946: Advanced Practicum in Applied Medical Psychology
Credits: 1-3 Max: 8 **Grading Scheme:** S/U
Prerequisite: consent of area head and program director.
Supervised clinical experience in inpatient and outpatient consultation, assessment and intervention with psychosomatic, stress-related, and somatopsychic disorders.

CLP 6947: Practicum in Intervention
Credits: 1-4 Max: 18 **Grading Scheme:** S/U
Prerequisite: consent of program director.
Designed for individual with special interests and needs.

CLP 6948: Advanced Practicum in Clinical Child Psychology
Credits: 1-3 Max: 8 **Grading Scheme:** S/U
Prerequisite: CLP 6943, consent of area head and program director.
Supervised clinical experiences working with children or adolescents in either inpatient or outpatient settings.

CLP 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

CLP 7317: Advanced Health Psychology and Behavior Medicine
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CLP 7936.
Theory, research, and clinical applications related to core topic areas. Special attention to pathophysiology, research methods, issues of diversity, and ethical concerns.

CLP 7404C: Special Issues, Methods, and Techniques in Psychological Treatment

Credits: 3 Max: 12 Grading Scheme: Letter
Prerequisite: CLP 6407, CLP 6417, or consent of instructor.

CLP 7427C: Neuropsychological Assessment of Children
Credits: 3 Grading Scheme: Letter
Prerequisite: PSB 6067 or consent of instructor.
Research, theory, and basic procedures.

CLP 7428C: Neuropsychological Assessment of Adults
Credits: 3 Grading Scheme: Letter
Prerequisite: PSB 6067 or consent of instructor.
Research, theory, and basic procedures.

CLP 7525: Best Methods for Studying Psychological Change
Credits: 3 Grading Scheme: Letter
Prerequisite: CLP 6529
Application of change methods (ongiudinal mixed effects, latent growth models, survival analysis) to research problems in psychology.

CLP 7934: Special Topics In Clinical Psychology
Credits: 1-9 Max: 15 Grading Scheme: Letter
Prerequisite: admission to CLP.
Advanced seminar for in-depth examination of selected issues and topics.

CLP 7949: Internship
Credits: 1-2 Max: 6 Grading Scheme: S/U
Prerequisite: admission to candidacy for the doctorate, successful completion of the qualifying examination, and consent of the program director.
Reading assignments and conferences. Must include 1500 work hours; designed as a 2-semester sequence.

CLP 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

CLP 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

CLT 6295: Greek Drama in Translation
Credits: 3 Grading Scheme: Letter
Prerequisite: B.A. in classics or related field.
Readings of plays by Aeschylus, Sophocles, Euripides, and Aristophanes, and discussion of their context and production within fifth-century Athenian society.

CNT 5106C: Computer Networks
Credits: 3 Grading Scheme: Letter
Design, implementation, and internals of networks. Routing, congestion control, internetworking, TCP/IP, optimization, and proxy services.

CNT 5410: Computer and Network Security
Credits: 3 Grading Scheme: Letter
Prerequisite: COP 3530, COT 5405. *Corequisite:* COP 4600.
Issues, analysis, and solutions. Viruses, worms, logic bombs, network attacks, covert channels, steganography, cryptology, authentication, digital signatures, electronic commerce.

CNT 5517: Mobile Computing
Credits: 3 Grading Scheme: Letter
Prerequisite: CNT 4007C.

Emerging topics of wireless and mobile computing and networking including mobile computing models, mobile-IP, adhoc networks, Bluetooth, and 802.11b. Mobile database access and mobile transactions in context of emerging field of M-commerce.

CNT 6107: Advanced Computer Networks
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 5615 , COP 5536 , and CNT 5106C
Computer network architecture, including topologies, media, switching, routing, congestion control, protocols, and case studies.

CNT 6885: Distributed Multimedia Systems
Credits: 3 **Grading Scheme:** Letter
Design issues; survey of recent advances, including compression, networking, and operating system issues.

COM 6315: Advanced Research Methods
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: MMC 6421 and STA 6126 or equivalents, and consent of instructor.
Scientific method, measurement, analysis. Student research required.

COM 6338: Advanced Web Topics I: Advanced Design
Credits: 4 **Grading Scheme:** Letter
Prerequisite: Digital Design, Intro to Web Design, Digital Imagery
Delving deeply into the processes of website design. Students will have 4 contact hours of instruction per week from lectures posted in E-Learning, not including individual work. Because the class is asynchronous, students may access lectures at any time during the week.

COM 6940: Supervised Teaching
Credits: 1-3 Max: 5 **Grading Scheme:** S/U

COP 5536: Advanced Data Structures
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 3530.
Development of efficient data structures used to obtain more efficient solutions to classical problems, such as those based on graph theoretical models, as well as problems that arise in application areas of contemporary interest.

COP 5555: Programming Language Principles
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 3530.
History of programming languages, formal models for specifying languages, design goals, run-time structures, and implementation techniques, along with survey of principal programming language paradigms.

COP 5615: Distributed Operating System Principles
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 4600.
Concepts and techniques for efficient management of computer system resources.

COP 5618: Concurrent Programming
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 3100, 3530.
Overview of principles and programming techniques. Reasoning about concurrency, synchronization, program structuring, multi-threaded server applications.

COP 5625: Programming Language Translators
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 5555.
Anatomy of translators for high-level programming languages.

COP 5725: Database Management Systems
Credits: 3 **Grading Scheme:** Letter

Prerequisite: COP 3530, 4600, or equivalent.
Introduction to systems and procedures for managing large computerized databases.

COP 6726: Database System Implementation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 4600 and 4720 or COP 5725.
DBMS architecture, query processing and optimization, transaction processing, index structures, parallel query processing, object-oriented and object-relational databases, and related topics.

COP 6755: Distributed Database Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 5615, COP 5725, and a course in computer networks.
Distributed database systems including the areas of distributed database design, resource allocation, access plan selection, and transaction management.

COT 5405: Analysis of Algorithms
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 3530.
Introduction and illustration of basic techniques for designing efficient algorithms and analyzing algorithm complexity.

COT 5442: Approximation Algorithms
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 3530 or COT 5405
Fundamentals of algorithmic paradigms, analysis, techniques, and software. Topics include greedy methods, randomized algorithms, lP-rounding, approximability, covering, packing, clustering, and network problems.

COT 5520: Computational Geometry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 3530.
Design, analysis, and implementation of algorithms and date structures to solve geometric problems. Applications in graphics, robotics, computational biology, data mining, and scientific computing. Convex hulls, Voronoi diagrams, triangulations, arrangements, and range searching.

COT 5615: Mathematics for Intelligent Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAC 2313, Multivariate Calculus; MAS 3114 or MAS 4105, Linear Algebra; STA 4321, Mathematical Statistics.
Mathematical methods commonly used to develop algorithms for computer systems that exhibit intelligent behavior.

COT 6315: Formal Languages and Computation Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: COP 3530 and familiarity with discrete mathematics and data structures.
Introduction to theoretical computer science including formal languages, automata theory, Turing machines, and computability.

CPO 5935: Advanced Topics in Comparative Politics
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: departmental approval.

CPO 6046: Politics in Advanced Industrial Societies
Credits: 3 **Grading Scheme:** Letter
Comparative analysis of typical political, economic, and social problems confronting governments of advanced industrial states.

CPO 6059: Democracy and Its Competitors
Credits: 3 **Grading Scheme:** Letter
Analysis of democracy's components and several forms of authoritarianism such as apartheid, racism, fascism, right-wing populism, and totalitarianism.

CPO 6077: Social Movements in Comparative Perspective
Credits: 3 **Grading Scheme:** Letter
Examines major classical and contemporary theoretical approaches to the field of collective action and social movements.

CPO 6091: Introduction to Comparative Political Analysis
Credits: 3 **Grading Scheme:** Letter
Introduction to major theoretical and methodological approach to study of comparative politics.

CPO 6206: Seminar in African Politics
Credits: 3 **Grading Scheme:** Letter
Study of African politics in comparative perspective.

CPO 6307: Latin American Politics I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: knowledge of Spanish or Portuguese; French may be substituted with consent of instructor.

CPO 6732: Democratization and Regime Transition
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CPO 6091.
Review of structural, institutional, and cultural dimensions of democratization, with special attention to Latin America, Africa, and Eastern Europe.

CPO 6736: Post-Communist politics
Credits: 3 **Grading Scheme:** Letter
Analysis of problems associated with democratic transition and market reform in the post-communist countries of Eastern Europe and the former Soviet Union.

CPO 6756: Comparative Elections and Party Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CPO 6091
Major issues related to the study of elections and political parties in the comparative context. Specifically, we will discuss the relationship between political parties and electoral institutions in authoritarian, democratic, and transitioning political systems.

CPO 6757: The European Union In Comparative Perspective
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CPO 6091 (B or better)
Graduate level introduction to the study of the European Union from a comparative perspective. Assuming familiarity with graduate level comparative politics (CPO 6091), but no previous knowledge of the EU is required. The EU is analyzed as a comparative case through an institutionalist perspective.

CPO 6786: Peasant Politics and Society
Credits: 3 **Grading Scheme:** Letter
Analysis of social organization and politics of the rural poor in Latin America, Africa, Asia, and pre-industrial Europe.

CPO 6795: Environmental Politics
Credits: 3 **Grading Scheme:** Letter
Explores a variety of social-scientific approaches to the question of how politics (including ideologies, institutions, interests, and power relationships) shape humans' relationship with the natural environment.

CPO 6796: Water Politics
Credits: 3 **Grading Scheme:** Letter
Interdisciplinary exploration of the political dimensions of human manipulation of water, wetlands and watersheds. Topics include large-scale hydrodevelopment, common-pool resources, community-based water management, marketization, and transboundary waters. Also provides a general introduction to social-scientific theorizing on human-environment relations.

CRW 6130: Fiction Writing
Credits: 3 **Max: 12** **Grading Scheme:** Letter

CRW 6166: Studies in Literary Form
Credits: 3 **Max: 12** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Formal aspects of literature.

CRW 6331: Verse Writing

Credits: 3 Max: 12 Grading Scheme: Letter

CRW 6906: Individual Work
Credits: 1-3 Max: 12 Grading Scheme: Letter
Individual study in reading literature and criticism, required for MFA specialization in creative writing.

CWR 5125: Groundwater Flow I
Credits: 3 Grading Scheme: Letter
Prerequisite: CWR 4202 or consent of instructor.
Porous media flow. Darcy's law. Conservation of mass. Laplace equation. Flownets. Well hydraulics.

CWR 5127: Evaluation of Groundwater Quality
Credits: 3 Grading Scheme: Letter
Prerequisite: CWR 5125 or CWR 6525, or consent of instructor.
Characteristics of flow in saturated and unsaturated zones; solute convection and dispersion; effects of chemical reactions and adsorption; management of groundwater quality.

CWR 5235: Open Channel Hydraulics
Credits: 3 Grading Scheme: Letter
Prerequisite: CWR 4202 or consent of instructor.
Classification of flow, Normal depth. Specific energy and critical depth. Gradually varied flow. Transitions.

CWR 6115: Surface Hydrology
Credits: 3 Grading Scheme: Letter
Prerequisite: MAP 2302, CWR 3201, or EGN 3353C.
Occurrence and distribution of water by natural processes including atmospheric thermodynamics, precipitation, runoff, infiltration, water losses, flood routing and catchment characteristics, analysis, and methods of runoff prediction. Current hydrologic computer models.

CWR 6126: Variable-Density Groundwater Flow
Credits: 3 Grading Scheme: Letter
Prerequisite: CWR 5125 Groundwater Flow 1 or consent of instructor.
Numerical groundwater modeling, including groundwater flow, contaminant transport, and variable-density flow and transport equations and finite-difference approximations.

CWR 6236: Sediment Transport I
Credits: 3 Grading Scheme: Letter
Prerequisite: CWR 5235 or consent of instructor.
Introduction to movable bed models. Sediment properties. Scour initiation. Influence of slope. Stable channels. Bed forms. Transport as bed load and suspended transport.

CWR 6240: Mixing and Transport in Turbulent Flow
Credits: 3 Grading Scheme: Letter
Prerequisite: ENG 3353 (or CWR 3201), MAP 2302.
Applying fluid mechanics to problems of turbulent mixing and transport of substances in the natural environment.

CWR 6252: Environmental Biochemistry of Trace Metals
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Environmental impact and fate of trace metals and metalloids as they cycle through geological and biological environmental compartments. Emphasizes anthropogenic activities of metals with growing environmental concerns, including arsenic, mercury, chromium, and lead.

CWR 6255: Diffusive and Dispersive Transport
Credits: 3 Grading Scheme: Letter
Prerequisite: CWR 4202 or consent of instructor.
Introduction to diffusive and dispersive transport processes in flowing water. Fick's law. Available analytical and numerical models.

CWR 6525: Groundwater Flow II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CWR 5125 or consent of instructor.
Analytical and computer modeling of groundwater flow problems by means of finite difference, finite element, and boundary element methods.

CWR 6536: Stochastic Subsurface Hydrology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: senior-level course in probability and statistics, calculus through differential equations, soil physics, and/or subsurface hydrology.
Stochastic modeling of subsurface flow and transport including geostatistics, time series analysis, Kalman filtering, and physically based stochastic models.

CWR 6537: Contaminant Subsurface Hydrology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 2302 or 4341 or equivalent; CGS 2420 or equivalent; SWS 4602C or ABE 6252 or CWR 5125or CWR 5127or equivalent; or EES 6208 or equivalent.
Physical-chemical-biological concepts and modeling of retention and transport of water and solutes in unsaturated and saturated media. Applications of environmental aspects of soil and groundwater contamination.

DAA 6757: Pilates Technique for the Dancer
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Systematic achievement of strength, tone, flexibility, and posture for optimal physical performance in dance.

DAA 6905: Graduate Dance Project
Credits: 1-3 **Grading Scheme:** Letter
Dance to enhance and develop skills in a specific style of dance or movement study.

DAN 6436: Laban Movement Analysis
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Experiential examination of movement from the integrated theoretical framework of body, effort, shape, and space.

DAN 6949: Dance Clinical Practice
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: DAN 3775 and consent of instructor.
Clinical experience in using movement to enhance healing in a hospital or community setting. Student works through Shands Arts in Medicine or a comparable program, in individually contracted situations.

DCP 6211: Preservation Topics, Issues, and Practice
Credits: 3 **Grading Scheme:** Letter
Focuses on a critical assessment of current preservation practices and how they can be applied to a sustainable future. Historic preservation of existing buildings and landscapes embodies the concept of sustainable architecture and landscape architecture.

DCP 6710: History and Theory of Historic Preservation
Credits: 3 **Grading Scheme:** Letter
National, state, and local historic preservation policies and programs are explored. Theoretical concepts that shape the way we view, protect, and preserve historic interiors, structures, sites, districts, and landscapes.

DCP 6711: History of the Built Environment for Preservation Practice
Credits: 3 **Grading Scheme:** Letter
Historical developments in American cultural heritage through the study of buildings, sites, and figures.

DCP 6712: Preservation Technology: Conserving Modern Buildings
Credits: 3 **Grading Scheme:** Letter
Principles and practices of physical conservation of culturally significant structures and sites of the Post World War II period.

DCP 6713: Historic Preservation: Principles, Practice, and Engineering

Credits: 3 **Grading Scheme:** Letter
Principles and practices of physical conservation of culturally significant structures and sites. Presentation and study of contemporary advocacy, planning, and technology.

DCP 6714: Built Heritage Resources: Research, Documentation, And Conservation
Credits: 3 **Grading Scheme:** Letter
Examines the principles and practices guiding the preservation of built heritage resources at three different scales: cultural and urban landscapes and building ensembles; architecture; and materials and finishes.

DCP 6715: Preservation Building Technology
Credits: 3 **Grading Scheme:** Letter
Survey of traditional building materials and systems, preservation principles and conventions, and the behavior of building systems in older structures.

DCP 6716: Cultural Resource Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Focusing on interpretive and research topics in a case study format. Topics include introduction to new technologies, use of modern materials in historic buildings, conservation and sustainability, historic building dating methods and other issues pertaining to historic sites.

DCP 6730: Preservation Policy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: DCP 6710 or consent of instructor.
Study of federal and state preservation policy and ways regulations and laws are put into effect. Lectures will be supplemented with selected field trips, providing students with the opportunity to meet and learn from active cultural resource professionals, regulatory officers and site managers.

DCP 6905: Independent Study
Credits: 1-3 **Max: 9** **Grading Scheme:** Letter
Prerequisite: Consent of faculty member supervising the study
Research in special or individual DCP projects and issues, under faculty supervision.

DCP 6931: Special Topics in Design, Construction, and Planning
Credits: 1-4 **Max: 6** **Grading Scheme:** Letter

DCP 6943: Practicum in Historic Preservation
Credits: 3 **Grading Scheme:** Letter
Enables students to work in real-life situations, finding solutions to diverse historic preservation issues, while acquiring research methodology and presentation skills.

DCP 6971: Research for Master's Thesis
Credits: 1-9 **Max: 9** **Grading Scheme:** S/U
Research for master's thesis in Historic Preservation

DCP 7790: Doctoral Core I
Credits: 3 **Grading Scheme:** Letter
Philosophy, theory, and history of inquiry into the processes of design, urban development, and building systems.

DCP 7792: Doctoral Core II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: DCP 7790.
Urban, environmental, and legal systems in the context of urban development.

DCP 7794: Doctoral Seminar
Credits: 1 **Max: 4** **Grading Scheme:** S/U
Corequisite: DCP 7911; for entering Ph.D. students.
Successfully negotiating graduate school and writing a dissertation.

DCP 7911: Advanced Design, Construction, and Planning Research I

Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6167. *Corequisite:* DCP 7794; for entering Ph.D. students.
Survey and critical analysis of research in the disciplines of design, construction, and planning. Emphasizes theory and methods.

DCP 7912: Advanced Design, Construction, and Planning Research II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: DCP 7911.
Conducting advanced research in architecture, design, landscape, planning, and construction.

DCP 7940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U
Prerequisite: not open to students who have taken 6940.
Independent student teaching under the supervision of a faculty member.

DCP 7949: Professional Internship
Credits: 1-5 Max: 5 **Grading Scheme:** Letter
Professional faculty-supervised practicum.

DCP 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

DCP 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

DEN 6602: Orthodontic Treatment–Appliance Management and Effect of Treatment Part 1: Class I Treatment
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Survey of all methods and techniques used to treat various malocclusions and their basic biologic principles.

DEN 6603: Orthodontic Treatment–Appliance Management and Effect of Treatment Part 2: Class II Treatment
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Continuation of DEN 6602.

DEN 6604: Orthodontic Treatment–Appliance Management and Effect of Treatment Part 3: Class II Treatment and Overbite Treatments
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Continuation of DEN 6603.

DEN 6605: Orthodontic Treatment–Appliance Management and Effect of Treatment Part 4: Class II Treatment and Overbite Treatments
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Continuation of DEN 6604.

DEN 6606: Orthodontic Treatment–Appliance Management and Effect of Treatment Part 5: Class III and Crossbite Treatments and Soft Tissue Considerations
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Continuation of DEN 6605.

DEN 6607: Orthodontic Treatment–Appliance Management and Effect of Treatment Part 6: Impactions, Transplantations and Stability
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.

Continuation of DEN 6606.

DEN 6608: Analysis, Diagnosis, and Treatment Planning: Part I
Credits: 1 Max: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Information to aid in examining patient, gathering data, analyzing and manipulating data, diagnosing, and subsequent treatment plan development.

DEN 6609: Analysis, Diagnosis, and Treatment Planning: Part II
Credits: 1 Max: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Information to aid in examining a patient, gathering data, analyzing and manipulating data, diagnosing, and subsequent treatment plan development.

DEN 6610: Biology of Tooth Movement: Part I
Credits: 1 Max: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Review of literature related to biology of orthodontic tooth movement.

DEN 6612: Orthodontic Biomechanics: Part I
Credits: 1 Max: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Biomechanical principles, biomechanics in certain treatment approaches, methods of research in biomechanics.

DEN 6613: Orthodontic Biomechanics: Part II
Credits: 1 Max: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Biomechanical principles, biomechanics in certain treatment approaches, methods of research in biomechanics.

DEN 6614: Ortho-Perio Relationships: Part I
Credits: 1 Max: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Understanding the effects of orthodontics on periodontal tissue, treating the periodontally compromised patient, and literature on various periodontal procedures.

DEN 6615: Ortho-Perio Relationships: Part II
Credits: 1 Max: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Understanding effects of orthodontics on periodontal tissue, treatment of periodontally compromised patient, and literature on various periodontal procedures.

DEN 6616: Orthognathic Surgery: Part I
Credits: 1 Max: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Principles involved in correction of skeletal problems by orthodontics and oral and maxillofacial surgery.

DEN 6617: Orthognathic Surgery: Part II
Credits: 1 Max: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Principles involved in correcting skeletal problems by orthodontics and oral and maxillofacial surgery.

DEN 6618: Postnatal Growth and Development
Credits: 1 Max: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Review of topics in postnatal growth and development pertinent to orthodontics. Emphasizes basic concepts of facial growth.

DEN 6622: Principles of Occlusion
Credits: 2 Grading Scheme: Letter

Chronological history of gnathology and developing treatment philosophies. In-depth biomechanical and neuro-physiological study of human dental occlusion. The role of sound occlusion in oral health, and current methods of treatment.

DEN 6623: Maxillofacial Prosthetics
Credits: 1 **Grading Scheme:** Letter
The art and science of anatomic, functional, and cosmetic reconstruction, using nonliving substitutes for structures missing as a result of surgical intervention, trauma, or congenital malformation.

DEN 6624: Dental Implant Restoration
Credits: 1 **Grading Scheme:** Letter
Prerequisite: D.M.D. or D.D.S. degree.
Diagnostic and laboratory principles involved with restoration of dental implants.

DEN 6625: Fixed Prosthodontic Ceramics
Credits: 1 **Grading Scheme:** Letter
Prerequisite: D.M.D. or D.D.S. degree.
Laboratory and diagnostic principles associated with preparation and fabrication of metal and ceramic fixed partial prostheses.

DEN 6626: Advanced Removable Partial Dentures
Credits: 1 **Grading Scheme:** Letter
Prerequisite: D.M.D. or D.D.S. degree.
Principles and applications. Survey of supporting tissues, classification systems, biomechanics, treatment planning, materials, and historical overview of removable partial prosthodontics.

DEN 6627: Treatment Planning Seminar
Credits: 1 **Grading Scheme:** Letter
Prerequisite: D.M.D. or D.D.S. degree.
Format to evaluate treatment planning skills, to present comprehensive cases in organized and logical manner and to use literature and experience to defend treatment plans.

DEN 6642: Introduction to Advanced Endodontics
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Analysis of principles, philosophies, and treatment procedures relative to morphology, physiology, and pathology of human dental pulp and periradicular tissues.

DEN 6643: Treatment Planning/Cases Presentation
Credits: 1 **Grading Scheme:** Letter
Prerequisite: DEN 6642.
Seminars to analyze patient treatment plans with regard to differential diagnosis and treatment of oral pains of pulpal and/or periradicular origin, vital pulp therapy, nonsurgical and surgical root canal therapy, intentional replantation and replantation of avulsed teeth, endodontic implants, and bleaching of discolored teeth.

DEN 6644: Nonsurgical Endodontic Care I
Credits: 1 **Grading Scheme:** Letter
Prerequisite: DEN 6642.
Supervised clinical experience in comprehensive management of patients' needs in areas of differential diagnosis of pulp and periradicular disease, vital pulp therapy, nonsurgical root canal therapy, bleaching of discolored teeth, and procedures related to coronal restorations by means of post and/or cores involving root canal space.

DEN 6645: Nonsurgical Endodontic Care II
Credits: 1 **Grading Scheme:** Letter
Prerequisite: DEN 6644.
Continuation of DEN 6644.

DEN 6646: Surgical Endodontics I
Credits: 1 **Grading Scheme:** Letter
Prerequisite: DEN 6642.

Supervised clinical experience in comprehensive management of patients' needs in areas of differential diagnosis of pulp and periradicular disease requiring surgical intervention, selective removal of pathological tissue resulting from pulpal pathosis, intentional replantation and replantation of avulsed teeth, surgical removal of tooth structure such as in apicoectomy, hemisection, and root amputation and endodontic implants.

DEN 6647: Surgical Endodontics II
Credits: 1 **Grading Scheme:** Letter
Prerequisite: DEN 6646.
Continuation of DEN 6646.

DEN 6652: Review of Periodontics Literature I
Credits: 1 **Grading Scheme:** Letter
Periodontal data collection, etiology of periodontal disease, pathogenesis of periodontal diseases, acute periodontal lesions, and classification of periodontal diseases.

DEN 6653: Review of Periodontics Literature II
Credits: 1 **Grading Scheme:** Letter
Prerequisite: DEN 6652.
Diagnosis, prognosis and treatment planning including tooth mobility and tooth movement, prognosis, plaque control and nonsurgical periodontal therapy.

DEN 6654: Review of Periodontics Literature III
Credits: 1 **Grading Scheme:** Letter
Prerequisite: DEN 6653.
Principles of periodontal surgery and wound healing.

DEN 6655: Review of Periodontics Literature IV
Credits: 1 **Grading Scheme:** Letter
Prerequisite: DEN 6654.
Mucogingival surgery, antibiotic therapy, ultrasonics, irrigation and maintenance of the periodontal patient. Discussion of restorative considerations and orthodontics.

DEN 6656: Introduction to Advanced Periodontology
Credits: 1 **Grading Scheme:** Letter
Intense general review of periodontal structure, function and disease pathogenesis. Tissues of periodontium, cementum, bone, periodontal ligament and epithelial attachment. Review of etiology of disease process pertaining to microbial flora and host response.

DEN 6657: Periodontal Histology and Histopathology
Credits: 1 **Grading Scheme:** Letter
Survey of histology and histopathology of periodontium, utilizing light and electron microscopy.

DEN 6658: Treatment Planning in Periodontal Therapy
Credits: 1 **Grading Scheme:** Letter
Interdisciplinary seminar. Students present findings of examination of patients with advanced dental diseases and discuss diagnosis and treatment planning for these patients.

DEN 6670: Craniofacial Anomalies
Credits: 1 **Max: 2** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Etiology, development, treatments, and treatment outcomes of craniofacial anomalies.

DEN 6671: Prenatal Growth and Development
Credits: 1 **Max: 2** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Selected topics in cellular and molecular aspects of craniofacial development.

DEN 6672: Materials in Orthodontics
Credits: 0-1 **Max: 4** **Grading Scheme:** Letter

Prerequisite: consent of instructor.
Evaluation of the basics and the applicability of materials normally used in orthodontia, to enable the practioner to evaluate new materials commonly introduced in today's market.

DEN 6674: Advanced Oral Pathology
Credits: 1 **Grading Scheme:** Letter
Survey of clinical characteristics, microscopic features, and treatment and prognosis of diseases affecting the head and neck, oral mucosa, and jaws.

DEN 6675: Craniofacial Pain
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Structure, function, and pathofunction of cranio-cervical region and stomatognathic system emphasizing differential diagnosis and case-specific management.

DEN 6678: Advanced Oral Medicine and Drug Interactions in Dentistry
Credits: 2 **Grading Scheme:** Letter
Prerequisite: consent of instructor. Designed for dental specialty and general practice residents.
Understanding medications available to practicing dentists.

DEN 6679: Advanced Radiology and Interpretation
Credits: 1 **Grading Scheme:** Letter
A series of lectures designed to provide graduate students with advanced information on oral and maxillofacial radiology. Subjects include material designed to prepare the advanced practitioner in radiologic management of patients with complex diagnostic problems.

DEN 6680: Principles and Craniofacial Biology and Emerging Therapies
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Consent of instructor.
Reviewing basic biological, biochemical, cellular and molecular concepts important to the appreciation and understanding of the unique functions of the hard and soft oral tissues. It also provides a framework to introduce students to emerging therapies in the treatment of oral diseases and the biological concepts behind these therapies.

DEN 6681: Craniofacial Pathobiology
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Consent of instructor.
Emphasizing biochemical, molecular and cellular aspects of pathological conditions that either are localized to craniofacial components within of effecting the oral cavity, are systemic but effect oral functions, or emanate from the orall cavity to influence system health.

DEN 6905: Individual Study
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter

DEN 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

DEN 6934: Special Topics in Dentistry
Credits: 1-3 **Max: 3** **Grading Scheme:** S/U
Prerequisite: Consent of instructor
Presenting a series of topics that are relevant to the majority of specialties, provide relevant information for practicing dentistry at the highest level of knowledge, and to prepare them for the future changes in dentistry.

DEN 6935: Special Topics in Dentistry
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter

DEN 6936: Practice Management
Credits: 1 **Grading Scheme:** S/U

Fundamental management principles and practices. Emphasizes establishing the dentist in practice without making major business mistakes. Consideration to selecting an associate, developing an association contract, and understanding the associate relationship.

DEN 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

DEN 6941: Clinical Teaching in Dentistry
Credits: 1 Grading Scheme: S/U
Assessing recall factors that influence learning in clinical situations. Accessing relevant learning and factors while in clinical situations, thus providing effective instructional decisions. Designed to help the participant recall and use this information.

DEN 6942: Grand Rounds
Credits: 1-3 Max: 3 Grading Scheme: S/U
Prerequisite: Consent of instructor
The broadest possible input on treatment of patients with perspectives from endodontics, orthodontics, periodontology, pediatric dentistry, prosthodontics and oral surgery. Interdisciplinary treatment plans will be developed for patients that are brought to the grand rounds by participating attending and resident practitioners. The intent is to develop a comprehensive treatment plan for cases forwarded to the group.

DEN 6971: Research for Master's Thesis
Credits: 1-6 Grading Scheme: S/U

DEN 6973: Project in Lieu of Thesis
Credits: 1-9 Max: 9 Grading Scheme: S/U
Prerequisite: consent of instructor.
Project or research acceptable to the candidate's supervisory committee and the Graduate School.

DEP 6057: Advanced Developmental Psychology I
Credits: 3 Grading Scheme: Letter
Surveys research literature on developmental changes during infancy and cognitive development during childhood.

DEP 6058: Advanced Developmental Psychology II
Credits: 3 Grading Scheme: Letter
Theories and current literature in social development, focusing on the period of infancy through adolescence.

DEP 6059: Seminar: Special Topics in Developmental Psychology
Credits: 1-3 Max: 12 Grading Scheme: Letter
Examination of theory and research in selected topic.

DEP 6099: Survey of Developmental Psychology
Credits: 2-3 Max: 3 Grading Scheme: Letter
Prerequisite: graduate status.
Empirical, theoretical, and methodological foundations of developmental psychology.

DEP 6216: Psychological Disturbances of Children
Credits: 3 Grading Scheme: Letter
Prerequisite: admission to CLP or PSY or consent of instructor.
Stresses both affective and cognitive.

DEP 6406: Advanced Adulthood and Aging
Credits: 3 Grading Scheme: Letter
Overview of major theories and research in psychology in relation to aging.

DEP 6409: Seminar: Adult Development and Aging
Credits: 3 Max: 9 Grading Scheme: Letter
Topics in the psychology of aging, with emphasis on theory, research, and methodology.

DEP 6799: Current Research Methods in Developmental Psychology
Credits: 3 Grading Scheme: Letter

Methods for study of development, including experimental and observational techniques.

DEP 6936: Current Research in Developmental Psychology
Credits: 1-2 Max: 20 Grading Scheme: Letter

DEP 7608: Theories of Developmental Psychology
Credits: 3 Grading Scheme: Letter
Theoretical perspectives and major theorists in child and developmental psychology.

DIE 6241: Advanced Medical Nutrition Therapy
Credits: 3 Grading Scheme: Letter
Prerequisite: admission to Master of Science-Dietetic Internship.
Opportunity to integrate theories and principles of medical nutrition therapy into clinical practice.

DIE 6242: Advanced Medical Nutrition Therapy II
Credits: 4 Grading Scheme: Letter
Prerequisite: admission to Master of Science-Dietetic Internship and DIE 6241.
Opportunity to integrate principles of medical nutrition therapy into clinical practice.

DIE 6516: Professional Development in Dietetics
Credits: 2 Grading Scheme: Letter
Prerequisite: DIE 6938. *Corequisite:* DIE 6944.
Professional development assessment, planning, and evaluation for future dietetics professionals.

DIE 6905: Problems in Dietetics
Credits: 1-3 Max: 4 Grading Scheme: Letter
Prerequisite: consent of instructor. Not open to students on probation or conditional admission.
Individual study and research carried out in community, hospital, or laboratory settings.

DIE 6938: Advanced Dietetic Seminar
Credits: 1 Grading Scheme: Letter
Prerequisite: admission to Master of Science-Dietetic Internship. *Corequisite:* DIE 6942.
Problem-solving, leadership, and analytical skills.

DIE 6942: Dietetic Internship I
Credits: 8-12 Max: 12 Grading Scheme: S/U
Prerequisite: DIE 6242. *Corequisite:* DIE 6938.
Internship in dietetics in affiliated institutions offering core rotations in community nutrition, food systems management, and clinical dietetics. Emphasizes applying theory to practice.

DIE 6944: Dietetic Internship II
Credits: 4-8 Max: 12 Grading Scheme: S/U
Prerequisite: DIE 6942.
Internship in affiliated institutions offering elective and/or specialty rotations (e.g., nutrition support, diabetes, pediatrics, sports nutrition, wellness, advanced food systems, and staff experience). Emphasizes skill development for entry-level practice.

DIE 6949: Dietetic Internship in Sports Nutrition
Credits: 4 Max: 15 Grading Scheme: S/U
Prerequisite: admission to the sports nutrition emphasis of the combined Master of Science-Dietetic Internship (MS-DI) program.
Sports nutrition internship. Emphasizes developing competency in conducting, managing, and supervising nutrition care services for intercollegiate athletes.

DIG 5555c: Digital Media Projection Design I
Credits: 3 Grading Scheme: Letter
Prerequisite: Enrollment in the MA in DAS program or consent of Instructor.
Students will be learning theoretical, technical and historical production-oriented perspectives of using projections for a variety of events. Students collaboratively design, construct and present a digital projection media project. Students work as "projection designer" on two main projects and write a research paper on an approved topic in projection design.

DIG 5931C: Special Topics
Credits: 1-3 Max: 6 Grading Scheme: Letter
Prerequisite: Admission in MA DAS program or consent of instructor.
Complements theory-based digital arts offerings with an up-to-the-minute examination of emergent cultural and technological events and developments.

DIG 6027C: Interactive Storytelling
Credits: 1-4 Max: 4 Grading Scheme: Letter
Prerequisite: admission in MA DAS program or consent of instructor.
Integrates participation and storytelling as foundations of interactivity. Explores how storytelling is incorporated into contemporary interactive platforms including games and social networks, using online and open-source tools to create content, taking advantage of mobile hardware already in students' possession.

DIG 6028: Roots of Digital Culture
Credits: 1-3 Grading Scheme: Letter
Prerequisite: admission in MA DAS program or consent of instructor.
Interdisciplinary approach to technological and cultural underpinnings shaping current digital media (video games, the Internet, computer-animated movies, virtual reality and online social networking), exploring and presenting individuated perspectives in both written and digital media assignments.

DIG 6050C: Entertainment Technology
Credits: 1-4 Max: 4 Grading Scheme: Letter
Prerequisite: admission in MA DAS program or consent of instructor.
Evolving digital entertainment technologies and techniques, providing a forum to discuss current and future multimedia and hybrid media technologies, including the completion of an original design, script or treatment for a digital entertainment artifact.

DIG 6125C: Digital Design & Visualization
Credits: 1-3 Max: 6 Grading Scheme: Letter
Prerequisite: admission in MA DAS program or consent of instructor.
Creation of 2D and 3D content for large-scale visualization systems employed in the creative services and industrial design fields. Providing participatory experience in controlling multi-screen sound and visualization environments in both intermediate and large-scale display environments.

DIG 6126C: Interaction Design
Credits: 1-3 Max: 6 Grading Scheme: Letter
Prerequisite: admission in MA DAS program or consent of instructor.
Extend theoretical and practical perspectives into several focused projects using interaction principles prevalent in the entertainment and simulation industries, by creating and evaluating solutions across iterative design and testing cycles researching usability and affective influence. Emphasizes principles of cognitive psychology, including mental models, targeting and interface metaphors.

DIG 6256C: Audio Design For Digital Production
Credits: 1-3 Grading Scheme: Letter
Prerequisite:
Admission into the M.A. in DAS program or consent of instructor.
Capturing, storing, processing, and retrieving audio in analog and digital domains for visual media and information systems. Recording, editing, processing, and mixing sound for 2-d and 3-d artifacts.

DIG 6288: Music and Sound Design for Digital Media
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate-level status or consent of instructor.
Techniques, tools, and current research in music and sound design for digital media. For digital arts and science non-music majors.

DIG 6358C: Applied 3D Modeling and Animation
Credits: 3 Grading Scheme: Letter
Prerequisite: Enrollment in the MA DAS program or consent of Instructor.

Creating digital 3D assets that accurately represent real world objects, produce digital 3D environments from concept to completion, develop digital 3D characters capable of interacting with their environments, and construct quality particle systems and post-process effects. Students learn to integrate these assets into real-time engines using industry standard practices and pipelines.

DIG 6556c: Digital Media Projection Design II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Enrollment in the MA in DAS program or consent of Instructor and completion of Digital Media Projection Design 1
Students will be completing a full Digital Media Projection Design working as "Lead Projection Designer" of a visual digital media presentation and prepare the design for live execution. This class requires attendance at all design, production and technological meetings pertaining to the project. This class applies skills added in Digital Media Projection Design 1 with LEAD DESIGNER project duties and responsibilities.

DIG 6589C: Digital Portfolio
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NONE.
Intended for NON-DAS majors
Providing students with technical and design skills for the creation of a digital portfolio with interactive media suitable for distribution including DVD and a portfolio website. It also covers techniques for using and linking social media, digital branding and personal marketing.

DIG 6719: Videogame Theory and Analysis
Credits: 2-4 Max: 4 **Grading Scheme:** Letter
Prerequisite: Admission into the MA in DAS program for either the 12-hour certificate or as a full-time Major or written consent of Instructor.
Surveying the emerging interdisciplinary study of videogames. Examine contemporary and historical scholarship on the medium. Focus on video games as socially-situated semiotic spaces that exist in dialogue with society at large.

DIG 6744C: Movement, Media and Machines
Credits: 1-4 Max: 4 **Grading Scheme:** Letter
Prerequisite: Admission into the MA in DAS program as a full-time Major or written consent of Instructor.
Exploring existing and emergent relationships between human movement, interactive & post-produced media and various electro-mechanical and digital machines. Texts, techniques and presentations from the spectrum of movement-based inquiry provide an interdisciplinary forum for transdisciplinary investigation.

DIG 6746C: Graduate Seminar in Sensors and Electronics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: digital media art students only, DIG 3130 (or equivalent programming experience) or consent of instructor.
Explores how devices respond to and interact with human physical action. Students create artwork, exploring physical interfaces beyond mouse/keyboard/screen interactions through the use of microcontrollers and sensors.

DIG 6751C: Protocols for Multimedia Interfaces
Credits: 2-4 Max: 4 **Grading Scheme:** Letter
Prerequisite: Admission into the MA in DAS program as a full-time Major or written consent of Instructor.
Covering protocols that control the interface components of a wide range of human-computer interaction devices including computers, mobile phones, multimedia players etc. Principles of interactive event handling and skills in coding touch screen interaction using contemporary platforms and mobile device environments, virtual world interaction, web-based interaction, as well as standard interaction methods for computer applications.

DIG 6788C: Digital Production & Game Design
Credits: 1-4 Max: 6 **Grading Scheme:** Letter
Prerequisite: Admission in MA DAS program or consent of instructor.
Students form small production teams and collaborate on a semester-long project with appointed production milestones, exploring intermediate and advanced 2-D and 3-D game design and visualization paradigms.

DIG 6840C: Interdisciplinary Research Seminar in Digital Arts & Sciences
Credits: 1-4 Max: 6 **Grading Scheme:** Letter
Prerequisite: admission in MA DAS program or consent of instructor.

Virtual World Environments (VWEs) as venues for rapid-prototyping of ideas, inventions, and interactions, addressing the implications of VWEs for communications, ethics, and public policy, by creating avatars and exploring digital media venues inside an online 3-D environment.

DIG 6850C: Digital Arts & Sciences Convergence
Credits: 1-4 Max: 4 Grading Scheme: Letter
Prerequisite: admission in MA DAS program or consent of instructor.
Transformations resulting from the convergence of digital technologies and global cultures. Analyzes how film, video games, animation and the recording arts intersect in the creation of digital artifacts and cultural phenomena. Interdisciplinary teams study and undertake real-time international communications and collaborations.

DIG 6906: Independent Study - Graduate Level
Credits: 1-4 Max: 4 Grading Scheme: Letter
Prerequisite: Consent of faculty member supervising the study.
Independent study of individual Digital Arts & Sciences projects and issues, under faculty supervision.

DIG 6950C: Digital Performance Production
Credits: 1-4 Max: 4 Grading Scheme: Letter
Prerequisite: admission in MA DAS program or consent of instructor.
Provides instruction on the configuration, assembly and execution of events in venues using streaming technologies for a variety of entertainment, business and research applications. Students demonstrate individuated achievement in performance technologies and integrated techniques via a final event of their own design.

DIG 6971: Research for Master's Thesis
Credits: 1-3 Max: 6 Grading Scheme: S/U
Prerequisite: Full-time student majoring in MA DAS program.

DIG 6973: Capstone Project in Lieu of Thesis
Credits: 1-6 Max: 6 Grading Scheme: S/U
Prerequisite: Admission into the MA in DAS program as a full-time Major; successful completion of at least 18 hours of course work in the major area; permission of instructor
Submission of an original project based upon extended study of a topic within the field of Digital Arts & Sciences (DAS). DIG 6973 is the course for students interested in completing a capstone project in lieu of a Thesis for a Master's of Arts degree.

EAB 5436: Behavioral Pharmacology
Credits: 3 Grading Scheme: Letter
Prerequisite: EAB 3002, STA 3023.
Experimental analysis of the mechanisms based on interactions of drugs with environmental variables controlling behavior.

EAB 6099: Survey of Behavior Analysis
Credits: 2-3 Max: 3 Grading Scheme: Letter
Prerequisite: admission to graduate status or consent of instructor.
Survey of basic learning and motivational processes including operant and classical conditioning. Introduction to individual-subject research methods and to applied behavior analysis.

EAB 6118: Theoretical Foundations of Behavior Analysis
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Examination of current theoretical issues in behavior analysis, with emphasis upon systematic integration of behavior principles into general behavior theory.

EAB 6707: Applied Behavior I
Credits: 3 Grading Scheme: Letter
Research methods. Measurement, reliability, experimental design, extension of basic research to applied settings.

EAB 6716: Behavior Analysis in Developmental Disabilities
Credits: 3 Grading Scheme: Letter
Prerequisite: EAB 3764 and consent of instructor.

Behavioral approaches to study and treatment of mental retardation and developmental disabilities. Acquisition techniques, assessment, and treatment of behavior disorders, program evaluation, and management.

EAB 6719: Seminar: Strategies and Tactics of Human Behavioral Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EAB 6707.
Advanced study of a scientific approach to investigating human behavior in applied settings.

EAB 6750: Quantitative Methods
Credits: 3 **Grading Scheme:** Letter
Introduction to quantitative methods in single-case research.

EAB 6780: Ethics and Professional Issues
Credits: 1-3 Max: 3 **Grading Scheme:** Letter
Examines ethical decision making and regulatory standards in applied behavior analysis, ethics in research and publication, and professional issues arising in various settings.

EAB 6937C: Seminar: Special Topics in Experimental Analysis of Behavior
Credits: 1-4 Max: 9 **Grading Scheme:** Letter
Prerequisite: EAB 6099.
Current research, theory, and instructional techniques.

EAB 6939: Seminar: Special Topics in Applied Behavior Analysis
Credits: 1-3 Max: 9 **Grading Scheme:** Letter
Current research, technological developments, and professional issues.

EAB 7089: Advanced Seminar: Experimental Analysis of Behavior
Credits: 3 Max: 9 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Restricted areas of experimental analysis of behavior such as schedules of reinforcement, stimulus control, current issues in research methods, and complex repertoires.

EAB 7090: Verbal Behavior
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EAB 6118.
Current empirical and theoretical issues relevant to functional analysis of verbal behavior.

EAP 5835: Academic Spoken English I
Credits: 4 **Grading Scheme:** S/U
Prerequisite: for international graduate students, especially those who expect to become teaching assistants. No credit toward any graduate degree.
Intensive training in English, particularly English used in formal speaking and pedagogy.

EAP 5836: Academic Spoken English II
Credits: 2-3 **Grading Scheme:** S/U
Prerequisite: EAP 5835 or qualifying SPEAK score. Required for international graduate students who are teaching but have not satisfied Graduate School requirements for oral English communication. No credit toward any graduate degree.
TAs are videotaped biweekly in their classrooms. Weekly instruction addresses language, cultural, and pedagogical problems encountered in the classroom.

EAP 5837: Academic Spoken English Tutorial
Credits: 3 **Grading Scheme:** S/U
Prerequisite: EAP 5835 or qualifying SPEAK score. Designed for international graduate students. No credit toward any graduate degree.
Language and interpersonal communication skills needed for one-on-one exchanges. International students are matched with undergraduates seeking tutoring in the graduate student's area of expertise. Tutoring sessions are videotaped and analyzed.

EAP 5845: Academic Writing
Credits: 3 **Grading Scheme:** S/U

Prerequisite: for international students. No credit toward any graduate degree.
Organizational strategies and formats for writing graduate-level papers, theses, and dissertations. Emphasizes writing in the student's discipline. Offered fall and spring terms.

EAP 5846: Research and Technical Writing
Credits: 3 Max: 12 Grading Scheme: S/U
Prerequisite: for international and U.S. students. No credit toward any graduate degree.
The overall process of research writing, with assignments geared to the students' professional careers.

EAP 5937: Special Topics in Academic Spoken English
Credits: 2 Grading Scheme: S/U
Prerequisite: designed for international graduate students. No credit toward any graduate degree.
Overview of advanced oral English skills practiced intensively in other ASE courses for international students. Academic presentations and discussions, interpersonal communication strategies, cross-cultural issues, and accent modification.

EAS 5938: Special Topics in Aerospace Engineering
Credits: 1-4 Max: 8 Grading Scheme: Letter

EAS 6135: Molecular Theory of Fluid Flows
Credits: 3 Grading Scheme: Letter
Prerequisite: EGM 6812 or equivalent.
Introduction to the molecular dynamics of gases and liquids, the Boltzmann equation, Chapman-Enskog expansion and derivation of Euler and Navier-Stokes equations, and lattice Boltzmann methods; and application to gas, liquid, and multiphase flows.

EAS 6138: Gasdynamics
Credits: 3 Grading Scheme: Letter
Prerequisite: EAS 4103 or EML 5714.
Theory of sound waves, subsonic and supersonic flows, shockwaves, explosions and implosions.

EAS 6242: Advanced Structural Composites
Credits: 3 Grading Scheme: Letter
Prerequisite: EGM 3520.
Micro- and macro-behavior of a lamina. Stress transfer of short fiber composites. Classical lamination theory, static analysis of laminated plates, free-edge effect, failure modes.

EAS 6415: Guidance and Control of Aerospace Vehicles
Credits: 3 Grading Scheme: Letter
Prerequisite: EAS 4412 or equivalent.
Applying modern control theory to aerospace vehicles. Parameter identification methods applied to aircraft and missiles.

EAS 6905: Aerospace Research
Credits: 1-6 Max: 12 including EGM 5905 and EGM 6905 Grading Scheme: Letter

EAS 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

EAS 6935: Graduate Seminar
Credits: 1 Max: 6 Grading Scheme: Letter, S/U

EAS 6939: Special Topics in Aerospace Engineering
Credits: 1-6 Max: 12 Grading Scheme: Letter
Laboratory, lectures, or conferences covering selected topics in space engineering.

EAS 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

EAS 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U

Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

EAS 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

ECH 5708: Disinfection, Sterilization, and Preservation
Credits: 2 **Grading Scheme:** Letter
Describes problems and the need for these treatments; causative agents and their nature; nature and the use of chemical and physical antimicrobial agents; specific problems and solutions.

ECH 5938: Topics in Colloid Science
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHY 2049 and 2056L, CHM 2046 and 2046L, MAC 2312 or equivalent.
Colloids and interfacial phenomena, colloid interaction forces, electrokinetic phenomena, transport phenomena influenced by colloidal forces, and electrokinetic phenomena. Examples and applications.

ECH 6126: Thermodynamics of Reaction and Phase Equilibria
Credits: 3 **Grading Scheme:** Letter
Methods of treating chemical and phase equilibria in multi-component systems through application of thermodynamics and molecular theory.

ECH 6270: Continuum Basis of Chemical Engineering
Credits: 3 **Grading Scheme:** Letter
Integrated introduction to transport processes in continuous media with emphasis on fluid mechanics and heat and mass transfer.

ECH 6272: Molecular Basis of Chemical Engineering
Credits: 3 **Grading Scheme:** Letter
Statistical mechanics and microscopic explanation of macroscopic laws of classical thermodynamics, transport phenomena, and chemical kinetics. Statistical mechanical theories that connect molecular structure to macroscopic properties.

ECH 6285: Transport Phenomena
Credits: 1-3 **Max: 3** **Grading Scheme:** Letter
Prerequisite: ECH 6270.

ECH 6326: Computer Control of Processes
Credits: 3 **Grading Scheme:** Letter
Introduction to digital computers, sampled data systems and Z-transforms, control of multiple input-multiple output systems, optimal control, state estimation and filtering, and self-tuning regulators.

ECH 6506: Chemical Engineering Kinetics
Credits: 3 **Grading Scheme:** Letter
Fundamental aspects of chemical reactors, including collision theory, transition rate theory, unimolecular rate theory, homogeneous gas and liquid phase kinetics, and heterogeneous kinetics.

ECH 6526: Reactor Design and Optimization
Credits: 3 **Grading Scheme:** Letter
Fundamentals of heterogeneous reactor design including the characterization of catalytic reactions and support, the development of global rate of the intrinsic reaction affected by chemical and physical deactivation of catalyst, intraphase and interphase mass and heat transfer, and the design and optimization of various types of heterogeneous reactors.

ECH 6709: Electrochemical Engineering Fundamentals and Design
Credits: 3 **Grading Scheme:** Letter
Fundamentals of electrodics and ionics applied to systems of interest in electrochemical engineering.

ECH 6726: Interfacial Phenomena I
Credits: 2 **Grading Scheme:** Letter

Air-liquid and liquid-liquid interfaces; surface-active molecules, adsorption at interfaces, foams, micro- and macro-emulsions, retardation of evaporation and damping of waves by films, surface chemistry of biological systems.

ECH 6727: Interfacial Phenomena II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: CHM 2046 and 2046L.
Solid-gas, solid-liquid, solid-solid interfaces. Adsorption of gases and surface-active molecules on metal surfaces, contact angle and spreading of liquids, wetting and dewetting, lubrication, biolubrication, flotation, adhesion, biological applications of surfaces.

ECH 6843: Experimental Basis of Chemical Engineering
Credits: 3 **Grading Scheme:** Letter
Statistical design of experiments and treatment of data including regression analysis, interpolation, and integration. Introduction to analytical techniques including electron and photon spectroscopes, chromatography, and mass spectrometry.

ECH 6847: Mathematical Basis of Chemical Engineering
Credits: 3 **Grading Scheme:** Letter
Methods of linear systems, chemical engineering applications in finite and infinite dimensional spaces, concepts of stability, application to transport phenomena.

ECH 6851: Impedance Spectroscopy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: familiarity with applications of differential equations.
Intended for chemists, physicists, materials scientists, and engineers with an interest in applying electrochemical impedance techniques to study a broad variety of electrochemical processes.

ECH 6905: Individual Work
Credits: 1-6 Max: 12 **Grading Scheme:** Letter
Individual engineering projects suitable for a nonthesis Master of Engineering degree.

ECH 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

ECH 6926: Graduate Seminar
Credits: 1 Max: 10 **Grading Scheme:** Letter

ECH 6937: Topics in Chemical Engineering I
Credits: 1-4 Max: 9 **Grading Scheme:** Letter
Separations processes, reactor design, applied molecular and kinetic theory, thermodynamics, particulate systems. Properties of chemical substances, transport phenomena, non-Newtonian fluid dynamics, turbulence, applied mathematics, computer science, biochemical and electrochemical engineering.

ECH 6939: Topics in Chemical Engineering III
Credits: 1-4 Max: 9 **Grading Scheme:** Letter

ECH 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

ECH 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

ECH 7938: Advanced Special Chemical Engineering Topics for Doctoral Candidates
Credits: 1-4 Max: 8 **Grading Scheme:** Letter

ECH 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ECH 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

ECO 5715: Open Economy Macroeconomics
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ECP 5702. Designed primarily for M.B.A. students.
International linkages arising from capital flows and exchange rates as well as comparison on macroeconomic policies and performance across countries. Effect of macroeconomic events on international business environment.

ECO 6075: Economics/Consumer Education
Credits: 3 **Grading Scheme:** Letter
Objectives, content, resource materials, and methods of teaching economic/consumer education in the elementary and secondary schools.

ECO 6407: Game Theory and Competitive Strategy: Theory and Cases
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Designed primarily for M.B.A. students.
Analysis of business problems with small number of decision makers. Oligopoly competition and coordination, entry deterrence reputation, and other problems. Problems and cases to illustrate principles using strategic analysis.

ECO 6409: Game Theory Applied to Business Decisions
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ECP 5702 or equivalent. Designed primarily for MBA students.
Business settings analyzed wherein a few decision makers profoundly affect one another's well being. Oligopoly competition and coordination, nonprice choices, entry deterrence, reputation formation, contract design, and management of work teams.

ECO 6716: International Macroeconomics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ECP 5705. Designed primarily for M.B.A. students. Not designed for doctoral students in economics.
Macroeconomic policies and their effects on the international business environment.

ECO 6906: Individual Work in Economics
Credits: 1-4 **Max: 8** **Grading Scheme:** Letter

ECO 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

ECO 6936: Special Topics
Credits: 1-4 **Max: 16** **Grading Scheme:** Letter

ECO 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

ECO 6957: International Studies in Economics
Credits: 1-4 **Max: 12** **Grading Scheme:** S/U
Prerequisite: admission to approved study abroad program and permission of department.

ECO 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

ECO 7113: Information Economics
Credits: 1-2 **Max: 2** **Grading Scheme:** Letter
Prerequisite: ECO 7115 and ECO 7408. *Corequisite:* ECO 7404.
Analysis of information problems, remedies through contracting or adoption of different procedures and organization when complete contracting is infeasible.

ECO 7115: Microeconomic Theory
Credits: 3 **Grading Scheme:** Letter
Corequisite: ECO 7408 or equivalent.
Analysis of optimization applied to consumer and product theory including comparative statistics and duality.

ECO 7118: Markets and Institutions
Credits: 1-2 Max: 2 Grading Scheme: Letter
Partial equilibrium analysis of four basic market structures: competition, monopoly (monopsony), oligopoly, and monopolistic competition. Topics include pricing strategies, vertical integration, and bilateral monopoly. Examination of policy implications.

ECO 7119: Information, Incentives, and Agency Theory
Credits: 3 Grading Scheme: Letter
Prerequisite: ECO 7115.
Recent theoretical work in literature on design of incentive schemes in presence of limited information. Mathematical modeling and proof techniques emphasized.

ECO 7120: General Equilibrium and Welfare Economics
Credits: 1-2 Max: 2 Grading Scheme: Letter
Prerequisite: ECO 7115. *Corequisite:* ECO 7406.
Introduction to general equilibrium analysis, including existence of equilibrium, core convergence, and fundamental theorems of welfare economics.

ECO 7206: Macroeconomic Theory I
Credits: 3 Grading Scheme: Letter
Coreq: ECO 7115, ECO 7408. Classical, Keynesian, and new classical aggregate income and employment analysis. Demand for money. Inflation and unemployment. Monetary policy and stabilization. Time series and rational expectations models.

ECO 7272: Economic Growth I
Credits: 1 or 2 Grading Scheme: Letter
Prerequisite: ECO 7115 and ECO 7415. *Corequisite:* ECO 7406.
Introduction and overview of theoretical and empirical developments in determinants of long-run standards of living.

ECO 7404: Game Theory for Economists
Credits: 1-2 Max: 2 Grading Scheme: Letter
Prerequisite: ECO 7115 and ECO 7408.
Introduction to modern game theory as used in economics. Emphasis on use of techniques in simple applications.

ECO 7405: Mathematical Economics: Game Theory
Credits: 3 Grading Scheme: Letter
Prerequisite: ECO 7404 and ECO 7408 or consent of instructor.
Advanced game theory including incomplete information games with application to economics.

ECO 7406: Dynamic Economics: Theory and Applications
Credits: 1-2 Max: 2 Grading Scheme: Letter
Prerequisite: ECO 7115 and ECO 7408.
Review of techniques and applications of dynamic optimization and growth with introduction to modern dynamic techniques to analyze growth, resource management, stabilization policy, capital accumulation, asset pricing, search behavior, and incentive contracting.

ECO 7408: Mathematical Methods and Applications to Economics
Credits: 1-2 Max: 2 Grading Scheme: Letter
Mathematical techniques used in graduate work in economics and finance. Linear algebra and differential equations, with emphasis on results used in economic theory and econometrics.

ECO 7415: Statistical Methods in Economics
Credits: 3 Grading Scheme: Letter
Coreq: ECO 7408. Introduction to fundamental statistical concepts: estimation, hypothesis testing, linear regression, and analysis of variance.

ECO 7424: Econometric Models and Methods
Credits: 3 Grading Scheme: Letter
Prerequisite: ECO 7415.
Introduction to classical econometric theory, linear models, and estimation methods.

ECO 7426: Econometric Methods I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ECO 7424 or departmental approval.
Stochastic models. The general linear model and problems associated with its use in econometric research. Theory of the simultaneous equation approach, model construction, and estimation techniques.

ECO 7427: Econometric Methods II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ECO 7424 or AEB 7571.
Advanced econometric theory with applications to topics such as nonlinear estimation, limited dependent variable models, time-series analysis, and specification testing.

ECO 7452: Best Empirical Practices in Economics
Credits: 1-2 Max: 2 **Grading Scheme:** Letter
Analysis of empirical papers to develop skills for evaluating and conducting empirical testing of economic theory.

ECO 7456: Practicum in Empirical Research
Credits: 1 **Grading Scheme:** Letter, H
Prerequisite: Ph.D. student.
Practical training for first-year Ph.D. students through all stages of research process culminating in generation of first draft of original research paper.

ECO 7516: Tax Theory and Public Policy
Credits: 1-2 Max: 2 **Grading Scheme:** Letter
Prerequisite: ECO 7525.
Survey of economics of taxation. Optimal commodity and income taxation for efficiency and redistribution, tax incidence, capital taxation, and uncertainty and taxes.

ECO 7525: Welfare Economics and The Second Best
Credits: 1-2 **Grading Scheme:** Letter
Prerequisite: ECO 7115
Introduction and overview of public sector economics. Basic welfare economics, optimal commodity and income taxation, and public goods and welfare.

ECO 7534: Empirical Public Economics I
Credits: 1-2 Max: 2 **Grading Scheme:** Letter
Prerequisite: ECO 7424 and 7525.
Taxation, expenditures, marketplace of local governments, federalism and sources of inefficiency in government, voter turnout.

ECO 7535: Empirical Public Economics II
Credits: 1-2 Max: 2 **Grading Scheme:** Letter
Education, welfare policy, health policy, and environmental policy.

ECO 7536: Theoretical Public Economics
Credits: 1-2 Max: 2 **Grading Scheme:** Letter
Prerequisite: ECO 7115.
The course is concerned primarily with public goods and their provision.

ECO 7706: Theory of International Trade
Credits: 3 **Grading Scheme:** Letter
Historical and economic background of foreign trade; theory of international trade; fundamentals of international exchange; international commercial policies and international trade; exchange fluctuations and their control; international monetary institutions.

ECO 7707: International Economic Relations
Credits: 3 **Grading Scheme:** Letter
International trade and income distribution, international technology diffusion, foreign direct investment and multinational enterprise, formation and reform of trade and investment policy.

ECO 7925: Research Skills Workshop
Credits: 3 **Grading Scheme:** S/U
Prerequisite: passed written qualifying exams.
Transition from learning about work of others to doing research. Selecting area of research, surveying literature, narrowing to specific topic, formulating model, collecting data if appropriate, working through theoretical or empirical analysis, and writing first draft.

ECO 7938: Advanced Economics Seminar
Credits: 1-4 Max: 8 **Grading Scheme:** Letter
For advanced graduate students in economics. Student must have completed graduate core program and have preliminary dissertation topic.

ECO 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ECO 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

ECP 5415: Antitrust Policy and Managerial Decisions
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ECP 5702. Designed primarily for M.B.A. students.
Overview of antitrust laws and review of their implementation. Examination of civil remedies available to injured persons. Evaluation of specific damage models.

ECP 5702: Managerial Economics
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Designed primarily for M.B.A. students.
Microeconomic forces that influence decisions made by firms. Cost concepts, pricing strategies, capital investment, human resource management, innovation, and the influence of the competitive environment of firms.

ECP 5705: Economics of Business Decisions
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Designed primarily for M.B.A. students.
Synthesis and application of microeconomic theory and related business administration principles to managerial decision making through a problem-solving orientation.

ECP 6407: Economics for Managing Information for Electronic Commerce
Credits: 2 **Grading Scheme:** Letter
Special economic issues pertaining to commerce in information age. Questions relating to pricing of information services, protection of intellectual property, evaluation of information quality and accuracy, and design of markets to facilitate information flows.

ECP 6417: Public Policy and Social Control
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Designed primarily for M.B.A. students.
Problems in developing and applying concepts of public interest in a market economy. Relationships among industrial structure, business conduct, and economic performance. Measurement of concentration and evaluation of performance.

ECP 6701: Competitive Strategies in Expanding Markets
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ECP 5702; MBA and other master's students.
Identify and analyze strategies in expanding markets created by technological change and accelerated globalization.

ECP 6708: Cases in Competitive Strategy
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ECO 6409. Designed for MBA students.

Current and recent cases to illustrate practical principles using strategic analysis. Class discussions of cases comprise first part; student presentations comprise second part. Practical business lessons from applying strategic methodology.

ECP 7407: Theory of Industrial Organization:Product Differentiation and Strategy
Credits: 1-2 Max: 2 Grading Scheme: Letter
Prerequisite: ECO 7115, ECO 7404, ECO 7118
Models of oligopoly with differentiated products, modern monopolistic competition models, and strategic moves in oligopoly.

ECP 7408: Empirical Industrial Organization
Credits: 1-2 Max: 2 Grading Scheme: Letter
Prerequisite: ECO 7424 required; ECO 7426 recommended or consent of instructor.
Empirical examination of current issues. Returns to scale, market structure, entry and exit, technological progress, and examination of particular regulated industries.

ECP 7418: Economics of Regulation
Credits: 1-2 Max: 2 Grading Scheme: Letter
Theory and practice of regulatory institutions, with focus on pricing and incentive issues. Analysis of alternatives to traditional regulatory policy.

ECP 7419: Current Research in Regulation
Credits: 1-2 Max: 2 Grading Scheme: Letter
Explores current research topics in regulation. Emphasizes energy, environment, telecommunications, and water, with an objective of preparing students to contribute to this research.

ECS 6423: Latin American Business Economics
Credits: 2 Grading Scheme: Letter
Review of political, economic and cultural background of region including trade patterns and policies; direct foreign investment and multinational firms; determination of foreign exchange rate risk; effects of currency crises and monetary policies on business environment; corporate strategies relevant for Latin America; international marketing and finance strategies appropriate for region; and role of government policies affecting operations of firms.

EDA 5938: Special Topics
Credits: 1-3 Max: 6 Grading Scheme: Letter
Explores current topics of special interest.

EDA 6061: Educational Organization and Administration
Credits: 3 Grading Scheme: Letter
Basic concepts and practices in local, state, and federal organizations and administration.

EDA 6107: Leading Change in Educational Organizations
Credits: 3 Grading Scheme: Letter
Organizational dynamics, and leadership theory and practice, and their roles in promoting successful change.

EDA 6192: Educational Leadership: The Individual
Credits: 3 Grading Scheme: Letter
The individual as a leader and the role of educational leaders in group development.

EDA 6193: Educational Leadership: Instruction
Credits: 3 Grading Scheme: Letter
Examination and analysis of role in curriculum change and school improvement.

EDA 6195: Educational Policy Development
Credits: 3 Grading Scheme: Letter
Contemporary research on political power in policy decision making and role of educational leaders in policy development.

EDA 6215: Communications in Educational Leadership
Credits: 3 Grading Scheme: Letter
School/community relations and communication implications for educational leaders.

EDA 6222: Administration of School Personnel

Credits: 3 **Grading Scheme:** Letter
Problems of the professional school staff and administration of staff personnel in public schools.

EDA 6225: Labor Relations in Public Education
Credits: 3 **Grading Scheme:** Letter
Various aspects of employee, union, and management relationships in public education.

EDA 6232: Public School Law
Credits: 3 **Grading Scheme:** Letter
The law as it affects public school operation in America. Religion; desegregation; compulsory attendance; torts; curriculum; student control and discipline; and teacher freedoms, employment, and dismissal.

EDA 6242: Public School Finance
Credits: 3 **Grading Scheme:** Letter
State, local, and federal financing of education.

EDA 6271: Technology Leadership for Educational Administrators
Credits: 3 **Grading Scheme:** Letter
Application of computer technology to leadership and management of educational enterprise.

EDA 6423: Data-Driven Decision Making in Educational Organizations
Credits: 3 **Grading Scheme:** Letter
Analytical and leadership issues related to conducting data-driven decision making in a professional, legal, ethical, and methodologically sound manner.

EDA 6503: The Principalship
Credits: 3 **Grading Scheme:** Letter
Organization and administration of the school; emphasis on competencies necessary for leadership and management of the school center, both elementary and secondary.

EDA 6905: Individual Work
Credits: 1-6 Max: 12 including EDG 6905 **Grading Scheme:** Letter
Prerequisite: students must have approval of proposed project before registering.
For advanced students who wish to study individual problems under faculty guidance.

EDA 6931: Special Topics
Credits: 1-5 Max: 10 **Grading Scheme:** Letter

EDA 6935: Problems in School Administration and Supervision
Credits: 1-15 Max: 15 **Grading Scheme:** S/U
In-service training through regularly scheduled on-campus work conferences open only to superintendents and supervisors; or a problems course, offered through extension or on campus, for superintendents, supervisors, principals, junior college administrators, and trainees for such positions.

EDA 6948: Supervised Practice in School Administration
Credits: 1-15 Max: 15 **Grading Scheme:** S/U
Prerequisite: open only to advanced students.
Opportunity to perform administrative duties under supervision.

EDA 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

EDA 7206: Organizational Leadership in Education
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDA 6192.
Developing concepts and refining skills associated with planning and organizing in educational institutions.

EDA 7945: Practicum in Supervision and Administration
Credits: 1-15 Max: 15 **Grading Scheme:** S/U
A seminar and an internship in administration and supervision.

EDA 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

EDA 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

EDA 7985: Research Design in Educational Administration
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDF 7486 or equivalent. Open only to advanced graduate students.
Conceptualizing problems in administration and determining appropriate research procedures.

EDE 5940: Integrated Teaching and Learning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: admission to the master's certification program in elementary education plus 15 credits, EDF 6113, and RED 5316 or RED 5355.
Student interns develop general pedagogical competencies and skills necessary to successful teachers.

EDE 6225: Practices in Childhood Education
Credits: 3 **Grading Scheme:** Letter
Corequisite: EDE 6948.
Elementary school practices related to the fundamental principles of curriculum development; selecting, organizing, and developing effective teaching-learning situations.

EDE 6266: Teaching and Learning in Elementary Classrooms
Credits: 3 **Grading Scheme:** Letter
Prerequisite: admission to the master's certification program in elementary education.
Introduction to the program.

EDE 6325: Teacher Inquiry/Action Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDE 6948.
Purpose, goals, and processes of teacher inquiry and application of this methodology in the classroom.

EDE 6905: Individual Work
Credits: 1-5 Max: 12 including ESE 6905 **Grading Scheme:** Letter
For advanced students who wish to study individual problems in childhood education and/or early childhood education under faculty guidance.

EDE 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

EDE 6932: Special Topics
Credits: 1-5 Max: 10 **Grading Scheme:** Letter
Prerequisite: consent of department chair.

EDE 6948: Internship in Elementary Schools
Credits: 3-12 Max: 12 **Grading Scheme:** Letter
Prerequisite: consent of the department. *Corequisite:* EDE 6225.
Supervised teaching in elementary grades K-6.

EDE 7047: Issues in Teacher Education
Credits: 3 Max: 9 **Grading Scheme:** Letter
Current issues and theory in teacher education and teacher education reform.

EDE 7935: Seminar in Curriculum & Instruction
Credits: 1-6 Max: 6 **Grading Scheme:** Letter
Current research and an overview of the total program.

EDF 5441: Assessment in General and Exceptional Student Education
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 3122.
Basic measurement concepts, designing classroom assessments, and interpreting results from traditional or alternative assessments; using these to plan instruction and evaluate student performance.

EDF 5552: Role of School in Democratic Society
Credits: 3 **Grading Scheme:** Letter
Common conceptions of democracy, equality, freedom, liberty, and equality and what these conceptions imply for educational aims and practice.

EDF 6113: Educational Psychology: Human Development
Credits: 3 **Grading Scheme:** Letter
Current research and theories in the area of human development.

EDF 6211: Educational Psychology: General
Credits: 3 **Grading Scheme:** Letter
Basic principles, techniques, and research; designed for graduate students preparing to teach who have a minimal background in psychology.

EDF 6215: Educational Psychology: Learning Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Logic and methodologies of theories of learning.

EDF 6232: Principles of Learning and Instructional Practice
Credits: 3 **Grading Scheme:** Letter
Topics include transfer of training, reinforcement, forgetting, and problem solving.

EDF 6355: Educational Psychology: Personality Dynamics
Credits: 3 **Grading Scheme:** Letter
Dynamics of behavior and their implications for education, counseling and guidance, administration, family relationships, and social action.

EDF 6400: Quantitative Foundations of Education Research Overview
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 2023, STA 2122 or equivalent.
Overview of quantitative methods: validity, reliability, research design, and inferential statistics.

EDF 6401: Educational Statistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 2023. Primarily for Ed.D. candidates.
Application to educational data and problems.

EDF 6402: Quantitative Foundations in Educational Research: Inferential Statistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDF 6400.
Analysis of variance: One-way ANOVA, two-way ANOVA, ANOVA, repeated measures, and split plot.

EDF 6403: Quantitative Foundations of Educational Research
Credits: 6 **Grading Scheme:** Letter
Prerequisite: STA 2023, 2122, or equivalent.
Integrated coverage of fundamentals in the general field of education research. Includes statistics, experimental design, and data processing.

EDF 6434: Educational Measurement
Credits: 3 **Grading Scheme:** Letter
Prerequisite: undergraduate statistics course.
Overview of educational measurement and testing, emphasizing cognitive ability and achievement testing.

EDF 6436: Theory of Measurement
Credits: 4 **Grading Scheme:** Letter
Prerequisite: STA 2023; EDF 4430.
Introductory study of true score models, reliability, validity, norms, scaling, item analysis, and basic elements of instrument construction.

EDF 6471: Survey Design and Analysis in Educational Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDF 6403.
Development and analysis techniques for surveys and questionnaires. Techniques of protocol development, data collection, analysis, and reporting.

EDF 6475: Qualitative Foundations of Educational Research
Credits: 4 **Grading Scheme:** Letter
Introduction to philosophical, historical, sociological, and other methodologies as aspects of qualitative educational research.

EDF 6481: Quantitative Research Methods in Education
Credits: 4 **Grading Scheme:** Letter
Prerequisite: STA 2023, 2122 or equivalent.
Design and data analysis for educational research.

EDF 6520: History of Education
Credits: 3 **Grading Scheme:** Letter
Salient issues in education from the Reformation to the present.

EDF 6544: Philosophical Foundations of Education
Credits: 3 **Grading Scheme:** Letter
Philosophical bases for democracy and education.

EDF 6606: Socioeconomic Foundations of Education
Credits: 3 **Grading Scheme:** Letter
Sociological analysis of democratic educational aims, the school as a social system, interest groups, the teaching profession, and economic stratification in America.

EDF 6616: Education and American Culture
Credits: 3 **Grading Scheme:** Letter
Graduate-level introduction to the social foundations of education (history, philosophy, and sociology).

EDF 6630: Educational Sociology
Credits: 3 **Grading Scheme:** Letter
Sociological theory and research with direct relevance to the study of education.

EDF 6812: Comparative Education
Credits: 3 **Grading Scheme:** Letter
Relationships of school and society in different cultural areas of the world.

EDF 6820: Education in Latin America
Credits: 3 **Grading Scheme:** Letter
Traditions and contemporary social, political, and cultural aspects.

EDF 6905: Individual Study
Credits: 1-3 **Max: 12** **Grading Scheme:** Letter
Prerequisite: consent of department chair.
For advanced students who wish to study individual problems in psychological, social, or philosophical foundations of education, or research and measurement under faculty guidance.

EDF 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U
Prerequisite: consent of department chair.

EDF 6938: Special Topics
Credits: 1-3 Max: 12 Grading Scheme: Letter
Prerequisite: consent of department chair.

EDF 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: consent of department chair.

EDF 6941: Practicum in Educational Research
Credits: 2-9 Max: 9 Grading Scheme: Letter
Prerequisite: EDF 6403. Arrangements must be made with instructor before registration.
Experience in conducting various phases of quantitative or qualitative educational research under individual supervision.

EDF 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

EDF 7117: Affective Development and Education
Credits: 3 Grading Scheme: Letter
Prerequisite: EDF 6113 or equivalent.
Application of theory and research.

EDF 7146: Advanced Cognitive Development
Credits: 3 Grading Scheme: Letter
Prerequisite: EDF 6113.
Cognitive development theory and research.

EDF 7405: Advanced Quantitative Foundations of Educational Research
Credits: 4 Max: 8 Grading Scheme: Letter
Prerequisite: EDF 6403.
Integrated coverage of important approaches to educational research. Includes application of experimental design, regression analysis, and computer processing to selected educational research problems.

EDF 7412: Structural Equation Models
Credits: 3 Grading Scheme: Letter
Prerequisite: EDF 6436, EDF 7405.
Confirmatory factor analysis and causal models.

EDF 7413: Advanced Topics in Structural Equation Modeling
Credits: 3 Grading Scheme: Letter
Prerequisite: EDF 7412
Methods for conducting methodological research about structural equation modeling (SEM) and advanced techniques in SEM: multilevel SEM, mixture models, latent variable interactions, advanced latent growth models and SEM with complex survey data.

EDF 7435: Rating Scale Design and Analysis in Educational Research
Credits: 3 Grading Scheme: Letter
Prerequisite: EDF 6403 and EDF 6434 or EDF 6436.
Development and analysis techniques for questionnaires and rating scales. Applications of psychometric models to item, scale, and rater evaluation; bias detection; factor analysis; and measurement of change.

EDF 7439: Item Response Theory
Credits: 3 Grading Scheme: Letter
Prerequisite: EDF 6436.
Psychometric models for test scores; estimation of ability and item parameters; applications of and current issues in IRT.

EDF 7474: Multilevel Models
Credits: 3 Grading Scheme: Letter
Prerequisite: EDF 6403 or EDF 6481 and EDF 7405.
Models and methods for analysis of multilevel data.

EDF 7479: Qualitative Data Analysis: Approaches and Techniques
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDF 6475.
Theories, approaches, and techniques of qualitative data analysis.

EDF 7482: Quasi-experimental Design and Analysis in Educational Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDF 7405 : Advanced Quantitative Foundations of Educational Research
Examining quasi-experimental educational research designs and methods for data analysis for treatment comparisons that do not use random assignment of participants to conditions. Topics include matched designs, regression discontinuity designs, and control of selection bias using propensity scores, instrumental variables, and fixed effects.

EDF 7483: Qualitative Data Collection: Approaches and Techniques
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDF 6475.

EDF 7486: Methods of Educational Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 2023. Primarily for Ed.D. candidates.
Examination of research methodologies. Problem identification as well as organization and presentation of data.

EDF 7491: Evaluation of Educational Products and Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDF 6403 or equivalent.
Models and methods for formative and summative evaluation of educational products and programs.

EDF 7555: Values and Ethics in Education
Credits: 3 **Grading Scheme:** Letter
The conception and role of values in education, with special emphasis on moral values (ethics).

EDF 7639: Research in Educational Sociology
Credits: 3 **Grading Scheme:** Letter
Research techniques in educational sociology, emphasis on ethnography.

EDF 7931: Seminar in Educational Research
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: EDF 6403.
In-depth examination of specific methodological approaches to educational research.

EDF 7932: Multivariate Analysis in Educational Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDF 6403 and EDF 7405.
Review of selected studies, focusing on methods of data analysis. Emphasis on using multivariate techniques.

EDF 7934: Seminar in Educational Foundations
Credits: 3 **Max: 12** **Grading Scheme:** Letter
Advanced study in historical, philosophical, social, and comparative foundations.

EDF 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

EDF 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

EDG 6017: Writing for Academic Purposes
Credits: 3 **Grading Scheme:** Letter

Enhancing the capacity of doctoral students from all academic disciplines to write for academic purposes. Focusing on exploring the ways in which language is used as a creative resource for presenting information, structuring text, embedding perspectives, developing arguments, referencing sources, and addressing audience needs in academic writing.

EDG 6047: Teacher Leadership for Educational Change
Credits: 3 **Grading Scheme:** Letter
Understanding teachers' roles in the educational change and improvement process.

EDG 6207: Transforming the Curriculum
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDE 6325.
Design more rigorous and engaging curriculum leading to increased student understanding and mastery of subject matter. Examine different ways of assessment.

EDG 6225: Global Studies Methods in K-12 Education
Credits: 3 **Grading Scheme:** Letter
Overview of current issues and strategies for incorporating them into the K-12 curriculum. Intended for non-education majors.

EDG 6226: Foundations of Research in Curriculum & Instruction
Credits: 3 **Grading Scheme:** Letter
Introduction to research in curriculum and instruction, scholars in the field, and expectations of the professoriate. Students will explore Boyer's domains of scholarship that serve as a framework for STL doctoral programs.

EDG 6250: The School Curriculum
Credits: 3 **Grading Scheme:** Letter
Required in all graduate programs in curriculum and instruction. Theoretical and research bases underlying the development of the total school program from kindergarten through community college. Basic curriculum course for graduate students.

EDG 6285: Evaluation in the School Program
Credits: 3 **Grading Scheme:** Letter
Procedures and techniques of evaluation in school programs. Emphasizes needs assessment, school self-study, and course evaluation.

EDG 6348: Instructional Coaching for Enhanced Student Learning
Credits: 3 **Grading Scheme:** Letter
This course is designed as a graduate study of instructional coaching, a form of job-embedded professional development focused on improving teaching practice in order to improve student learning. It is designed for educators at all levels and in all roles.

EDG 6356: Teaching, Learning and Assessment
Credits: 3 **Grading Scheme:** Letter
Historical and in-depth exploration of assessment practices related to curricular issues.

EDG 6415: Culturally Responsive Classroom Management
Credits: 3 **Grading Scheme:** Letter
Examines the role culture plays in teaching and learning. Explores what is needed to establish a culturally responsive classroom in which all students can succeed.

EDG 6445: Meeting the Educational Needs of Students Living in Poverty
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EDE 6325 Teacher Inquiry/Action Research
Enhancing knowledge of the impact of poverty on children, and improve their instructional and management strategies to better meet the needs of children living in poverty.

EDG 6905: Individual Work
Credits: 1-6 Max: 12 including EDA 6905 **Grading Scheme:** Letter
Prerequisite: student must have approval of proposed project before registering.
For advanced students who wish to study individual problems under faculty guidance.

EDG 6910: Supervised Research

Credits: 1-5 Max: 5 Grading Scheme: S/U

EDG 6931: Special Topics
Credits: 1-4 Max: 12 including EDA 6905 Grading Scheme: Letter
Prerequisite: consent of instructor.

EDG 6940: Supervised Teaching
Credits: 2 Max: 10 Grading Scheme: S/U
Prerequisite: adviser's consent.
For graduate students serving as teaching assistants under the supervision of a faculty member.

EDG 6953: TLSI Online Portfolio Preparation
Credits: 1-3 Max: 3 Grading Scheme: Letter
Prerequisite: EDE 6325.
Development of portfolio artifacts. Preparation for defense of program portfolio.

EDG 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

EDG 6973: Project in Lieu of Thesis
Credits: 1-9 Grading Scheme: S/U
Developing, testing, and evaluating original educational technology, curricular materials, or an intervention program.

EDG 7222: Curriculum: Theory and Research
Credits: 3 Grading Scheme: Letter
Prerequisite: EDG 6250.
Theories of curriculum organization and a survey of curriculum research and patterns of curriculum.

EDG 7224: Critical Pedagogy
Credits: 3 Grading Scheme: Letter
Core concepts and practice of critical educational theory.

EDG 7252: Perspectives in Curriculum, Teaching, and Teacher Education
Credits: 3 Grading Scheme: Letter
Issues related to curriculum, teaching, and teacher education.

EDG 7303: Teacher Learning and Socialization in High Poverty Schools
Credits: 3 Grading Scheme: Letter
Explores theory and research related to teacher learning, focusing on high-poverty schools.

EDG 7326: Differentiated Supervision and Teacher Professional Development
Credits: 3 Grading Scheme: Letter
Study of teacher professional development and supervision at both the theoretical and practical levels.

EDG 7359: Professional Development and Teacher Learning
Credits: 3 Grading Scheme: Letter
Prerequisite: EDG 6226 : Foundations and Research in Curriculum & Instruction
Examining teacher learning within professional development, the essential elements of high quality professional development, how to measure the impact of professional development, and multiple ways in which professional development is being played out in the district, state, and national contexts.

EDG 7665: Bases of Curriculum and Instruction Theory
Credits: 3 Grading Scheme: Letter
Prerequisite: EDG 6250 or equivalent.
Applies behavioral science theory and research to the development of curriculum and instruction theory. Topics include social forces, human development, and learning theories.

EDG 7941: Field Experience in Curriculum and Instruction
Credits: 1-4 Max: 10 Grading Scheme: Letter
Prerequisite: open only to advanced graduate students.

Supervised experiences appropriate to the student's professional goals.

EDG 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

EDG 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

EDG 7982: Practitioner Research: Theory & Practice
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Intended for doctoral students.

Develops a strong theoretical understanding of the purposes of practitioner inquiry, as a form of educator professional development, while helping students to translate this knowledge into practices that support school improvement.

EDH 6040: Theory of College Student Development
Credits: 3 **Grading Scheme:** Letter
Examination of theories describing patterns of growth and development during college years.

EDH 6046: Diversity Issues in Higher Education
Credits: 3 **Grading Scheme:** Letter
Models, theories, and skills for understanding multicultural students at the postsecondary level.

EDH 6048: Advising College Student Organizations
Credits: 3 **Grading Scheme:** Letter
Advisement practices, student organization culture, and group development theories.

EDH 6049: Domestic and International College Student Services
Credits: 3 **Grading Scheme:** Letter
Overview of higher education student services in the United States and international institutions.

EDH 6051: Educational Outcomes of American Colleges and Universities
Credits: 3 **Grading Scheme:** Letter
Exploration of impact of postsecondary educational institutions and barriers to student development.

EDH 6053: The Community Junior College in America
Credits: 3 **Grading Scheme:** Letter
Programs, issues, and problems.

EDH 6066: American Higher Education
Credits: 3 **Grading Scheme:** Letter
History, philosophy, and policies, with emphasis on current practices and problems.

EDH 6067: Seminar: International Higher Education
Credits: 3 **Grading Scheme:** Letter
Characteristics of selected foreign higher education systems with emphasis on history and philosophy, access, curriculum and instruction, student and faculty characteristics, governance, management, and finance.

EDH 6305: College and University Teaching
Credits: 3 **Grading Scheme:** Letter
Contemporary issues, problems, and research related to the role of the college faculty member and the teaching-learning process.

EDH 6360: Foundations and Functions of College Student Personnel
Credits: 3 **Grading Scheme:** Letter
Introduction to history, roles, and functions.

EDH 6361: Theories and Assessment of Higher Educational Environments
Credits: 3 **Grading Scheme:** Letter
Examines theoretical approaches that define and describe various elements of higher educational environments.

EDH 6503: Resource Development in Higher Education
Credits: 3 **Grading Scheme:** Letter
Exploration of financial resource development in higher education institutions and organizations.

EDH 6632: Current Issues in Community College Leadership
Credits: 3 **Grading Scheme:** Letter
Case-based approach to examining current issues on community college campuses.

EDH 6637: Crisis Management in Higher Education
Credits: 3 **Grading Scheme:** Letter
Introduction to real crisis situations. Students form emergency plans based on different crisis response models.

EDH 6931: Special Topics in Higher Education
Credits: 1-3 **Max: 10** **Grading Scheme:** Letter

EDH 6935: Seminar in College Student Personnel Administration
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Culminating seminar integrating core curriculum and practitioner experience.

EDH 6945: Practicum in College Teaching I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: prior arrangements must be made with the coordinating professor of the College of Education.
Provision made for the student to teach under the supervision of a professor at either the community college, four-year college, or university level. Seminars cover topics related to improvement of college teaching.

EDH 6946: Practicum in College Teaching II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: prior arrangements must be made with the coordinating professor of the College of Education.
Provision made for the student to teach under the supervision of a professor at either the community college, four-year college, or university level. Seminars cover topics related to improvement of college teaching.

EDH 6947: Practicum in Student Personnel
Credits: 3 **Max: 6** **Grading Scheme:** S/U
Prerequisite: adviser's consent, and written application to practicum coordinator.

EDH 7225: Seminar: Curriculum in Higher Education
Credits: 3 **Grading Scheme:** Letter
Issues and problems in college and university curricula. Curriculum planning, implementation, and evaluation.

EDH 7405: The Law and Higher Education
Credits: 3 **Grading Scheme:** Letter
The legal structure of higher education, religion, academic freedom of faculty, employment, due process, students' rights of speech and expression, search and seizure, desegregation, and tort liability.

EDH 7505: The Financing of Higher Education
Credits: 3 **Grading Scheme:** Letter
Junior college through university. Theoretical basis for use of tax funds for education, student fees and tuition, state methods for financing, planning, cost benefit, budgeting, federal role, and capital outlay.

EDH 7631: Administration of Instruction in Higher Education
Credits: 3 **Grading Scheme:** Letter
Skills and knowledge for current and future college leaders.

EDH 7634: Student Affairs Administration in Higher Education
Credits: 3 **Grading Scheme:** Letter

Major issues. Purposes, structure, program evaluation, and budgeting.

EDH 7635: Higher Education Administration
Credits: 3 **Grading Scheme:** Letter
Educational policies, functions, and practices.

EDH 7916: Contemporary Research on Higher Education
Credits: 3 **Grading Scheme:** Letter
Examination and analysis of research related to higher education. Implications for application of findings for improvement of colleges and universities.

EDH 7942: Group Supervision in Student Personnel
Credits: 1 Max: 5 **Grading Scheme:** S/U
Prerequisite: written application to internship coordinator before registration.

EDH 7948: Internship in Student Personnel
Credits: 5 **Grading Scheme:** S/U
Prerequisite: adviser's consent; and written application to internship coordinator before registration.

EDM 6005: The Emergent Middle School
Credits: 3 **Grading Scheme:** Letter
Program, organization, and rationale of the newly emerging middle school in American school districts.

EDM 6235: Interdisciplinary Planning, Teaching, and Assessment
Credits: 3 **Grading Scheme:** Letter
Interdisciplinary team organization, integrated curriculum, team planning, collaboration consultation, and strategies for assessment.

EDP 6052: Cognitive Psychology Applied to Education
Credits: 3 **Grading Scheme:** Letter
Introduction to cognitive-psychological research and applications to education.

EDS 6140: Supervision of Instruction
Credits: 3 **Grading Scheme:** Letter
Systematic approaches to supervising instructional personnel including observation and programs of continuing professional development.

EEC 6205: Early Childhood Curriculum
Credits: 3 **Grading Scheme:** Letter
Students develop and/or implement instructional strategies consistent with their personal philosophies of early childhood education.

EEC 6304: Creativity in the Early Childhood Curriculum
Credits: 3 **Grading Scheme:** Letter
Techniques for teaching all areas of the early childhood curriculum to support the development of children's creativity with an emphasis on art and music.

EEC 6525: Issues in Child Care Administration
Credits: 3 **Grading Scheme:** Letter
Child care background, curriculum, organization, staffing, training of staff, parent education and involvement, funding, and research.

EEC 6615: Early Childhood Education: Background and Concepts
Credits: 3 **Grading Scheme:** Letter
Trends in the teaching of nursery and kindergarten children as shown in past and current educational theory.

EEC 6905: Individual Work
Credits: 1-4 Max: 12 **Grading Scheme:** Letter
Prerequisite: Consent of department chair, approval of proposed project, and completion of at least 9 hours of graduate work.

Individual study conducted under the supervision of a faculty member.

EEC 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

EEC 6933: Special Topics
Credits: 1-12 Max: 12 Grading Scheme: Letter
Prerequisite: Consent of instructor.
Selected topics in the theory and practice of early childhood education not included in the established curriculum.

EEC 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: consent of instructor.

EEC 6946: Practicum in Early Childhood Education
Credits: 1-6 Max: 11 Grading Scheme: Letter
Supervised experience in a variety of early childhood settings with weekly seminars.

EEC 7056: Early Childhood Policy and Advocacy
Credits: 3 Grading Scheme: Letter
Prerequisite: Intended for doctoral students only
Focuses on understanding, analyzing, and evaluating early childhood policies at federal, state, and local levels and internationally. Analyzes relationships among early childhood policies, research, and practices.

EEC 7617: Early Childhood Asessment & Evaluation
Credits: 3 Grading Scheme: Letter
Prerequisite: EDF 6400 and EDF 6402; or EDF 6403; or consent of instructor
Doctoral students will explore in depth the role of assessment and evaluation in research, practice, and policy as it relates to the field of early childhood studies.

EEC 7666: Theory and Research in Early Childhood Studies
Credits: 3 Grading Scheme: Letter
Prerequisite: Intended for doctoral students; permission of instructor.
Reading, evaluating, synthesizing, and discussing early childhood theory and applied early childhood research. Discussions of commonly encountered issues related to the ethical conduct of research in applied contexts.

EEC 7979: Advanced Research
Credits: 1-12 Max: 12 Grading Scheme: S/U
Prerequisite: Designed for students with a masters' degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.
Research for doctoral students before admission to candidacy.

EEE 5317C: Introduction to Power Electronics
Credits: 3 Grading Scheme: Letter
Prerequisite: EEE 3396, EEE 3308C. *Corequisite:* EEL 4657.
Components and circuits for power applications. Switched-mode power supplies.

EEE 5320: Bipolar Analog IC Design
Credits: 3 Grading Scheme: Letter
Prerequisite: EEE 3308C
Amplifier stages, active loads, output stages, op-amps, feedback, frequency response, compensation.

EEE 5322: VLSI Circuits and Technology
Credits: 3 Grading Scheme: Letter
Prerequisite: EEE 3396 and EEE 3308C
Introduction to VLSI circuit technology and manufacturing. Fabrication, device models, layout, parasitics, and simple gate circuits.

EEE 5336L: Solid-State Technology Laboratory
Credits: 1 Grading Scheme: Letter

Solid-state device fabrication. Safety issues.

EEE 5354L: Semiconductor Device Fabrication Laboratory
Credits: 3 **Grading Scheme:** Letter
This course will be offering hands-on experience in semiconductor material characterization and device fabrication techniques.

EEE 5400: Future of Microelectronics Technology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEE 3396 or equivalent.
Survey of state-of-the-art microelectronics technology and prospects for future technologies. Nanoscale MOSFETs, strained Si, high-K gate dielectrics, carbon nanotubes, molecular electronics, and single-electron devices.

EEE 5405: Microelectronic Fabrication Technologies
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEE 3396.
Principles of microelectronic device fabrication. Emphasis on fundamentals of microfabrication processing and microelectronic device process flows. Computerized process simulation.

EEE 5426: Introduction to Nanodevices
Credits: 3 **Grading Scheme:** Letter
Physical principles of modern solid-state devices and their applications; quantum mechanics; fundamentals of nanoelectronics.

EEE 6321: MOS Analog IC Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEE 5320 .
Design of analog circuits in CMOS IC technology. MOS switches, MOS op amp circuits, circuit simulation using SPICE.

EEE 6323: Advanced VLSI Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEE 5322 .
Advanced very large scale integrated circuit design, testability, and performance evaluation. Use of industrial VLSI software. Building an advanced CMOS VLSI circuit.

EEE 6325: Computer Simulation of Integrated Circuits and Devices
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Basic methods of numerical simulation of semiconductor devices and electronic circuits with reference to PISCES and SPICE. PDE discretization; numerical integration, Newton/iterative linearization, linearized system solution.

EEE 6328C: Microwave IC Design
Credits: 3 **Grading Scheme:** Letter
Fundamentals of microwave integrated circuit design. Use of computer software to design simple microwave circuits. Microwave circuit testing.

EEE 6374: Radio Frequency (RF) Integrated Circuits and Technologies
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEE 4306C, EEE 5322 .
Requirements for RF integrated circuits. Design and implementation. Interdependence of RF circuit performance wit devices, parasitics, packages, and process technology.

EEE 6382: Semiconductor Physical Electronics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEE 4420, EEE 5426 .
Crystal structure and symmetry, carrier statistics, lattice dynamics, energy band theory, equilibrium properties of semiconductors, recombination-generation and trapping processes, electronic transport phenomena, scattering mechanisms, and optical properties.

EEE 6390: VLSI Device Design
Credits: 3 **Grading Scheme:** Letter

Prerequisite: EEE 4420, EEE 5426 , EEE 5400 .
Criteria and tradeoffs in designing high-performance semiconductor devices in scaled (VLSI) Si-based integrated-circuit technologies.

EEE 6397: Semiconductor Device Theory I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEE 4420, EEE 5426 .
Semiconductor device physics, equilibrium and non-equilibrium processes, pn junctions, BJT operation, charge-control modeling, and high-current and heavy-doping effects.

EEE 6402: Nonclassical Si-Based Nanoscale CMOS Devices
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEE 6390 , EEE 6397 .
Physics underlying novel devices for extreme CMOS scaling. Unique effects in fully depleted SOI MOSFETS, multi-gate MOSFETS, FinFETS. Simulation-based project using a physics/process-based compact model for double-gate FETs.

EEE 6428: Computational Nanoelectronics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEE 4420/ EEE 5426 or EEL4329/ EEL 5400.
Using nanotechnology simulation tools to study nanoscale devices; band structure, transport; molecular transistors, nanowires, nanotransistors, and quantum dots.

EEE 6431: Carbon Nanotubes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEE 5400.
Basic semiconductor and solid-state physics of carbon nanotubes, nanotube geometrical and electronic structure, and current nanotube research.

EEE 6460: Advanced Microsystem Technology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5225.
Advanced micro-fabrication technologies, micro-system design, interface circuits, and MEMS packaging. CMOS, Optical, and RF MEMS.

EEE 6465: Design of MEMS Transducers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5225, and EEL 4331 or EEL 5331.
Design of MEMS transducer systems with physical, technological and economic constraints.

EEL 5182: State Variable Methods in Linear Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 4657.
Linear algebra and state variable methods for design and analysis of discrete and continuous linear systems.

EEL 5225: Principles of Micro-Electro-Mechanical Transducers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 3396 or consent of instructor.
Introduction to principles of micro-electro-mechanical devices and systems.

EEL 5400: Airborne Sensors and Instrumentation
Credits: 3 **Grading Scheme:** Letter
Remote sensing problems formulated in terms of information extraction to decide what sensors and algorithms are needed for a given application.

EEL 5401: Airborne Laser Scanning: Data Processing and Analysis
Credits: 3 **Grading Scheme:** Letter
Acquisition, processing, and analysis of laser ranging data, utilizing it for several earth science applications.

EEL 5441: Fundamentals of Photonics

Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEE 3396 and EEL 3472.
Review of electromagnetic fields and waves, energy bands in semiconductors, p-n junctions and optical properties of semiconductors. Fundamentals of optical modulators and switches, laser theory, laser characteristics, photodetectors, optical waveguides, and photonic applications.

EEL 5447: Laser Theory and Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 3473 and EEL 5441 or equivalent.
Study of lasers from basic principles to operational characteristics.

EEL 5451L: Photonics Laboratory
Credits: 2 **Grading Scheme:** Letter
Prerequisite: EEL 4440 or 4445 or EEL 5441.
Experiments in wave optics, acousto-optics, lasers, fiber optics, planar wave guides, and coherent optics.

EEL 5462: Advanced Antenna Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL3472
Electromagnetic field theory and its application to antenna design.

EEL 5490: Lightning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 3472.
Introduction to lightning discharge processes. Electromagnetics relevant to lightning measurements. Applications for determining lightning charge, current, location, and characteristics. Lightning protection.

EEL 5525: Foundations of Digital Signal Processing
Credits: 3 **Grading Scheme:** Letter
Analysis and design of digital filters for discrete signal processing, spectral analysis, and fast Fourier transform.

EEL 5544: Noise in Linear Systems
Credits: 3 **Grading Scheme:** Letter
Passage of electrical noise and signals through linear systems. Statistical representation of random signals, electrical noise, and spectra.

EEL 5546: Electronic Countermeasures
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 4516 or EEL 5544.
Analysis of electronic countermeasures for radar systems. Pulsed and spread spectrum detection; barrage, incoherent, and coherent jammers; burn through analysis; autocorrelation receiver structures.

EEL 5547: Introduction to Radar
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 4516 or EEL 5544.
Basic principles of cw and pulsed radar; angle, range, and doppler tracking; accuracy and resolution; signal design.

EEL 5666C: Intelligent Machines Design Laboratory
Credits: 4 **Grading Scheme:** Letter
Prerequisite: EEL 4744C.
Design simulation, fabrication, assembly, and testing of intelligent robotic machines.

EEL 5718: Computer Communications
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 4514.
Design of data communication networks: modems, terminals, error control, multiplexing, message switching, and data concentration.

EEL 5721: Reconfigurable Computing

Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL4712C or EEL 5764 or consent of instructor.
Fundamental concepts at introductory graduate level in reconfigurable computing based upon advanced technologies in field-programmable logic devices. Topics include general concepts, device architectures, design tools, metrics and kernels, system architectures, and application case studies.

EEL 5737: Principles of Computer System Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 4712 or equivalent; EEL 3834 or equivalent. The project's programming component primarily uses a scripting language (Python) and requires basic understanding of data structures, algorithms, and Unix.
This class will be providing a broad introduction to the main principles and abstractions for engineering hardware and software systems, and in-depth studies of their use on computer systems across a variety of designs, be it in operating system, a client/server application, a database server, or a fault-tolerant disk cluster.

EEL 5764: Computer Architecture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 4713C, 4744C, or equivalents.
Fundamentals in design and quantitative analysis of modern computer architecture and systems, including instruction set architecture, basic and advanced pipelining, superscalar and VLIW instruction-level parallelism, memory hierarchy, storage, and interconnects.

EEL 5840: Elements of Machine Intelligence
Credits: 3 **Grading Scheme:** Letter
Engineering and hardware concepts pertaining to design of intelligent computer systems.

EEL 5905: Individual Work
Credits: 1-4 **Max: 6** **Grading Scheme:** Letter
Prerequisite: consent of adviser.
Selected problems or projects.

EEL 5934: Special Topics in Electrical Engineering
Credits: 1-3 **Max: 8** **Grading Scheme:** Letter

EEL 6264: Advanced Electric Energy Systems I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Energy systems planning and operation with emphasis on advanced analysis methodologies and computer simulation.

EEL 6265: Advanced Electric Energy Systems II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 6264.
Continuation of EEL 6264 with additional emphasis given to the new electric energy technologies.

EEL 6443: Integrated and Fiber Optics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5441.
Review of electromagnetic waves. Dielectric interfaces, propagation in graded-index media, slab waveguides, coupled waveguides, waveguide fabrication and characterization.

EEL 6486: Electromagnetic Field Theory and Applications I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: undergraduate course in fields and waves.
Advanced electrostatics, magnetostatics, time-varying electromagnetic fields, wave propagation, waveguides.

EEL 6487: Electromagnetic Field Theory and Applications II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 6486.
Electromagnetic radiation, antennas, wave propagation in anisotropic media.

EEL 6502: Adaptive Signal Processing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5525 , EEL 5544.
Theory of adaptation with stationary signals; performance measures. LMS, RLS algorithms. Implementation issues and applications.

EEL 6503: Spread Spectrum
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5544 and EEL 6535.
Techniques and applications; spreading sequence design; code division multiple access; multi-user detection.

EEL 6507: Queuing Theory and Data Communications
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5544.
Introduction to basic queuing models; performance analysis of multiple access protocols; error control strategies.

EEL 6509: Wireless Communication
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5544.
Introduction. Satellite and cellular systems, propagation, modulation techniques, multiple access techniques, channel coding, speech and video coding, and wireless computer networks.

EEL 6527: Digital Filtering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: analysis and design of digital filters.
Introduction to number transforms, complexity of algorithms, and finite fields. Development of transforms and digital filter using algebraic operators and finite fields plus the technological consideration of DSP system and system integration.

EEL 6532: Information Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5544 or equivalent.
Applications of information theory to communications and other releated areas.

EEL 6533: Statistical Decision Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5544.
Hypothesis testing of signals in the presence of noise by Bayes, Neyman-Pearson, minimax criteria; estimation of signal parameters.

EEL 6535: Digital Communications
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5544.
Digital modulation techniques; analysis of digital communication systems in presence of noise; optimum principles; synchronization; equalization.

EEL 6537: Spectral Estimation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5544, EEL 5525 .
Measurement and analysis of signals and noise. Digital filtering and spectral analysis; fast Fourier transform.

EEL 6550: Error Correction Coding
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5544 or equivalent. *Corequisite:* EEL 5544 or 4516.
Introduction to abstract algebra, block coding and decoding, convolutional coding and decoding, trellis coded modulation, and run-length-limited codes.

EEL 6562: Image Processing and Computer Vision
Credits: 3 **Grading Scheme:** Letter

Pictorial data representation; feature encoding; spatial filtering; image enhancement; image segmentation; cluster seeking; two-dimensional z-transforms; scene analysis; picture description language; object recognition; pictorial database; interactive graphics; picture understanding machine.

EEL 6586: Automatic Speech Processing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5525 .
Various models of speech production and perception. Operation of speech synthesizers. Discussion of speech recognition. Mathematical models of speech signals.

EEL 6591: Wireless Networks
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5718 and knowledge of probability and statistics.
Design and analysis of wireless networks including channel characteristics, physical layer, cellular concepts, multiple access control protocols, FEC and ARQ protocols, resource allocation, and wireless standards.

EEL 6614: Modern Control Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5182.
Optimization of systems using the calculus of variations, dynamic programming, and the maximum principle. Extensive study of the linear plant with a quadratic performance index. Observers and dynamic compensators.

EEL 6617: Linear Multivariable Control
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAS 4105, EEL 5182.
Transfer matrix theory of systems, emphasis on feedback, internal stability, model matching, and assignment of invariant factors.

EEL 6619: Robust Control Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5182.
Analysis and design of multivariable control systems in presence of uncertainties.

EEL 6706: Fault-Tolerant Computer Architecture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5764 or CDA 5155.
Design and quantitative analysis of fault-tolerant architectures and dependable systems including fundamental issues, redundancy techniques, evaluation methods, design methodology, and applications.

EEL 6763: Parallel Computer Architecture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5764.
Advanced architecture emphasizing design and quantitative analysis of parallel architecture and systems, including theory, hardware technologies, parallel and scalable architectures, and software constructs.

EEL 6769: Hardware-Software Interactions: Nonnumeric Processing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 6767 or COP 5725 or consent of instructor.
Information representations; content and context search methods; associative memories, retrieval language mapping; parallel processing; hardware and software garbage collections.

EEL 6785: High-Performance Computer Networks
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5718 or CEN 6505.
Design and quantitative analysis of high-speed networks and interconnects including protocols, hardware and software interfaces, switching, light-weight communication layers, flow and error control, and quality of service.

EEL 6814: Neural Networks for Signal Processing
Credits: 3 **Grading Scheme:** Letter

Prerequisite: EEL 6502.
Optimal filters in vector spaces. Linear machines and discriminant functions. Gradient descent learning in additive neural model. Performance measures of multilayer perceptions and Hopfield. Dynamic neural networks and issues of short term memory; unsupervised learning; feature extraction, data reduction; potential functions; syntactic pattern description; recognition grammars; machine intelligence.

EEL 6825: Pattern Recognition and Intelligent Systems
Credits: 3 **Grading Scheme:** Letter
Decision functions; optimum decision criteria; training algorithms; unsupervised learning; feature extraction, data reduction; potential functions; syntactic pattern description; recognition grammars; machine intelligence.

EEL 6841: Machine Intelligence and Synthesis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5840.
Theory of machine intelligence applied to general problem of engineering intelligent computer systems and architecture. Applications emphasized.

EEL 6871: Autonomic Computing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5934: Special Topics in Electrical Engineering or EEL 6892
Introducing beginning graduate students to autonomic computing and networking (AC) systems. AC systems are IT systems capable of self-management, self-healing, self-tuning, self-configuration and self-protection. Introduction to the defining characteristics of AC, why it is necessary, foundational AC principles based on control theory, artificial intelligence and systems concepts.

EEL 6892: Virtual Computers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEL 5764 or COP 5615 or equivalent.
Techniques for virtualization of networked computer systems. Virtual machines (classic VMs, application binary interface VMs, para-virtualization), virtual distributed file systems (file system proxies, call-forwarding), and virtual networks (tunneling, virtual private networks).

EEL 6905: Individual Work
Credits: 1-4 **Max: 6** **Grading Scheme:** Letter
Prerequisite: consent of adviser.
Selected problems or projects.

EEL 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

EEL 6935: Special Topics in Electrical Engineering
Credits: 1-4 **Max: 12 including EEL 5905 and EEL 6905** **Grading Scheme:** Letter

EEL 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

EEL 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

EEL 6972: Research for Engineer's Thesis
Credits: 1-15 **Grading Scheme:** S/U

EEL 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

EEL 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

EES 5105: Advanced Wastewater Microbiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
The role of microorganisms and other biota in major environmental problems, wastewater processes, and natural bodies of water.

EES 5107: Ecological and Biological Systems
Credits: 3 **Grading Scheme:** Letter
System dynamics, fundamental microbiological principles, and general ecological principles and structure and function of ecosystems.

EES 5207: Environmental Chemistry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 2046.
Survey of principles of chemistry with applications to water, emphasizing properties, composition, redox equilibria, and complexation; environmental organic chemistry; earth's atmosphere with emphasis on chemical composition, gaseous inorganic pollutants and oxides, and photochemical smog.

EES 5245: Water Quality Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 2046, EES 4201, or EES 6208, or consent of instructor.
Applying the principles of analytical chemistry to determine the chemical composition of natural waters and wastewaters. Emphasizes methods used routinely to determine water and wastewater quality and to interpret data.

EES 5305C: Ecological and General Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 2302 or equivalent.
Systems ecology, including examples, languages, theoretical formulations, and models for designing, synthesizing, and predicting systems of man and nature.

EES 5306: Energy Analysis
Credits: 3 **Grading Scheme:** Letter
Energetics of systems of environment and economics; energy analysis of environmental systems, agroecosystems, regional and national economies; energy evaluation of public policy.

EES 5307: Ecological Engineering
Credits: 3 **Grading Scheme:** Letter
Principles and practices in designing and managing the environment with society. Systems concepts for organizing humanity, technology, and nature.

EES 5315: Ecology and the Environment
Credits: 2 **Grading Scheme:** Letter
Applying ecological principles to environmental problems and management.

EES 5415: Environmental Health
Credits: 3 **Grading Scheme:** Letter
Effects of environment pollution on health. Methods of evaluating, treating, and preventing pollutants of health significance.

EES 6007: Advanced Energy and Environment
Credits: 3 **Grading Scheme:** Letter
Energy basis for a system of humanity and nature, including principles of systems ecology, ecological economics, and public policy.

EES 6009: Ecological Economics
Credits: 2 **Grading Scheme:** Letter
Examines new research areas; models and mathematical theories common to ecology and economics, interfaces between ecology and economics, and relationships of energy and money.

EES 6026C: Environmental Systems Dynamics

Credits: 3 **Grading Scheme:** Letter
Prerequisite: CGS 2425 or equivalent.
Feedback principles and methods introduced and used to develop and test hypotheses of causes of dynamics in environmental systems. Hypotheses tested through computer modeling.

EES 6028: Spatial Modeling Using Geographic Information Systems
Credits: 3 **Grading Scheme:** Letter
Advanced applications of GIS and principles of spatial analysis and modeling in environmental engineering sciences.

EES 6051: Advanced Environmental Planning and Design
Credits: 3 **Grading Scheme:** Letter
Sustainable communities and regions. Quantitative methods for evaluating environmental impacts and carrying capacity. Theories of spatial and temporal organization of systems of humanity and nature.

EES 6135: Aquatic Microbiology
Credits: 3 **Grading Scheme:** Letter
Behavior of microorganisms in freshwater, marine and soil environments. Stress of pollution on microbial communities. Adsorption of microorganisms to surfaces.

EES 6136: Aquatic Autotrophs
Credits: 3 **Grading Scheme:** Letter
The function of algae and macrophytes in lake systems. Environmental problems associated with excessive growth of algae and macrophytes, and methods for their control.

EES 6137: Aquatic Heterotrophs
Credits: 3 **Grading Scheme:** Letter
The role of zooplankton, benthic invertebrates, and fish in freshwater systems. Emphasizes trophic-level interactions, nutrient cycling, and the potential of each group for predicting water quality.

EES 6140: Biology of Exotic Species
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EES 4103.
Examines case histories of species' introduction worldwide and the mechanisms responsible for establishment and dominance of native communities by exotic taxa.

EES 6208: Principles of Water Chemistry I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 2046 or consent of instructor.
Applying chemical principles to aqueous reactions. Emphasizes thermodynamics, kinetics, and aqueous equilibria including acid-base, solubility, complexation, precipitation, and redox.

EES 6209: Principles of Water Chemistry II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EES 4201 or EES 6208, or consent of instructor.
Application of chemical principles to reactions and composition of natural waters; emphasis on organic compounds, chemical models, and fate of organic contaminants.

EES 6225: Atmospheric Chemistry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENV 4101 or consent of instructor.
Nature, sources, and sinks of fixed and variable constituents of atmosphere. Chemical changes occurring. Influences and properties of atmospheric components of natural and anthropogenic origin.

EES 6246: Advanced Water Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EES 4200, EES 5245, or consent of instructor.
Advanced chemical procedures used in water chemistry research. Applying instrumental methods for determining trace inorganic and organic natural water constituents.

EES 6301: Comparative Approaches in Systems Ecology
Credits: 3 **Grading Scheme:** Letter
Alternative approaches for understanding ecological interactions. Prediction after ecosystem perturbations and optimal design with nature are evaluated in the context of natural selection and thermodynamics. Static, dynamic, deterministic, and stochastic study of energy flow, element cycling, and information feedback.

EES 6308C: Wetland Ecology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BSC 2005 or EES 4103.
Defining and classifying major wetland ecosystems, formation of wetlands, wetland functions and values; wetlands ecological engineering and management; and integrating wetlands into developing landscape. Emphasizes everal field trips to natural and altered wetlands.

EES 6318: Principles of Industrial Ecology
Credits: 3 **Grading Scheme:** Letter
Linkage of industry activity with environmental and social sciences. Corporate environmental management and environmental ethics. Resources, laws, and economics. Environmental accounting. Industrial products and processes, and life cycle assessments. Case studies of corporate environmental policies.

EES 6356: Estuarine Systems
Credits: 3 **Grading Scheme:** Letter
Coastal ecosystems: their components, processes, systems, models, and management including tropical, arctic, and man-affected types. Field trip and literature review.

EES 6371: Environmental Meteorology and Oceanography
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 2302 and PHY 2049.
Principles of meteorology and oceanography and interactions of atmosphere and oceans with human economy.

EES 6405: Environmental Toxicology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BSC 2005 or EES 4102, or consent of instructor.
Effects of environmental toxicants on humans, animals, and the environment.

EEX 5940: Supervised Student Teaching in Special Education
Credits: 9 **Grading Scheme:** Letter
Intensive field experience while working with students with disabilities.

EEX 6053: Students with Disabilities: Advanced Study of Characteristics and Services
Credits: 3 **Grading Scheme:** Letter
Advanced issues in identification of students with disabilities and delivery of services to meet their academic, developmental, and functional needs.

EEX 6072: Accessing Academic and Social Communities for Students with Disabilities
Credits: 3 **Grading Scheme:** Letter
Information and expertise related to meeting effectively academic and social needs of full range of students in inclusive settings.

EEX 6098: Students with Disabilities in Higher Education
Credits: 3 **Grading Scheme:** Letter
Introducing participants to the nature and needs of students with disabilities in higher edication settings. The focus of this course will be on the effects of various types of disabilities on learning. Relevant laws and issues of compliance and professional ethics will also be addressed.

EEX 6125: Interventions for Language and Learning Disabilities
Credits: 3 **Grading Scheme:** Letter
Language development and disorders and their impact on learning for students with (or at risk for) disabilities. Classroom-based intervention strategies for promoting language and literary development.

EEX 6219: Reading Assessment and Intervention for Students with Disabilities
Credits: 3 **Grading Scheme:** Letter
The reading process and dyslexia; particularly the special educator's role in preventing and remediating reading disabilities.

EEX 6222: Evaluation in Special Education
Credits: 3 **Grading Scheme:** Letter
Prerequisite: or coreq: prior experience with exceptional students; introductory courses in measurement, statistics.
Issues and practices related to educational assessment of students with special needs.

EEX 6233: Assessment, Curriculum, and Instruction for Students with Mild Disabilities
Credits: 3 **Grading Scheme:** Letter
Prerequisite: admission to graduate status.
Providing educational services to students with mild disabilities.

EEX 6234: Assessment, Curriculum, and Instruction for Students with Severe Disabilities
Credits: 3 **Grading Scheme:** Letter
Prerequisite: unified elementary courses 4th year.
Providing educational services for students with severe disabilities.

EEX 6249: Advanced Strategies for Teaching Students with Disabilities
Credits: 3 **Grading Scheme:** Letter
Designed to assist students in acquisition, proficiency, and application of best practices for teaching students with disabilities.

EEX 6269: Academic Strategies for Postsecondary Students with Disabilities
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEX 6098 Students with Disabilities in Higher Education
EEX 6299 Understanding Assessment for Postsecondary Students with Disabilities
Using and developing appropriate academic strategies for postsecondary students with disabilities. The course will include strategies for learning new content, retaining ingormation, expressing knowledge, and appropriate use of technology to support students' academic needs. Participants will learn to effectively match strategies to students' needs.

EEX 6296: Differentiated Instruction
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate status or consent of instructor.
Provides teachers, administrators, and other professionals with information and expertise related to differentiating instruction to effectively meet the academic needs of the full range of students in their schools in inclusive settings.

EEX 6299: Understanding Assessment for Postsecondary Students with Disabilities
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEX 6098 Students with Disabilties in Higher Education
Introducing participants to the role of assessment in identification and intervention for students with disabilities in higher education. Participants will learn about various approaches to diagnosis and types of assessments commonly used. One focus of the course is on the interpretation of assessment reports for developing accommodations and interventions.

EEX 6661: Teaching and Managing Behavior for Student Learning
Credits: 3 **Grading Scheme:** Letter
Practical strategies and techniques for teaching children and youths with behavioral problems.

EEX 6750: Families and Transition for Students with Disabilities
Credits: 3 **Grading Scheme:** Letter
Information and strategies for using family-centered approach to planning and implementing transitions for students with disabilities.

EEX 6777: Organizational and Life Skills for Postsecondary Students with Disabilities
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEX 6098 Students with Disabilities in Higher Education
EEX 6299 Understanding Assessment for Postsecondary Students with Disabilities

Adressing the skills necessary for academic and life succuess for postsecondary students with disabilities and the challenges these students face. Participants will learn to help students develop self-determination and self-advocacy skills, as well as organization and time management. Strategies for developing communication skills will also be adressed.

EEX 6785: Introduction to Education-Healthcare Transition
Credits: 3 **Grading Scheme:** Letter
An increased number of youth with special healthcare needs (SHCN), including chronic illness and disability, are transitioning from school to the workplace, post-secondary education and the community. Throughout the course collaborative efforts between the education and medical fields focused on supporting the transition of youth with SHCN will be studied.

EEX 6786: Transdisciplinary and Transition Services in Special Education
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEX 6863.
Collaboration, transition planning, and professional development for serving children and youths with disabilities.

EEX 6788: Methods for Integrating Education-Health Care Transition
Credits: 3 **Grading Scheme:** Letter
Teaching evidence-based practices in Education-Healthcare Transition (E-HCT) supoprting youth with chronic illness as they transition from school to the workplace, post-secondary education, the community and into adult healthcare. Participants will apply their knowledge innovative methods to promote E-HCT.

EEX 6789: Legal Aspects and Policy in Education-Healthcare Transition
Credits: 3 **Grading Scheme:** Letter
Increasing knowledge of laws and policies that impact education and healthcare transition for youth with special healthcare needs. As more educational and medical systems are working together to assist youth with SHCN, personnel must become familiar with legal mandates that impact Education-Healthcare Transition.

EEX 6817: Seminar in Education-Healthcare Transition (E-HCT)
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EEX 6785: Introduction to Education-Healthcare Transition
EEX 6789 EEX 6789: Legal Aspects and Policy in Education-Healthcare Transition
EEX 6788 EEX 6788: Methods for Integrating Education-Health Care Transition
Developing an action research project based on the integration of education and healthcare transition to support youth with chronic illness transition from school to the workplace, post-secondary education, the community and adult healthcare. Students will plan and execute an action research project.

EEX 6835: Practicum in Special Education: Severe Disabilities
Credits: 3 **Grading Scheme:** Letter
Prerequisite: unified elementary courses 4th year.
Field-based experience in educational settings that serve students with severe disabilities.

EEX 6841: Practicum in Special Education: Mild Disabilities
Credits: 3 **Grading Scheme:** Letter
Field-based experience in educational settings that serve students with mild disabilities.

EEX 6863: Supervised Practice in Special Education
Credits: 12 **Grading Scheme:** S/U
Prerequisite: approval of special education faculty in area of specialization and Office of Student Teaching.
Supervised teaching in selected school settings designed to serve children and youths who have been classified as having behavioral and/or learning problems. Seminars and continuous evaluation of teaching experiences.

EEX 6905: Individual Work
Credits: 1-4 Max: 12 **Grading Scheme:** Letter
Prerequisite: consent of department chair, approval of proposed project, and completion of at least 9 hours of graduate work.

EEX 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

EEX 6936: Special Topics
Credits: 1-3 Max: 12 Grading Scheme: Letter
Prerequisite: consent of department chair.

EEX 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

EEX 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

EEX 6973: Project in Lieu of Thesis
Credits: 1-9 Grading Scheme: S/U
Development, testing, and evaluation of original educational technology, curricular materials, or intervention program.

EEX 7303: Inquiry in Special Education: Analysis of the Literature
Credits: 3 Grading Scheme: Letter
Prerequisite: EDF 6403.
Designed to assist in solidifying knowledge of research design acquired through course work in educational foundations by applying that knowledge to special education literature.

EEX 7304: Introduction to Field of Inquiry in Special Education
Credits: 3 Grading Scheme: Letter
Prerequisite: EDF 6403; coreq: EDF 6475.
Acquisition, organization, and interpretation of information about research. Nature of inquiry and process of generating questions about a broad array of disability-related research topics. Critical analysis of research outcomes.

EEX 7428: Teacher Education in Special Education
Credits: 3 Grading Scheme: Letter
Preparation for teaching preservice teachers and practicing professionals. Effective teaching practices, collaborative models of teacher education, role of field experiences, and student advisement. Teacher education research literature reviewed and problems of conducting research with teachers and trainees discussed.

EEX 7526: Grant Writing Seminar in Education
Credits: 3 Grading Scheme: Letter
Developing basic skills in writing grant proposals for research, training, and/or model demonstration.

EEX 7709: Social-Emotional Learning & Play in Early Childhood
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Critical examination of the research and theoretical literature on social-emotional learning and play in the early childhood years. Special attention to implications for practice, policy and professional development.

EEX 7787: School Improvement for All Students
Credits: 3 Grading Scheme: Letter
Prerequisite: advanced graduate status or consent of instructor.
Seminar addressing research and professional literature on changing schools to improve academic and behavioral outcomes for all students.

EEX 7865: Internship: Special Education
Credits: 1-12 Max: 12 Grading Scheme: Letter

EEX 7934: Seminar: Trends in Special Education
Credits: 3 Grading Scheme: Letter
Prerequisite: admission limited to advanced degree students in special education.
Emphasis on trends in special education and future considerations for research, and local, state, and federal priorities.

EEX 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U

Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

EEX 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

EGI 6051: Education of the Gifted Child
Credits: 3 **Grading Scheme:** Letter
Definitions of giftedness, characteristics of gifted children, and outside-of-school influences which affect achievement of gifted children.

EGI 6245: Program Development for the Gifted
Credits: 3 **Grading Scheme:** Letter
School programs for the gifted. Educational provisions for the achieving and underachieving gifted individual.

EGM 5005: Laser Principles and Applications
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Applications of lasers for lidar aerodynamic and structural testing and for cutting and welding of materials.

EGM 5111L: Experimental Stress Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 3520.
Introduction to techniques of experimental stress analysis in static systems. Lecture and laboratory include applications of electrical resistance strain gauges, photoelasticity, brittle coatings, moire fringe analysis, and X-ray stress analysis.

EGM 5121C: Data Measurement and Analysis
Credits: 3 **Grading Scheme:** Letter
Tools for random data analysis (including types of random data, mean values, mean-square values, probability density and distribution functions, moments and characteristic functions, and spectral and correlation analysis); bias and random error estimates in data measurements; input-output system models; and measurement examples.

EGM 5533: Applied Elasticity and Advanced Mechanics of Solids
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 3520.
Bars, beams, thin-walled structures, and simple continua in the elastic and inelastic range. Virtual work approaches, elastic energy principles, plastic limit theorems, and creep deformation procedures. Introduction to instability and fracture mechanics. Design applications.

EGM 5584: Biomechanics of Soft Tissue
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGN 3353C and EGM 3520.
Introduction to solid and fluid mechanics of biological systems. Rheological behavior of materials subjected to static and dynamic loading. Mechanics of cardiovascular, pulmonary, and renal systems. Mathematical models and analytical techniques used in biosciences.

EGM 5816: Intermediate Fluid Dynamics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGN 3353C (or CWR 3201), MAP 2302.
Basic laws of fluid dynamics. Introduction to potential flow, viscous flow, boundary layer theory, and turbulence.

EGM 5933: Special Topics in Engineering Science and Mechanics
Credits: 1-4 **Max: 8** **Grading Scheme:** Letter

EGM 6006: Laser-Based Diagnostics
Credits: 3 **Grading Scheme:** Letter
Introduction to laser-based measurement techniques. Emphasizes light scattering, raman spectroscopy, plasma spectroscopy, and fluorescence, including the underlying physics and also practical implementations.

EGM 6321: Principles of Engineering Analysis I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 4313 or MAP 4305.
Solution of linear and nonlinear ordinary differential equations. Methods of Frobenius, classification of singularities. Integral representation of solutions. Treatment of the Bessel, Hermite, Legendre, hypergeometric, and Mathieu equations. Asymptotic methods including the WBK and saddle point techniques. Treatment of nonlinear autonomous equations. Phase plane trajectories and limit cycles. Thomas-Fermi, Emden, and van der Pol equations.

EGM 6322: Principles of Engineering Analysis II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 4313 or MAP 4341.
Partial differential equations of first and second order. Hyperbolic, parabolic, and elliptic equations including the wave, diffusion, and Laplace equations. Integral and similarity transforms. Boundary value problems of the Dirichlet and Neumann type. Green's functions, conformal mapping techniques, and spherical harmonics. Poisson, Helmholtz, and Schroedinger equations.

EGM 6323: Principles of Engineering Analysis III
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 4313 or MAP 4341.
Integral equations of Volterra and Fredholm. Inversion of self-adjoint operators via Green's functions. Hilbert-Schmidt theory and the bilinear formula. The calculus of variations. Geodesics, Euler-Lagrange equation and the brachistochrone problem. Variational treatment of Sturm-Liouville problems. Fermat's principle.

EGM 6341: Numerical Methods of Engineering Analysis I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 4313 or equivalent.
Finite-difference calculus; interpolation and extrapolation; roots of equations; solution of algebraic equations; eigenvalue problems; least-squares method; quadrature formulas; numerical solution of ordinary differential equations; methods of weighted residuals. Use of digital computer.

EGM 6342: Fundamentals of Computational Fluid Dynamics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 6341 and EGM 6813 or consent of instructor.
Fundamentals of computational fluid dynamics. Spatial discretisations, semi-discritisations, time-integration methods, full discretisations.

EGM 6352: Advanced Finite Element Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 6351.
The discontinuous Galerkin method applied to transient problems. Optimization theory applied to formulating mixed FEM; treatment of constraints (e.g., incompressibility). General shape functions. Electromagnetics, heat, fluids, and solids. Other advanced topics.

EGM 6365: Structural Optimization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 4500, EGM 4350,EML 5526, or EGM 6451.
Structural optimization via calculus of variations. Applying techniques of numerical optimization to design trusses, frames, and composite laminates. Calculating the sensitivity of structural response. Approximation and fast reanalysis techniques. Optimality criteria methods.

EGM 6570: Principles of Fracture Mechanics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 6611.
Introduction to the mechanics of fracture of brittle and ductile materials. Linear elastic fracture mechanics; elastic-plastic fracture; fracture testing; numerical methods; composite materials; creep and fatigue fracture.

EGM 6595: Bone Mechanics
Credits: 3 **Grading Scheme:** Letter

Biology, composition, and mechanical properties of cortical bone tissue, cancellous bone tissue, and cartilage. Bone modeled as anisotropic elastic material, as bioviscoelastic material, and as composite material. Adaptation to stress and remodeling; articular cartilage.

EGM 6611: Continuum Mechanics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 3520.
Tensors of stress and deformation. Balance and conservation laws, thermodynamic considerations. Examples of linear constitutive relations. Field equations and boundary conditions of fluid flow.

EGM 6671: Inelastic Materials
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 6611.
Virtual work, stability, extremum principles. Applications on the microscale, miniscale, and macroscale. Thermodynamics, internal variables, damage parameters, and time and temperature effects. Fracture mechanics. Finite elastoplasticity.

EGM 6812: Fluid Mechanics I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGN 3353C.
Flow kinematics. Fundamental laws and equations in integral and differential forms. Potential flows. Introduction to laminar flows in simple geometries, laminar and turbulent boundary layer flows. External flows. One-dimensional compressible flows.

EGM 6813: Fluid Mechanics II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 6812.
Mathematical and physical structures of the Navier-Stokes equation. Exact solutions of the Navier-Stokes equation for viscous flows. Low Reynolds number flows. Incompressible and compressible laminar boundary layer flows. Free shear flows. Energy equation and heat transfer. Unsteady flows. Instability. Turbulence.

EGM 6855: Bio-Fluid Mechanics and Bio-Heat Transfer
Credits: 3 **Grading Scheme:** Letter
Prerequisite: undergraduate fluid mechanics.
Biothermal fluid sciences. Emphasizes physiological processes occurring in human blood circulation and underlying physical mechanisms, from an engineering perspective.

EGM 6905: Individual Study
Credits: 1-6 **Max: 12 including EGM 5905 and EAS 6905** **Grading Scheme:** Letter

EGM 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

EGM 6934: Special Topics in Engineering Mechanics
Credits: 1-6 **Max: 12** **Grading Scheme:** Letter

EGM 6936: Graduate Seminar
Credits: 1 **Max: 6** **Grading Scheme:** Letter, S/U
Discussions and presentations in the fields of graduate study and research.

EGM 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

EGM 7819: Computational Fluid Dynamics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 6342 and EGM 6813 or equivalent.
Finite difference methods for PDE. Navier-Stokes equations for incompressible and compressible fluids. Boundary fitted coordinate transformation, adaptive grid techniques. Numerical methods and computer codes for fluid flow problems.

EGM 7845: Turbulent Fluid Flow
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 6813 or equivalent.

Definition of turbulence, basic equations of motion. Instability and transition. Statistical methods, correlation and spectral functions. Experimental methods, flow visualization. Isotropic homogeneous turbulence. Shear turbulence, similitude, the turbulent boundary layer, rough turbulent flow. Jets and wakes. Heat convection, thermally driven turbulence.

EGM 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

EGM 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

EGN 5010L: NRF Training Lab
Credits: 1 **Grading Scheme:** Letter
This course will be teaching Nanoscale Research Facility (NRF) cleanroom users the fundamental and practical aspects of various micro/nanofabrication processes via combination of classroom lectures and hands-on labs. Students will also recieve training on one or more NRF tools.

EGN 5949: Practicum/Internship/Cooperative Work Experience
Credits: 1-6 Max: 6 **Grading Scheme:** S/U
Prerequisite: graduate student.
Practical cooperative engineering work under approved industrial and faculty supervision.

EGN 6039: Engineering Leadership
Credits: 3 **Grading Scheme:** Letter
Concepts, theory and practice of engineering leadership; effective written and oral communications and presentations; engineering leadership characteristics, individual differences and self-awareness; developing and building teams; managing change, conflicts, and crises; and understanding real-world ethics and core values.

EGN 6640: Entrepreneurship for Engineers
Credits: 3 **Grading Scheme:** Letter
Introduction to entrepreneurship, idea generating and feasibility analysis, and business planning. Lectures, case studies, student-led discussions, team business plans, and investor presentations.

EGN 6642: Engineering Innovation
Credits: 3 **Grading Scheme:** Letter
Concepts of innovative thinking and innovation practices. Using lectures, case studies, team exercises, and guest speakers, the course teaches life skills in innovative thought and action that students can use in careers ranging from starting companies to executing R&D projects in large companies.

EIN 6227: Advanced Quality Management and Engineering for Business Processes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: introductory statistics or consent of instructor.
Philosophy of continuous improvement and methodology for applying team problem solving to manufacturing and service industries. Hands-on application of basic statistical quality tools; introduction to quality function deployment; concurrent engineering; business process reengineering; process analysis; benchmarking. Team project.

EIN 6336: Advanced Production and Inventory Control
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ESI 6417, ESI 6429.
Production planning and control; problem identification and formulation. Mathematical theory of single- and multicommodity inventory systems; problem solving using dynamic programming and Markov chains.

EIN 6357: Advanced Engineering Economy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 4321.
Economic analysis of capital expenditure decisions. Financial mathematics and microeconomics. Decision under risk and uncertainty. Game theory and utility theory.

EIN 6367: Facilities Layout and Location
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ESI 6417.
Planar and discrete layout problems and locations problems; network location problems. Single- and multi-objectives. Industrial and public sector applications.

EIN 6392: Manufacturing Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ESI 6314 and undergraduate probability and statistics.
Variety and importance of management decisions. Total quality management, just-in time manufacturing, concurrent engineering, material requirements planning, production scheduling, and inventory control.

EIN 6905: Special Problems
Credits: 1-6 Max: 9 **Grading Scheme:** Letter
Laboratory, lecture, field work, or conferences.

EIN 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

EIN 6918: Graduate Seminar
Credits: 1 Max: 15 **Grading Scheme:** S/U

EIN 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

EIN 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

EIN 6972: Research for Engineer's Thesis
Credits: 1-15 **Grading Scheme:** S/U

EIN 7933: Special Problems
Credits: 1-6 Max: 12 **Grading Scheme:** Letter
Laboratory, lecture, field work, or conferences.

EIN 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

EIN 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

EMA 5008: Particle Science and Technology: Theory and Practice
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHY 2049/2049L or equivalent and CHM 2046/2046L or equivalent.
Introduction to field by surveying theoretical and practical aspects. Particulate preparation, particle characterization, surface modifications, particulate systems, and technological applications.

EMA 5095: Critical Analysis of Research in Materials Science & Engineering
Credits: 3 **Grading Scheme:** Letter
Corequisite: EMA 6313
Critical methods for reviewing technical papers, for writing effective technical papers, and for developing meaningful research projects, in the field of materials science and engineering.

EMA 5108: Vacuum Science and Technology
Credits: 3 **Grading Scheme:** Letter

Prerequisite: CHM 2045, PHY 3101, MAP 2302, or equivalents, or consent of instructor.
Introduction to the generation and use of vacuum for scientific research and industrial production. Kinetic theory of gases discussed as necessary to understand vacuum phenomena. Description of components and materials, vacuum systems design and uses in metallurgy, electronics, physics, and chemistry.

EMA 5365: Biomimetic Synthesis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA 3010 or equivalent.
Investigation of processes utilized by organisms to control mineralization of their hard parts, to gain understanding of mechanisms used by them to obtain precise control over size, shape, texture, orientation, and composition.

EMA 6001: Properties of Materials - A Survey
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Bachelor's degree in physics, chemistry, or engineering.
Review of physical properties of materials such as mechanical, electrical, optical, magnetic, and thermal properties.

EMA 6005: Thin and Thick Films
Credits: 3 **Grading Scheme:** Letter
Prerequisite: (EMA3010 & CHM2046 & PHY2048) or equivalents
Techniques for depositing thin metallic semiconductor and dielectric films. The relationships between deposition technique and thin film properties. Properties unique to thin films.

EMA 6105: Fundamentals and Applications of Surface Science
Credits: 3 **Grading Scheme:** Letter
Prerequisite: (CHM2045 & MAP2302) or equivalents or consent of instructor
Fundamental and experimental description of phenomena occurring at surface of solids, including structure, composition, atomic and molecular processes, and electronic properties. Experimental approaches and data used to support theoretical models.

EMA 6106: Advanced Phase Diagrams
Credits: 3 **Grading Scheme:** Letter
Prerequisite: (EMA4120 & EMA4224) or equivalents
Phase diagrams considering systems with as many as four components; emphasis on pressure temperature composition diagrams.

EMA 6107: High Temperature Materials
Credits: 3 **Grading Scheme:** Letter
Prerequisite: (EMA4120 & EMA4224) or equivalents
Physical and mechanical metallurgy. Principles of strengthening alloys, alloy and process selection, alloy development, and design principles for elevated temperature applications.

EMA 6109: Physical Chemistry of High Temperature Materials
Credits: 3 **Grading Scheme:** Letter
Interrelated aspects of solid state chemistry critical to materials science and chemical education. Science behind adapting inorganic materials for specific purposes making matter do what is wanted by positioning atoms in their proper structures

EMA 6110: Electron Theory of Solids for Materials Scientists I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: (EMA3010 & MAP2302 & PHY2049) or equivalents
Wave equation and its application to free electrons, bound electrons, and electrons in crystals. Electron-band theory and its applications. Electrical properties of metals, alloys, and semiconductors, heat capacity and thermal properties.

EMA 6111: Electron Theory of Solids for Materials Scientists II
Credits: 3 **Grading Scheme:** Letter
Atomistic (classical) and electron theory of optical properties of metals, alloys, and dielectrics. Nonlinear optics, lasers. Raman-spectra.

EMA 6114: Advanced Materials Principles 2
Credits: 3 **Grading Scheme:** Letter

Prerequisite: EMA 6313.
Structure, properties, processing, and applications of semiconductors, metals, ceramics, polymers, and biomaterials. Structure and properties of thin films, surfaces, and interfaces.

EMA 6128: Materials Microstructures
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA 6316 or equivalent.
Geometry of microstructures: kinematics and kinetics of microstructural evolution in materials processing.

EMA 6136: Diffusion, Kinetics, and Transport Phenomena
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA 4125 or equivalent.
Physical basis, equation, and theories of diffusion, tracer, chemical, multicomponent, and multiphase diffusion in general force fields.

EMA 6165: Polymer Physical Science
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA3066 or equivalent
Solid state properties of amorphous and semi-crystalline polymers.

EMA 6166: Polymer Composites
Credits: 3 **Grading Scheme:** Letter
Physical and mechanical properties of polymers and polymer composites as related to preparation and microstructure.

EMA 6226: Synthesis and Properties of Metallic Nanostructures
Credits: 3 **Grading Scheme:** Letter
Up-to-date review of metallic nanostructures including fabrication techniques, thermal stability, phase transformation, mechanical properties, magnetic properties, and applications.

EMA 6227: Advanced Mechanical Metallurgy II
Credits: 3 **Grading Scheme:** Letter
Continuation of EMA 6226.

EMA 6265: Mechanical Properties of Polymers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA 3066 or equivalent.
Linear and nonlinear viscoelastic behavior of polymers with emphasis on molecular and microstructure aspects.

EMA 6313: Advanced Materials Principles I
Credits: 3 **Grading Scheme:** Letter
Crystal structure, bonding, order and disorder in solids. Phase diagrams and phase transitions. Mechanical, optical, and electrical properties.

EMA 6315: Colloidal Hydrodynamics
Credits: 3 **Grading Scheme:** Letter
Background on physical side of flow of colloidal dispersions for graduate students from different engineering disciplines. Low Reynolds number hydrodynamics and role of surface forces on stability of rheology of colloidal dispersions.

EMA 6316: Materials Thermodynamics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA4314 or equivalent
Thermodynamics of materials systems, surfaces in solids, irreversible processes.

EMA 6319: Applied Colloid and Interfacial Chemistry for Engineers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA 6316 or equivalent.
Principles used to disperse powders in liquids with practical examples relating to ceramic and metal particle processing properties.

EMA 6412: Synthesis and Characterization of Electronic Materials

Credits: 3 **Grading Scheme:** Letter
Prerequisite: (EMA3413 & EMA4314) or equivalents
Principles of materials growth and characterization in electronic and photonic industries. Bulk and epitaxial growth technologies, corresponding characterization methods for evaluation and quality control. Theoretical bases for these techniques.

EMA 6416: Organic Electronics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA3413 or equivalent
Basics of semiconductors, electronic structures, charge transport properties, and optoelectronic devices based on organic semiconductors.

EMA 6445: Electroceramics
Credits: 3 **Grading Scheme:** Letter
Basic physical, chemical and mathematical principles of ceramic conductors, dielectrics and ferroelectrics and their applications are discussed. Emphasizes structure-processing-microstructure property relationships.

EMA 6446: Solid State Ionics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA 6316 or equivalent, or consent of instructor.
Defect solid state and its relation to electronic properties of ceramic materials; defect equilibria and transport; influence of chemical and electric potentials and interfaces; and application of ionically conducting solids in solid-state electrochemical transducer systems and devices.

EMA 6448: Ceramic Processing
Credits: 3 **Grading Scheme:** Letter
Introduction to the science of ceramic processing, with emphasis on theoretical fundamentals. Examples of state-of-the-art industrial processes discussed.

EMA 6461: Polymer Characterization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA3066 or equivalent
Use of a broad variety of spectroscopic and other scattering phenomena in polymer research.

EMA 6507: Scanning Electron Microscopy and Microanalysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA3010 or equivalent
Principles and theories of microscopy with an emphasis on scanning electron microscopy (SEM). Provides the necessary theoretical background to become an effective user of MAIC SEM facilities.

EMA 6507L: Scanning Electron Microscopy and Microanalysis Lab
Credits: 1 **Grading Scheme:** Letter
Corequisite: EMA 6507.
Practical training to become a proficient user of MAIC SEM facilities, leading to an authorization as a JEOL SEM-6400 user at the MAIC.

EMA 6510: Survey of Materials Analysis Techniques
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA3010 or equivalent
Principles and techniques used in characterization of materials. Chemical, microstructural, and surface analysis of materials; metals, ceramics, polymers, and semiconductor systems.

EMA 6512C: X-ray Scattering for Thin Film Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Theoretical basis of x-ray scattering from thin films, multilayers and single crystals for characterizing their thickness, mass density, surface and interface morphology, structural quality, and orientation.

EMA 6518: Transmission Electron Microscopy

Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA 3513C or equivalent.
Instrumentation associated with transmission electron microscopy. Kinematical and dynamical theories of diffraction contrast and their application. Diffraction analysis in TEM for structural determination. Analytical techniques for obtaining structural and compositional information at high spatial resolution. Phase contrast and high resolution electron microscopy.

EMA 6518L: Transmission Electron Microscopy Laboratory
Credits: 1 **Grading Scheme:** Letter
Specimen preparation for analysis in TEM. Demonstration of principles of contrast theories. Specialized methods for characterizing structure and composition of materials at high spatial resolution.

EMA 6519L: Specialized Research Techniques in Materials Science
Credits: 1-2 Max: 10 **Grading Scheme:** Letter
Prerequisite: EMA 6507C or equivalent.
Utilizing primarily STEM, TEM, SEM, EMP, FIM, and optical metallography.

EMA 6540: Fundamentals of Crystallography
Credits: 3 **Grading Scheme:** Letter
The course will cover the derivation and analysis of structure-property relationships in common electroceramic material systems based on their crystal structure, symmetry and anisotropy.

EMA 6541: Applied Crystallography and Powder Diffraction
Credits: 3 **Grading Scheme:** Letter
Explores crystal structures, microstructures, and diffraction. Emphasizes the determination of structure from diffraction patterns. Hands-on and practical applications directly related to graduate student research are integrated components of the course.

EMA 6580: Science of Biomaterials I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: (CHM2045 or CHM2095) or equivalent
Introduction to variables that control compatibility and performance of biomaterials, including physical and chemical properties, corrosion, fatigue, and interfacial histochemical changes.

EMA 6581C: Polymeric Biomaterials
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ((CHM2045 or CHM2095) & EMA3066) or equivalents
Biomedical implant and device applications of synthetic and natural polymers. Biocompatibility and interfacial properties of polymers in physiological environment, especially concerning short-term devices (catheters) and long-term implants (intraocular lenses, vascular and mammary prostheses, etc.).

EMA 6589: Mechanical Behavior of Biomaterials
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA 4223 or equivalent.
Basis for elastic and viscoelastic response of biological materials to stress and strain. Foundation for composite behavior of organic-organic and organic-inorganic materials. Description of modeling biological structures to achieve mechanical optimization.

EMA 6590: Advances in Biomaterials and Tissue Engineering for Healthcare
Credits: 3 **Grading Scheme:** Letter
Use of new bioactive and bio-nano structures, surfaces and properties for healthcare applications, including tissue engineering, regenerative medicine, stem cell engineering, protein therapeutics, and bio-photonics testing of cell-material interactions. Socio-economic issues affecting cost and availability of new materials and technologies for healthcare.

EMA 6591: Clinical Applications of Biomaterials and Tissue Engineering
Credits: 3 **Grading Scheme:** Letter
Biomaterials, implants, devices, and new concepts in regenerative medicine and tissue engineering. Current technologies for replacement of tissues and organs, with emphasis upon case histories of specific medical and dental clinical applications, including economic and ethical concern analyses.

EMA 6616: Advanced Electronic Materials Processing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA3413 or equivalent
Materials requirements for high speed devices and processing modules needed for their fabrication. Examples of current industrial processes.

EMA 6625: Advanced Metals Processing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: (EMA4120 & EMA4224) or equivalents
Advanced treatment of solidification phenomena during metals processing. Topics to include nucleation, kinetics, solidification structure, segregation, and effects of processing variables on structure and properties.

EMA 6667: Polymer Processing
Credits: 2-3 Max: 3 **Grading Scheme:** Letter
Prerequisite: EMA 3066 or equivalent.
Major processing methods for polymers and polymeric composites as related to the rheological behavior of these systems. Synthesis of polymers via industrial processes.

EMA 6715: Fracture of Brittle Materials
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA 4223, EGM 3520, or equivalent.
Latest concepts in deformation, fracture, and toughening of brittle materials. Application of fracture mechanics and fractals to failure of brittle materials. Development of an approach to failure analysis for brittle materials.

EMA 6803: Classical Methods in Computational Materials Science
Credits: 3 **Grading Scheme:** Letter
Proficiency developing and using common tools for computational materials research at the atomic level.

EMA 6804: Quantum Methods in Computational Materials Science
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMA 6313, C/C++, Fortran, or other suitable scientific programming language.
Theory, methods, and application of common quantum mechanical software (GAUSSIAN and VASP) for computational study of materials.

EMA 6805: Mathematical Methods in Materials Science I
Credits: 2 **Grading Scheme:** Letter
Review of mathematical methods with emphasis upon applications in materials science and engineering.

EMA 6806: Mathematical Methods in Materials Science II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: EMA 6805 or equivalent.
Applications of advanced differential equations, transform methods, and computational analysis.

EMA 6808: Error Analysis and Optimization Methodologies in Materials Research
Credits: 3 **Grading Scheme:** Letter
Statistical approach to materials research, basic and relevant statistical concepts, error analysis, factorial matrices, reducing variance, nested designs and sampling plans, mixture designs, optimization techniques, response surface method, and Taguchi method.

EMA 6905: Individual Work in Materials Science and Engineering
Credits: 1-4 Max: 8 **Grading Scheme:** Letter

EMA 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

EMA 6936: Seminar in Materials Science and Engineering
Credits: 1 Max: 14 **Grading Scheme:** S/U
Offered in fall and spring. Required of all students.

EMA 6938: Special Topics in Materials Science and Engineering

Credits: 1-4 Max: 6 **Grading Scheme:** Letter

EMA 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

EMA 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

EMA 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

EME 5054: Foundations of Educational Technology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
History, foundations, and literature in educational technology.

EME 5207: Designing Technology-Rich Curricula
Credits: 3 **Grading Scheme:** Letter
Extensive work in curriculum development utilizing instructional technologies. Contrasting views of curriculum development.

EME 5315: Communicating with Technology
Credits: 3 **Grading Scheme:** Letter
Explores the communication process and how factors related to technology enhance or hinder this process.

EME 5316: Educational Technology Management Issues
Credits: 3 **Grading Scheme:** Letter
Explores classroom management issues through appropriate uses of educational technology.

EME 5403: Instructional Computing I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: baccalaureate degree.
Explores uses of educational technologies and learning environments.

EME 5404: Instructional Computing II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EME 5403.
Overview of educational technologies in teaching and learning. Developing meaningful and engaging learning environments that foster critical inquiry in students.

EME 5405: Internet in K-12 Instruction
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EME 5403 or 4406.
Preparing preservice teachers, in-service teachers, and teacher educators to use the Internet.

EME 5431: Integrating Technology in the Mathematics Classroom
Credits: 3 **Grading Scheme:** Letter
Examines technology in use. Multiple methodologies in which technology can be used to create and enhance appropriate learning environments.

EME 5432: Integrating Technology into Social Science Classroom
Credits: 3 **Grading Scheme:** Letter
Educational technology tools available for integrating into curriculum. Multiple methods using technology to create and enhance appropriate learning environments.

EME 5433: Integrating Technology into Science Classroom
Credits: 3 **Grading Scheme:** Letter

Examines technology use. Applications in learning theory; philosophy of science instruction; computer applications in science; integration of science with other subject areas; assessment.

EME 6059: Blended Learning Environments
Credits: 3 **Grading Scheme:** Letter
Exploring blended learning from perspectives of theory and practice. The course is designed for educators and instructional designers in K-12, higher education, corporate environments, and other professional settings.

EME 6076: Virtual School Philosophy and Pedagogy
Credits: 3 **Grading Scheme:** Letter
Providing educators with experience and skill with online-teaching approaches known to be effective for K-12 learning. Students examine models of virtual schooling, their underlying philosophies, and their implications on teaching.

EME 6156: Games and Simulations for Teaching and Learning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
The characteristics and terminology of games and simulations; development life cycles; design principles; evaluation; and an emphasis on connecting principles of learning to the design of games and simulations.

EME 6205: Digital Photography and Visual Literacy
Credits: 3 **Grading Scheme:** Letter
Explores the main aspects of digital photography and the importance of students being visually literate.

EME 6208: Designing Integrated Media Environments I
Credits: 3 **Grading Scheme:** Letter
Design traditional multimedia environments and learn advanced techniques for creating presentation. Importance of cognitive processes and their relationships to design and instruction.

EME 6209: Designing Integrated Media Environments II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EME 6208.
Project based. Applying skills and theories learned previously. Real-world problems.

EME 6235: Managing Educational Projects
Credits: 3 **Grading Scheme:** Letter
Examining principles of planning, scheduling, allocating resources, budgeting, proposals preparation, cost control, risk assessment and personnel management for instructional projects. Students negotiate an effective design project plan, how to implement the plan, and how to control and monitor project activities.

EME 6236: Distance Education Leadership and Management
Credits: 3 **Grading Scheme:** Letter
Examining the roles and responsibilities of leaders and managers in distance education programs. Focuses on contributors to quality program delivery in K-12, higher education, corporate, healthcare, and international contexts.

EME 6405: Educational Technology and Teaching
Credits: 4 **Grading Scheme:** Letter
Prerequisite: EME 5403.
Developing knowledge of computer technology in education and using that knowledge to solve educational problems. Gain experience working with computer systems.

EME 6458: Distance Teaching and Learning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EME 5403.
Topics assist educators who teach at distance in synchronous time. Effective teaching methodologies, along with various theories about distance learning, examined.

EME 6505: Educational Television Design and Production
Credits: 4 **Grading Scheme:** Letter

Learn to plan, produce, use, and evaluate videotape programs for educational purposes. Learn to operate the major components of a small, nonbroadcast television studio.

EME 6602: Human-Computer Interactivity and the Learner
Credits: 4 **Grading Scheme:** Letter
Prerequisite: EME 6208, EME 6405.
Interaction and educational principles driving research. Elements of user interface, user behavior and systems monitoring that behavior, intelligent artifacts, hypermedia, and distributed information systems.

EME 6606: Advanced Instructional Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EME 6609.
Focuses on the student who is becoming an instructional design (ID) Professional by refining skills and adding to the skills learned in the beginning Instructional Design course, building on the foundational knowledge about the practice of ID, and encouraging the development of communication skills through formal project management.

EME 6609: Instructional Design
Credits: 3 **Grading Scheme:** Letter
Focuses on the application of instructional design principles to the development of instruction. Topics include contemporary issues and trends in instructional design, foundations in learning research, requirements for instruction, task and needs analysis, learning situations and instructional models, learner characteristics, hardware and software innovations, assessing instructional outcomes, and factors affecting utilization.

EME 6716: Organization and Administration of Educational Media Centers
Credits: 3 **Grading Scheme:** Letter
Principles of organizational and administrative theory and procedures and issues related to selecting instructional materials used to operate EMCs at all levels of education.

EME 6935: Seminar: Distance Education Issues and Applications
Credits: 1 Max: 4 **Grading Scheme:** Letter
Mechanisms and logistics that support distance education development and delivery.

EME 6945: Practicum in Educational Media and Instructional Design
Credits: 3-8 Max: 8 **Grading Scheme:** Letter
Supervised experiences appropriate to the student's professional goals.

EME 7938: Seminar in Educational Media and Instructional Design
Credits: 3 Max: 9 **Grading Scheme:** Letter
Seminar for advanced degree graduate students.

EML 5045: Computational Methods for Design and Manufacturing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 3023 or consent of instructor.
Geometric and solid modeling, feature-based design, and parametric models. Applications to product design, rapid prototyping, and manufacturing.

EML 5104: Classical and Statistical Thermodynamics
Credits: 3 **Grading Scheme:** Letter
First and second laws of thermodynamics. Free energy and chemical equilibrium. Micro- and macroscopic states. Fermi-Dirac and Bose-Einstein statistics. Partition functions.

EML 5124: Two-Phase Flow and Boiling Heat Transfer
Credits: 3 **Grading Scheme:** Letter
Prerequisite: introductory-level fluid mechanics and heat transfer.
Basic principles, mathematical modeling, and applications of two-phase flow, boiling heat transfer, and evaporation and condensation.

EML 5131: Combustion
Credits: 3 **Grading Scheme:** Letter

Prerequisite: EML 3101 or consent of instructor.
Chemical thermodynamics, chemical kinetics, flame propagation, detonation and explosion, combustion of droplets and spray.

EML 5215: Analytical Dynamics I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: dynamics.
Analytical methods of statics and dynamics. Principle of virtual work, holonomic and nonholonmic constraints. Lagrange equations for constrained and unconstrained systems, conservation laws, stability analysis by perturbation about steady state, Jacobi first integral, generalized impulse and momentum.

EML 5223: Structural Dynamics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 4220.
Vibration analysis and synthesis of continuous and multidegree-of-freedom lumped-parameter systems. Computational and experimental techniques in modal analysis.

EML 5224: Acoustics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENG 3353C, EGM 4313, or consent of instructor.
Theory of sound. Plane waves and three-dimensional acoustic fields. Sound transmission and reflection. Dissipation, radiation, and scattering.

EML 5311: Control System Theory
Credits: 3 **Grading Scheme:** Letter
Analyzing dynamic mechanical engineering control systems. Introduction to classical, digital, and state space techniques. Modeling, stability, transient response, and frequency response. Considers implementation.

EML 5318: Computer Control of Machines and Processes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CGS 2425 or consent of instructor.
Basic concepts, including hardware and software. Modeling of machines, processes, and their controllers.

EML 5455: Clean Combustion Technology
Credits: 2 **Grading Scheme:** Letter
Latest developments in combustion of solid fuels, cocombustion of fuels, fluidized bed combustion, and gasification for combustion turbine applications.

EML 5465: Energy Management for Mechanical Engineers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Energy use analysis in building envelopes, mechanical systems, and industrial processes. Energy conservation strategies and design techniques. Alternative energy applications.

EML 5515: Gas Turbines and Jet Engines
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 4419 or consent of instructor.
Theory and analysis of gas turbine engines and major components.

EML 5516: Design of Thermal Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 4141 and 4702 or equivalent.
Modeling of thermal equipment; system simulation; optimization, search methods, thermal system design and optimization using dynamic, geometric, and linear programming; simulation of large systems, vector and reduced gradient searches.

EML 5526: Finite Element Analysis and Application
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 3520 or consent of instructor.
Fundamentals, including discrete system analysis, dynamic analysis of structures, steady state and transient heat transfer analysis, and incompressible fluids analysis. Modeling, analysis, and design using FEA software.

EML 5591: Biometrics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 2511, EMA 3010, EEL 3003 or 3111, EML 3023.
Examines human/machine interface. Introduces basic human anatomy. Explores physical capabilities and limitations, in the context of practical design problems. Investigates injury prevention, both acute and cumulative.

EML 5595: Mechanics of the Human Locomotor System
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGM 3401, 3520.
Analyzing the human musculoskeletal system as sensors, levers, and actuators. Joint articulations and their mechanical equivalents. Kinematic and kinetic analysis of human motion. Introduction to modeling human body segments to analyze human activities.

EML 5598: Orthopedic Biomechanics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: mechanics of materials.
Mechanical properties of the human body's hard and soft tissues. Mechanical and biological considerations for repair and replacement of soft and hard tissues and joints. Fracture fixation, orthopedic implants for hip and knee, and orthotic and prosthetic devices.

EML 5605: Advanced Refrigeration
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 4601.
Analysis and design considerations for vapor compression, absorption, steam-jet, thermoelectric, and air refrigeration systems.

EML 5714: Introduction to Compressible Flow
Credits: 3 **Grading Scheme:** Letter
One-dimensional and quasi-one-dimensional compressible fluid flows. Mach waves, normal shocks, oblique shocks, Prandtl-Meyer expansions, isentropic flow with area change, Fanno flow, Rayleigh flow.

EML 6146: Microscale Heat Transfer
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 4141.
Kinetic theory and transport phenomena; fundamentals of statistical mechanics; microscale heat conduction, convection and radiation; applications.

EML 6154: Conduction Heat Transfer
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 2302, EML 4141.
Heat conduction in homogeneous, heterogeneous, isotropic, anisotropic, stationary, and moving bodies; in Cartesian, cylindrical and spherical systems. Examines exact and approximate solutions.

EML 6155: Convective Heat Transfer I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 4702, 4141.
Applying equations of motion and energy to forced and free convection with laminar and turbulent flow. Solution techniques to include simplification to ordinary differential equations, boundary layer approximations, similarity transformations, and integral approximations. Phenomenological treatment of turbulent transport.

EML 6156: Multiphase Convection Heat Transfer
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 6155.
Detailed coverage of advanced convection heat transfer topics: boiling and condensation, high-velocity convection, transpiration cooling, convection around bodies, free jet flow, oscillating fluids, and microelectronic cooling.

EML 6157: Radiation Heat Transfer
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 2302, EML 4141.
Theory and analysis of radiation exchange in transparent and absorbing, and emitting and scattering media.

EML 6216: Analytical Dynamics II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 5215 or consent of instructor.
Continuation of Analytical Dynamics I. Vector and analytical dynamics in three dimensions. Rotational kinematics, particle and rigid-body motion, moments of inertia. Comparing Lagrangian techniques with the vector methods of Euler and Newton; vibrations, Euler's angles, gyroscope motion, and axially symmetric bodies.

EML 6267: Structural Dynamics of Production Machinery
Credits: 3 **Grading Scheme:** Letter
Reviews mechanical vibrations with two degrees of freedom. Natural and forced vibrations of multi-degree-of-freedom systems. Experimental and computational modal analysis and synthesis. Vibrations of machine tools, rolling mills, robots.

EML 6278: Advanced Rotor Dynamics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 4220 and consent of instructor.
Analyzing dynamic stability, critical speeds, and unbalance response of rotor-bearing systems. Special problems encountered in modern applications operating through and above the critical speeds.

EML 6281: Geometry of Mechanisms and Robots I
Credits: 3 **Grading Scheme:** Letter
Developing applications to basic theory of the mathematics required to design spatial mechanisms and robot arms. Examples include mathematical description of the elements of mechanisms and robot arms (namely linkages and joints); their mobility and their analysis.

EML 6282: Geometry of Mechanisms and Robots II
Credits: 3 **Grading Scheme:** Letter
Applying the theory of screws to determine stationary and uncertainty configurations of mechanisms and robot arms. Dexterity and workspace of robot arms.

EML 6324: Fundamentals of Production Engineering
Credits: 3 **Grading Scheme:** Letter
Fundamentals of metal cutting, metal forming, and welding. Accuracy and rigidity of machine tools. Automation, numerical control, adaptive control.

EML 6350: Introduction to Nonlinear Control
Credits: 3 **Grading Scheme:** Letter
Introduction to nonlinear analysis and control systems theory. Lyapunov-based analysis and design techniques.

EML 6351: Nonlinear Control II: Adaptive Control
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 6350
Control methods for uncertain nonlinear systems. Lyapunov-based robust, adaptive, learning, and estimation-based methods.

EML 6352: Optimal Estimation
Credits: 3 **Grading Scheme:** Letter
Mathematical basis of parameter and state estimation methods with applications to mechanical and aerospace systems.

EML 6365: Robust Control Synthesis
Credits: 3 **Grading Scheme:** Letter
Application of uncertainty modeling and robust controls to dynamic systems for both analysis and synthesis.

EML 6417: Solar Energy Utilization
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Solar energy; its characteristics and availability; collection and storage; conversion and use as heat, refrigeration, thermal electric and power, photovoltaic conversion; and other applications.

EML 6451: Energy Conversion
Credits: 3 **Grading Scheme:** Letter

Converting available forms of energy into mechanical and electrical forms; energy conversion schemes, including conventional cycles in unusual environments. MHD, photovoltaics, thermionic and thermoelectric conversion and fuel cells.

EML 6597: Mechanics of Gait
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 5595.
Concepts, nomenclature, and control mechanics of normal and pathological bipedal gait.

EML 6606: Advanced Air Conditioning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EML 4600.
Air-conditioning system selection and system design; air-handling techniques including noise control, cleaning, and temperature and humidity control; modern technological development and economic analysis.

EML 6905: Individual Projects in Mechanical Engineering
Credits: 1-3 **Max: 9** **Grading Scheme:** Letter

EML 6934: Special Topics in Mechanical Engineering
Credits: 1-4 **Max: 12** **Grading Scheme:** Letter

EML 6936: Nonthesis Project
Credits: 1-4 **Max: 6** **Grading Scheme:** S/U
An in-depth project for graduate students not pursuing a thesis master's degree.

EML 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

EML 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

EML 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

ENC 5236: Advanced Business Writing for Accounting
Credits: 4 **Grading Scheme:** Letter
Practice in and examination of theories of professional writing.

ENC 6428: Digital English
Credits: 3 **Max: 12** **Grading Scheme:** Letter
Digital technologies, media, and programs related to the discipline of English. Scholarship and theory about (and production of work in) such media (web, MOO).

ENG 6016: Psychological Approaches to Literature
Credits: 3 **Max: 6** **Grading Scheme:** Letter

ENG 6075: Literary Theory: Issues
Credits: 3 **Max: 12** **Grading Scheme:** Letter

ENG 6076: Literary Theory: Theorists
Credits: 3 **Max: 12** **Grading Scheme:** Letter

ENG 6077: Literary Theory: Forms
Credits: 3 **Max: 12** **Grading Scheme:** Letter
Forms of theory studies (e.g., "schools," writing practices, assemblages of theoretical issues).

ENG 6137: The Language of Film
Credits: 3 **Max: 12** **Grading Scheme:** Letter

ENG 6138: Studies in the Movies
Credits: 3 Max: 12 Grading Scheme: Letter

ENG 6906: Individual Work
Credits: 1-3 Max: 12 Grading Scheme: Letter

ENG 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

ENG 6932: Film and Video Production
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: None.
A variable-topics film and video production seminar.

ENG 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

ENG 7939: Seminar in Variable Topics
Credits: 1-5 Max: 12 Grading Scheme: Letter

ENG 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ENG 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

ENL 6206: Studies in Old English
Credits: 3 Max: 12 Grading Scheme: Letter

ENL 6216: Studies in Middle English
Credits: 3 Max: 12 Grading Scheme: Letter

ENL 6226: Studies in Renaissance Literature
Credits: 3 Max: 12 Grading Scheme: Letter

ENL 6236: Studies in Restoration and 18th-Century Literature
Credits: 3 Max: 12 Grading Scheme: Letter

ENL 6246: Studies in Romantic Literature
Credits: 3 Max: 12 Grading Scheme: Letter

ENL 6256: Studies in Victorian Literature
Credits: 3 Max: 12 Grading Scheme: Letter

ENL 6276: Studies in 20th-Century British Literature
Credits: 3 Max: 12 Grading Scheme: Letter

ENT 5275: Family Business Management
Credits: 2 Grading Scheme: Letter
Crucial aspects of managing small business enterprises. Identifying and analyzing characteristic operating problems of small firms and techniques for solving them. Strategic operating and psychological issues associated with running a privately-held or family firm.

ENT 6006: Entrepreneurship
Credits: 2 Grading Scheme: Letter
Practical, hands-on understanding of the stages of the entrepreneurial process. Focuses on the decision-making process in a start-up company.

ENT 6008: Entrepreneurial Opportunity
Credits: 2 **Grading Scheme:** Letter
Introduces non-business graduate students to entrepreneurship and the entrepreneurial process.

ENT 6016: Venture Analysis
Credits: 2 **Grading Scheme:** Letter
Explores and critiques real-world examples of how new business ventures were conceived, started, and run.

ENT 6116: Business Plan Formation
Credits: 2 **Grading Scheme:** Letter
Prerequisite: None.
Professional development and preparation of a company business plan. Full analysis of the plan and outside evaluation and ranking.

ENT 6416: Venture Finance
Credits: 2 **Grading Scheme:** Letter
Capital structure and financing needs of start-up companies. Valuation of nonpublicly traded companies. Intellectual property.

ENT 6506: Social Entrepreneurship
Credits: 2 **Grading Scheme:** Letter
Process of starting, financing, assessing and managing succession of mission-based for-profit and not-for-profit ventures.

ENT 6616: Creativity in Entrepreneurship
Credits: 2 **Grading Scheme:** Letter
Explores the fundamental tools used to make both individuals and organizations more creative and innovative.

ENT 6706: Global Entrepreneurship
Credits: 2 **Grading Scheme:** Letter
Consideration of global market context in starting entrepreneurial ventures internationally.

ENT 6905: Individual Work in Entrepreneurship
Credits: 1-4 Max: 8 **Grading Scheme:** Letter
Individual work in an Entrepreneurship related topic.

ENT 6930: Special Topics
Credits: 1-4 Max: 8 **Grading Scheme:** Letter
Rotating topics in special topics in entrepreneurship-related fields of study.

ENT 6933: Entrepreneurship Lecture Series
Credits: 1-4 Max: 8 **Grading Scheme:** Letter
Explores opportunity recognition, business planning, capital sourcing, growth and harvest. Provides a background necessary for students interested in careers in start-up ventures, high-growh firms, business consulting or venture capital. Introduces students to resources in the entrepreneurial arena and provide a forum for networking and career development.

ENT 6946: Entrepreneurial Consulting Project
Credits: 2 **Grading Scheme:** Letter
To teach entrepreneurship by working the through real problems of real companies. To teach team dynamics, goal setting, and project management in an unscripted environment. To aid the economy by producing value-adding solutions to business problems.

ENT 6950: Integrated Technology Ventures
Credits: 1-4 Max: 8 **Grading Scheme:** Letter
Teams of engineering, business, and law students work together to commercialize UF developed technology. Objectives include commercialization of University of Florida technology through teaching entrepreneurship while attempting to commercialize a real technology, teaching team dynamics, goal setting, and project management.

ENT 6957: International Studies in Entrepreneurship
Credits: 1-4 Max: 8 **Grading Scheme:** Letter
Academic credit for courses taken overseas.

ENU 5142: Reliability and Risk Analysis for Nuclear Facilities
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENU 4144 or 5005 and 4934 or ENU 6935.
Nuclear facilities' safety systems including reliability and probabilistic risk assessment.

ENU 5176L: Principles of Nuclear Reactor Operations Laboratory
Credits: 1 **Grading Scheme:** Letter
Prerequisite: ENU 4144 or equivalent and consent of instructor.
Principles of reactor operations applied to startup, operation, and control of the training reactor to include performing reactor physics measurements and instrumentation and control calibrations.

ENU 5186: Nuclear Fuel Cycles
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENU 4104.
Fuel cycle from uranium mining through waste management. Reactor fuel cycle including economics and advanced fuel management. Nodal code evaluation of criticality, power peaking and power sharing through operating cycle, use of burnable poisons and reshuffle and reload for uranium and plutonium cycles.

ENU 5196: Nuclear Reactor Power Plant System Dynamics and Control
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENU 4192 and EEL 4657 or EML 5311.
Control theory analysis applied to nuclear power reactor dynamic models with feedback and to integrated nuclear power plant dynamic models with feedback.

ENU 5516L: Nuclear Engineering Laboratory II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ENU 4612L or ENU 5615L and 4104 or ENU 6106.
Laboratory practice in neutron and gamma detection and analysis. Determination of basic neutron parameters in nonmultiplying and multiplying media.

ENU 5615C: Nuclear Radiation Detection and Instrumentation
Credits: 4 **Grading Scheme:** Letter
Prerequisite: ENU 3003 and EEL 3303L or equivalent. *Corequisite:* ENU 6051; or prereq of ENU 4605 or equivalent.
Interaction of radiation with matter, radiation-detection systems, pulse shaping, amplification, amplitude and time-analyzing circuitry; counting and measuring devices and control systems for nuclear reactors.

ENU 5615L: Nuclear Radiation Detection and Instrumentation Lab
Credits: 1 **Grading Scheme:** Letter
Laboratory associated with ENU 5615C.

ENU 5626: Radiation Biology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: one year each of college biology, chemistry, and physics; permission of instructor.
Effects of radiation on biological molecules, cells, and man including cancer and mutagenesis; use of radiation in treatment of disease.

ENU 5658: Imaging System Analysis with Medical Physics Applications
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Calculus 1-3 (MAC2311, MAC 2313 and MAC 2313) or Equivalent
The application of linear systems theory for the analysis of medical imaging systems with an emphasis on radiological imaging. Topics covered include the following: convolution, Fourier Transform, linear filtering, sampling theory, image reconstruction from projections and methods for image quality evaluation.

ENU 5705: Advanced Concepts for Nuclear Energy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENU 4104, 4144 and EML 3100.
Plasmas and thermonuclear fusion; fast reactors, advanced LWRs, and other advanced fission reactors; nuclear pumped lasers; TE, TI, and MHD conversion and Stirling engines as applied to advanced reactor concepts.

ENU 6051: Radiation Interaction Basics and Applications I
Credits: 3 **Grading Scheme:** Letter
Interaction of X-rays, gamma rays, neutrons, and charged particles with matter; radioactive decay, nuclear moments, and nuclear transitions. Application to basic problems in nuclear engineering sciences.

ENU 6052: Radiation Transport Basics and Applications
Credits: 3 **Grading Scheme:** Letter
Particle distribution functions. Elementary transport and statistical description of particulate matter. Development of transport relations and their solutions. Applications to basic problems in nuclear engineering sciences.

ENU 6053: Radiation Interaction Basics and Applications II
Credits: 3 **Grading Scheme:** Letter
Continuation of ENU 6051. Nuclear Structure, stability and models; nuclear reactions; ionization of matter by charged particles, neutrons, and electromagnetic radiation with application to basic problems in nuclear engineering sciences.

ENU 6061: Survey of Medical Radiological Physics
Credits: 1 **Grading Scheme:** Letter
Prerequisite: undergraduate classical and modern physics, and differential equations.
An overview of the areas of medical radiological physics including diagnostic radiography, nuclear medicine, and radiation therapy. Basic radiation physics, biology, and safety.

ENU 6106: Nuclear Reactor Analysis I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENU 6051.
Nuclear criticality, neutron transport equation, multigroup neutron diffusion theory, and perturbation theory. Reactor kinetics: point model, reactivity feedback, and space-time models.

ENU 6107: Nuclear Reactor Analysis II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENU 6106.
Fast and thermal spectrum calculations for homogeneous and heterogeneous reactor cores. Nuclear reactor core design including nuclear and thermal hydraulic analyses. Core power distributions, composition changes, and reactivity control.

ENU 6126: Fundamentals of Reactor Kinetics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENU 4001, ENU 4605, ENU 4103.
Nuclear reactor kinetics, including mathematics, transport and diffusion considerations, steady state and time dependent reactor physics, delayed neutron properties, photoneutrons, and neutron reactions, approximations and solutions to the kinetics equations, numerical solution methods using explicit, implicit, integral, marching, and finite difference solution methods.

ENU 6623: Radiation Dosimetry
Credits: 3 **Grading Scheme:** Letter
Concepts, dosimetry quantities and units, calculations for external gamma, beta, and neutron radiation, calculation of dose from internal radioactivity, dose measurements concepts, gamma and beta dose measurements, dose assessment from survey and personnel monitoring.

ENU 6627: Therapeutic Radiological Physics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENU 5615C, ENU 6051.
Introduction to radiation therapy physics: teletherapy, brachytherapy, interstitial therapy. Production of photons and electrons for therapeutic use. Radiation measurement and dosimetry clinical applications. Radiation protection and quality assurance.

ENU 6636: Medical Radiation Shielding & Protection
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BME XXXX-Radiological Physics, Measurements and Dosimetry
Shielding design fundamentals. Methods of calculating gamma-ray attenuation, fast neutron penetration, effects of ducts and voids in shields, problems of heat generation and deposition in reactor components.

ENU 6651: Clinical Rotation in Radiation Therapy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: working knowledge of therapeutic radiological physics.
Experience in clinical therapeutic radiological procedures, patient dosimetry, and treatment planning.

ENU 6652: Clinical Rotation in Diagnostic Radiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: working knowledge of diagnostic radiological physics.
Experience in clinical diagnostic radiological procedures. Application of physical principles to imaging and the quality assurance of the imaging chain.

ENU 6655: Advanced Diagnostic Radiological Physics
Credits: 3 **Grading Scheme:** Letter
Applying advanced physical principles, image acquisition, and processing techniques to clinical imaging physics. Methods and principles of MRI and ultrasound imaging. Digital image archiving, transmission and processing standards, and networks.

ENU 6657: Diagnostic Radiological Physics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENU 5615C, ENU 6051, ENU 6053.
X- and gamma-ray production and spectra. Radiopharmaceuticals. Medical imaging concepts and hardware. Clinical overview of diagnostic x-ray and nuclear medicine. Application of radiation protection principles.

ENU 6659: Nuclear Medicine Instrumentation and Procedure
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENU 5615C or equivalent.
Theory, evaluation, applications of detecting and imaging systems in nuclear medicine including collimators, scintillation probes, cameras, data-processing devices; uses of radionuclides in medicine for radiopharmaceutical preparation.

ENU 6805: Introduction to Nuclear Reactor Materials
Credits: 3 **Grading Scheme:** Letter
Introducing the materials used in nuclear energy systems and their response to the reactor environment. The majority of materials related issues encountered in the nuclear power plants are discussed in this course.

ENU 6905: Individual Work
Credits: 1-6 **Max: 12** **Grading Scheme:** Letter
Supervised study or research in areas not covered by other graduate courses.

ENU 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

ENU 6935: Nuclear and Radiological Engineering Seminar
Credits: 1 **Max: 3** **Grading Scheme:** Letter
Discussion of research, current trends in the nuclear related industry, government, and research establishments.

ENU 6936: Special Projects in Nuclear and Radiological Engineering Sciences
Credits: 1-9 **Max: 12** **Grading Scheme:** Letter, H
Nonthesis research projects.

ENU 6937: Special Topics in Nuclear and Radiological Engineering Sciences
Credits: 1-9 **Max: 12** **Grading Scheme:** Letter, H

ENU 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

ENU 6972: Research for Engineer's Thesis
Credits: 1-15 **Grading Scheme:** S/U

ENU 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U

Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ENU 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

ENV 5072: Pollution Control and Prevention
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 2046, PHY 2005.
Survey of engineering processes used to control pollutants in four environmental engineering systems: water, air, waste, and radioactive materials. Pollution prevention for a sustainable environment.

ENV 5075: Environmental Policy
Credits: 3 **Grading Scheme:** Letter
Policy analysis, making, and implementation. Analytical methods for evaluating alternative policies. Legal, social, political, and economic patterns and processes that shape the climate in which environmental policy is made.

ENV 5105: Foundations of Air Pollution
Credits: 3 **Grading Scheme:** Letter
Principal types, sources, dispersion, effects, and physical, economic and legal aspects of control of atmospheric pollutants.

ENV 5305: Advanced Solid Waste Treatment Design
Credits: 3 **Grading Scheme:** Letter
Review of solid and hazardous waste treatment processes, including thermal, biological, chemical, and mechanical treatment. Analysis of existing operations.

ENV 5306: Municipal Refuse Disposal
Credits: 3 **Grading Scheme:** Letter
Quantities and characteristics of municipal refuse and hazardous materials. Collection methods, transfer stations, equipment and costs. Refuse disposal practices, regional planning and equipment.

ENV 5518: Field Methods in Environmental Hydrology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CWR 5125 or equivalent.
Field methods for characterizing sites for environmental and hydrologic evaluation. Focuses on subsurface systems and ground water interactions.

ENV 5520: Fluid Flow in Environmental Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 2046, PHY 2005.
Fundamentals of fluid flow and their relation to environmental systems such as surface water, ground water, and engineering systems.

ENV 5555: Wastewater Treatment
Credits: 4 **Grading Scheme:** Letter
Prerequisite: ENV 4514C or equivalent.
In-depth study of the physical, chemical, and biological processes used to treat wastewater. Emphasizes cause and effect of physical and biological actions.

ENV 5565: Hydraulic Systems Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CWR3201.
Hydraulic design of water distribution systems, wastewater collection and disposal systems, and water and wastewater treatment plants.

ENV 6050: Advanced Pollutant Transport
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENV 3040, 4501, or consent of instructor.

Quantifying physical, biological, and chemical processes occurring in natural freshwater ecosystems. Mathematical analysis of the effects of conservative and nonconservative pollutant loadings to lakes and rivers. Detailed study of dissolved oxygen mass balance modeling and eutrophication.

ENV 6052: Immiscible Fluids in Porous Media
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Mechanics of immiscible fluids in porous media. Static fluid distributions, and steady and unsteady multiphase flow. Remediation of sites contaminated with nonaqueous phase liquids.

ENV 6116: Air Pollution Sampling and Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENV 4101 or consent of instructor.
Determining the concentration of normally encountered ambient pollutants. Practical experience in ambient air and indoor sampling.

ENV 6126: Air Pollution Control Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENV 4101 or consent of instructor.
Design, analysis, operational limitations, cost and performance evaluation of control processes and equipment. Field visits to and inspection of industrial installations.

ENV 6130: Aerosol Mechanics
Credits: 3 **Grading Scheme:** Letter
Generating, collecting, and measuring aerosols. Theory of fluid dynamic, optical, electrical, inertial, and thermal behavior of gas-borne particles.

ENV 6146: Atmospheric Dispersion Modeling
Credits: 3 **Grading Scheme:** Letter
Predicting downwind pollutant concentrations from point, line, and areal sources.

ENV 6215: Health Physics
Credits: 3 **Grading Scheme:** Letter
Techniques of hazard evaluation and radiation control; monitoring methods; survey techniques; biological sampling; instrument calibration; exposure standards and radiation protection regulation; on-site radiation safety surveys and evaluation.

ENV 6216: Radioactive Wastes
Credits: 3 **Grading Scheme:** Letter
Source, treatment, and disposal. Emphasizes preventing environmental contamination.

ENV 6301: Advanced Solid Waste Containment Design
Credits: 3 **Grading Scheme:** Letter
Current practice in designing solid and hazardous waste landfills, waste piles, monofills, and surface impoundments. Regulations, siting, sizing, liners, leachate and gas management, operations, closure, and post-closure.

ENV 6435: Advanced Water Treatment Process Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENV 4514C, EES 4201
Design of selected water treatment processes including disinfection, air stripping, adsorption, ion exchange and membrane processes.

ENV 6435C: Advanced Water Treatment Process Design
Credits: 4 **Grading Scheme:** Letter
Prerequisite: CHM 2046, EES 4201 or 6208, ENV 4514C.
Designing water treatment processes including air stripping disinfection, activated carbon adsorption, ion exchange, membrane processes, and ozonation. Predesigning laboratory studies to select appropriate process parameters.

ENV 6435L: Water Treatment Process Design Laboratory
Credits: 1 **Grading Scheme:** Letter

Corequisite: ENV 6435
Development of water treatment design parameters by performing bench scale and pilot scale experiments on selected treatment processes.

ENV 6437: Advanced Wastewater System Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENV 4514C or equivalent. *Corequisite:* ENV 4561 or equivalent.
Layout and design of sanitary sewage systems, pumping stations, force mains, wastewater treatment plants, and methods of effluent disposal. Emphasizes preparing design drawings and estimating costs.

ENV 6438: Advanced Potable Water Systems Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EES 4201 or EES 6208, and ENV 4514C.
Design of water treatment operations, including coagulation, flocculation, mixing, sedimentation, filtration, softening, corrosion control, and sludge management. Design costs.

ENV 6439: Activated Carbon: Environmental Design and Application
Credits: 3 **Grading Scheme:** Letter
Theory and application of manufacturing activated carbon, its use in water treatment/remediation (i.e., design of activated carbon systems), and thermal reactivation.

ENV 6441: Water Resources Planning and Management
Credits: 3 **Grading Scheme:** Letter
Principles and practice of water resource planning and management. Protocols used at local, state, federal, regional, and international levels. Plan formulation, evaluation, and implementation. Stakeholder involvement in planning processes. Analytical tools. Case studies.

ENV 6508: Wetland Hydrology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: basic fluid flow course or consent of instructor.
Water flow and chemical transport in wetlands. Surface water and ground water interaction in wetlands. Constructed wetlands for water treatment.

ENV 6510: Groundwater Restoration
Credits: 3 **Grading Scheme:** Letter
Designing water treatment systems using aeration, activated carbon, reverse osmosis, and in situ bioremediation to restore contaminated groundwater.

ENV 6511: Biological Wastewater Treatment
Credits: 3 **Grading Scheme:** Letter
Theory and current research associated with biological treatment processes.

ENV 6556: Advanced Waste Treatment Operations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: course or professional experience in unit operations and processes of water and wastewater treatment.
Biological, physical, and chemical processes used in the advanced treatment of domestic and industrial wastewater. Reuse application and guidelines.

ENV 6905: Individual Work
Credits: 1-4 Max: 8 **Grading Scheme:** Letter
Faculty-supervised individual research or study of material not covered in formal courses.

ENV 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

ENV 6916: Nonthesis Project
Credits: 1-3 Max: 3 **Grading Scheme:** Letter

ENV 6932: Special Problems in Environmental Engineering
Credits: 1-4 Max: 8 **Grading Scheme:** Letter

ENV 6935: Graduate Environmental Engineering Seminar
Credits: 1 Max: 6 Grading Scheme: Letter, S/U

ENV 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

ENV 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ENV 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

ENY 5006: Graduate Survey of Entomology
Credits: 2 Grading Scheme: Letter
Corequisite: ENY 5006L.
Insect structure, function, development, classification, ecological niches, and control of those harmful to plants and animals.

ENY 5006L: Graduate Survey of Entomology Laboratory
Credits: 1 Grading Scheme: Letter
Corequisite: ENY 5006.
Practical experience working with insects, using laboratory equipment, dissecting insects, and preparing laboratory reports. Collection required.

ENY 5031C: Insect Field Biology
Credits: 3 Grading Scheme: Letter
For nonmajors. Role of insects in nature. Field exercises and experiments.

ENY 5151C: Techniques in Insect Systematics
Credits: 2 Grading Scheme: Letter
Prerequisite: ENY 3005C.
Procedures and techniques used to study systematics of insects and related organisms.

ENY 5160C: Survey of Science with Insects
Credits: 3 Grading Scheme: Letter
Interactions of insects with man and environment.

ENY 5164: Graduate Survey of Invertebrate Field Biology
Credits: 3 Grading Scheme: Letter
Field-oriented survey of invertebrate biodiversity and conservation.

ENY 5212: Insects and Wildlife
Credits: 3 Grading Scheme: Letter
Prerequisite: ENY 5006L or equivalent
Insects and other arthropods and their relationships with wild vertebrate animals.

ENY 5223C: Biology and Identification of Urban Pests
Credits: 3 Grading Scheme: Letter
Biology, behavior, identification. Damage recognition of species that infest houses, damage structures, and affect pets and humans.

ENY 5226C: Principles of Urban Pest Management
Credits: 3 Grading Scheme: Letter
Methods of controlling household, structural, and occasional pests. Chemical and nonchemical control of cockroaches, termites, and fleas.

ENY 5236: Insect Pest and Vector Management
Credits: 3 Grading Scheme: Letter

Principles and practices used in pest management, emphasizing arthropod pests affecting crop and ornamental plants, humans, and livestock.

ENY 5241: Biological Control
Credits: 4 **Grading Scheme:** Letter
Principles involved in the natural and biological control of insects.

ENY 5245: Agricultural Acarology
Credits: 2 **Grading Scheme:** Letter
Introduction to mites of agricultural importance, their biology, behavior, and control.

ENY 5332: Graduate Survey of Urban Vertebrate Pest Management
Credits: 2 **Grading Scheme:** Letter
Biology, ecology, health risks, exclusion, and control of vertebrate pests in urban environment.

ENY 5405: Insects as Vectors of Plant Pathogens
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENY3005, ENY5006, or equivalent
This course will be presenting information on insect, other arthropod and nematode vectors of plant pathogens, and the role and management of these vectors in agricultural and environmental areas. Including material on identification and morphology of important vectors and how these features affect transmission of plant pathogens.

ENY 5516: Turf and Ornamental Entomology
Credits: 3 **Grading Scheme:** Letter
Identification, biology, and integrated management of common arthropod families and species inhabiting turfgrasses and popular ornamental plants in the urban environment with emphasis on the Southeastern U.S.

ENY 5566: Tropical Entomology
Credits: 3 **Grading Scheme:** Letter
Natural history, ecology, behavior, natural ecosystems, and agroecosystems of tropics.

ENY 5567: Tropical Entomology Field Laboratory
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ENY 5566.
Field experience observing the natural history, ecology, and behavior of insects in natural ecosystems and agroecosystems in the tropics.

ENY 5572: Advanced Apiculture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
The biology of honey bees and the craft of apiculture will be examined by exploring the natural history, biogeography and ecology of honey bees. Honey bee anatomy, physiology, colony social structure, pests/diseases, pollination ecology, management and current topics in beekeeping will be discussed.

ENY 5611: Immature Insects
Credits: 4 **Grading Scheme:** Letter
Structure and identification of immature forms of insects, especially the Holometabola.

ENY 5820: Insect Molecular Genetics
Credits: 3 **Grading Scheme:** Letter
Basics of DNA, RNA, gene transcription and translation, and tools used in molecular genetics of insects.

ENY 6166: Insect Classification
Credits: 3 **Grading Scheme:** Letter
Classification of adult insects to family and of some to species level. Habitat, niche, and relationship to environment.

ENY 6203: Insect Ecology
Credits: 3 **Grading Scheme:** Letter
Corequisite: ENY 6203L

Advanced course on concepts in ecology with emphasis in insects; relationships with their biotic and physical environments and basics of ecological research.

ENY 6203L: Insect Ecology Laboratory
Credits: 1 **Grading Scheme:** Letter
Corequisite: ENY 6203
Methodology and instrumentation used in ecological research with insects.

ENY 6248: Termite Biology and Control
Credits: 2 **Grading Scheme:** Letter
Taxonomy, identification, behavior, ecology, and methods of control for the economically important termites of the New World.

ENY 6401: Insect Physiology
Credits: 4 **Grading Scheme:** Letter
Physiology and biochemistry of insect development and adaptation for survival.

ENY 6401L: Insect Physiology Laboratory
Credits: 1 **Grading Scheme:** Letter
Prerequisite: ENY 3005 & BSC 2010 & BSC 2011
This graduate-level laboratory course complements the lecture course in Insect Physiology (ENY 6401). Students will learn internal and external anatomy of insects and gain proficiency in physiological, biochemical, and molecular biology techniques such as estimating respiratory gas exchange, protein purification and quantification, and estimating enzyme activity

ENY 6454: Behavioral Ecology and Systematics of Insects
Credits: 3 **Grading Scheme:** Letter
A theoretical and practical treatment of behavioral ecology and how phylogenetic methods can be employed to both develop and test hypotheses of how insect behavior has evolved.

ENY 6591C: Advanced Mosquito Identification
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ENY 3005 or ENY 4161
Intensive, hands-on training on morphological features and the identification of adult and larval mosquitoes species that occur in North America, and discussions on historical and current issues in mosquito taxonomy.

ENY 6593: Advanced Mosquito Biology
Credits: 3 **Grading Scheme:** Letter
This course will be covering six critical areas of mosquito biology; classification, natural history and ecology, physiology, population dynamics, mosquito-borne diseases, and control of mosquitoes. Students will understand the fundamental processes governing mosquitoes and mosquito-borne diseases.

ENY 6651C: Insect Toxicology
Credits: 3 **Grading Scheme:** Letter
Chemistry, toxicity, mode of action, metabolism, and environmental considerations of insecticides and related compounds. Mechanisms of resistance to insecticides.

ENY 6665: Advanced Medical and Veterinary Entomology I
Credits: 3 **Grading Scheme:** Letter
Corequisite: ENY 6665L.
Taxonomy, morphology, and biology of arthropods of medical and veterinary importance. A collection and project proposal will be required.

ENY 6665L: Advanced Medical and Veterinary Entomology Laboratory
Credits: 1 **Grading Scheme:** Letter
Corequisite: ENY 6665: Advanced Medical and Veterinary Entomology I.
Identification of mosquitoes, ticks, lice, fleas, and other disease vectors. Collection required.

ENY 6706: Forensic Entomology
Credits: 3 **Grading Scheme:** Letter

The role of arthropods in decomposition, in criminal and civil investigations and the increasing importance of science on society. The material discussed in this course deals with death and some may consider images and concepts disturbing.

ENY 6706l: Forensic Entomology Laboratory
Credits: 1 **Grading Scheme:** Letter
Corequisite: ENY 6706: Forensic Entomology.
Laboratory and field experiments designed to accompany ENY 6706 that will involve decomposing pig carcasses or other applied forensic applications.

ENY 6821: Insect Pathology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Associations existing between insects and microorganisms including mutualistic relationships, commensalism, vector biology, and insect-pathogen interactions.

ENY 6822C: Molecular Biology Techniques with Invertebrates and Their Pathogens
Credits: 4 **Grading Scheme:** Letter
Prerequisite: basic course in genetics, biochemistry, or molecular biology.
Insects, nematodes, bacteria, viruses. Cloning of DNA, DNA blots, PCR, sequencing and analysis.

ENY 6905: Problems in Entomology
Credits: 1-4 Max: 12 **Grading Scheme:** Letter
Individual study under faculty guidance. Student and instructor to agree on problem and credits prior to registration.

ENY 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U
Research for nonthesis M.S. students.

ENY 6931: Entomology Seminar
Credits: 1 Max: 8 **Grading Scheme:** Letter, S/U
Presentation and discussion of current research topics.

ENY 6932: Special Topics in Entomology
Credits: 1-2 Max: 4 **Grading Scheme:** S/U
Reports and discussions on selected topics announced in advance.

ENY 6934: Selected Studies in Entomology
Credits: 1-4 Max: 8 **Grading Scheme:** Letter
Current issues. Subject matter variable, may be repeated with different subject each time.

ENY 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

ENY 6942: Insect Diagnostics
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Identifying insects and diagnosing plant damage caused by insects.

ENY 6943: Entomology Internship
Credits: 1-3 Max: 6 **Grading Scheme:** S/U
Diagnosing plant disorders caused by complex of insects and other factors.

ENY 6944: Entomology Extension Internship
Credits: 1-3 Max: 6 **Grading Scheme:** S/U
Diagnosing insect damage to plants in field and greenhouse. Learning to make control recommendations.

ENY 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

ENY 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U

Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ENY 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

EOC 5860: Port and Harbor Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGN 3353C (or CWR 3201), MAP 2302 or equivalent.
Principles of port design; wave penetration; harbor oscillations; sediment movement and pollutant mixing; port structures, port operations; case studies.

EOC 6196: Littoral Processes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: OCP 6165.
Shoreline developments; nearshore hydrodynamics; sediment transport phenomena by waves and wind; methods of determining littoral transport quantities; effects of groins, jetties, and other coastal structures on littoral processes.

EOC 6430: Coastal Structures
Credits: 3 **Grading Scheme:** Letter
Prerequisite: OCP 6165.
Planning and design for beach nourishment, breakwaters, jetties, seawalls and coastal protection structures.

EOC 6850: Numerical Simulation Techniques in Coastal and Ocean Engineering
Credits: 3 **Grading Scheme:** Letter
Numerical treatment of problems in ordinary and partial differential equations with application to incompressible geophysical fluid flows.

EOC 6905: Individual Study in Coastal and Oceanographic Engineering
Credits: 1-4 **Max: 8** **Grading Scheme:** Letter

EOC 6932: Selected Field and Laboratory Problems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGN 3353C (or CWR 3201), MAP 2302 or equivalent.
Field and/or laboratory investigations employing modern research techniques and instrumentation.

EOC 6934: Advanced Topics in Coastal and Oceanographic Engineering
Credits: 1-6 **Max: 9** **Grading Scheme:** Letter
Waves; wave-structure interaction; coastal structures; ocean structures; sediment transport; instrumentation; advanced data analysis techniques; turbulent flow and its applications.

EOC 6939: Graduate Seminar
Credits: 1 **Max: 6** **Grading Scheme:** S/U
Guest lecturers; lectures by COE faculty and students.

EOC 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

EOC 6972: Research for Engineer's Thesis
Credits: 1-15 **Grading Scheme:** S/U

EOC 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

EOC 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

ESC 5211: Current Topics in Earth Science for Teachers
Credits: 3 **Grading Scheme:** Letter
Corequisite: ESC 5211L recommended. May not be taken for major credit in earth sciences.
Basic principles and overview of recent advances in earth sciences, for secondary science teachers.

ESE 6215: The Secondary School Curriculum
Credits: 3 **Grading Scheme:** Letter
Scope, function, and types of secondary school curricula and ways of improving existing programs.

ESE 6344: Classroom Practices and Assessment in Secondary Education
Credits: 3 **Grading Scheme:** Letter
Practical applications of recent research on effective classroom practices.

ESE 6345: Effective Teaching and Classroom Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of departmental.
Advanced strategies for planning and presenting the general academic content of mathematics, science, foreign language, social studies, and English in the secondary school.

ESE 6905: Individual Work
Credits: 1-4 Max: 12 including EDE 6905 **Grading Scheme:** Letter

ESE 6939: Special Topics
Credits: 3 Max: 10 **Grading Scheme:** Letter

ESE 6945: Student Teaching in Secondary School
Credits: 3-9 Max: 9 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Supervised teaching in the secondary school, Grades 6-12.

ESI 5236: Reliability Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ESI 4567C, STA 4322.
Mathematical models and methods of reliability engineering. Typical component failure distributions; system reliability as a function of component reliability. Reliability block diagrams and fault trees.

ESI 6162C: Advanced Industrial Applications of Microprocessors
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CGS 2425.
Concepts of microprocessors; microcomputer architecture and languages. Interfacing and computational requirements. Applications to industrial and manufacturing systems. Emphasis on laboratory experiments and "hands-on" experience.

ESI 6314: Deterministic Methods in Operations Research
Credits: 4 **Grading Scheme:** Letter
Prerequisite: calculus through differential equations, knowledge of linear algebra, and experience using mainframes or PCs.
Introduction to basic models and their solution with modern computer packages. Emphasis on modeling, computer solution, and sensitivity analysis with minimal reference to model theory and development of algorithmic methods.

ESI 6321: Applied Probability Methods in Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: calculus, differential equations, undergraduate probability, and statistics.
Applied probability theory and statistics, reliability engineering, quality control, robust design, forecasting, Markov processes, and queuing theory.

ESI 6323: Models for Supply Chain Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: prior course work in linear programming, probability, and stochastic processes.
Essential elements including controlling and coordinating activities such as order processing, purchasing, material storage and handling, production scheduling, packaging, transportation, and setting customer service standards.

ESI 6341: Intro to Stochastic Optimization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Basic knowledge of calculus, statistics and linear programming.
Introduction to Stochastic Optimization is intended as a first introductory course for graduate students in such fields as engineering, operations research, statistics, mathematics, and business administration (in particular, finance or management science). 3 credits.

ESI 6355: Decision Support Systems for Industrial and Systems Engineers
Credits: 4 **Grading Scheme:** Letter
Prerequisite: programming course in C++ or Java and operations research.
Applications of decision support systems: developing and implementing systems arising in industrial and systems engineering using popular database management and spreadsheet software.

ESI 6417: Linear Programming and Network Optimization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: matrix theory.
Formulation and solution techniques for network flow and linear programming problems. Algorithms for network optimization. The simplex method, theory and computation. Duality theory, sensitivity analysis.

ESI 6418: Linear Programming Extensions and Applications
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ESI 6417, ESI 6429.
Extension of linear programming to large scale linear and nonlinear problems. Integer programming methods. Applications of the methodology to real world models.

ESI 6420: Fundamentals of Mathematical Programming
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Mathematical background, ability to proof mathematical statements and ability to write simple codes with Matlab or C.
Introducing mathematical programming with an emphasis on classical optimization concepts, models and solution techniques. Focus on convex analysis (convex sets, separation theorems, convex functions), optimality conditions (Fritz-John & Karush-Kuhn-Tucker), Lagrangian duality and iterative solution methods 9gradient, conjugate gradients & barrier methods.

ESI 6429: Introduction to Nonlinear Optimization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ESI 6417 and multivariable calculus.
Nonlinear optimization models, convex sets and functions, optimality conditions, nonlinear algorithms, dynamic programming methods.

ESI 6448: Discrete Optimization Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: linear programming and nonlinear optimization or equivalent.
Modeling with integer variables; enumeration and cutting plane methods; decomposition algorithms; branch and bound methods; computational complexity and software issues; special combinatorial optimization problems; parallel algorithms for integer programming.

ESI 6449: Integer Programming
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ESI 6417 and ESI 6448
Advanced topics in the theory, algorithms and applications of integer programming. Focus on polyhedral approaches (cutting planes, integer polyhedra, primal algorithms), theory of lattices and algebraic geometry approaches (Gobner bases, generating functions, sos relaxations).

ESI 6470: Principles of Manufacturing Systems Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: calculus through differential equations.
Introduction to modern manufacturing systems. Components of product and process design, computer-integrated manufacturing and automation. Current areas of development and research.

ESI 6492: Global Optimization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: linear and nonlinear programming.
Properties of nonconvex functions, convex envelopes, and duality. Complexity issues, applications of global optimization and software issues. Algorithms for quadratic programming. Concave minimization, Lipschitz optimization, and nonconvex network flow problems.

ESI 6529: Digital Simulation Techniques
Credits: 3 **Grading Scheme:** Letter
Prerequisite: computer programming and probability theory.
Computer programming aspects of digital simulation. Deterministic simulation; stochastic simulation. Use of simulation languages.

ESI 6533: Advanced Simulation Design and Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ESI 6546, and a graduate-level course in statistical inference.
Fundamental concepts and techniques for stochastic simulation and applications in communications, transportation and manufacturing systems, and financial engineering. Discrete-event systems and Monte-Carlo evaluation.

ESI 6546: Stochastic Modeling and Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6326.
Stochastic processes, with emphasis on model building and probalistic reasoning. Review of elementary probability theory. Poisson process and renewal theory. Discrete and continuous time Markov chains. Brownian motions, random walks, and martingales. Applications in queuing, reliability, inventory theory, logistics, and finance.

ESI 6552: Systems Architecture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: calculus, linear algebra, ESI 6xxxa.
Foundations for developing and evaluating architectures for systems of systems. Process for generating functional, physical, and operational architecture from a top-level operations concept.

ESI 6553: Systems Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: calculus, linear algebra, basics of statistics, ESI 6314.
Broad introduction to systems engineering and the structured approaches needed to design complex systems. Emphasizes formulation of systems problems and approaches to their solution. Introduces basic mathematical techniques for dealing with systems design.

ESI 6555: Systems Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: calculus, linear algebra, basics of statistics.
Introduction to the concepts of systems and the role of systems engineering in their development. Basic framework for planning and assessing system development, and how systems analysis methods and techniques are integrated into systems engineering processes.

ESI 6912: Advanced Topics in ISE
Credits: 1-4 Max: 8 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Course work in specialized topics for graduate students.

EUH 5195: The Archaeology of the Middle Ages
Credits: 3 **Grading Scheme:** Letter
Examining key issues in the theory and practice of medieval archaeology. Major themes include the relation between history and archaeology, nationalism in archaeology, urban centers, rural settlements, church and monastic archaeology, wetland archaeology, mortuary archaeology, crafts, social relations, power in the Middle Ages, gender, ethnicity, and state formation.

EUH 5546: Topics in British History
Credits: 3 Max: 9 **Grading Scheme:** Letter

EUH 5934: Topics in European History
Credits: 3 Max: 15 Grading Scheme: Letter

EUH 6126: Readings in Medieval History
Credits: 3 Grading Scheme: Letter
Major themes; readings combine classic studies that shaped the field with current work exploring issues like gender, textuality and historical memory, and popular religion.

EUH 6174: Conversion in the Middle Ages
Credits: 3 Grading Scheme: Letter
Examines the religious experience of the middle ages through reading and discussion of concepts such as conversion, martyrdom, sainthood, gender, and power.

EUH 6175: Ethnicity in the Middle Ages
Credits: 3 Grading Scheme: Letter
Ethnicity as a form of social and political mobilization in the middle ages. Focuses on issues such as migration, ethnogenesis, medieval law, language and ethnic identity, kingdoms, and ethnic communities.

EUH 6176: Villages and Peasants in the Middle Ages
Credits: 3 Grading Scheme: Letter
In-depth examination of such key concepts as manorialism, corvee, manumission, and using written and archaeological sources.

EUH 6177: Economy and Society in Late Antiquity and the Early Middle Ages
Credits: 3 Grading Scheme: Letter
Examines the processes by which land tenure, trade, and aristocratic demand interacted to become powerful forces in shaping political, social, and economic conditions of the transition from Antiquity to the Middle Ages (from Late Antiquity to the early Middle Ages).

EUH 6213: Europe, 1500-1763
Credits: 3 Grading Scheme: Letter

EUH 6289: Readings, Modern Europe
Credits: 3 Max: 6 Grading Scheme: Letter
Major themes; readings combine classic studies that shaped the field with current works exploring a wide range of topics.

EUH 6469: Modern German History
Credits: 3 Grading Scheme: Letter
Interpretations of and approaches to German history, and introduction to advanced research in the area.

EUH 6935: Readings, Early Modern Europe
Credits: 3 Max: 6 Grading Scheme: Letter
Major themes; readings combine classic studies that shaped the field with current works exploring a wide range of topics.

EUH 6937: Readings in Mediterranean History
Credits: 3 Max: 6 Grading Scheme: Letter

EVR 5322: Scientific Processes in Conservation and Development
Credits: 2 Grading Scheme: Letter
Prerequisite: one ecology course.
Scientific bases and critical thinking focused on the interplay between environmental conservation and economic and social development.

EVR 5705: Natural Resources and Innovation Systems
Credits: 3 Grading Scheme: Letter
Prerequisite: Graduate standing
Natural resource science, technology, and the innovation process; cases in food, agriculture, forestry, water, urban environment, and energy, and their role in sustaining society.

EVR 6320: Sustainable Natural Resource Management
Credits: 3 Grading Scheme: Letter

Prerequisite: one ecology course.
Principles and practices for sustainably managing natural resources (soil, water, forests, fisheries, biodiversity); systems, cases, models, drivers, scenario evaluation, adaptive learning, and collaborative decision-making.

EVR 6933: Seminar
Credits: 1 Max: 4 Grading Scheme: S/U

EVR 6934: Internship
Credits: 3 Max: 6 Grading Scheme: S/U
Intensive workplace experience in business, government, or nongoverment organization related to a specific program of study.

EVR 6979: Nonthesis Master's Project
Credits: 1-2 Max: 2 Grading Scheme: S/U
Creating a technical paper involving analysis and synthesis, but not necessarily generating new data.

EXP 6099: Survey of Cognition and Sensory Processes
Credits: 2-3 Max: 3 Grading Scheme: Letter
Prerequisite: graduate status.
Empirical and theoretical foundations.

EXP 6609: Seminar: Cognition
Credits: 3 Max: 9 Grading Scheme: Letter
Prerequisite: EXP 3604 or consent of instructor.
Selected topics in the areas of thinking, problem solving, and reasoning.

EXP 6939: Seminar: Current Issues in Cognition and Sensory Processes
Credits: 3 Max: 9 Grading Scheme: Letter
Prerequisite: consent of instructor.

FAS 5203C: Biology of Fishes
Credits: 4 Grading Scheme: Letter
Prerequisite: BSC 2011/2011L or consent of instructor.
Emphasizes trends in evolution, integrative and sensory biology, physiology, feeding ecology, reproduction, growth, and population dynamics as they relate to fisheries. Offered fall term in odd-numbered years.

FAS 5255C: Diseases of Warmwater Fish
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Intensive, 2-week course (80 contact hours) in methodology for diagnosing and treating parasitic, bacterial, viral, nutritional, and environmental diseases of warmwater food fish and aquarium species. Offered summer term in even-numbered years.

FAS 5276C: Field Ecology of Aquatic Organisms
Credits: 4 Grading Scheme: Letter
Prerequisite: FAS 4305C or consent of instructor.
Understanding principles of fish and shellfish ecology through field studies. Intensive study in lakes, rivers, and coastal marshes to gain understanding of how fish and shellfish interact with their environment. Requires extensive field trips. Offered summer term.

FAS 5335C: Applied Fisheries Statistics
Credits: 4 Grading Scheme: Letter
Prerequisite: FAS 5276C or consent of instructor.
Population sampling and estimation, statistical assumptions and robustness, mark-recapture, growth, and empirical modeling of populations. Offered fall term in even-numbered years.

FAS 5901: Scientific Thinking in Ecology
Credits: 2 Grading Scheme: Letter
General philosophical foundations of science and specific critiques and perspectives found in ecology and aquatic sciences. Offered fall term.

FAS 6154: Aquatic Invertebrate Ecological Physiology

Credits: 3 **Grading Scheme:** Letter
Prerequisite: undergraduate course in animal physiology.
Biochemical, physiological, behavioral, and ecological adaptations that allow animals to survive in particular environments.

FAS 6171: Applied Phycology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: undergraduate chemistry or biochemistry.
Ecology, management, use, and control of freshwater and marine algae and aquatic microorganisms. Overview of associated products, processes, and problems and economic implications. Offered fall term in even-numbered years.

FAS 6272: Marine Ecological Processes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate student status
The ecological, biological, and environmental processes that drive patterns in productivity, behavior, population dynamics, and community structure in marine and estuarine ecosystems.

FAS 6337C: Fish Population Dynamics
Credits: 4 **Grading Scheme:** Letter
Prerequisite: STA 6166.
Analyzing fish populations for management purposes. Methods for estimating population parameters such as growth, recruitment, and mortality. Using population parameters and computer models to predict yield and catch composition, and bioenergetics approaches for fisheries management problems. Offered spring term in odd-numbered years.

FAS 6339c: Advanced Quantitative Fisheries Assessment
Credits: 4 **Grading Scheme:** Letter
Prerequisite: FAS 6337C Fish Population Dynamics
Covering topics related to fisheries stock assessment and management. Focusing on modern assessment techniques and their associated challenges.

FAS 6355C: Fisheries Management
Credits: 4 **Grading Scheme:** Letter
Prerequisite: FAS 5276C or consent of instructor.
Integrating scientific, social, political, and legal factors in fisheries management. Offered fall term in odd-numbered years.

FAS 6905: Individual Study
Credits: 1-6 **Max: 10** **Grading Scheme:** Letter, H
Contemporary problem or topic.

FAS 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

FAS 6932: Special Topics in Fisheries and Aquatic Sciences
Credits: 1-4 **Max: 10** **Grading Scheme:** Letter
Fisheries biology, aquaculture, and associated aquatic sciences.

FAS 6933: Seminar
Credits: 1 **Max: 3** **Grading Scheme:** S/U

FAS 6935: Contemporary Problems in Fisheries and Aquatic Sciences
Credits: 2 **Max: 10** **Grading Scheme:** Letter
Prerequisite: graduate student standing.
Library research, oral reports, and discussions of scientific problems or topics announced in advance. Offered fall and spring terms.

FAS 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

FAS 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

FAS 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been admitted to a doctoral program. Not appropriate for students who have been admitted to candidacy.

FAS 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

FES 6705: Communications in Emergency Management
Credits: 3 **Grading Scheme:** Letter
Discussing several aspects of communication: communication coordination among emergency responders and agencies; effective communication with the public, including education programs; and guidelines for media relations and the use of new and traditional media to communicate during a crisis

FES 6724: Fire and Emergency Services Response Planning
Credits: 3 **Grading Scheme:** Letter
Comprehensive response planning including theory and value of response planning are examined. Steps to develop a strategic response plan are examined and discussed.

FES 6726: Hazard Mitigation and Preparedness
Credits: 3 **Grading Scheme:** Letter
Introducing major principles involved in preparing for and mitigating the impact of hazards in the context of ES/DM including key features and characteristics of both natural and man-made hazards, the risk assessment process that is used to determine community vulnerability, and in-depth discussion of hazard mitigation planning.

FES 6735: International Emergency/Disaster Management
Credits: 3 **Grading Scheme:** Letter
Applying science and technology, planning, risk analysis, and management in dealing with events that have the potential to kill and injure large numbers of people, do extensive property damage, and destroy our economic and physical infrastructure.

FES 6736: Homeland Security and Emergency Management
Credits: 3 **Grading Scheme:** Letter
Understanding of issues related to domestic and international terrorism, understanding of key terms and incidents, and development of practical plans for providing emergency services before, during, and after a terroristic incident.

FES 6786: Research Methods in FES
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Completion of 18 graduate credit hours in FES
Covering the research proposal development process and the statistical, computational, visualization, and presentation tools available to the researcher.

FES 6806: Disaster Response and Recovery
Credits: 3 **Grading Scheme:** Letter
Exploring response and recovery operations in the emergency / disaster management profession. Typical challenges to be expected during response efforts along with tools and techniques to enhance the ability to protect lives, reduce property damage and minimize disruption through multi-organizational preparedness, coordination and improvisation will be examined.

FES 6826: Emergency Services - Disaster Planning
Credits: 3 **Grading Scheme:** Letter
Introducing the process and practice of emergency/disaster planning. The relationship between emergency planning and disaster management and the principles of social psychology, communication theory and approaches to public education are explored.

FES 6827: Business Continuity and Disaster Planning
Credits: 3 **Grading Scheme:** Letter
Addressing risks from cyber attacks, rioting, protests, product tampering, bombs, explosions, and terrorism. Extensive disaster planning and readiness checklists and developing alternate work and computing sites and emergency facilities.

FES 6836: Impacts of Natural and Man-made Disasters on Buildings
Credits: 3 **Grading Scheme:** Letter
Impacts of natural and man-made disasters, including terrorist attacks, on buildings.

FES 6916: Research for Master's Report
Credits: 3 **Grading Scheme:** Letter/ SU
Prerequisite: FES 6XXX Research Methods
Research for Masters Report

FES 6940: Practicum in FES
Credits: 1-3 Max: 3 **Grading Scheme:** S/U
Prerequisite: Completion of 18 graduate credit hours in FES
Practicum in FES

FIL 6061: History of Documentary Film I
Credits: 3 **Grading Scheme:** Letter
History of development from its roots in nineteenth-century art forms to its role in World War II. Styles and techniques of documentary. Contribution as persuasive means of communication to achieve social and political goals.

FIL 6062: History of Documentary Film II
Credits: 3 **Grading Scheme:** Letter
History of development from end of World War II to present. Styles and techniques of documentary. Contribution as persuasive means of communication to achieve social and political goals.

FIL 6101: Advanced Radio, Television, and Film Writing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Forms, techniques, and types of writing as they apply to radio, television, and film.

FIL 6315: Writing for Documentary I
Credits: 3 **Grading Scheme:** Letter
Elements of good documentary topic, role of drama in documentary writing, structure in documentary writing, story development in documentary, interviewing for documentary, basic tools of documentary writing, and law and ethics in documentary.

FIL 6317: Producing and Writing the Documentary
Credits: 3 **Grading Scheme:** Letter
Fundamentals of producing, directing, and writing; and the business and aesthetic dimensions of documentary.

FIL 6335: Business of Documentary
Credits: 1 **Grading Scheme:** Letter
Nonproduction aspects of documentary: fund raising, promotion, distribution, and film festivals.

FIL 6340: Issues and Problems in Documentary
Credits: 3 **Grading Scheme:** Letter
Ethical and legal issues in documentary filmmaking.

FIL 6365: Documentary Pre-Production Planning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Conceptualizing and developing television documentary. Components include the idea, funding, planning production, and producing the preview tape, and writing and presenting a proposal.

FIL 6366: Documentary Procedures II
Credits: 3 **Grading Scheme:** Letter
Theoretical, aesthetic, and technical principles of nonlinear editing for documentary.

FIL 6377: Documentary Field Production
Credits: 3 **Grading Scheme:** Letter
Basics of producing, shooting, lighting, sound gathering, and editing. Technical and creative aspects.

FIL 6378: Documentary Research Methods
Credits: 3 **Grading Scheme:** Letter
Research process preceding the production of television documentary and the skills needed to construct an effective research strategy.

FIL 6380: Advanced Post-Production Techniques
Credits: 2 **Grading Scheme:** Letter
Advanced technical, theoretical, and aesthetic principles of post-production process used in editing television documentaries. Emphasizes developing continuity, building sequences, refining dramatic structure, narrators, and special effects.

FIN 5405: Business Financial Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ACG 5065. Required of all MBA degree candidates who have had no basic business finance course.
Analysis of business financing and investing decisions.

FIN 5437: Finance I: Asset Valuation, Risk, and Return
Credits: 2 **Grading Scheme:** Letter
Prerequisite: must be M.B.A. student. Required of all M.B.A. students who lack basic business finance course.
Analysis of business financing and investing decisions. Selected financial tools and concepts. Risk analysis and capital budgeting.

FIN 5439: Finance II: Capital Structure and Risk Management Issues
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5437. Required of all M.B.A. students.
Continuation of FIN 5437. Focus on corporate financial decision making.

FIN 6108: Personal Financial Management
Credits: 1 **Max: 2** **Grading Scheme:** Letter
Prerequisite: designed for students admitted in MBA program.
Personal financial planning, how to accumulate and preserve personal wealth, creating an integrated financial plan, financial modeling, tax planning, portfolio construction and the fundamentals of risk and insurance.

FIN 6246: Money and Capital Markets
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FIN 5405, college-level mathematics, and statistics.
Financial markets, with emphasis on flow of funds, interest rate determination, and allocation of resources.

FIN 6296: Capitalism
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439 or Master of Science-Finance students.
This course introduces the concept of capitalism including the evolution of capitalism and its role in a modern free market economy. The course places particular emphasis on securities markets covering the sources and users of capital. Each of these topics considers the interaction of government, financial markets and society.

FIN 6306: Investment Banking
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439. Designed for M.B.A. students.
Hands-on approach to various aspects of investment banking industry. Lectures and guest speakers from investment banking firms.

FIN 6418: International Cash Flow Management
Credits: 2 **Grading Scheme:** Letter
Working capital management and cash management with emphasis on international applications.

FIN 6425: Corporation Finance
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FIN 5405 or consent of instructor. Designed for MBA students.
Applying business finance problems. Students prepare written solutions to case problems.

FIN 6427: Measuring and Managing Value

Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439 or Master of Science-Finance students.
Applying basic financial theory to valuing companies and creating value through sound financial decision making.

FIN 6429: Financial Decision Making
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439 or Master of Science-Finance students.
Applying basic financial theory to help managers determine how to finance their businesses. Optimal debt policy, distribution of firm cash flow policies, equity issuance strategies, risk management, and using hybrid securities in financing business.

FIN 6432: Asset Valuation and Corporate Finance
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Master of Business Administration students
Financial concepts and tools that are essential to managing a business. Financial information to succeed as general managers. Provide foundation for students planning to take further elective courses in finance.

FIN 6434: Private Equity
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439 or Master of Science-Finance students.
Overview of the private equity market and the role of intermediaries. How intermediaries add value in the private equity market.

FIN 6438: Study in Valuation
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439 or Master of Science-Finance students.
Independent analysis of firms in industry. Assessment of relative investment attractiveness of these firms and industry. Projects presented and critiqued by investment professionals.

FIN 6465: Financial Statement Analysis
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439 or Master of Science-Finance students.
Examination of fundamental analysis of corporate financial statements. Identification of reliable estimates of fundamental corporate earning power and earning risks.

FIN 6477: Entrepreneurial Finance
Credits: 2 **Grading Scheme:** Letter
Investigate conventional principles of corporate finance that can be used to analyze the financing needs of new ventures.

FIN 6489: Financial Risk Management
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5437 and FIN 5439 or enrolled in Master of Science-Finance Program.
This course is a practical introduction to the main concepts of managing risk, namely market, credit, liquidity, operational, legal and regulatory, business, strategic, and reputation risk. However, the bulk of the course will focus on financial market and credit risk. The course will make little use of mathematical formalism and will emphasize intuitive quantitative arguments. Students are expected to be comfortable with basic probability and statistics and be able to program either in a formal language such as MATLAB or in Excel.

FIN 6496: Mergers & Acquisitions
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439 OR Enrolled in Master of Science-Finance Program.
The primary objective of this course is to survey the process of mergers and acquisitions ("M&A"), develop your skills in the design and evaluation of these transactions, and expose students to the key tactical issues typically confronted in M&A transactions.

FIN 6518: Investment Concepts
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439 or Master of Science-Finance students.
Survey of current theory and practice. Asset pricing theory and empirical test, bond and equity valuation, efficient markets, international management, and valuation and use of derivative securities.

FIN 6525: Asset Management Project
Credits: 1 Max: 2 Grading Scheme: Letter
Training in optimal portfolio allocation, measuring tracking error/value at risk and performance attribution. Group experience to manage and evaluate portfolios.

FIN 6526: Portfolio Theory
Credits: 2 Grading Scheme: Letter
Prerequisite: FIN 5439 or Master of Science-Finance students.
Survey of modern approaches in security portfolio management. Two levels of examination: (1) management of owner's aggregate portfolio and (2) security selection strategies, such as mutual funds, followed by managers.

FIN 6537: Derivative Securities
Credits: 2 Grading Scheme: Letter
Prerequisite: FIN 5439 or Master of Science-Finance students.
Principles of derivatives. Structure and operation of markets, theoretical foundations and valuation models for various securities, and practical applications in investments and risk management, and financial engineering.

FIN 6545: Fixed Income Security Valuation
Credits: 2 Grading Scheme: Letter
Prerequisite: FIN 5439. Designed for M.B.A. students.
Basics of interest rate determination, forward rates, and effects of interest rate uncertainty on holding period returns. Also pricing of fixed income securities with attached options.

FIN 6547: Interest Rate Risk Management
Credits: 2 Grading Scheme: Letter
Prerequisite: FIN 6545.
Basic tools. Concepts of duration, immunization, and hedging with financial futures.

FIN 6549: Special Topics in Fixed Income Securities
Credits: 2 Grading Scheme: Letter
Prerequisite: FIN 6545.
Municipal bond markets and timing strategies; performance attribution and tracking error; and asset allocation for pensions and endowments.

FIN 6575: Emerging Markets Finance I
Credits: 2 Grading Scheme: Letter
Prerequisite: FIN 5439 or students enrolled in the MSF program
This course provides an introduction to the economic and institutional context in which investing and finance occurs in developing countries. The objective is to equip students with the analytical tools and institutional knowledge that will be helpful in understanding emerging financial markets.

FIN 6576: Emerging Markets Finance II
Credits: 2 Grading Scheme: Letter
Prerequisite: FIN 5439 or Master of Science-Finance students.
Introduction to the essential elements of investing and raising capital in the emerging markets. The main perspective is that of an investment manager. Focuses on valuation, investment strategies, and corporate finance in the emerging markets.

FIN 6585: Securities Trading
Credits: 2 Grading Scheme: Letter
Prerequisite: FIN 5439 or students enrolled in the MSF program
This course focuses on the operations of securities markets and broker/dealer intermediaries. We will evaluate a spectrum of issues regarding the formulation of trading decisions, the design of market structures, and the regulation of securities trading. Trading simulation will be used to provide in-class demonstrations of relevant concepts and hands-on experience in making trading decisions in different market structures.

FIN 6595: Investment Analytics
Credits: 2 Grading Scheme: Letter
Prerequisite: Master of Science-Finance students or MBA with concentration in Finance.
Examines the theory and the quantitative empirical tools that are necessary for global asset allocation in an institutional setting.

FIN 6596: Introduction to Computational Methods & Derivative Pricing
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5437 and FIN 5439 OR Master of Science-Finance Program.
Providing practical applications of MATLAB functions and programming to fundamental financial instruments, such as bonds and stocks, and their derivatives. Though this is an introductory course, where mathematical and programming tools will be kept at a basic level, students must be familiar with undergraduate calculus and be comfortable with elementary programming.

FIN 6608: Financial Management of the Multinational Corporation
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 6638, FIN 5439 or M.S.-finance student or M.A.-international business students.
Issues unique to global operating environment or significantly different from their purely domestic counterparts. Use of different national as well as global capital markets to manage the finance function.

FIN 6626: International Finance
Credits: 3 **Grading Scheme:** Letter
Financial markets and institutions, and problems by corporations operating in the international environment.

FIN 6638: International Finance
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439 or Master of Science-Finance or Master of Arts-International Business students.
Introduction to markets. Focus on foreign exchange markets, international bond markets, and international equity markets.

FIN 6643: Project Analysis in a Global Environment
Credits: 2 **Grading Scheme:** Letter
Evaluation of long-term investment decisions. Analysis of foreign direct investment.

FIN 6727: Economic Organizations and Markets
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439. Designed for M.B.A. students.
Economics based approach to organizational issues including compensation, assignment of decision rights, and assessment of performance.

FIN 6728: Capitalism and Regulation
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5439 or finance students pursuing a Master of Science.
Analyzes the role of capital markets in creating economic welfare. Examines the impact of regulations of capital markets. Students consider the rationality of certain financial market regulations in the context of traditional arguments for market regulation. Explores regulations across countries and over time impact financial market development and economic growth. Examines the political economy of the regulation of financial and product markets is examined.

FIN 6729: Economics Organizations and Markets
Credits: 3 **Grading Scheme:** Letter
Economics-based approach to organizational issues including compensation, assignment of decision rights, and assessment of performance. Examination of corporate governance issues, i.e., conflicts between stockholders and managers.

FIN 6905: Individual Work in Finance
Credits: 1-4 Max: 7 **Grading Scheme:** Letter
Prerequisite: permission of department and Director of Graduate Studies.
Reading and/or research in finance as needed by graduate students.

FIN 6930: Special Topics in Finance
Credits: 1-4 Max: 16 **Grading Scheme:** Letter
Selected topics in financial research, theory, or of special current significance.

FIN 6935: Finance Professional Speaker Series
Credits: 1 Max: 2 **Grading Scheme:** Letter
Rotating presentations by prominent finance professionals, providing informed perspective on career strategies, opportunities, and real-life applications.

FIN 6936: Special Topics In Investment Finance
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FIN 5437 & FIN 5439 OR Enrolled In Master of Science-Finance students.
Examining special investment topics pertaining to certain asset classes such as commodities, inflation protected bonds, and currencies and to provide a link between economic theory and live applications using the Bloomberg Professional Terminal. For each topic we will be covering the basic theoretical underpinnings and examine market/security structure, portfolio implications, and how Bloomberg data can be used to understand these implications.

FIN 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

FIN 6957: International Studies in Finance
Credits: 1-4 Max: 12 **Grading Scheme:** S/U
Prerequisite: admission to approved study abroad program and permission of department.

FIN 6958: International Finance Study Tour
Credits: 2 **Grading Scheme:** Letter
Academic and practical exposure to international financial markets and international business practices.

FIN 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

FIN 7446: Financial Theory I
Credits: 4 **Grading Scheme:** Letter
The first in a two-course sequence. Emphasis on the theory of the firm's investment and financing decisions.

FIN 7447: Financial Theory II
Credits: 4 **Grading Scheme:** Letter
Emphasis on the theory of the financial intermediary system asset pricing theory.

FIN 7808: Corporate Finance
Credits: 4 **Grading Scheme:** Letter
Theory and empirical analyses of corporate financial decisions in a world of risk with both perfect and imperfect markets.

FIN 7809: Investments
Credits: 4 **Grading Scheme:** Letter
Theory and empirical analyses of security investment decisions in a world of risk with both perfect and imperfect markets.

FIN 7848: Marketing Microstructure
Credits: 2 **Grading Scheme:** Letter
Empirical research in finance, focused on the application of econometric and statistical techniques to address research problems in finance.

FIN 7938: Finance Research Workshop
Credits: 1-4 Max: 7 **Grading Scheme:** Letter
Analysis of current research topics. Paper presentation and critiques by doctoral students, faculty, and visiting scholars.

FIN 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

FIN 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

FLE 6165: Bilingual-Bicultural Education
Credits: 3 **Grading Scheme:** Letter
Foundational principles and practices in the field of bilingual-bicultural education in the U.S. and in other nations. Critical examination of theories and practices related to language policy in education.

FLE 6167: Cross-Cultural Communication for Teachers
Credits: 3 **Grading Scheme:** Letter
Critically explores ways educators can establish equitable and culturally responsive classrooms. Examines theories related to language, culture, and social justice.

FLE 6336: Teaching Foreign Languages in Elementary Schools
Credits: 3 **Grading Scheme:** Letter
Pedagogy and critical issues related to content-based foreign language instruction and the integration of culture in the elementary foreign language classroom.

FLE 6337: Methods of Teaching and Assessing Foreign Language in Secondary School
Credits: 3 **Grading Scheme:** Letter
Explores the history of foreign language instruction, first- and second-language acquisition, and pedagogical issues of curriculum, methods, and assessment. Field teaching component.

FLE 6385: Foreign Languages Teaching Methods
Credits: 3 **Grading Scheme:** Letter
This course will address both theoretical and practical issues related to the teaching of foreign languages at the college level.

FLE 6946: Practicum in Teaching and Assessing Foreign Languages at Secondary Level
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of department chair.
Directed experiences emphasizing instructional strategies, selecting instructional materials, structuring and sequencing learning tasks, and diagnosing student progress. Practicum in secondary public schools.

FNR 5072C: Environmental Education Program Development
Credits: 3 **Grading Scheme:** Letter
Comprehensive approach, from needs assessment to evaluation, applied to youth-based, nonformal environmental education. Required field trip and group project. Offered fall term of odd-numbered years.

FNR 5335: Agroforestry
Credits: 3 **Grading Scheme:** Letter
Biological, ecological, socioeconomic, and technical-managerial aspects of tree/crop, tree/animal, and tree/crop/animal systems. Examples of traditional and modern, rotational, and intercropped systems, and analyses of their structure, functioning, and potentials, with special reference to the tropics and subtropics. Offered spring term.

FNR 5462: Spatial Models and Decision Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FOR 3434C, basic statistics, or instructor permission.
Environmental modeling in a spatial context using descriptive and prescriptive tools and spatial reasoning.

FNR 5608: Research Planning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor. Required for all new M.S. students.
History and philosophy of science, scientific method, development of a research proposal. Research facilities and programs are presented. Offered fall term.

FNR 6564: Ecohydrology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: permission of instructor
Introductory course on ecohydrology - the study of interactions between organisms, ecosystems, and the hydrologic cycle. Uses a blend of theory and case studies.

FOL 6326: Technology in Foreign Language Education
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FOL 6943, FRE 6943 , or equivalent.
Technology in classrooms. The interface between pedagogy and technology.

FOL 6943: Romance Language Teaching Methods

Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Required of all graduate students who will be involved in teaching and have not had a similar course elsewhere.

FOR 5157: Ecosystem Restoration Principles and Practice
Credits: 3 **Grading Scheme:** Letter
Application of ecological theory and economic and political constraints to restoration practice. Emphasizes regional, national, and international case studies.

FOR 5159: Ecology and Restoration of Longleaf Pine Ecosystems
Credits: 3 **Grading Scheme:** Letter
History, structure, function and ecological and economic importance; regeneration ecology, stand dynamics, restoration techniques, ownership patterns, and socio-economic and political and policy aspects of restoration

FOR 5161: Forest Productivity and Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Silviculture, disease management, and genetic improvement. Stand development and composition, competition, growth-limiting factors, epidemiology, choice of species and provenance, and tree breeding. Offered spring term of odd-numbered years.

FOR 5435: Forest Information Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Sampling methodology for natural resource inventories, involving remote sensing, geographic information systems (GIS), and global positioning system (GPS). Offered spring term of even-numbered years.

FOR 5615: Forest Conservation and Management Policies and Issues
Credits: 3 **Grading Scheme:** Letter
Current policies in North America and internationally. Historical patterns of resource use and policy response are reviewed as a basis for evaluating current issues. Offered fall term.

FOR 5625: Forest Water Resources Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SOS 3022.
Forest Management practices in relation to hydrologic responses and water quality considerations.

FOR 5756: Non-Timber Forest Products
Credits: 3 **Grading Scheme:** Letter
Intensive review of non-timber forest products worldwide, and how forests are managed to provide these products.

FOR 6005: Conservation Behavior
Credits: 3 **Grading Scheme:** Letter
Methods for changing behavior in various groups to improve environmental sustainability.

FOR 6154: Analysis of Forest Ecosystems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate status or consent of instructor.
Energy, water, carbon and nutrient fluxes in forests; applications to forest and landscape management. Offered spring term of even-numbered years.

FOR 6156: Simulation Analysis of Forest Ecosystems
Credits: 3 **Grading Scheme:** Letter
Conceptual basis, evaluation, implementation, testing, and analysis of forest simulation models. Students develop and present modeling projects.

FOR 6164: Silviculture: Concepts and Application
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Course in ecology.

Principles governing establishment, treatment, and control of forest stands; regeneration systems; intermediate cuttings; intensive cultural practices; land use ethics; and management systems.

FOR 6170: Tropical Forestry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Promise and pitfalls of production-oriented management as a conservation strategy for naturally regenerated tropical forests. Ecological constraints to sustainable forest management in the tropics; strategies, tools, and techniques for large- and small-scale management of old growth and secondary tropical forests for timber and non-timber forest products and services; future of forests and forestry in tropical landscapes. Offered spring term.

FOR 6172C: Tropical Forestry Field Course
Credits: 2 **Grading Scheme:** Letter
Taught in Amazon Basin of Brazil. Emphasis on appreciation of practical considerations inherent in tropical forestry issues, including challenges/opportunities for improvement. Supplemental fee required.

FOR 6215: Fire Paradigms
Credits: 3 **Grading Scheme:** Letter
Reviewing dominant fire paradigms worldwide, including in-depth review of specific paradigm, its theoretical basis, and social/ecological/management implications.

FOR 6310: Forest Genetics and Tree Improvement
Credits: 3 **Grading Scheme:** Letter
Review of Mendelian, population, and quantitative genetics as important in natural forests and breeding programs of forest trees. Principles of tree improvement programs, gene conservation, and breeding strategy development for a wide variety of tree species. Offered fall term of odd-numbered years.

FOR 6340: Physiology of Forest Trees
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate status or consent of instructor.
Growth and development of woody perennial plants, with emphasis on understanding how environmental factors affect their physiology. Offered fall term of odd-numbered years.

FOR 6345C: Plant Water Relations Techniques
Credits: 2 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Instruments and techniques to quantify water balance/status of plants in field. Emphasis on theory, assumptions, and pros and cons of techniques.

FOR 6543: Natural Resource Economics and Valuation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Extending microeconomic principles to problems in forest production, supply behavior, forest valuation, and multiple use of forest lands. Offered spring term of odd-numbered years.

FOR 6628: Community Forest Management
Credits: 3 **Grading Scheme:** Letter
Integrates theory from the socio-economic and bio-physical sciences with on-the-ground realities in implementing community-based forest management and conservation.

FOR 6665: Landscape Planning for Ecotourism
Credits: 3 **Grading Scheme:** Letter
Planning frameworks and techniques of large natural areas. Offered fall term.

FOR 6905: Research Problems in Forest Resources and Conservation
Credits: 1-6 **Max: 10** **Grading Scheme:** Letter
Prerequisite: consent of instructor.

FOR 6910: Supervised Research

Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: consent of instructor.

FOR 6933: Seminar
Credits: 1 Max: 2 Grading Scheme: Letter

FOR 6934: Topics in Forest Resources and Conservation
Credits: 1-4 Max: 10 Grading Scheme: Letter
Selected topics in forestry and natural resources.

FOR 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: consent of instructor.

FOR 6971: Research for Master's Thesis
Credits: 1-6 Grading Scheme: S/U

FOR 7979: Advanced Research
Credits: 1-15 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

FOR 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

FOS 5205: Current Issues in Food Safety and Sanitation
Credits: 3 Grading Scheme: Letter
Microbial, chemical, and biological safety of food; principles of sanitation for food processing and retail food industries.

FOS 5225C: Principles in Food Microbiology
Credits: 4 Grading Scheme: Letter
Prerequisite: MCB 3020 or consent of instructor.
Fundamental aspects of biological contamination and its control during harvesting, processing, and storage of foods. Analysis of microbial food fermentation, microbial ecology of foods, selection of methods to examine foods for microbial content.

FOS 5437C: Food Product Development
Credits: 3 Grading Scheme: Letter
Prerequisite: 4000-level food science course, or consent of instructor.
Value-added food products. Technology, safety, health/nutrition, legal, quality, and economic/marketing considerations.

FOS 5561C: Citrus Processing Technology
Credits: 3 Grading Scheme: Letter
Prerequisite: undergraduate course in food processing.
Grading, inspection, sampling, extraction, and concentration of citrus products. Emphasizes manufacturing and quality assurance. Taught partly at Lake Alfred Citrus Research and Education Center.

FOS 5645: Functional Foods and Nutraceuticals
Credits: 3 Grading Scheme: Letter
Prerequisite: Graduate status
Analysis, chemistry, processing, bioavailability, and health benefits of bioactive food components. Content will include both basic knowledge and the latest research trends.

FOS 5732: Current Issues in Food Regulations
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Governmental laws and regulations affecting the food industry.

FOS 6125C: Sensory Evaluation of Food
Credits: 3 Grading Scheme: Letter

Prerequisite: STA 6166.
Principles and techniques of sensory evaluation of foods. Emphasizes basics of taste and olfactory perception; the basic psychology of common sensory tests; the proper use of discrimination testing, consumer acceptability and preference testing, and descriptive analysis; and statistical analysis of sensory data.

FOS 6126C: Psychophysical Aspects of Foods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FOS 4311C and 4722C.
Physical and chemical stimuli controlling human sensory perception of texture, color, and flavor of foods.

FOS 6226C: Advanced Food Microbiology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: FOS 4222/4222L, MCB 4303/4303L and BCH 6415.
Selection of laboratory methods, characterization of food-borne pathogens and spoilage organisms.

FOS 6315C: Advanced Food Chemistry
Credits: 4 **Grading Scheme:** Letter
Prerequisite: BCH 4024 or 3025 and FOS 4311C.
Functions of lipids, carbohydrates, proteins, enzymes and other components in foods and their reactions and interactions during food processing and storage.

FOS 6317C: Flavor Chemistry and Technology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: basic and organic chemistry.
Psychophysics of taste and aroma, sensory analysis, flavor extraction, measurement techniques, flavor precursors, off-flavors, Maillard flavors, bioflavors, flavoring materials, flavor safety and authenticity.

FOS 6355C: Instrumental Analysis and Separations
Credits: 5 **Grading Scheme:** Letter
Prerequisite: CHM 3120, FOS 4311C.
Separation of food chemicals; gas, high performance liquid, thin-layer, ion-exchange and molecular size chromatography; characterization via UV-visible, IR, NMR, and mass spectrometry.

FOS 6428C: Advanced Food Processing
Credits: 4 **Grading Scheme:** Letter
Prerequisite: FOS 4427C.
Reaction kinetics, heat transfer mechanics, and process design, optimization and economics.

FOS 6455C: Industrial Food Fermentations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FOS 4222/4222L.
Microbiological, chemical, and physical principles and practices in fermentation of foods and constituents.

FOS 6646: Proteins and Enzymes in Food Systems
Credits: 4 **Grading Scheme:** Letter
Prerequisite: FOS 6315C.
Structure, function, and analytical techniques for proteins and enzymes in food systems.

FOS 6648: Carbohydrates in Food Systems
Credits: 2 **Grading Scheme:** Letter
Prerequisite: FOS 6315C or equivalent.
Structure, physical and chemical properties of carbohydrates, and their analysis, function, and reactivity in food systems.

FOS 6905: Problems in Food Science
Credits: 1-3 **Max: 4** **Grading Scheme:** Letter
Prerequisite: consent of instructor. Not open to students on probation or conditional admission.
Individual study carried out in laboratory, library, pilot plant, or the food industry.

FOS 6910: Supervised Research

Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: consent of instructor.

FOS 6915: Research Planning
Credits: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Required of first-year graduate students. Planning and initiating research, experimental techniques, analyzing data, reporting results.

FOS 6936: Topics in Food Science
Credits: 1-4 Max: 8 Grading Scheme: Letter
Prerequisite: consent of instructor.
Special aspects or current developments in food science.

FOS 6938: Food Science Seminar
Credits: 1 Max: 4 Grading Scheme: Letter
Prerequisite: consent of instructor.
Preparing and presenting reports on specialized aspects of research and technology in food science.

FOS 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: consent of instructor.

FOS 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

FOS 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

FOS 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

FOT 6940: Translation Studies Practicum
Credits: 3 Grading Scheme: Letter
Prerequisite: FOT 6805 .
Practical training for free-lance or job environment, using computer-assisted translation tools. By working closely with a mentor, professional experience in translation is acquired.

FOW 6930: Special Study in Romance Languages and Literatures
Credits: 1-3 Max: 9 Grading Scheme: Letter
Rotating topics in literary theory, cultural studies, or literary study involving two or more Romance languages.

FRE 6060: Beginning French for Graduate Students I
Credits: 3 Grading Scheme: S/U
For students with no formal preparation who need a reading knowledge.

FRE 6061: Beginning French for Graduate Students II
Credits: 3 Grading Scheme: Letter, S/U
Prerequisite: FRE 6060 or equivalent.
For students who need proficiency in reading.

FRE 6466: Advanced Translation and Stylistics
Credits: 3 Grading Scheme: Letter
Translation from English to French and French to English. Texts selected from modern authors. Various genres and styles.

FRE 6735: Special Studies in French Linguistics
Credits: 3 Grading Scheme: Letter

Rotating topics relevant to second language acquisition, sociolinguistics, and/or theoretical linguistics.

FRE 6736: The French language in the Americas
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None, but FRE 6785 or FRE 6855 recommended.
Examining of the presence of French in the Americas. Topics we will be covering are origin of French in the Americas, language practices of Francophone communities, linguistic characteristics of the varieties of French, effect of language contact on language behavior and representations, identity issues. Focus varies from year to year.

FRE 6785: French Phonetics and Phonology
Credits: 3 **Grading Scheme:** Letter
Introduction to French phonological processes. Explanatory evidence: production of speech sounds, classification of sounds, and their interrelationships (gliding, nasalization, assimilation). Morphological and syllable structure. Specifically French phenomena: liaison, elision, final consonant drop, schwa drop. Relationship of morphology to phonology, especially verb system.

FRE 6827: Sociolinguistics of French
Credits: 3 **Grading Scheme:** Letter
Sociolinguistic issues in the French-speaking world: language variation, discourse analysis, attitudes toward varieties of French, and contact with speakers of other languages.

FRE 6845: History of the French Language
Credits: 3 **Grading Scheme:** Letter
Phonological, morphological, syntactic, and lexical evolution of French language.

FRE 6855: Structure of French
Credits: 3 **Grading Scheme:** Letter
Explores the French language as a system of communication and mental representation. Analyzes morphological, syntactic, and semantic aspects of contemporary French. Emphasizes historical, psychological, and sociological dimensions of linguistic investigation.

FRE 6856: French in the 21st Century
Credits: 3 **Grading Scheme:** letter
Prerequisite: None, but FRE 6785 or FRE 6855 recommended.
Examining of how the French language is changing in the 21st century, from phonological, morphological, syntactic, lexical and semantic points of view. Addressing such topics as phonological assimilation; the negative; interrogative structures; the future tense; and borrowings, calques and semantic shifts, in different varieties of French.

FRE 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U
Practical training in teaching elementary French courses.

FRE 6943: Romance Language Teaching Methods
Credits: 2, 4, 6 Max: 6 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Required for students needing practice and direction in college-level teaching.

FRE 6945: Practicum in Advanced College Teaching
Credits: 2 Max: 6 **Grading Scheme:** S/U
Practical training and orientation for advanced doctoral students in teaching upper-division courses. Gain upper-level teaching experience by working closely with a mentor in all areas of the teaching process.

FRE 6956: Overseas Studies in French
Credits: 1-5 Max: 5 **Grading Scheme:** Letter
Prerequisite: permission of graduate coordinator (French).
Course work in French as part of approved study-abroad program.

FRW 6217: Seventeenth-Century French Prose
Credits: 3 **Grading Scheme:** Letter

Major prose works of the classical period. Fermentation in philosophical and moral thought that characterized early modern period France. Cartesian thought, new science, Jansenism, libertines, and moralistes. Also includes texts by La Fayette and Sevigne.

FRW 6276: Readings in Eighteenth-Century Literature
Credits: 3 **Grading Scheme:** Letter
Rotating topics: theater, novel, image of the Orient, Anglo-French connection, women writers of the Old Regime.

FRW 6288: Twentieth-Century French Novel
Credits: 3 **Grading Scheme:** Letter
Analyzes representative novels. Emphasizes literary modernism, surrealism, and the new novel in light of pertinent cultural discourses and literary history.

FRW 6315: Seventeenth-Century French Drama
Credits: 3 **Grading Scheme:** Letter
Theory and practice of dramaturgy in classical period as reflected in plays of Corneille, Molière, and Racine. Close textual analysis to disengage aesthetic and ideological problematics posed by each play.

FRW 6328: Twentieth-Century French Theater
Credits: 3 **Grading Scheme:** Letter
Critical and historical study of representative plays. Theater as a genre and a cultural and political space. Discussion of theoretical writings. Viewing of selected plays on film.

FRW 6346: French Poetry of the Renaissance
Credits: 3 **Grading Scheme:** Letter

FRW 6355: Modern French Poetry
Credits: 3 **Grading Scheme:** Letter
Historical approach combined with close readings of poetic texts. Introduction to numerous theoretical and critical writings. In addition to poetic texts taken from traditional cannon, less frequently taught poets are presented.

FRW 6396: French Cinema
Credits: 3 **Grading Scheme:** Letter
Critical and historical study of representation of gender and ethnicity in French films.

FRW 6416: Later French Medieval Literature
Credits: 3 **Grading Scheme:** Letter

FRW 6536: The Romantic Period
Credits: 3 **Grading Scheme:** Letter
Development and main tenets of 19th-century French Romanticism. Various themes and genres (novel, poetry, theater, etc.) exploited by "romantic" artists. Socioeconomics and cultural matrices fostering movement. Relationship between literature and visual arts. Constructions of gendered, cultural, and artistic subjectivities. Exoticism (spatial, temporal, and mystic voyages). Representations of Paris and French society.

FRW 6556: French Realism and Naturalism
Credits: 3 **Grading Scheme:** Letter

FRW 6715: The Philosophic Movement
Credits: 3 **Grading Scheme:** Letter
Readings from major figures such as Voltaire, Montesquieu, Diderot, and Rousseau. Historiography of the period. Key issues of Enlightenment (religious tolerance, slavery, women's rights, etc.). Key institutions of the 18th century (encyclopedia, newspaper, salon).

FRW 6780: Studies in Francophone Literature and Culture (Excluding the Caribbean and Sub-Saharan Africa
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Literature and cultures of the Francophone world. Quebec, North Africa, Vietnam, the Middle East, Belgium and Switzerland, or regions of France.

FRW 6805: Introduction to Graduate Study and Research

Credits: 3 **Grading Scheme:** Letter
Tools, problems, and methods of literary and linguistic research.

FRW 6825: French Critical Theory
Credits: 3 Max: 6 **Grading Scheme:** Letter
Review and comparative analysis of approaches to literature from Romanticism to Deconstruction. Act of reading and writing examined through eyes of Sainte-Beuve, Taine, Lanson, Bachelard, Geneva School, Ricoeur, Bataille, Blanchot, Barthes, Foucault, Genette, Lacan, Kristeva, Todorov, Derrida, and others. Rotating topics.

FRW 6900: Special Study in French Literature
Credits: 3 Max: 9 **Grading Scheme:** Letter
Selected topic or problem (varied each semester).

FRW 6905: Individual Work
Credits: 1-3 Max: 9 **Grading Scheme:** Letter
Available only by special arrangement with graduate adviser.

FRW 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

FRW 6938: Seminar in French Literature
Credits: 3 Max: 15 **Grading Scheme:** Letter
Intensive research study of an author or topic.

FRW 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

FRW 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

FRW 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

FYC 5008: Personal and Family Tax Planning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate standing.
Principles, current law and practice of income taxation and its impact on financial planning for individuals, couples and families in their roles as investors, employees and business owners.

FYC 5009: Personal and Family Insurance Planning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate standing.
Introduces students to risk management and insurance decisions in personal and family financial planning. Topics include insurance for life, health, disability, property and liability risks, as well as annuities, group insurance and long term care.

FYC 5106: Personal and Family Retirement and Estate Planning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate standing.
Provides individuals with knowledge of both public and private retirement plans including Social Security, Medicare, Medicaid, defined benefit, defined contribution plans and their regulatory provisions. Estate planning aspects focus on the efficient conservation and transfer of wealth through trusts, wills, probate and charitable giving consistent with the client's goals.

FYC 5935: Personal and Family Financial Planning Capstone
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FYC 5008 , FYC 5009 and FYC 5106.

Critical thinking and decision making about personal and family financial management topics in the context of the financial planning process. Students analyze and prioritize goals and make recommendations for a client in areas of household accounting, taxes, investments, risk management, retirement planning and estate planning.

FYC 6020: Principles of Family, Youth, and Community Sciences
Credits: 3 **Grading Scheme:** Letter
Prerequisite: principles of sociology; general psychology.
Critical issues in the new century. Applying key principles of family, youth, and community sciences to selected problems.

FYC 6111: Families and Violence
Credits: 3 **Grading Scheme:** Letter
Examines the major types of family violence across the life span, including all forms of child maltreatment, intimate partner violence, and elder abuse.

FYC 6117: Military Families in Community Context
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Military culture and procedures, issues related to service in the military, the impact that military service can have on the individual and family, and strategies for providing services to military personnel and their families.

FYC 6131: Ethics for FYCS Practitioners
Credits: 3 **Grading Scheme:** Letter
Basic elements of ethics, professional ethics, and professionals as ethical "agents."

FYC 6207: Adolescent Problematic Behavior
Credits: 3 **Grading Scheme:** Letter
Prerequisite: core major courses.
Ecological model to examine common themes of adolescent development with challenges that lead to problematic behavior.

FYC 6221: Grant Proposals for Community-Based Organizations
Credits: 3 **Grading Scheme:** Letter
Skills needed to develop funding proposals to support community-based projects and organizations.

FYC 6222: Parenting and Child Relationships
Credits: 3 **Grading Scheme:** Letter
Prerequisite: core courses.
Relationships affecting child development outcomes.

FYC 6223: Promoting Positive Youth Development
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FYC 6207.
Examines risk and protective factors for promoting youth development.

FYC 6224: Resilience and Positive Youth Development
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FYC 6230 Theories of Youth and Family Development.
Conceptual and applied examination of resilience as a shaping force in youth development from infancy through the emerging adult years.

FYC 6230: Theories of Youth and Family Development
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SYG 2430 or FYC 3101 and 3201.
Historical and contemporary theories of youth and family development.

FYC 6234: Theoretical Approaches to Youth Programming
Credits: 3 **Grading Scheme:** Letter
In-depth examination and synthesis of historical (macro) and contemporary (micro) theories of youth development as they are used to inform the development of youth programs and services, curricula for nonformal community settings, and program planning and evaluation.

FYC 6302: Sustainable Community Development
Credits: 3 **Grading Scheme:** Letter
Relationships among economic, social, and environmental aspects of sustainability. Analytic and professional skills to build sustainable communities. Community study and in-depth analysis.

FYC 6320: Community Development
Credits: 3 **Grading Scheme:** Letter
Process and methods for community development. Develops skills for managing change in communities.

FYC 6330: Theories of Community Development
Credits: 3 **Grading Scheme:** Letter
Sociological concept of community and its application in public development policies.

FYC 6331: Involving Youths in Community Issues
Credits: 3 **Grading Scheme:** Letter
Overview of methods for investigating community issues. How to engage youths in scientific, technological, and social issues at the community level.

FYC 6412: Historical Foundations of Philanthrophy
Credits: 3 **Grading Scheme:** Letter
History of philanthropy and evolution of the nonprofit section in the U.S. from colonial period to present.

FYC 6421: Nonprofit Organizations
Credits: 3 **Grading Scheme:** Letter
Community nonprofit organizations. Governance, policy and decision making, and planning.

FYC 6422: Policy Issues and Case Studies in Nonprofit Organizations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FYC 6241.
Study and analysis of policy and cases related to development and operation of nonprofit organizations.

FYC 6423: Non-Governmental Organizations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FYC 6421.
Non-governmental organizations and their political and economic impacts.

FYC 6424: Fund Raising for Community Nonprofit Organizations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FYC 6421.
Critical evaluation of fund raising theory, research on the profession, and best contemporary fund raising practices in the nonprofit sector.

FYC 6425: Risk Management in Nonprofit Organizations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FYC 6421 Nonprofit Organizations.
A foundation in the concepts, principles and strategies associated with risk management in nonprofit organizations. Topics include the nature and purpose of risk management; the general risk management exposures facing nonprofit organizations; and risk mitigation strategies for nonprofits.

FYC 6620: Program Planning and Evaluation for Human Service Delivery
Credits: 3 **Grading Scheme:** Letter
Prerequisite: core FYCS courses.
Contemporary theories and process for planning and evaluating human service education and delivery programs.

FYC 6662: Public Policy and Human Resource Development
Credits: 3 **Grading Scheme:** Letter
Current policies and laws impacting youths, families, and communities. Strategies to change these policies and laws.

FYC 6800: Scientific Reasoning and Research Design
Credits: 3 **Grading Scheme:** Letter

Scientific reasoning, scientific method, and quantitative and qualitative research design.

FYC 6802: Advanced Research Methods for Family, Youth, and Community Sciences
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FYC 6800 or equivalent.
Research tools and techniques appropriate for an ecological model, emphasizing a multi-method approach.

FYC 6901: Problems in Family, Youth, and Community Sciences
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Advanced students select and study problem related to family, youth, and community sciences.

FYC 6912: Nonthesis Project in Family, Youth, and Community Sciences
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Developing an original applied project such as program evaluation, policy analysis, or in-depth review of current issue in human resource development.

FYC 6932: Topics, in Family, Youth, and Community Sciences
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Critical review of selected topics.

FYC 6933: Seminar in Human Resource Development
Credits: 1 Max: 2 **Grading Scheme:** S/U
Explores current topics, trends, and research findings.

FYC 6934: Professional Internship/Practicum in Family, Youth, and Community Sciences
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Directed work experience or internship in professional capacity.

FYC 6971: Research for Master's Thesis
Credits: 1-6 **Grading Scheme:** S/U

GEA 6419: Seminar: South America
Credits: 3 **Grading Scheme:** Letter
Cultural, economic, political, and resource characteristics and development of representative areas.

GEA 6466: Seminar on Geography of Amazonia
Credits: 3 **Grading Scheme:** Letter
Exploration of biophysical basis of natural resource management, cultural diversity, and economic development in Amazonia.

GEA 6468: Resource Utilization and Conservation in Latin America
Credits: 3 **Grading Scheme:** Letter
Regional appraisal of human and natural resources. Analysis of role of resource utilization and conservation in development of Latin American countries.

GEB 5114: Entrepreneurship and Venture Finance
Credits: 3 **Grading Scheme:** Letter
Entrepreneurial processes. Exploration of boom in world economies. Participation in entrepreneurial culture.

GEB 5118: New Venture Creation
Credits: 4 **Grading Scheme:** Letter
Classroom lectures, panels of leading entrepreneurs, and team project. Background and tools necessary to develop an investment-grade business plan for a new venture, whether intracorporate or stand-alone.

GEB 5212: Professional Writing in Business
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Written structure of memoranda, executive summaries, mission statements, marketing and SWOT analyses, product and management structure descriptions, marketing and business plans. Conventions and psychological principles governing reader preferences and assumptions.

GEB 5215: Professional Communication in Business

Credits: 1-3 Max: 6 Grading Scheme: Letter
Balance between descriptive information and application of organizational communication theories and techniques for business and professional speaking.

GEB 5216: Professional Communication
Credits: 1-2 Max: 2 Grading Scheme: S/U
Concepts and strategies needed to develop professional oral communication skills in business. Individual and team presentations.

GEB 5217: Executive Communication
Credits: 1-2 Max: 2 Grading Scheme: S/U
Guidelines to help build confidence as presenters and to make workplace presentations more effective.

GEB 5225: Advanced Business Writing
Credits: 1 Grading Scheme: Letter
Prerequisite: GEB 5212.
Advanced writing techniques focusing on interdependence between corporate strategy and communications.

GEB 5506: Corporate Intrapreneurship
Credits: 2 Grading Scheme: Letter
Examines, defines, and characterizes the role of the intrapreneur in a corporation. Transition from entrepreneurship to intrapreneurship. Skills and methodology for successful intrapreneurship.

GEB 5929: Foundations Review
Credits: 1-3 Max: 3 Grading Scheme: S/U
Overview of M.B.A. core courses to be used in working professional programs.

GEB 6119: Technology Venture Sequence
Credits: 2 Grading Scheme: Letter
Background and tools needed to participate in new venture creation process. Development of business plans.

GEB 6157: Entrepreneurship Experiential Learning Project
Credits: 1-3 Max: 3 Grading Scheme: Letter
Corequisite: Must be a graduate student to receive graduate credit
Development of entrepreneurial skills in business through authentic experiences.

GEB 6365: International Business
Credits: 3 Grading Scheme: Letter
Prerequisite: designed for M.B.A. students.
Explores major characteristics, motivations, interactions, and structural realities of international economics via functional areas of business. Development of multinational framework for effective and efficient firm operation.

GEB 6366: Fundamentals of International Business
Credits: 2 Grading Scheme: Letter
Prerequisite: designed for M.B.A. students.
Complexities of extending the market to more than a single nation/state. Impact on multinational corporation of different cultures and languages, multiple legal systems, national and global capital markets, foreign exchange, and political issues.

GEB 6368: Globalization and the Business Environment
Credits: 2 Grading Scheme: Letter
Political and economic relations in connection with the structural power sources that directly and indirectly affect the design and shape of global political economy.

GEB 6905: Individual Work
Credits: 1-4 Max: 8 Grading Scheme: Letter
Prerequisite: consent of Associate Dean or M.B.A. Director.
Reading and/or research in business administration.

GEB 6924: Entrepreneurship Professional Speaker Series
Credits: 1-2 Max: 2 Grading Scheme: Letter

Prerequisite: Must be an MS-Entrepreneurship student
Topics relevant to entrepreneurship and innovation.

GEB 6928: Professional Development Module IV
Credits: 1 Max: 2 Grading Scheme: S/U
Prerequisite: designed for M.B.A. students.
Personal financial planning.

GEB 6930: Special Topics
Credits: 1-3 Max: 12 Grading Scheme: Letter
Prerequisite: consent of instructor.
Topics not offered in other courses and of special current significance.

GEB 6941: Internship
Credits: 1-4 Max: 6 Grading Scheme: S/U
Open only to graduate students in business administration. May not be used to meet credit requirements in M.B.A. program.
Applied course work. Several papers and reports.

GEB 6957: International Studies in Business
Credits: 1-4 Max: 12 Grading Scheme: S/U
Prerequisite: admission to approved study abroad program and permission of department.

GEO 5305: Environmental Biogeography
Credits: 3 Grading Scheme: Letter
Prerequisite: GEO 2200 or equivalent.
Description and explanation of spatial patterns of biodiversity, and underlying biophysical factors of human-environment interactions. Past and present distributions of organisms and how patterns of environmental variation influence the organisms. Biogeography is useful for designing nature reserves, forecasting how climate change may affect organisms, and explaining human adaptations to environmental variability. This class takes a mostly ecological approach to understanding biogeography.

GEO 5346: Natural Hazards
Credits: 3 Grading Scheme: Letter
Multidisciplinary analysis of natural and man-induced environmental catastrophes. Their perception and institutional adjustments.

GEO 5556: Geography of Innovation and Technological Change
Credits: 3 Grading Scheme: Letter
Generation, development, and spread of innovations by individuals, corporations, and organizations. Emphasizes the impact of innovations and technology on regional development and change.

GEO 5605: Advanced Urban Geography
Credits: 3 Grading Scheme: Letter
Theoretical and planning literature that examines the locational and environmental issues confronting contemporary North American urban populations.

GEO 5809: Geography of World Agriculture
Credits: 3 Grading Scheme: Letter
World distribution of crops and livestock related to natural and cultural conditions. Agricultural problems related to products, economic organization, agricultural regions, and the significance of world affairs.

GEO 5905: Individual Study: Directed Reading
Credits: 3 Max: 12 including GEO 6905 Grading Scheme: Letter

GEO 5920: Geography Colloquium
Credits: 1 Max: 6 Grading Scheme: S/U
Presentation and discussion of contemporary geographic research.

GEO 5945C: Field Course in Geography
Credits: 3 Grading Scheme: Letter

Methods of geographical fieldwork. Observation, classification, interpretation, note-taking, traversing, and mapping of data. Aerial analysis; landforms, climate, vegetation, soils, resources, settlement patterns, and land use.

GEO 6118: Contemporary Geographic Thought and Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: admission to graduate program in geography.
Summary of major currents of intellectual thought and research orientations in contemporary geography.

GEO 6119: Proposal Writing in Geography
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate standing in Geography or consent of instructor
Research design, proposal writing and proposal evaluation for geographic studies.

GEO 6160: Introduction to Quantitative Methods for Geographers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: statistics.
Working knowledge of statistical and quantitative techniques used by geographers. Focuses on spatial analysis.

GEO 6161: Intermediate Quantitative Methods for Geographers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GEO 6160.
Statistical techniques used in the spatial and social sciences. Regression analysis for cross-sectional, qualitative, time-series, and geocoded data.

GEO 6166: Advanced Quantitative Methods for Spatial Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GEO 6160 and GEO 6161 or equivalent or permission of instructor
Critical examination and analysis of spatial data and point patterns, trend-surface modeling and interpolation, count data modeling, cluster and hot-spot detection, process change statistics in space and time, and spatial regression models.

GEO 6255: Climatology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Introductory weather and climate course taken as an undergrad.
Climatology in a global context. Emphasizes energy budgets, weather systems in the tropics and extratropics, and atmospheric teleconnections such as El Nino.

GEO 6282: Fluvial Morphology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate standing, a basic physical geography or geology course and an introductory statistics course. Other interested individuals should consult instructor.
Study of fluvial processes, landforms and deposits and their changes due to environmental factors and human activities.

GEO 6348: Floods Seminar
Credits: 3 **Grading Scheme:** Letter
Analysis of the world's most extreme floods from the Pleistocene through present due to various causes. Emphasizes physical and human aspects of flood warning, preparedness, response and recovery throughout the world.

GEO 6375: Land Change Science Seminar
Credits: 3 **Grading Scheme:** Letter
Interdisciplinary study of land use and land cover change dynamics and their relationship with global environmental change.

GEO 6429: Seminar: Cultural Geography
Credits: 3 **Grading Scheme:** Letter
Review of literature, theoretical frameworks, and research design formulation in contemporary cultural geography.

GEO 6435: Seminar in Population
Credits: 3 **Grading Scheme:** Letter
Combination lecture and seminar dealing with social and population problems from a spatial perspective. Major research project required.

GEO 6451: Medical Geography
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Studying human-environment interactions and the influence of these interactions on public health. This course provides a broad-based, comprehensive survey of geographic approaches in medical studies.

GEO 6495: Environment and Behavior
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Theoretical and empirical analysis of how people perceive and interpret ordinary environments and their influence on well being.

GEO 6509: Seminar in Business Geography
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Selected problems in geography of economic activity.

GEO 6558: Geography of Inequality in Africa
Credits: 3 **Grading Scheme:** Letter
Socioeconomic inequality and uneven development in Africa. Economic polarization and rising inequality in social domains.

GEO 6905: Individual Work
Credits: 1-5 **Max: 12 including GEO 5905** **Grading Scheme:** Letter

GEO 6921: How to Survive and Thrive in Academia
Credits: 1 **Grading Scheme:** Letter
Strategies and approaches, from preparation in graduate school, to success on the academic job market, to getting tenure.

GEO 6931: Seminar in Cultural and Political Ecology
Credits: 3 **Grading Scheme:** Letter
Human-environment relationships from the perspective of cultural and political ecology.

GEO 6938: Selected Topics in Geography
Credits: 1-5 **Max: 15** **Grading Scheme:** Letter
Prerequisite: graduate standing in geography or a related field.

GEO 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

GEO 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

GEO 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

GER 6060: Beginning German for Graduate Students I
Credits: 3 **Grading Scheme:** S/U
For graduate students from other departments who need to acquire a reading knowledge of German. Not open to graduate students in German.

GER 6061: Beginning German for Graduate Students II
Credits: 3 **Grading Scheme:** Letter, S/U
Prerequisite: GER 6060 or its equivalent.
For graduate students from other departments who need to acquire a reading knowledge of German. Not open to graduate students in German.

GER 6505: German Culture

Credits: 3 **Grading Scheme:** Letter
Interdisciplinary study of periods and major aspects of German culture from the Middle Ages to the present.

GER 6940: Supervised Teaching
Credits: 1-3 Max: 3 **Grading Scheme:** S/U
Prerequisite: departmental approval.

GET 6295: Weimar Cinema
Credits: 3 **Grading Scheme:** Letter
Weimar cinema, and theory and criticism that surround it. Examination of intersection between formal-aesthetic and ideological-political aspects as manifest in film text.

GET 6299: New German Cinema and its Legacy
Credits: 3 **Grading Scheme:** Letter
New German cinema as response to Hollywood cinema, Germany's Nazi past and problems posed to society, and cinema by other mass media and new imaging technologies. Analytical texts draw from new historicism, cultural studies, psychoanalysis, and postmodernism.

GEW 6205: Foundations of Literary Study
Credits: 3 **Grading Scheme:** Letter
Required for M.A. and Ph.D. candidates in German. Focus on literary criticism and methodology. Different theoretical approaches to literature and research techniques. Recent developments.

GEW 6266: History of the German Novel
Credits: 3 **Grading Scheme:** Letter
Development of novel from its beginning in 17th century to its rise in late 18th, 19th, and 20th centuries as well as history of theories about novels.

GEW 6305: Studies in German Drama and Theater
Credits: 3 **Grading Scheme:** Letter
Main trends in the development of German drama during different literary periods. Analysis of individual plays and theoretical texts.

GEW 6405: Medieval and Renaissance Literature
Credits: 3 **Grading Scheme:** Letter
Courtly and heroic epic, Volksbücher, and major genres and trends from the Medieval and Renaissance period.

GEW 6425: From Luther to Lessing: Early Modern German Literature
Credits: 3 **Grading Scheme:** Letter
Analysis of major trends, authors, and texts from Reformation to Enlightenment.

GEW 6535: German Classical and Romantic Literature
Credits: 3 **Grading Scheme:** Letter
Analysis of major authors and texts. Special attention to developments in culture, aesthetics, and society.

GEW 6558: Young Germany, Biedermeier, Realism, and Naturalism
Credits: 3 **Grading Scheme:** Letter
Writers of the 19th century including Moerike, Heine, Droste-Huelshoff, Stifter, Keller, Raabe, Storm, Fontane, Meyer, Hauptmann.

GEW 6725: Culture and Society in the Weimar Republic
Credits: 3 **Grading Scheme:** Letter
Intellectual and cultural life between 1918 and 1933. Analysis of literary works from theater, cabaret, and cinema within context of social and political life of the Weimar Republic.

GEW 6735: Modern German Literature
Credits: 3 **Grading Scheme:** Letter
Literary trends and major works of early twentieth century. Authors may include Mann, Rilke, Kafka, and Hesse. Relation to contemporary cultural and aesthetic developments.

GEW 6736: Contemporary German Literature
Credits: 3 **Grading Scheme:** Letter
Literary trends from 1945 to present. Relation to contemporary cultural and aesthetic developments. Current developments.

GEW 6745: Literature and Culture in the Third Reich
Credits: 3 **Grading Scheme:** Letter
Analysis of major literary and nonliterary works of Nazi period. Appropriation of German literary tradition. Examination of Nazi theater and film. Literature of the so-called inner emigration.

GEW 6826: German Literary Theory
Credits: 3 **Grading Scheme:** Letter
Major figures in field from nineteenth century to present. Emphasis on question of hermeneutics and different responses developed by literary theoreticians. Special focus on most recent developments in field.

GEW 6900: Seminar in Germanic Languages and Literatures
Credits: 3 **Max: 9** **Grading Scheme:** Letter

GEW 6901: Special Study in Germanic Languages and Literatures
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Intensive study of a selected topic.

GEW 6905: Independent Study
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Available by special arrangement. May be taken only once for M.A. credit.

GEW 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

GEW 6971: Research for Master's Thesis
Credits: 1-9 **Grading Scheme:** S/U

GEW 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

GEW 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U
For students admitted to candidacy.

GEY 5935: Topics in Gerontology
Credits: 3 **Max: 12** **Grading Scheme:** Letter

GEY 6220: Overview of Geriatric Care Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GEY 6646.
Overview of geriatric care management in aging network.

GEY 6306: Interpersonal Communication Within the Aging Network
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GEY 6646.
Effective communication with clients, caregivers, and care teams. Dealing with conflict, therapeutic relationships, interviewing, report-writing, intergenerational communication, and cultural considerations.

GEY 6646: Issues and Concepts in Gerontology
Credits: 3 **Grading Scheme:** Letter
A multidisciplinary, team-taught survey of the field.

GEY 6905: Independent Study in Gerontology

Credits: 1-3 Max: 4 Grading Scheme: Letter

GEY 6936: Professional Development in Gerontology/Geriatrics
Credits: 1-2 Max: 10 Grading Scheme: S/U
Research proposals, professional ethics, teaching, theoretical issues, academic journals, research trends, methodologies, conference and colloquium presentations, and career planning.

GEY 7408: Psychotherapy with Older Adults
Credits: 3 Grading Scheme: Letter
Prerequisite: Admission to graduate study in counseling psychology or clinical and health psychology or consent of instructor; PCO 7944 for counseling psychology or CLP 6407 for clinical and health psychology.
Psychotherapeutic interventions with older adults.

GIS 5008C: Maps and Graphs
Credits: 4 Grading Scheme: Letter
Prerequisite: graduate standing.
General introduction to principles and techniques of thematic cartography and cartographic applications.

GIS 5009C: Advanced Cartography
Credits: 3 Grading Scheme: Letter
Prerequisite: GEO 4100C; CGS 3460 or consent of instructor.
Advanced methods including computer cartography and elements of cartographic reproduction.

GIS 5028C: Advanced Aerial Photo Interpretation
Credits: 3 Grading Scheme: Letter
Prerequisite: GEO 2200 or consent of instructor.
Uses of aerial photographs in geographical research.

GIS 5038C: Remote Sensing
Credits: 4 Grading Scheme: Letter
Prerequisite: GEO 4120C.
Uses of remote sensing imagery in geographical research.

GIS 5107C: Geographic Information Systems in Research
Credits: 4 Grading Scheme: Letter
Prerequisite: GEO 3162C or equivalent.
Geographic technology for creating, modifying, displaying, and analyzing spatial information. Geographic analysis and reasoning, computer software and hardware technology, and research applications of GIS. Geographic databases.

GIS 5306: Geographic Information Systems Applications in Environmental Systems
Credits: 3 Grading Scheme: Letter
Prerequisite: GEO 3171 or equivalent, consent of instructor.
Advanced study of applying GIS to research problems in geosciences, landscape ecology, and land management. Concepts, methods, data, and models for studying physical and ecological spatial patterns and processes. Not software-specific.

GIS 5540: Business Geography and New Real Estate Market Analysis
Credits: 3 Grading Scheme: Letter
Prerequisite: GEO 3171 or equivalent, consent of instructor.
Methods that professional human economic geographers have used in the business community, starting with William Applebaum and extending through the contemporary period. Use of GIS and geographic analysis in business decisions. Trade zone, geographic market-area analysis, and gravity retail models.

GIS 6425C: GIS Models for Public Health
Credits: 3 Grading Scheme: Letter
Prerequisite: (GEO4167C/GEO 6160 , or equivalent) and GIS (GIS3043/GIS 5107C , or equivalent), or the consent of the instructor

Focusing on the design of GIS-based models to address health and health care issues. Major topics include: a conceptual framework, landscape epidemiology models, disease diffusion models, health accessibility, human health behavior, and location-allocation of health services. Lab section helps students gain hands-on experience applying these models with GIS tools.

GLY 5156: Geologic Evolution of North America
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GLY 2010 or 2026; 4400C recommended.
Key geological features of North American plate and important aspects of their geological evolution through time. Current and past plate tectonic setting, major geological and geomorphologic provinces, geophysical aspects of North American lithosphere, and natural resources.

GLY 5245: Hydrogeochemistry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: inorganic chemistry, calculus, or consent of instructor.
Geological controls on chemical and isotopic composition of natural waters, including meteoric ground water, brines, and sea water; emphasizing thermodynamic and kinetic aspects of fluid-solid reactions.

GLY 5246: Geochemistry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 2046, GLY 2010C.
The abundance and distribution of the elements and their behavior during various geological processes.

GLY 5247: Surface and Ground Water Interactions
Credits: 3 **Grading Scheme:** Letter
Prerequisite: geology/hyrdroecology and undergraduate chemistry and physics.
Classic and new literature that deals with interactions between surface and ground water. Emphasizes submarine ground water discharge in estuary and coastal zones, hyporheic zones of streams, and karst aquifers.

GLY 5248: Physical Geochemistry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: calculus I, introductory chemistry, or consent of instructor.
Principles, theory, practice, and application of thermodynamics and kinetics to geochemical processes.

GLY 5255: Organic Geochemistry and Geobiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: one year introductory chemistry, one year introductory geology.
Theory, practice, and methods of organic geochemistry, organic biogeochemistry, and geomicrobiology.

GLY 5328: Advanced Igneous Petrology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GLY 4310C or equivalent.
Compositional variability, phase relations, and petrogenetic history of igneous rocks, volcanic regions, and mantle. Theories of petrotectonic associations and magmagenesis.

GLY 5455: Introduction to Geophysics and Tectonics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GLY 2010C, 2026C, or 4400C and 1 year of college physics or consent of instructor.
Physics of the Earth. Study of gravity and magnetic fields, seismic waves, thermal history, orogenic belts, and plate tectonic theory.

GLY 5466: Seismology and Earth Structure
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 2302 or GLY 5455 or PHY 2048 or PHY 2060 or consent of instructor.
Introduces basic theory of elastic wave propagation in the Earth. Applies seismology as a tool for determining Earth structure and explains relationships between earthquakes and plate tectonics.

GLY 5468: Terrestrial Gravity and Magnetism
Credits: 3 **Grading Scheme:** Letter

Prerequisite: MAP 2302 or PHY 2060, and GLY 5455, or by consent of instructor.
Survey of potential field theory with applications to gravity and magnetism of the Earth.

GLY 5476: Environmental Geophysics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GLY 2010C or 2026C and 1 year of college physics or consent of instructor.
Reflection and refraction seismology. Gravitational, magnetic and electrical methods of exploration. Instrumentation, surveying techniques, and data reduction and interpretation.

GLY 5558C: Sedimentology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GLY 2010 or 2026; 4552.
Lecture and discussion of major sedimentary processes active in coastal and continental margin settings, focus on relating processes with sedimentary facies. Class work augmented with frequent field trips.

GLY 5576: Continental Margin Stratigraphy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GLY4552 or equivalent
Basic concepts of sequence stratigraphy and to illustrate their application in the study of tectonics, sediment supply, and sea-level change. Emphasizes exploration tools, such as advanced well logging techniques and seismic stratigraphy, used to relate lithology with stratigraphy.

GLY 5705: Geomorphology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GLY 4400C.
Application of principles of geomorphology to origin and evolution of landscapes.

GLY 5736: Marine Geology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GLY 2010C, or 2026C, or OCE 1001.
Detailed introduction to the origin and evolution of ocean basins, ocean margins, and oceanic sediments and microfossils, including a paleoceanographic history of the marine realm.

GLY 5786L: Topics in Field Geology
Credits: 2 Max: 6 **Grading Scheme:** Letter
Prerequisite: graduate standing and consent of instructor.
Visits to selected sites and regions of outstanding geologic value and interest.

GLY 5827: Ground Water Geology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GLY 2010C, or 2026C.
Principles of ground water geology, with special reference to the Coastal Plain and Florida.

GLY 6075: Global Climate Change: Past, Present, and Future
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GLY 4552C.
Evolution of the Earth's climate through geologic time, including discussion of modern climatology and methods of paleoclimate interpretations.

GLY 6268C: Isotope Geology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: GLY 5246.
Application of radiogenic and stable isotopes to the solution of geologic problems such as geochronology, petrogenesis, and paleoclimatology.

GLY 6297: Topics in Geochemistry
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: GLY 5246.
Applications of geochemical (elemental and isotopic) methods and data to tectonics and petrology).

GLY 6425: Tectonics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GLY 4400C.
Evolution and formation of mid-ocean ridges, seamounts, hot spots, island arcs, back-arc basins, passive margins, and mountain chains.

GLY 6519: Stratigraphy and Timescales
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor, or undergraduate degree in geology.
Methods in stratigraphy including biostratigraphy, chemostratigraphy, manetostratigraphy, and cyclostratigraphy and how these tools are integrated to generate geologic timescales in absolute time.

GLY 6620C: Micropaleontology
Credits: 3 **Grading Scheme:** Letter
Classification and identification of biostratigraphically important microfossil groups and their use in local and regional correlation.

GLY 6695: Topics in Paleoclimatology
Credits: 4 **Max: 12** **Grading Scheme:** Letter
Prerequisite: undergraduate degree in geology or consent of instructor.
Studies of paleoclimates and interpretation of climate change from rock record.

GLY 6826: Hydrogeologic Modeling
Credits: 3 **Grading Scheme:** Letter
Application of computer modeling to hydrogeologic problems through use of analytical and numerical solutions.

GLY 6862: Numerical Methods in Earth Sciences
Credits: 3 **Grading Scheme:** Letter
Prerequisite: College level Calculus and Physics, or permission of instructor.
Providing graduate students with a solid introduction to the quantitative methods that are increasingly utilized in the Earth sciences.

GLY 6905: Individual Work
Credits: 1-4 **Max: 12** **Grading Scheme:** Letter
For work beyond that offered in regular courses.

GLY 6931: Seminar
Credits: 1 **Max: 2** **Grading Scheme:** Letter
Reading in special topics.

GLY 6932: Special Topics in Geology
Credits: 1-3 **Max: 9** **Grading Scheme:** Letter
Lectures, conferences, or laboratory sessions covering selected topics of current interest in modern geology.

GLY 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

GLY 6943: Internship in College Teaching
Credits: 2-6 **Max: 6** **Grading Scheme:** Letter
Required for Master of Science in Teaching candidates, but available for students needing additional practice and direction in college-level teaching.

GLY 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

GLY 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

GLY 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

GMS 5905: Special Topics in Biomedical Sciences
Credits: 1-4 Max: 4 **Grading Scheme:** Letter
Analysis and discussion of contemporary topics and the development of biomedical sciences.

GMS 6001: Fundamentals of Biomedical Sciences I
Credits: 5 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Integrated approach to cellular, molecular, biochemical, and genetic aspects of cell function.

GMS 6003: Fundamentals of Graduate Research and Professional Development
Credits: 1 Max: 2 **Grading Scheme:** S/U
Prerequisite: consent of instructor. Designed for new graduate students. *Corequisite:* GMS 6001.
Practical knowledge and understanding of issues to increase chances for a successful graduate education and professional career in biomedical sciences.

GMS 6004: IDP Practical Laboratory
Credits: 2 **Grading Scheme:** Letter
Five weeks of laboratory instruction complemented with supporting theoretical lectures and workshops on radiation safety, biosafety, and library resources. Practical laboratory experience in proteins and nucleic acids, including DNA cloning, PCR, Southern blotting, protein purification and characterization, and RNA methods for cDNA cloning.

GMS 6005: Fundamentals of Developmental Biology
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor. Designed for first-year graduate students.
Integrated overview of mechanistic principles of development deriving from experimental analysis of nematode worm, fruit fly, chick, and mouse.

GMS 6006: Fundamentals of Immunology and Microbiology
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor. Designed for first-year graduate students.
Integrated approach to immunology, microbiology, and immune response to infection.

GMS 6007: Fundamentals of Neuroscience
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor. Designed for first-year graduate students.
Fundamental concepts on development, structure, function, and plasticity of nervous system.

GMS 6008: Fundamentals of Physiology and Functional Genomics
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor. Designed for first-year graduate students.
Fundamental physiological concepts. Emphasizes the impact of functional genomics technology on contemporary physiology.

GMS 6009: Principles of Drug Action
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor. Designed for first-year graduate students.
Fundamental concepts of drug action, receptor structure and function, and pharmacokinetics.

GMS 6010: Yeast Genetics
Credits: 1 Max: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.
Using the yeast *Saccharomyces cerevisiae*, as a model eukaryotic cell to study the biological processes common to all eukaryotic organisms.

GMS 6011: Mouse Genetics
Credits: 1 Max: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.

Theoretical framework for understanding the fundamentals of mouse genetics and use of the mouse model to study human disease. Advanced technical tools used for research and their application to novel problems.

GMS 6012: Human Genetics
Credits: 1 Max: 3 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of instructor.
Theoretical framework for understanding the fundamentals of human genetics. Advanced technical tools used for research.

GMS 6013: Developmental Genetics
Credits: 1 Max: 3 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of instructor.
Theoretical framework for understanding the fundamentals of developmental genetics. Advantages and limitations of several model systems and their application to the study of development.

GMS 6014: Applications of Bioinformatics to Genetics
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6001; consent of instructor.
Storage, retrieval, and analysis of information related to genetics.

GMS 6015: Human Genetics II
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6012; consent of instructor.
Theoretical framework, emphasizing functional genomics and bioinformatics. Advanced technical tools used for research and development in these areas.

GMS 6017C: In-Vitro Fertilization Laboratory Practicum A
Credits: 4 Grading Scheme: S/U
Prerequisite: Master's degree in animal sciences. *Corequisite:* Acceptance into the Animal Molecular and Cellular Biology (AMCB) graduate program.
IVF training and lectures leading to proficiency in human-assisted reproductive technologies. Hands-on manipulation of human gametes in preparation for patient clinical management during infertility treatment.

GMS 6018L: Advanced in-Vitro Fertilization Laboratory Practicum
Credits: 4 Grading Scheme: S/U
Prerequisite: GMS 6017C and master's degree in animal science. *Corequisite:* acceptance into Animal Molecular and Cellular Biology (AMCB) graduate program.
Advanced IVF training leading to proficiency in human-assisted reproductive technologies. Hands-on manipulation of human gametes in preparation for patient clinical management during infertility treatment.

GMS 6021: Principles of Neuroscience I: Organization and Development of the Nervous System
Credits: 2 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of instructor.
Principles governing neural development and plasticity of the vertebrate central nervous system.

GMS 6022: Principles of Neuroscience II: Cellular and Molecular Neuroscience
Credits: 2 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of instructor.
Principles governing intercellular communication within the nervous system.

GMS 6023: Principles of Neuroscience III – Molecular Neuropharmacology and its Clinical Application
Credits: 2 Grading Scheme: Letter
Prerequisite: Principles of Neuroscience I and II
This course surveys the basic principles of neuropharmocology with an emphasis on the molecular pharmacologh of CNS disorders. The specific focus is to provide a description of the cellular and molecular actions of drugs on synaptic transmission with in-depth discussion of drug-induced changes in the functioning of the nervous system.

GMS 6024: Principles of Neuroscience IV: Neural Integration & Control
Credits: 2 Grading Scheme: Letter
Prerequisite: GMS 6023 or consent of instructor.

Principles governing the integration and control of information processing within the central nervous system.

GMS 6029: Brain Journal Club
Credits: 1 Max: 12 Grading Scheme: S/U
Prerequisite: consent of instructor.
Opportunities to present and participate in discussions of top-tier research papers in the neurosciences.

GMS 6032: Mechanisms of Host Defense
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6001, GMS 6006, or consent of instructor.
Biological and biochemical aspects of immunology, focusing on effector mechanisms of immune response to microbes and macromolecules.

GMS 6033: Immunity in Health and Disease
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6001, GMS 6006, or consent of instructor.
Biological and biochemical aspects of immunology, focusing on the molecular and cellular basis of human disease.

GMS 6034: Advanced Virology I: Genetics and RNA
Credits: 1 Grading Scheme: Letter
Prerequisite: consent of instructor.
Theoretical framework for understanding the fundamental concepts of viral genetics. Methods of analysis used to elucidate the mechanisms of virus reproduction.

GMS 6035: Advanced Virology II: RNA Viruses
Credits: 1 Grading Scheme: Letter
Prerequisite: consent of instructor.
Molecular biology and genetics of virology, focusing on the molecular biology of RNA viruses.

GMS 6036: Molecular Virology III: DNA Viruses
Credits: 1 Grading Scheme: Letter
Prerequisite: consent of instructor.
Molecular biology and genetics of virology, focusing on replication and pathogenesis of DNA viruses.

GMS 6038: Bacterial Genetics and Physiology
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6006 or consent of instructor.
Theoretical framework for understanding fundamental concepts.

GMS 6039: Bacterial Pathogenesis
Credits: 1 Grading Scheme: Letter
Prerequisite: consent of instructor.
Survey of medical microbiology, focusing on the genetics and physiology of bacteria, their use as research tools, and the role of bacteria in causing disease.

GMS 6040: Host-Pathogen Interactions
Credits: 1 Grading Scheme: Letter
Prerequisite: consent of instructor.
Survey of medical microbiology, focusing on the host response and subsequent evasion of that response by pathogens.

GMS 6052: Ion Channels of Excitable Membranes
Credits: 1 Grading Scheme: Letter
Prerequisite: consent of instructor.
Examines the background of ion channel proteins that regulate and respond to cell membrane potential. A cell's membrane potential is an important source of energy for regulating intracellular ion concentration, controlling the secretory process, and for electrical signaling in the nervous system.

GMS 6053: Cancer Biology and Therapeutics
Credits: 1 Grading Scheme: Letter

Prerequisite: GMS 6065 or consent of instructor.
Integrated approach for teaching of pharmacology and physiology pertaining to cancer.

GMS 6059: Gene Therapy from Bench to Bedside
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6034, GMS 6035, and GMS 6036 or consent of instructor.
Designing and using gene transfer vectors to treat various diseases. Understanding the practical successes and hurdles of gene therapy.

GMS 6063: Mechanisms of Aging
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.
Recent developments in the field of aging.

GMS 6064: Tumor Biology
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.
Current understanding of the molecular basis of cancer. Offered in odd-numbered years.

GMS 6065: Fundamentals of Cancer Biology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.
Broad-based introduction into causes of cancer, molecular and biological processes involved in malignancies, and current cancer treatment approaches.

GMS 6070: Sensory and Motor Systems
Credits: 1 **Max: 2** **Grading Scheme:** Letter
Prerequisite: medical, veterinary, or dental neuroscience.
Analyzing neural coding by model sensory or motor system, depending on student's research interest. Offered fall term.

GMS 6072: Neuroendocrinology and Neuroimmunology
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6007 or consent of instructor.
Cellular and molecular mechanisms regulating interactions among the immune, endocrine, and nervous systems.

GMS 6073: Developmental Neurobiology
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6007 or consent of instructor.
Focuses on current research that is being conducted to build on an understanding of how the nervous system develops. Examines both cellular and molecular perspectives.

GMS 6074: Comparative and Evolutionary Neurobiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6007 or consent of instructor.
Broad perspective of nervous system evolution, structure, and function in different species. Comparisons of cytoarchitectural principles that produce mammalian nervous systems are additional focus.

GMS 6077: Neural Degeneration and Regeneration
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Fundamental cytological, molecular, neurophysiological, and behavioral features associated with neural tissue reactions to trauma and neurodegenerative disease. Offered spring term.

GMS 6078: Synaptic Function and Plasticity
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.

Synapses that mediate fast electrical excitation and inhibition in the mammalian brain and how these synapses change with development and experience. Molecular biology of glutamate, GABA, and nicotinic acetylcholine receptor subtypes, experimental paradigms for studying long-lasting changes in synaptic function, and changes in animal behavior related to neuroplastic events.

GMS 6079: Computers in Biology
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.
Students will be introduced to the use of computers in studies of protein and nucleic acid sequences and cellular function.

GMS 6080: Basic Magnetic Resonance Imaging
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6007 or consent of instructor.
Principles behind nuclear magnetic resonance imaging (MRI) and spectroscopy (MRS) and how these methods are applied to studies of the human brain.

GMS 6090: Research in Medical Sciences
Credits: 1-10 **Max: 10** **Grading Scheme:** S/U
Supervised research other than that for the thesis or dissertation in biochemistry and molecular biology, genetics, immunology and microbiology, molecular cell biology, neuroscience, and physiology and pharmacology.

GMS 6096: Introduction to NIH Grant Writing for Biomedical Sciences
Credits: 1 **Grading Scheme:** S/U
This 14-week course will cover introductory topics related to preparing and submitting an NIH grant application. The format will be a one-hour lecture once a week by accomplished NIH-funded researchers. Target audience is advanced graduate students, postdocs, junior faculty, and senior faculty seeking an introduction to current grant submission procedures.

GMS 6121: Infectious Diseases
Credits: 4 **Grading Scheme:** Letter
Prerequisite: Consent of instructor.
Survey of medical microbiology directed at understanding infectious disease in terms of molecular pathogenesis, bacterial physiology, and genetics.

GMS 6145: Immunology of Gene Transfer
Credits: 1 **Grading Scheme:** Letter
Prerequisite: background in molecular biology, virology, and immunology.
Immunological aspects of gene therapy.

GMS 6151: Genetic Analysis Using Model Systems
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.
Major model systems used in scientific research.

GMS 6153: Advanced Bacterial Genetics
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6038 or consent of instructor.

Advanced principles of bacterial genetics, emphasizing work with bacteria and genetic constructs as tools in biotechnologies.

GMS 6155: DNA Microarray Data Analysis
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6014 or consent of instructor.
Hands-on study of microarray data analysis and relational databases.

GMS 6169: Antimicrobial Strategies
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Recent developments in the field of antimicrobial strategies including antiobiotics and their mechanisms of action, antibiotic resistance mechanisms, phage therapy, antimicrobial target identification, and vaccine approach.

GMS 6181: Special Topics in Microbiology
Credits: 1-6 Max: 18 Grading Scheme: Letter

GMS 6190: Seminar
Credits: 1; max:12 Grading Scheme: S/U
Presentations by invited speakers.

GMS 6193: Research Conference in Oral Biology
Credits: 1 or 3 Max: 8 Grading Scheme: S/U
Required of graduate students in oral biology; open to others by departmental approval. Critical discussion and appraisal of current research in the department by students and faculty.

GMS 6195: Epigenetics Journal Club
Credits: 1 Max: 12 Grading Scheme: S/U
Prerequisite: consent of instructor.
Presentation and critical discussions of recent original papers published in high-impact journals relating to the topic of epigenetics.

GMS 6196: Virology Journal Club
Credits: 1 Max: 12 Grading Scheme: Letter
Presentation and critical discussions of recent original articles in the virology literature.

GMS 6198: Bacterial Pathogenesis Journal Club
Credits: 1 Max: 12 Grading Scheme: Letter
Presentation and critical discussion of recent original papers on bacterial pathogenesis published in high-impact journals. Offered spring and fall term.

GMS 6221: Ethics in Genetics
Credits: 1 Grading Scheme: Letter
Prerequisite: Consent of instructor
Presentation and critical discussion of relevant topics pertaining to ethics, policy and translation in genetics research.

GMS 6231: Genomics and Bioinformatics
Credits: 3 Grading Scheme: Letter
Prerequisite: STA 6166 and PCB 5065 or consent of instructor.
Principles of genomic characterization and bioinformatic analysis of eukaryotes.

GMS 6232: Advanced Applications of Bioinformatics in Genetics
Credits: 1 Max: 12 Grading Scheme: Letter
Prerequisite: GMS 6014 or consent of instructor; programming experience.
Applying bioinformatics and computational approaches to solve research problems.

GMS 6233: Quantitative Models of Protein Evolution and Phylogenetics
Credits: 2 Grading Scheme: Letter
Prerequisite: Intended for graduate students interested in protein biology.
Discusses the intricacies and assumptions of methods of phylogenetic analysis from molecular data. Emphasizes the study of the theoretical principles underlying models of protein evolution, as used in phylogenetic analysis. Examines biological principles and mathematical tools used to model protein evolution in inferring phylogenetic relations. Develops quantitative models of protein evolution and studies algorithmic applications of existing models. Interactive lectures in a Socratic format, tailored to the progress of the students.

GMS 6234: Introduction to phylodynamics: A practical approach to molecular phylogenetics of pathogens
Credits: 3 Grading Scheme: Letter
Principles of molecular evolution. Mathematical models of DNA/RNA sequence evolution and their application to phylogenetic inference. Mathematical and statistical tools implemented in phylogenetic-tree reconstruction methods and molecular clock calibration. Introduction to coalescent theory. Phylodynamic models and their application to the study of viral and bacterial pathogens. Practical computer sessions analyzing real data with the MEGA5 and BEAST software packages.

GMS 6251: Molecular Therapy I – Vectors and Molecular Mechanisms

Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or instructor approval
Gene therapy is an established molecular medicine for treatment of multiple genetic diseases (e.g., primary immune deficiencies, inherited forms of blindness) and cancers. This course covers the most important/widely studied diseases and applications of gene therapy. Emphasis is given to diseases successfully treated by gene therapy in clinical trials.

GMS 6252: Molecular Therapy II – Disease Targets and Applications
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6251 Molecular Therapy I or instructor approval
Gene therapy is an established molecular medicine for treatment of multiple genetic diseases (e.g., primary immune deficiencies, inherited forms of blindness) and cancers. This course will be covering the most important/widely studied diseases and applications of gene therapy. Emphasis is given to diseases successfully treated by gene therapy in clinical trials.

GMS 6253: Molecular Therapy III – Immunology of Gene Transfer
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or instructor approval
This course will be covering the interaction between gene transfer vectors and their therapeutic gene products and the immune system, including mechanisms of innate and adaptive immune responses against gene-based drugs, viral immunology, immune modulation, immune tolerance, and use of gene transfer to enhance immune responses against cancer or infectious disease.

GMS 6290: Genetics/Genomics Program Graduate Seminar
Credits: 1 **Grading Scheme:** Letter
Prerequisite: enrolled in campus-wide genetics and genomics program or consent of instructor.
Presentations, seminars, and critical discussions of recent original research relating to genetics and genomics.

GMS 6312: Clinical Chemistry and Toxicology
Credits: 3 **Grading Scheme:** Letter
Comprehensive review of analytical techniques used in clinical chemistry and toxicology, and interpretation of laboratory data.

GMS 6313: Clinical Chemistry and Toxicology: A Rotation
Credits: 2-20 Max: 20 **Grading Scheme:** S/U
Prerequisite: GMS 6312.
Participation in all phases of practical clinical chemistry and toxicology. Chemical methodology, clinical interpretation, and significance of laboratory measurements used in diagnosing diseases. Individual investigative project in clinical chemistry and toxicology. Pathology graduate students specializing in clinical chemistry must spend 3 semesters on this rotation.

GMS 6335: Advanced Stem Cell Biology: Tissue Engineering
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6331 and GMS 6336
Current state of the art in using stem cells and other technologies to engineer tissues and organs for therapeutic use.

GMS 6336: Advanced Stem Cell Biology: Regenerative Medicine
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6331 .
Potential clinical applications of tissue-specific, adult stem cells; derivation, manipulation, uses, and limitations.

GMS 6337: B Cell Development in Health and Disease
Credits: 1 Max: 15 **Grading Scheme:** Letter
Prerequisite: GMS 6031 , GMS 6032, and GMS 6033 or equivalent. Strong background in immunology.
Advanced understanding of the role and regulation of B cells, emphasizing dysregulation of B cell functions in autoimmune diseases.

GMS 6338: Recent Advances in Cancer Metastasis
Credits: 1 **Grading Scheme:** Letter
Prerequisite: None.
Recent progress in cancer metastasis including the interactions between tumor cells and host environments at molecular and cellular levels during metastatic process as well as tools and models available for cancer metastasis research.

GMS 6381: Special Topics in Pathology

Credits: 1-4 Max: 12 Grading Scheme: Letter
Prerequisite: departmental approval.
Conference and supervised laboratory work. Topics selected to meet each student's needs. Offered in even-numbered years.

GMS 6382: Special Topics in Immunology
Credits: 1-3; max:6 Grading Scheme: Letter
Prerequisite: GMS 6140 or consent of instructor.
Analysis and discussion of contemporary topics in development of current concepts. Evaluation of the most recently published research literature. Seminars and discussions with invited speakers.

GMS 6393: Seminar in Clinical Chemistry
Credits: 1 Max: 7 Grading Scheme: S/U
Prerequisite: consent of instructor. *Corequisite:* GMS 6312.
Reports and discussions of current research and clinical literature presented by faculty, invited speakers, and graduate students.

GMS 6400C: Principles of Physiology
Credits: 6 Grading Scheme: Letter
Prerequisite: consent of instructor.
Physiology of mammalian organ systems, with special reference to the human.

GMS 6403: Advanced Endocrinology
Credits: 4 Grading Scheme: Letter
Prerequisite: GMS 6400C, PHA 3500, 3501 or equivalent, consent of instructor.
Readings discussions, and lectures on recent advances in endocrinology.

GMS 6405: Fundamentals of Endocrine Physiology
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of instructor. For 1st- and 2nd-year graduate students.
Human body endocrine system physiology.

GMS 6406: Fundamentals of Pulmonary/Respiratory Physiology
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of instructor.
Human body pulmonary/respiratory system physiology.

GMS 6408: Fundamentals of Renal Physiology
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of instructor.
Human body gastrointestinal system physiology.

GMS 6410: Physiology of the Circulation of Blood
Credits: 2 Grading Scheme: Letter
Physiology of the component parts of the circulation. The relation of structure and function. Emphasizes control mechanisms.

GMS 6411: Fundamentals of Cardiovascular Physiology
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of instructor.
Human body cardiovascular system physiology.

GMS 6412: Human Physiology for Biomedical Engineering
Credits: 4 Grading Scheme: Letter
Prerequisite: consent of instructor. For students in biomedical engineering.
Fundamentals of human physiology, processes, and regulatory mechanisms of major organ systems.

GMS 6413: Advances in Hypertension Research
Credits: 2 Grading Scheme: Letter
Prerequisite: GMS 6008: Fundamentals of Physiology and Functional Genomics
Exposes graduate students, post docs, and fellows to important aspects of hypertension research.

GMS 6414: Advanced Renal Physiology
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.
Advanced knowledge of renal physiology and pathophysiology.

GMS 6415: Fundamentals of Gastrointestinal Physiology
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.
Gastrointestinal system of human body.

GMS 6416: Human Endocrinology and Anatomy of Reproduction
Credits: 2 **Grading Scheme:** S/U
Prerequisite: master's degree.
Overview in relation to in vitro fertilization.

GMS 6421: Cell Biology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: undergraduate biochemistry or cell biology or consent of instructor. Taught in conjunction with 1st year IDP core course.
Fundamental mechanisms of cell functions, specializations, and interactions that account for the organization and activities of basic tissues.

GMS 6471: Fundamentals of Physiology and Functional Genomics I
Credits: 1 **Grading Scheme:** Letter
Prerequisite: Permission of instructor.
Fundamental physiological concepts with emphasis on the impact of functional genomics technology on contemporary physiology. Focuses on an overview of human physiology, cardiovascular system and muscle physiology. May be taken concurrently with Fundamentals of Physiology and Functional Genomics II and/or III.

GMS 6472: Fundamentals of Physiology and Functional Genomics II
Credits: 1 **Grading Scheme:** Letter
Prerequisite: Permission of the instructor
Fundamental physiological concepts with a focus on the impact of functional genomics technology on contemporary physiology. Emphasizes respiratory, renal, endocrine and autonomic nervous systems.

GMS 6473: Fundamentals of Physiology and Functional Genomics III
Credits: 1 **Grading Scheme:** Letter
Prerequisite: Permission of instructor.
Fundamental physiological concepts with a focus on the impact of functional genomics technology on contemporary physiology. Emphasizes gastrointestinal system and modern experimental approaches in physiology.

GMS 6490C: Research Methods in Physiology
Credits: 2-4 Max: 6 **Grading Scheme:** S/U
Special needs of each student are met by conferences and laboratory work,

GMS 6491: Journal Club in Physiology
Credits: 1 Max: 12 **Grading Scheme:** S/U
Timely research papers in all areas of physiology; namely, cellular physiology, molecular physiology, and functional genomics.

GMS 6495: Seminar in Physiology
Credits: 1 **Grading Scheme:** S/U
S/U

GMS 6496: Recent Advances in Physiology
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Content varies from year to year.

GMS 6497: Seminar on Vision

Credits: 2 **Grading Scheme:** Letter
Current research and theory on visual function. Literature survey and design of an experiment relevant to recent theory.

GMS 6506: Biologic Drug Development
Credits: 1 **Grading Scheme:** Letter
Explores the manufacturing and testing of biomedical products, quality control, quality assurance responsibilities, and regulatory compliance, providing practical understanding of the successes and hurdles that are faced in biopharmaceutical product development today.

GMS 6563: Molecular Pharmacology
Credits: 1 Max: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6009 or consent of instructor.
Biochemical approach to the actions of drugs, stressing analysis of drug-receptor interactions, structure-activity relationships, kinetics of distribution of drugs, and metabolism of foreign compounds.

GMS 6590: Seminar in Pharmacology
Credits: 1 Max: 15 **Grading Scheme:** Letter
Prerequisite: GMS 6500 .
Research reports and discussions of current research literature by graduate students, faculty, and invited lecturers.

GMS 6592: Ion Channels Journal Club: Pharmacology, Biophysics, and Neuroscience of Excitable Membranes
Credits: 1 **Grading Scheme:** S/U
Prerequisite: consent of instructor.
Recent papers in the context of larger issues in therapeutics and neuroscience. Discussions led by students and faculty.

GMS 6609: Advanced Gross Anatomy
Credits: 2-4 Max: 6 **Grading Scheme:** Letter
Regional and specialized anatomy of the human body taught by laboratory dissection, conferences, and demonstrations.

GMS 6621: Vision
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Introduction to methodology, anatomy, and function of vision.

GMS 6622: Mitochondrial Biology in Aging and Disease
Credits: 2 **Grading Scheme:** Letter
Prerequisite: graduate standing or consent of instructor
Basic biology of mitochondria; mitochondria in aging and disease; assessments for mitochondrial function and genetic variance.

GMS 6635: Organization of Cells and Tissues
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.
Three credit full semester course covering tissues and nine organ systems related to cell and tissue biology.

GMS 6642: Morphogenesis: Organ Systems I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6635, second-year IDP student.
Skin, respiratory, lymphatics, and special sense.

GMS 6643: Morphogenesis: Organ Systems II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6642, second-year IDP student.
GI, kidney, endocrine, male and female reproduction.

GMS 6644: Apoptosis
Credits: 1 **Grading Scheme:** Letter
Prerequisite: GMS 6001 or consent of instructor.
Modern view of the molecular mechanisms of tumor development. Offered in even-numbered years.

GMS 6690: Molecular Cell Biology Journal Club

Credits: 1 Max: 12 Grading Scheme: Letter
Faculty-student discussion of research papers and topics.

GMS 6705: Functional Human Neuroanatomy
Credits: 4 Grading Scheme: Letter
Prerequisite: consent of instructor.
Intensive introduction to the anatomy, function, and dysfunction of the human central nervous system.

GMS 6709: Current Topics in Vision
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of instructor.
Genetics, molecular biology, and biochemistry underlying vision and the diseases that affect this important human sense.

GMS 6711: Neurobiology of Pain
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of instructor.
Overview of neurobiological processes involved in pain, including methods of investigating pain processing in humans and other animals.

GMS 6735: Neuropharmacology
Credits: 1 Max: 3 Grading Scheme: Letter
Prerequisite: GMS 6007, GMS 6009, or consent of instructor.
Identification, synthesis, metabolism, and pharmacology of neurotransmitters and their receptors. Includes biogenic amines, neuropeptides, and other nervous system transmitters.

GMS 6750: Molecular Pathobiology of Neural Disease
Credits: 1 Grading Scheme: Letter
Prerequisite: consent of instructor.
Overview of a broad range of neural disorders emphasizing genetically determined conditions.

GMS 6760: Comparative Biology of Cell Signaling
Credits: 2 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of coordinator.
Overview of the principles governing cellular and molecular signaling in the nervous system. Introduction to novel experimental approaches and non-mammalian preparations used to explore these principles.

GMS 6791: Visual Neuroscience Journal Club
Credits: 1 Max: 9 Grading Scheme: S/U
Prerequisite: 1st-year IDP core course; or consent of instructor.
Presentation and discussion of cutting-edge research papers.

GMS 6792: Neuroscience Graduate Research Seminar
Credits: 1 Max: 12 Grading Scheme: S/U
Critique and analysis of student-developed neuroscience projects and presentations.

GMS 6800: Fundamentals of Epidemiology
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate standing
Introduction to epidemiology principles and methods for students majoring in any aspect of health.

GMS 6801: Epidemiology, Prevention, and Control of Infectious Diseases
Credits: 3 Grading Scheme: Letter
Prerequisite: GMS 6800 or consent of instructor.
Detailed review of epidemiology, prevention, and control of major infectious diseases and methodology used.

GMS 6802: Examining Health Outcomes for Chronic Diseases in Clinical and Community-based Research
Credits: 3 Grading Scheme: Letter
Prerequisite: GMS 6851 & Instructor Approval

In-depth analysis of risk factors and health outcomes assessment for adult and childhood chronic diseases. The impact of childhood chronic conditions on adult health is emphasized. The interplay of health disparities and chronic diseases also will be discussed.

GMS 6803: Data Management for Clinical Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Consent of instructor.
Introducing data management techniques as they apply to clinical research. Students will learn how to select and design data collection instruments and the steps necessary for ensuring quality control of data at various stages of study. Students will be provided hands-on opportunities to work with and manage data using statistical software.

GMS 6804: Medical Informatics
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6800, basic statistics, consent of instructor.
Issues in using computerized epidemiological and medical data sources and systems.

GMS 6810: Intermediate Epidemiology Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6800 or consent of instructor.
Methodological issues important for designing epidemiological studies of all diseases covered at the intermediate level.

GMS 6811: Grant Writing Skills for Clinical Research
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Instructor Approval
Instruction in preparing grant proposals related to clinical and translational research, including studies conducted in community settings. Emphasis is placed on National Institutes of Health (NIH) procedures, VA-funded research applications, and competitive foundation applications. Students receive individual mentoring and complete a proposal.

GMS 6812: Cancer Health Outcomes Assessment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6851 & Instructor Approval
Methods and measurement issues in cancer health outcomes assessment are addressed across the continuum of cancer care - prevention, screening, diagnosis, treatment, survivorship, and end of life. Outcomes covered include survival, health-related quality of life, patient satisfaction with care, and economic burden.

GMS 6813: Clinical Trials
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6800 or consent of instructor.
Principles for design and conduct. Emphasizes protocol preparations, randomization, sample size, trial monitoring, ethical issues, and data analyses.

GMS 6814: Molecular and Genetic Epidemiology
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6800 or consent of instructor.
Human genetics and molecular biology in studying host susceptibility to disease. Mendelian and non-Mendelian genetics.

GMS 6816: Pediatric Child Health Outcomes Assessment for Clinical and Community-Based Research
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6851 & Instructor Approval
This course covers methods and measurement issues related to assessing children's health outcomes in a range of clinical and community settings. Issues such as assessing outcomes for children with special health care needs and healthy children, considerations related to growth and development, defining outcomes from parent, child and adolescent perspectives, the conduct of health risk assessments among adolescents, and implications for researchers and clinicians are presented.

GMS 6818: Design and Conduct Clinical Trials I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: consent of instructor.

Scientific evaluation of health care interventions by clinical trials and the ethics, principles, and conduct of clinical trials in an epidemiological context.

GMS 6819: Design and Conduct Clinical Trials II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Complex issues in analyzing and interpreting clinical trials.

GMS 6820: Advanced Epidemiology Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6800, GMS 6810, consent of instructor.
In-depth examination of the design of epidemiological studies including biases, confounding, misclassification, and the concept of causal models.

GMS 6821: Measuring and Analyzing Health Outcomes I
Credits: 2 **Grading Scheme:** Letter

GMS 6822: Measuring and Analyzing Health Outcomes II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Cross-cultural translation, data-analysis issues, outcome measures for special populations.

GMS 6826: Advanced Design and Methodology for Case-Control Studies in Clinical Research
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Students are required to have taken a graduate course in health outcomes and policy prior to enrolling in the course. Students are expected to apply basic measures (Odds Ratios, Risk Ratios) and analysis techniques (logistic regression).
Providing instruction on design, critical assessment, and implementation of case-control studies. This advanced course will focus on design and methodological challenges particularly important in case control studies. Variations of the case- control study including case series, case-crossover, case-cohort, and nested case-control studies will be covered.

GMS 6827: Advanced Clinical Trial Methods
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Statistical principles and methods used in the design and analysis of clinical trials. Rotating topics include group sequential designs, adaptive clinical trials, and Statistical Monitoring of Clinical Trials.

GMS 6829: Longitudinal Research Design
Credits: 2 **Grading Scheme:** Letter
Prerequisite: a graduate course in epidemiology, a graduate course in statistics, and consent of instructor.
Design, evaluation, and implementation of cross-sectional and longitudinal research.

GMS 6830: Epidemiology and Health Policy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6800 or consent of instructor.
Reviews general principles and methods of epidemiology and health policy. Using data to establish health policy and legislation. Examples from literature.

GMS 6832: Economic Methods for Evaluating Value in Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Consent of instructor.
Evaluating the relative value of health care interventions through economic methods. Foundational topics include framing the analysis, defining alternatives, techniques for eliciting patient preferences, measuring costs, and assessing outcomes. Students are exposed to cost effectiveness analysis and related methods for combining these core elements into an economic evaluation.

GMS 6833: Health Care Policy and Vulnerable Populations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.

Policy tools used to explore how the health care system can serve vulnerable populations such as the poor, elderly, and children.

GMS 6834: Health Policy and Formulation of Payment Mechanisms for Health Care
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Analytic approaches to developing payment mechanisms. Emphasizes understanding provider reimbursement in health care.

GMS 6835: Health Policy Issues in Children's Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Analyzes critical issues in child health policy such as early intervention programs, new morbidities, health care, and insurance status for children in the U.S.

GMS 6841: Design and Analysis of Translational Research in Biomedical Sciences
Credits: 2 **Grading Scheme:** Letter
Common statistical analysis methods and widely used experimental design techniques including hypothesis testing, study design, confidence intervals, multiple regression, longitudinal data analysis, Non-linear regression for pharmacokinetics and pharmacodynamics, Kaplan-Meier estimates, proportional hazards models, randomization, and power analysis.

GMS 6842: Translational Research Methods
Credits: 2 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Concepts of translational research using a multidisciplinary approach to understand research design ranging from basic science discoveries to implementation of those discoveries in clinical and community settings.

GMS 6844: Experimental and Quasi-Experimental Research Designs for Community Settings
Credits: 2 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Research design, sampling, measurement, implementation, analysis, and interpretation for community settings.

GMS 6845: Clinical & Translational Research Practicum
Credits: 3 **Grading Scheme:** S/U
Prerequisite: GMS 7093
Application of clinical and/or translational research methodologies to the development of research questions and experimental design of doctoral research relevant to human health and disease.

GMS 6846: Meta-Analysis in Clinical, Health Services Research and Public Health
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Consent of instructor
Systematic overviews and meta-analysis techniques. Lectures and laboratory work. Develop and conduct a meta-analysis in small groups.

GMS 6851: Health Outcomes Research
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Permission of instructor.
An overview of principles and practices of health outcomes, health program evaluation and implementation science in the context of the translational research continuum. Content areas include the populations studied, data sources, and user audiences. Exposure to a range of health outcomes, program evaluation and implementation science topics and conceptual frameworks.

GMS 6852: Community Engaged Research for Clinical Effectiveness and Implementation Science Studies
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6851 & Instructor Approval
This course covers the principles and practices of clinical effectiveness and implementation science research conducted with community partners. The benefits of and barriers to conducting community engaged research will be addressed in the context of the translational research continuum. The relationships between community partner involvement and study design, data collection, and analytic methods are addressed. Additional topics include partnership development, relationships between researchers and the community, capacity building, and sustainability.

GMS 6853: Applied Topics in Dissemination and Implementation Science
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6851 & Instructor Approval
This course provides a framework for examining dissemination research and implementation sciences and its applicability to clinical and community-based research. The role of dissemination research and implementation sciences in the translational research spectrum will be a key focus. Translation research involves the study of how best to transfer evidence-based knowledge into routine or representative practice, and by definition requires involvement and input of the end-user, thus a key focus will be on examining different study designs in dissemination research and implementation science, and the strengths and limitations of different methodological approaches.

GMS 6854: Applied Topics in Clinical Effectiveness Research
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6851 & Instructor Approval
Clinical effectiveness research advances the translation of evidence about the effectiveness of treatments and heath care delivery strategies into practice by assessing what interventions and strategies work best for which patients and in what settings are different treatment approaches best used. This course provides an overview of the origins of clinical effectiveness research, the role of clinical effectiveness research in the translational research spectrum, and the different study designs used for conducting clinical effectiveness research. Case studies, guest lectures by faculty engaged in clinical effectiveness research, and other applied approaches will be used.

GMS 6861: Applied Biostatistics I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Consent of Department.
Basic probability and distribution concepts and statistical analysis methods, including descriptive measures, point estimation, hypothesis testing (e.g., t test, analysis of variance, chi-square test etc.), confidence interval, simple linear regression and some nonparametric methods. SPSS will be used for basic statistical analyses.

GMS 6862: Applied Biostatistics II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Applied Biostatistics I
Provides background to apply and appropriately interpret statistical applications in the medical and health related fields, and to formulate clinical and basic science research questions in statistical terms.

GMS 6863: Analysis and Study Design for High Dimension, Low Sample Size Data
Credits: 3 **Grading Scheme:** S/U
Prerequisite: consent of instructor.
Rotating topics include current statistical methods for the study, design and analysis of high dimension, and low sample size data. Emphasizes the importance of scientific thinking and analysis validity.

GMS 6872: Science and Ethics of in Vitro Fertilization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Scientific, practical, and ethical issues in establishing and operating a human in vitro fertilization laboratory.

GMS 6881: Special Studies in Epidemiology and Health Policy Research
Credits: 2 **Max: 4** **Grading Scheme:** S/U
Prerequisite: GMS 6800; consent of instructor.
Advanced or specialized topic in epidemiology or health policy with the approval of the instructor.

GMS 6882: Directed Readings in Epidemiology and Health Policy
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6800 or consent of instructor.
Student selects an advanced or specialized topic in epidemiology or health policy with instructor approval.

GMS 6883: Practicum Experience in Epidemiology and Health Policy
Credits: 2 **Grading Scheme:** S/U
Prerequisite: GMS 6800 or consent of instructor.
Student selects a state or federal health agency or research project in epidemiology and health policy with instructor approval.

GMS 6884: Research in Epidemiology and Health Policy
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6800, consent of instructor.
Individual, approved research topic or project in epidemiology and health policy.

GMS 6885: Research Designs in Health Outcomes and Policy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: GMS 6861 & GMS 6851 . These courses may be taken concurrently.
This course will be providing an overview of the research design of observational and experimental studies. This course will be focusing on critical assessment and methodological challenges important in health outcomes and policy studies. The course will also be providing the foundation for Department of Health Outcomes and Policy advanced methods and policy electives.

GMS 6893: Clinical and Translational Science Seminar Series
Credits: 2 Max: 6 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Researchers discuss clinical, laboratory, epidemiologic, and economic aspects of a given topic; also, intervention strategies and community outreach activities. Exposure to faculty who may be available for Clinical Preceptorship assignments. Topics rotate every 2 weeks.

GMS 6895: CTS Journal Club
Credits: 1 Max: 3 **Grading Scheme:** S/U
Prerequisite: GMS 7093
Rotating topics include the presentation and critical discussion of recent, original papers about clinical and/or translational research relevant to human health and disease.

GMS 6896: Health Outcomes and Policy Seminar
Credits: 1 **Grading Scheme:** Letter
Prerequisite: Permission of instructor.
Providing a forum for students and faculty to critically evaluate cutting-edge research and methodology and discuss the implications for their own research through interactive seminar series. Both recently published research and research in progress are evaluated.

GMS 6901: Seminar in Biology of Disease
Credits: 1 Max: 8 **Grading Scheme:** S/U
Current advances in etiology and treatment of disease.

GMS 6903: Manuscript and Abstract Writing for Clinician/Scientists
Credits: 2 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Didactic and interactive sessions to improve the quality of manuscript and abstract writing.

GMS 6905: Independent Studies in Medical Sciences
Credits: 1-10 Max: 12 **Grading Scheme:** Letter

GMS 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

GMS 6920: Genetics Journal Colloquy
Credits: 1 Max: 12 **Grading Scheme:** S/U
Prerequisite: consent of instructor.
Critical presentations and discussions of recent original articles.

GMS 6921: Immunology/Microbiology Journal Colloquy
Credits: 1 Max: 12 **Grading Scheme:** Letter
Prerequisite: GMS 6001, GMS 6006, or consent of instructor.
Critical presentations and discussions of recent original articles.

GMS 6931: Ethical and Policy Issues in Clinical Research
Credits: 2 **Grading Scheme:** Letter

Ethical and policy issues relating to conduct of clinical research. Basic understanding of regulations governing research on human subjects. Introduction to the topic of research with animals.

GMS 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

GMS 6943: Master's Translational Biotechnology Internship
Credits: 3 Grading Scheme: S/U
Prerequisite: GMS 6971
Summer Internship in Translational Biotechnology at a Biotechnology company (Florida-based preferred). Exposure to and participation in product development, regulatory compliance, business, science, medicine, manufacturing, and quality systems.

GMS 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

GMS 7001: Fundamentals of Biomedical Science Education
Credits: 2 Grading Scheme: Letter
Prerequisite: consent of instructor.
Overview of educational issues faced by biomedical scientists teaching at the undergraduate, graduate, or professional level. Practical guidelines most relevant for beginning biomedical science educators, including teaching skills and strategies and the underlying theory of learning and teaching.

GMS 7002: Practicum in Biomedical Science Education
Credits: 3 Grading Scheme: S/U
Prerequisite: GMS 7001.
Teach biomedical science and/or biotechnology (supervised by a professor) at summer workshops for high school students and teachers.

GMS 7003: Responsible Conduct of Biomedical Research
Credits: 1 Grading Scheme: Letter
Prerequisite: GMS 6001 or consent of instructor.
Key issues in the responsible conduct of biomedical research, following the research process from inception to planning, conducting, reporting, and reviewing biomedical research.

GMS 7093: Introduction to Clinical and Translational Research
Credits: 2 Grading Scheme: Letter
Prerequisite: Consent of APPCI program.
Design, management, measurement, and study limitations for research in the clinical setting.

GMS 7191: Research Conference
Credits: 1 Max: 12 Grading Scheme: S/U
Critical discussion and appraisal of research programs of faculty and students of the department.

GMS 7192: Journal Colloquy
Credits: 1 Max: 12 Grading Scheme: S/U
Critical presentations and discussions of recent original articles.

GMS 7194: Biotechnology Seminar
Credits: 1 Max: 12 Grading Scheme: Letter
Prerequisite: Prereq or coreq: Molecular Biology.
Given concurrently with BCH 7410. Presentations related to biotechnology industry by outside speakers and students.

GMS 7593: Topics in Pharmacology and Toxicology
Credits: 1-3 Max: 12 Grading Scheme: Letter
Seminars, informal conferences, or laboratory work on selected topics.

GMS 7794: Neuroscience Seminar
Credits: 1 Max: 12 Grading Scheme: S/U
Research seminars given by local, national, and occasionally international speakers.

GMS 7795: Special Topics in Neuroscience
Credits: 1-4 Max: 12 Grading Scheme: Letter
Specialized subjects in the neurosciences and allied disciplines. Current topics include biological imaging techniques, fundamentals of computational neuroscience, graduate research seminar series, write clubs, scientific communication workshop (Whitney Lab), and electrophysiological journal club (Whitney Lab).

GMS 7886: Health Outcomes and Policy PhD Seminar: Applied Research
Credits: 3 Grading Scheme: Letter
Prerequisite: GMS 6XXX:Research Designs in Health Outcomes and Policy
GMS 6861 & GMS 6862 & instructor approval
(GMS 6826: Advanced Design and Methodology for Case-Control Studies in Clinical Research or GMS 6829 or GMS 6832 or GMS 6844 or GMS 6846)

This course builds on students' knowledge of health outcomes theory, research design and methods with an applied focus. Students critically evaluate research with faculty who have successfully implemented health outcomes research in biomedical, clinical, and community settings. Students develop research questions, hypotheses, and study protocols in preparation for independent research.

GMS 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

GMS 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

GRE 6425: Greek Prose Composition
Credits: 3 Grading Scheme: Letter
Prerequisite: GRD 1131.
Construction of advanced sentences and complex prose in Classical Greek.

GRE 6755: Epigraphy
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: reading knowledge of ancient Greek and Latin at advanced level; basic reading knowledge of French and German.
Reading and interpretation of selected inscriptions in Greek and/or Latin.

GRK 6905: Individual Work in Modern Greek
Credits: 3-5 Max: 10 Grading Scheme: S/U
Prerequisite: graduate standing or consent of instructor.
Directed independent study.

GRW 6105: The Greek Tradition
Credits: 3 Grading Scheme: Letter
Synoptic survey of Greek literature.

GRW 6216: Greek Novel
Credits: 3 Max: 6 Grading Scheme: Letter
Selections from ancient Greek novels.

GRW 6316: Greek Tragedy
Credits: 3 Max: 9 Grading Scheme: Letter
Prerequisite: advanced reading ability in Greek.
Reading and analysis of Greek tragedies by Aeschylus, Sophocles, or Euripides, whose dramas form cornerstone of western theater. Text selection varies over 3-year cycle.

GRW 6317: Ancient Greek Comedy
Credits: 3 Grading Scheme: Letter

Prerequisite: advanced reading ability in Greek.
Reading and study of ancient Greek comedy, with selected plays by Aristophanes and Menander.

GRW 6345: Greek Lyric Poetry
Credits: 3 Max: 6 Grading Scheme: Letter
Variety and peculiarities of lyric content, style, grammar, structure, dialect, and meter shown through selected poems.

GRW 6346: Pindar
Credits: 3 Max: 6 Grading Scheme: Letter
Selected poems.

GRW 6347: Homer
Credits: 3 Max: 6 Grading Scheme: Letter
Readings from *Iliad* and *Odyssey.*

GRW 6386: Greek Historians
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: graduate status or consent of instructor.
Readings and analysis of Herodotus, Thucydides, or other major Greek historians.

GRW 6506: Plato
Credits: 3 Max: 6 Grading Scheme: Letter
Reading of *Symposium* and selected books of the *Republic*.

GRW 6705: Attic Orators
Credits: 3 Max: 9 Grading Scheme: Letter
Prerequisite: Graduate student status or consent of instructor.
Examines Attic oratory, focusing on rhetorical methods of persuasion; social dynamics of the disputing process; and political, social, and cultural impact of law on the Athenian democracy.

GRW 6905: Individual Work
Credits: 2-4 Max: 10 Grading Scheme: Letter
Prerequisite: graduate standing or consent of instructor.
Readings and reports in Greek language and literature.

GRW 6930: Special Topics in Greek Literature
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: graduate status or consent of instructor.
Intensive study of a particular author, genre, period, or subject.

GRW 6931: Comparative Study of Greek and Latin Literature
Credits: 3 Grading Scheme: Letter
Study of genre types.

GRW 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U
Prerequisite: reading knowledge of ancient Greek at an advanced level.

GRW 7979: Advanced Research
Credits: 3-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

GRW 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

HFT 6076: Introduction to Hospitality and Tourism
Credits: 2 Grading Scheme: Letter

This course will focus on the lodging and restaurant segments of the hospitality industry. This course takes a management perspective when introducing concepts and associated issues in the lodging, meetings/conventions, and restaurant operations. In addition, case study analysis will be largely used to enhance communications of business related concepts, ideas, and problem solving abilities through individual and group decision making in oral and written form.

HFT 6608: Hospitality Law and Risk Management
Credits: 2 **Grading Scheme:** Letter
This course will address law and risk management in the context of hospitality. In order for hospitality managers to be successful in reducing the probability of injury to participants, and providing the best defense against lawsuits, they must have knowledge of risk management and legal principles. The course is designed to convey the principles, tools, techniques and methods employed in order to be effective in reducing the risk of liability in the hospitality setting.

HFT 6747: Marketing in Hospitality/Tourism
Credits: 2 **Grading Scheme:** Letter
This course will provide a marketing analysis of the hospitality and tourism industry. The course will cover key marketing principles in practices and discuss tourism and hospitality marketing strategies. Case studies will be used to help students develop an understanding of the interrelationship among the marketing concepts that will be covered in this course. The course should allow students to take the proper marketing steps and make decisions given the latest trends in tourism and hospitality.

HIS 5450: Slavery in the New World: Comparative Perspectives
Credits: 3 **Grading Scheme:** Letter
Examines the evolution of slavery in the New World from its European and African antecedents through abolition and emancipation.

HIS 5484: Science and the Enlightenment
Credits: 3 **Grading Scheme:** Letter
Theoretical developments in the physical and biological sciences between the late seventeenth and late eighteenth centuries, including the significance of social and cultural dimensions of natural science.

HIS 5485: Special Studies in the History of Science
Credits: 3 **Max: 9** **Grading Scheme:** Letter

HIS 6060: Historical Method
Credits: 3 **Grading Scheme:** Letter
Introduction to the methods of research used by professional historians.

HIS 6061: Introduction to Historiography
Credits: 3 **Grading Scheme:** Letter
Introduction to the schools, theories, and philosophies of the discipline of history.

HIS 6416: Problems in Comparative Legal History
Credits: 3 **Grading Scheme:** Letter
Seminar begins with the question of what comparative legal history is and considers a series of case studies to explore approaches to comparative legal history.

HIS 6445: Postcolonial Theories
Credits: 3 **Grading Scheme:** Letter
Readings in history and theory of aftermaths of European imperialism. Emphasizes the passage from colonial to postcolonial regimes. Critiques of colonialism and nationalist decolonization emerging in nineteenth- and twentieth-century Americas, Asia, Africa, and Europe.

HIS 6469: Topics in Historiography of History of Science
Credits: 3 **Max: 9** **Grading Scheme:** Letter
History of writing in the discipline of history of science from the Enlightenment to Post-modern. Variable topics: classical studies, history of ideas, social construction.

HIS 6478: Topics in the Scientific Revolution
Credits: 3 **Grading Scheme:** Letter

Social, cultural, and intellectual roots of modern science from Copernicus to Newton. Variable topics: primary sources, historiography, humanism and science.

HIS 6480: Pre-Newtonian Sciences
Credits: 3 **Grading Scheme:** Letter
Physical and life sciences; may cut across chronological, geographical, and disciplinary boundaries.

HIS 6488: Readings in the History of Science
Credits: 1-4 Max: 12 **Grading Scheme:** Letter
Inquiry into the development of western scientific thought and institutions. Specific historical topics having intellectual coherence and substantial historiography.

HIS 6905: Individual Study
Credits: 1-3 Max: 12 including AMH 5905 **Grading Scheme:** Letter

HIS 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

HIS 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

HIS 6943: Internship in College Teaching
Credits: 2,4,6 Max: 6 **Grading Scheme:** Letter

HIS 6957: Nonthesis Project in History
Credits: 1-3 Max: 9 **Grading Scheme:** S/U
Nonthesis research.

HIS 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

HIS 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

HIS 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

HLP 6515: Evaluation Procedures in Health and Human Performance
Credits: 3 **Grading Scheme:** Letter
Evaluation and interpretation of tests and analysis of research data.

HLP 6535: Research Methods in Health and Human Performance
Credits: 3 **Grading Scheme:** Letter
Introduction to research methodology and design.

HLP 6911: Research Seminar
Credits: 1 Max: 6 **Grading Scheme:** S/U
Research presentations by graduate students and faculty in the College.

HLP 6935: Variable International Topics
Credits: 1-6 Max: 15 **Grading Scheme:** Letter
Prerequisite: adviser's approval.
Opportunity to study in a wide range of cultural settings.

HLP 7979: Advanced Research in Health and Human Performance
Credits: 1-12 **Grading Scheme:** S/U

Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field, or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

HLP 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

HOS 5085C: Principles of Postharvest Horticulture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BOT 3503 and BCH 3023 or equivalent.
Biological principles involved in harvesting, grading, packaging, transportation, and marketing horticultural crops, and their effects on quality maintenance. Offered even-numbered years in fall.

HOS 5115C: Horticultural Plant Morphology and Identification
Credits: 3 **Grading Scheme:** Letter
Prerequisite: for graduate students who have not taken ORH 3513C.
Principles and practices of horticultural plant identification using vegetative and floral morphology.

HOS 5242: Genetics & Breeding of Vegetable Crops
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AGR 3303 or equivalent.
Traditional and molecular breeding methods for vegetable crops and the influence of scientific research, government policies, and consumer preferences on vegetable crop improvement.

HOS 5306: Molecular Biology of Plant Hormones
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCH 6415 and HOS 4304 or equivalent.
Biochemistry, molecular biology, and physiology of plant hormones that control plant growth and development. Offered even-numbered years in fall.

HOS 5330: Postharvest Technologies for Horticultural Crops
Credits: 2 **Grading Scheme:** Letter
Prerequisite: HOS 5085C suggested. Open to graduate students and to upper-division undergraduate students with consent of instructor.
Intensive study of current technologies and procedures for harvesting and handling fresh fruit, vegetable, and ornamental crops grown in Florida. Requires field trip during spring break. Offered in spring.

HOS 5515C: Greenhouse and Nursery Operations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: for graduate students needing introduction to the principles of planning, organizing, and managing production operations. Not open to students who have taken ORH 3254.
Principles involved in managing nurseries. Interaction among media components, irrigation, and nutrition. Weekend field trips may be required.

HOS 5516C: Advanced Production of Greenhouse and Nursery Crops
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ORH 3254 or HOS 5515C.
Decisions in scheduling crops and developing cultural plans. Test for Pesticide Applicators License required. Practical aspects of managing nursery workers. Maintenance of crops outside assigned laboratory and one weekend field trip required.

HOS 5555: Tropical Fruit Production and Research in Florida
Credits: 3 **Grading Scheme:** Letter
A comprehensive study at the Tropical Research and Education Center at Homestead and field locations in South Florida. (Students will be in residence for 4 weeks at the Center.) Offered even-numbered years in summer.

HOS 5565: Advances in Vegetable Production Technology
Credits: 3 **Grading Scheme:** Letter
Survey of scientific knowledge related to production of vegetable crops. Offered odd-numbered years in spring.

HOS 5711: Phytochemicals in Food & Health

Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCH 4024 or equivalent or consent of instructor.
This course examines phytochemicals in fruits and vegetables including their distribution, roles in human health promotion, biosynthesis and degradation, enzymes, genes and case studies of crop breeding and engineering.

HOS 6201: Breeding Perennial Cultivars
Credits: 3 **Grading Scheme:** Letter
Prerequisite: AGR 3303.
Methods of breeding perennial fruit and ornamental cultivars using mutations, cell and tissue culture, polyploidy, recurrent selection, and wide hybridization. Conservation and domestication of wild plants. Offered odd-numbered years in fall.

HOS 6236: Molecular Marker Assisted Plant Breeding
Credits: 3 **Grading Scheme:** Letter
Providing an overview of terminology, methodology, and applied examples of utilizing molecular markers in a plant breeding program.

HOS 6311: Seed Physiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BOT 3503.
Examines dormancy, germination, growth, and development of seeds and the life processes involved; methods of handling and processing. Offered even-numbered years in spring.

HOS 6331: Postharvest Biology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BOT 3503 and BOT 5505C or equivalents.
Physiological, biochemical, and molecular aspects of senescence and ripening of harvested fruit, vegetative, and floral organs with attention to the storage and quality maintenance of harvested plant organs.

HOS 6345: Environmental Physiology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: BOT 3503 or consent of instructor.
Physiology from molecular to whole-plant level. The basis for responses to environmental factors such as light, temperature, water, atmosphere, and stress extremes. Offered even-numbered years in fall.

HOS 6412: Nutrition of Horticultural Crops
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BOT 3503 and HOS 4304 or equivalent.
Physiological, biochemical and environmental factors influencing nutritional status of horticultural plants and the resulting effects on growth, yield, and quality. Offered odd-numbered years in spring.

HOS 6523: Research and Development in Turfgrass Science
Credits: 3 **Grading Scheme:** Letter
Principles and practices of turfgrass improvement and management, including propagation, nutrition, physiology, soil management, and experimental methods applied to turf research.

HOS 6535: Woody Plant Physiology
Credits: 2 **Grading Scheme:** Letter
Prerequisite: BOT 3503 or equivalent.
Selected topics in fruit crop physiology, including dormancy/chilling; source-sink relations; light relations in plant canopy; water relations. Offered even-numbered years in fall.

HOS 6545: Advanced Citriculture I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: FRC 3212 and 4223 or equivalent.
Regulation of citrus vegetative growth including climactic, physiological, and cultural factors. Offered odd-numbered years in the fall at Lake Alfred CREC.

HOS 6546: Advanced Citriculture II
Credits: 3 **Grading Scheme:** Letter

Prerequisite: FRC 3212 and 4223 or equivalent.
Factors regulating flowering, fruit development and alternate bearing of citrus. Offered even-numbered years in spring at Lake Alfred CREC.

HOS 6905: Problems in Horticultural Science
Credits: 1-4 Max: 8 Grading Scheme: Letter
Independent study.

HOS 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

HOS 6931: Horticultural Science Seminar
Credits: 1 Max: 3 Grading Scheme: S/U
Oral presentation of material in one of the following areas: literature review, related to student's research; research results; or published paper, of relevance to horticulture. Subject matter determined by instructor. Offered in spring.

HOS 6932: Special Topics
Credits: 1-4 Max: 8 Grading Scheme: Letter
Study of contemporary research in horticultural science.

HOS 6934: Professional Seminar Preparation
Credits: 1 Grading Scheme: Letter
Preparation and oral presentation of proposal and research seminars emphasizing presentation design and mechanics.

HOS 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

HOS 6941: Practicum in Horticultural Science
Credits: 2-4 Max: 8 Grading Scheme: Letter
Prerequisite: admission is limited to graduate students majoring in horticultural science.
Supervised and individual work in professional areas of horticulture.

HOS 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

HOS 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

HOS 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

HSA 5103: Introduction to the U.S. Health Care System
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Overview of organization, delivery, and financing. Historical antecedents, patients, providers, payers, and health policy.

HSA 5174: Fundamentals of Health Care Finance
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Introduction to basic theory and principles of finance as applied to the health care industry. Financial statements, cost measurement, budgeting, and capital investment decisions.

HSA 6105: Professional Skills Seminar
Credits: 1 Max: 4 Grading Scheme: S/U
Prerequisite: consent of instructor.
Presentations by speakers from health-related organizations and programs designed to improve career planning and professional skills. May be repeated for credit.

HSA 6114: U.S. Health Care System
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Overview of structural elements of the contemporary system. Historical antecedents, patients, providers, payers, and the role of health policy.

HSA 6115: Introduction to Management of Health Services Organizations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Organizational principles and practices as applied to management. Organizational theory, managerial role, managing groups, work design, and organization design.

HSA 6126: U.S. Health Insurance System
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Description and analysis of U.S. health insurance systems. Topics include private vs. public insurers, demands for health insurance, health plan types, premium setting, and reimbursement of providers.

HSA 6152: Overview of U.S. Health Policy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Survey and critical analysis of federal and state health policy processes and outcomes as they relate to the effectiveness and efficiency of health services in the U.S. and selected countries.

HSA 6175: Health Care Financial Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EMHA option.
Applying corporate finance concepts and principles to health care organizations with the goal of improving financial decision making.

HSA 6177: Advanced Health Care Finance
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Applying accounting and financial management theory and principles to the health care industry, emphasizing managed care organizations and integrated delivery systems.

HSA 6179: Introduction to Health Care Finance
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Applying accounting and financial management theory and principles to the health care industry, emphasizing provider organizations.

HSA 6188: Strategic Management in Health Administration
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
The relationship of a health care organization to its environment. Strategic management processes, business planning, and other perspectives to aid in managing complex health care organizations.

HSA 6196: Health Services Operations Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Quantitative methods to support effective decision making. Descriptive statistics, sampling, quality control, hypothesis testing, regression analysis, forecasting, inventory control, and queuing models.

HSA 6197: Information Management in Health Administration
Credits: 3 **Grading Scheme:** Letter
Survey of information systems in healthcare administration (system composition, role, and development). Designing, evaluating, and selecting computer resources. Managing information technology in health care organizations. Current trends and issues in health care information systems.

HSA 6198: Information Management in Health Administration
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Survey of management information systems. Analyzing system requirements, system design and evaluation, selecting computer resources, and managing the implementation process.

HSA 6342: Human Resource Management for Health Services Managers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Knowledge and skills needed for effective management in complex health services organizations. Focuses on human resource acquisition, retention, and exit, as well as labor relations issues.

HSA 6385: Performance Management for Health Care Managers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Overview, emphasizing implementation. Aspects of performance defined in relation to structure, process, and outcomes, and meeting expectations and requirements of patients, insurers, government, and other organizations.

HSA 6427: Legal and Ethical Issues in Health Administration
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Survey of legal and ethical issues relating to health administration. Topics include government regulation, tort liability and malpractice, the professional-patient relationship, right to die, and patients without decisional capacity.

HSA 6436: Health Economics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Fundamental economic relations governing production, consumption, reimbursement, and financing of health services. Characteristics of markets for acute and long-term care services, insurance, and health care labor. Economic evaluation of technology.

HSA 6855: Internship in Health Administration
Credits: 6 **Grading Scheme:** S/U
Supervised fieldwork in a health administration setting.

HSA 6858: Internship in Health Services Research
Credits: 1-6 **Max: 6** **Grading Scheme:** S/U
Prerequisite: consent of instructor.
Supervised fieldwork.

HSA 6878: Externship in Legal Aspects of Health Services Administration
Credits: 3 **Max: 6** **Grading Scheme:** S/U
Supervised fieldwork in a health administration or health legal setting.

HSA 6905: Individual Study in Health Administration
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter

HSA 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

HSA 6911: Research Seminar in Health Services Research
Credits: 1 **Max: 6** **Grading Scheme:** S/U
Research presentations by graduate students.

HSA 6930: Special Topics in Health Services Administration
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter
Selected topics in theory and research in health services administration.

HSA 6935: Seminar in Health Administration
Credits: 2 **Max: 4** **Grading Scheme:** Letter

Prerequisite: consent of instructor.
Current issues including new organizational forms for health services delivery and financing, and changing governmental programs related to health care.

HSA 6939: Capstone Seminar in Health Administration
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Analysis of cases dealing with administrative and policy issues in health services. Emphasizes problem-solving in ill-defined, multi-faceted situations.

HSA 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

HSA 6946: Internship in Public Health Management and Policy
Credits: 1-6 Max: 6 **Grading Scheme:** S/U
Supervised fieldwork.

HSA 7106: Seminar in Health Care Access and Utilization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Overview of context and processes in which individuals seek and obtain health care services; distributional issues; equity.

HSA 7116: Health Services Organizational Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Major perspectives in organization theory and their applications to the health care sector.

HSA 7157: Research Foundations of Health Policy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
In-depth examination of U.S. health policy issues concerning cost, quality, and access; and interdisciplinary research methods used to address such issues.

HSA 7414: Society, Health, and Medical Care
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Overview of health and medical care as sociocultural phenomena; health behaviors, health care organizations, and health services delivery in a social and historical context.

HSA 7437: Advanced Health Economics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Exposure to advanced economics models of the health care sector, including static and dynamic models of consumer and producer behavior, risk selection in insurance markets, and optimal reimbursement mechanisms.

HSA 7707: Health Services Research Methods I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Current and historical thinking about the philosophy of science and scientific modeling. Experimental and quasi-experimental design. Introduction to measurement and sampling.

HSA 7708: Health Services Research Methods II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Review and appraisal of methods. Findings and examples from historical and contemporary studies. Introduction to qualitative and quantitative research methodologies.

HSA 7759: Quality and Outcomes in Health Services Research
Credits: 3 **Grading Scheme:** Letter

Prerequisite: consent of instructor.
Current research concerning small area variation, outcomes, appropriateness, and effectiveness. Theory and specifics of alternative quality improvement and assurance approaches. History of approaches to health care quality assessment.

HSA 7905: Advanced Individual Study in Health Services Research
Credits: 1-3 Max: 6 Grading Scheme: Letter

HSA 7936: Seminar in Health Care Costs and Financing
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Examination of health services research related to costs and financing. Cost measurement and analysis, health insurance, sources and methods of payment, current policy.

HSA 7938: Advanced Seminar in Health Services Research
Credits: 3 Max: 12 Grading Scheme: Letter
Prerequisite: completion of graduate core program and preliminary dissertation topic.

HSA 7979: Advanced Research
Credits: 1-4 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

HSA 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

HSC 5135: Emotional Health Education
Credits: 3 Grading Scheme: Letter
Importance of emotional health in achieving optimal health. Health educator's role in program development, supportive listening, and referral strategies for counseling. Development of communication skills. Common emotional health problems and concerns. Not open to students who have completed HSC 3134.

HSC 5138: Human Sexuality
Credits: 3 Grading Scheme: Letter
Theory and practice, including psychosexual development, human reproduction, sexual relationships, dysfunction, therapy, legal and ethical issues, as well as teaching and facilitative techniques. Not open to students who have completed HSC 3133.

HSC 5142: Drug Education
Credits: 3 Grading Scheme: Letter
Social, behavioral, environmental, and historical perspectives on substance abuse; content, issues, and instructional strategies appropriate for health education regarding alcohol, tobacco, and other drugs in school and community settings. Not open to students who have completed HSC 3140.

HSC 5315C: Teaching Health in Elementary Schools
Credits: 3 Grading Scheme: Letter
Examines needed health education areas, lesson and unit planning, methods and innovative approaches to health instruction, and evaluating comprehensive school health education.

HSC 5536C: Medical Terminology for the Health Professions
Credits: 3 Grading Scheme: Letter
Literal and "actual" meanings of medical and scientific terms. Anatomy, physiology, diagnostic, clinical, therapeutic, and pathology pictures presented with compound medical terms. Writings and pronunciation exercises augment the visual format to provide an interactive working knowledge of medical language.

HSC 5576: Nutrition Education for Special Populations
Credits: 3 Grading Scheme: Letter
Assessing nutrition information needs for selected population groups. Planning, implementing, and evaluating nutrition education programs for school and community settings. Not open to students who have completed HSC 3574.

HSC 5606: Spirituality and Health

Credits: 3 **Grading Scheme:** Letter
Exploring current research and theory about the relationship of spirituality and health/disease.

HSC 5618: Advanced Exercise Therapy, Adapted Physical Activity, & Health
Credits: 3 **Grading Scheme:** Letter
Art and science of effectively teaching exercise therapy, adapted physical activities, and healthy living strategies. Medical and health characteristics of common disabilities and methods for prescribing appropriate exercise therapy programs are presented. Multiple adapted equipment ideas will be presented to facilitate teaching in inclusive settings for all ages. Clinical experiences with individuals with disabilities are provided.

HSC 5626: Minority Health Issues
Credits: 3 **Grading Scheme:** Letter
Current health problems confronting socioeconomically disadvantaged groups and ethnic minority groups.

HSC 5657: Health and End-of-Life Issues
Credits: 3 **Grading Scheme:** Letter
Cultural, spiritual, and psychological traditions that affect health decisions, behavior, and medical care. Emphasizes developing professional and personal skills for coping with end-of-life issues for oneself and for assisting others.

HSC 5925: Seminar in Health Education
Credits: 1-6 **Max: 6** **Grading Scheme:** Letter

HSC 5938: Special Topics
Credits: 1-6 **Max: 12** **Grading Scheme:** Letter

HSC 5956: Writing for Professional Publications
Credits: 3 **Grading Scheme:** Letter
Procedures and practices in scholarly writing for health-related professional publications including topic selection, literature searches, internet applications, documentation, manuscript preparation, reasons for rejection, and legal and ethical considerations.

HSC 6037: Philosophy and Principles of Health Education
Credits: 3 **Grading Scheme:** Letter
History, philosophy, and ethics; theories of health behavior and principles of learning; areas of professional specialization; roles and functions of professional health educators; certification and continuing education; trends.

HSC 6216: Environmental Health
Credits: 3 **Grading Scheme:** Letter
Human interactions and the environment. How the environment, broadly defined, affects human health. Exploring personal and local solutions to current environmental concerns.

HSC 6235: Patient Health Education
Credits: 3 **Grading Scheme:** Letter
Health education theory and principles applied to the primary health care setting. Overview of agents and processes of disease, emphasizing program development for teaching protocols for specific diseases. Recent developments in patient education (e.g., outpatient programs and wellness centers).

HSC 6318: Planning Health Education Programs
Credits: 3 **Grading Scheme:** Letter
Basic principles of health education for various community settings, and using communication media in joint planning for comprehensive health education.

HSC 6506: Epidemiology
Credits: 3 **Grading Scheme:** Letter
Procedures used in studying the origin, distribution, and control of chronic and communicable diseases. Emphasizes the role of health education interventions in disease control.

HSC 6567: Health Promotion and Programming in Gerontology
Credits: 3 **Grading Scheme:** Letter

Planning, implementing, and evaluating health maintenance and promotion programs for adult populations, emphasizing the aging process.

HSC 6571: Contemporary Issues in Health Promotion
Credits: 3 **Grading Scheme:** Letter
Emotional health, value systems, stress and depression, aging and death, drug abuse, physical fitness, weight control, consumer health, and chronic and communicable diseases.

HSC 6575: Women's Health Issues
Credits: 3 **Grading Scheme:** Letter
Relevance for health promotion, prevention, education, and counseling.

HSC 6595: HIV/AIDS Education
Credits: 3 **Grading Scheme:** Letter
Examine the medical, social, legal and educational implications of HIV/AIDS on individuals and society.

HSC 6603: Theories of Health Behavior and Practice in Health Education
Credits: 3 **Grading Scheme:** Letter
Selected health behavior theories and applying these theories to the practice of health education and health promotion.

HSC 6605: Scientific Foundations of Holistic Health
Credits: 3 **Grading Scheme:** Letter
Examining and interpreting the holistic principles that influence and modify the health potential of the individual and the community.

HSC 6625: Trends in International Health
Credits: 3 **Grading Scheme:** Letter
Disease patterns and prevalence, contributing factors, organizational and governmental initiatives, and model programs; emphasizes problems amenable to health education interventions. Not open to students who have completed HSC 4650.

HSC 6629: Health Promotion for Priority Populations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Health issues confronting politically and socioeconomically disadvantage groups and ethnic minority groups.

HSC 6637: Social Marketing and Health
Credits: 3 **Grading Scheme:** Letter
Current theory and knowledge in field of social marketing. Analysis of components and applications of marketing within context of health behavior.

HSC 6646: Community Health Methods in Injury Prevention & Control
Credits: 3 **Grading Scheme:** Letter
Prerequisite: HSC 3032
Research-based concepts and theories related to unintentional injury prevention and control. Epidemiology and mechanisms of injury, community health injury surveillance systems, incidence and prevalence rates by category of injury, and role of law in injury prevention. Methods for planning, implementing, and evaluating injury prevention programs. Trends and future directions for research.

HSC 6665: Health Communication
Credits: 3 **Grading Scheme:** Letter
Survey of theory and research relevant to the role of communication processes in health behavior, health care, and health promotion.

HSC 6667: Health Communication Programs
Credits: 3 **Grading Scheme:** Letter
Prerequisite: HSC 6665 or consent of instructor.
Theory, research, and skills for planning, implementing, and evaluating health communication programs.

HSC 6668: Interpersonal Communication and Health
Credits: 3 **Grading Scheme:** Letter

Theory, research, and application of the role of interpersonal communication in health behavior, health care, and health promotion.

HSC 6695: Worksite Health Promotion
Credits: 3 **Grading Scheme:** Letter
Procedures involved in planning, implementing, and evaluating comprehensive health promotion programs; factors in risk assessment and reduction; strategies and resources for employee health education; ethical issues in client relations. Not open to students who have completed HSC 4694.

HSC 6712: Evaluating Health Education Programs
Credits: 3 **Grading Scheme:** Letter
Models and strategies for conducting formative and summative evaluations of health education programs.

HSC 6735: Research Methods in Health Education
Credits: 3 **Grading Scheme:** Letter
Introduction to methods of health education research.

HSC 6850: Internship in Health Education
Credits: 1-12 **Max: 12** **Grading Scheme:** Letter

HSC 6904: Readings in Health Education
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter

HSC 6905: Independent Study
Credits: 1-3 **Max: 12** **Grading Scheme:** Letter

HSC 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

HSC 6935: Current Topics in Health Education
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter

HSC 6939: Special Topics
Credits: 1-5 **Max: 10** **Grading Scheme:** Letter, S/U

HSC 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

HSC 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

HSC 6973: Project in Lieu of Thesis
Credits: 1-9 **Grading Scheme:** S/U
Planning, implementing, and evaluating a health education program intervention.

HSC 7904: Advanced Readings in Health Education
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter

HSC 7905: Advanced Independent Study in Health Education
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter

HSC 7937: Advanced Seminar in Health Education
Credits: 3 **Grading Scheme:** Letter

HUM 5357: Creativity and Health: Foundations of the Arts in Medicine
Credits: 3 **Grading Scheme:** Letter
This online course will be exploring the theoretical foundations that facilitate an understanding of the relationship of creativity to health and inform the field and practice of the arts in medicine.

HUM 5595: Arts in Medicine in Practice

Credits: 3 **Grading Scheme:** Letter
Prerequisite: none - only students accepted to the Graduate Certificate program will take this course
Exploring the practice of the arts in medicine in the fields of health and human services. The course will be providing a dynamic, interdisciplinary overview of diverse practices and methodologies in the field of arts in medicine in community and healthcare settings.

HUM 6340: Arts Advocacy and Public Policy
Credits: 3 **Grading Scheme:** Letter
An in depth study of the principles, practice, and policy of government's involvement with the arts sector. Students will study the historic relationships between the artist and government at all levels of society.

HUM 6353: Arts in Medicine Professional Seminar
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Creativity and Health; Arts in Medicine in Practice
The course will be providing a practical orientation to professional competencies, practice, and ethics for the field of arts in medicine. The professional seminar will be focusing on core issues, trends, and critical debates central to current practice within the discipline and its historical and contemporary applications.

HUM 6354: Arts in Medicine Advanced Professional Seminar
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Creativity and Health; Arts in Medicine in Practice; Arts in Medicine Graduate Practicum; Arts in Medicine Professional Seminar
The Arts in Medicine Advanced Professional Seminar will be providing an advanced orientation to professional competencies, practice, and ethics for the field of arts in medicine. This online professional seminar will focus on in-depth issues, trends, and critical debates central to current practice within the discipline and its historical and contemporary applications. This course is designed to synthesize and integrate student learning in preparation for practice in the field of arts in medicine.

HUM 6358: Arts in Medicine Capstone Proposal
Credits: 1 **Grading Scheme:** Letter
Prerequisite: Creativity and Health; Arts in Medicine in Practice; Arts in Medicine Practicum
Engaging the student in research, planning, and submission/approval of a capstone project plan as a part of the Master of Arts in Arts in Medicine. The student will undertake extensive literature review and other research to support the development of a plan for undertaking an arts project that addresses health in a healthcare or community setting.

HUM 6359: Arts in Medicine Capstone
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Creativity and Health; Arts in Medicine in Practice; Arts in Medicine Practicum; Arts in Medicine Capstone Proposal
This course will be engaging the student in advanced practice of the arts in medicine in a healthcare or community environment. The student will be implementing and evaluating a defined arts project in the healthcare or community setting, with the goal of developing professional level arts in medicine practice.

HUM 6942: Arts in Medicine Graduate Practicum
Credits: 3 **Grading Scheme:** Letter
Prerequisite: HUM6930, Creativity and Health: Foundations of the Arts in Medicine
This course will be engaging the student in focused professional level practice in an established arts in medicine program. The student will undertake 150 hours of work, including arts practice and administration, in an approved healthcare or community program setting, with the goal of preparing for professional arts in medicine practice.

HUM 6944: Arts in Action: Consulting Project in Performing Arts Management
Credits: 3 **Grading Scheme:** Letter
Providing opportunities for arts administration students to experience an arts organization through hands-on learning experience. Students must research an organization where they will work, negotiate their duties, and write a proposal outlining their projected work experience, which must be approved by the program director.

HUN 5246: Current Issues in Dietary Supplements
Credits: 2 **Grading Scheme:** Letter
Prerequisite: HUN 2201 or consent of instructor.

Federal laws and regulations covering definition, marketing, and labeling of dietary supplements. Discusses specific vitamins, minerals, herbs, and ergogenic aids. Reviews scientific literature and public information.

HUN 5441: Metabolic Response to Enteral and Parenteral Nutrition
Credits: 2 **Grading Scheme:** Letter
Prerequisite: BCH 3025, HUN 2201, and PET 2350 or equivalents.
Response of the body's organ systems to enteral and parenteral nutritional support, emphasizing physiological and biochemical adaptations.

HUN 5447: Nutrition and Immunity
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PCB 4713C.
Role of nutrition in immunity. Effect of nutrients, foods, and dietary supplements on regulation of the immune system.

HUN 6245: Advanced Human Nutrition
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCH 4024 or 3025, and a nutrition principles course.
Molecular and cellular aspects of nutrients and discussion of research techniques in genomics and proteomics.

HUN 6255: Clinical Nutrition
Credits: 2-12 Max: 12 **Grading Scheme:** Letter
Nutritional requirements and metabolism of nutrients in normal individual, altered nutritional requirements and metabolism of nutrients in different disease states, and practical aspects of nutritional and metabolic support of different types of patients.

HUN 6301: Nutritional Aspects of Lipid Metabolism
Credits: 3 **Grading Scheme:** Letter
Role of lipids in nutrition, with emphasis on energy metabolism and derangements in chronic diseases.

HUN 6305: Nutritional Aspects of Carbohydrates
Credits: 3 **Grading Scheme:** Letter
Characteristics, absorption, and metabolism of common carbohydrates in the food chain; carbohydrate metabolism and its regulation; carbohydrate metabolism in disease.

HUN 6321: Proteins and Amino Acids in Nutrition
Credits: 4 **Grading Scheme:** Letter
Prerequisite: BCH 3025.
Digestion, absorption, and degradation; emphasis on turnover, requirements, assessment of quality, and effects of deficiencies, toxicities, and physiological stresses.

HUN 6331: Vitamins in Human Nutrition
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCH 4024 or 3025.
Biochemical and physiological functions; nutrient requirements and interactions; response to deficiencies and excesses.

HUN 6356: Minerals in Nutrition
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BCH 4024 or equivalent.
Biochemical and physiological aspects of mineral absorption, metabolism, and function.

HUN 6812C: Analytical Techniques in Nutritional Biochemistry
Credits: 1 **Grading Scheme:** Letter
Prerequisite: BCH 4024 or 3025 and consent of instructor.
Biochemical analyses of tissues and fluids, radio-tracer methodology, metabolic studies, tissue handling, and formulation of experimental animal diets.

HUN 6905: Problems in Nutritional Sciences
Credits: 1-3 Max: 4 **Grading Scheme:** Letter
Prerequisite: consent of instructor. Not open to students on probation or conditional admission.
Individual study carried out in laboratory, library, pilot plant, or food industry.

HUN 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: consent of instructor.
For nonthesis students only.

HUN 6936: Topics in Nutritional Sciences
Credits: 1-4 Max: 8 Grading Scheme: Letter
Prerequisite: consent of instructor.
Special aspects or current developments in nutritional sciences.

HUN 6938: Nutritional Sciences Seminar
Credits: 1 Max: 4 Grading Scheme: Letter
Prerequisite: consent of instructor.
Presentation of reports on research in nutrition.

HUN 6939: Advanced Clinical Nutrition
Credits: 2-12 Max: 12 Grading Scheme: Letter
Applying normal and therapeutic nutrition principles to specific clinical topics based on cases from the health center environment.

HUN 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: consent of instructor.

HUN 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U
Prerequisite: for thesis students only.

HUN 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

HUN 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

ICM 5905: Special Studies
Credits: 1-3 Max: 12 Grading Scheme: Letter
Prerequisite: Graduate Standing

ICM 6420: Commercial Management and Cost Control
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate standing.
Budgeting and estimating, and principles of cost analysis for international projects.

ICM 6440: Construction Value Management
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate standing.
Classical value management/value engineering principles; practical applications for designers, contractors, suppliers, and other construction functions. Students conduct full-scale VM/VE studies of recent international projects.

ICM 6680: Principles of International Sustainable Construction
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate standing.
Techniques for creating good indoor and outdoor environments, renewable resources, conservation, low environmental impact methods, life cycle assessments.

ICM 6682: Construction Ecology and Metabolism
Credits: 3 Grading Scheme: Letter

Prerequisite: graduate standing.
Application of ecological theory and developments in industrial ecology to ecological design in built environment.

ICM 6684: High-Performance Green Building Delivery Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing, BCN 6585 or ICM 6680, or consent of instructor.
Overview of emerging delivery systems for high-performance green buildings and the basis on which their sustainability can be evaluated. LEED criteria are discussed in detail.

ICM 6710: Construction Human Resource Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Theories of human behavior and influence and leadership, organization, environment, motivation, and culture.

ICM 6750: Managing Construction Information Technology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Applications of computer and information systems in international construction industry. How information technology develops and how it dramatically affects structure, process, and performance of projects.

ICM 6751: International Construction Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Principles of overseas marketing and business development. International contract documents and management and performance aspects of international construction projects.

ICM 6752: Construction Finance and Investment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Aspects of project finance, from funding sources to financial engineering as well as managerial economics and accounting relevant to effect project management.

ICM 6761: Advanced Planning, Scheduling, and Logistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Overall schedule, including overall durations and phasing and review points, principles of logistics planning, and practicalities of detailed network scheduling.

ICM 6762: Construction Risk Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Overview of what is meant by risk and uncertainty and influences in international construction industry.

ICM 6770: Advanced Project Safety Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
International, governmental, and construction industry requirements of safety and loss control regulations. Project responsibilities.

ICM 6772: International Strategic Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Performance measurements and evaluation processes. Students assess international business opportunities, formulate business strategy, and learn how project strategy should be developed to best advantage of firm.

ICM 6905: Directed Independent Study in International Construction
Credits: 1-3 **Max: 3** **Grading Scheme:** Letter

ICM 6910: Supervised Research

Credits: 1-3 Max: 3 Grading Scheme: S/U

ICM 6930: Construction Communication and Research
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate standing.
Research proposal development process and statistical, computational, visual, and presentational tools available to researcher.

ICM 6934: International Construction Research
Credits: 1-6 Max: 12 Grading Scheme: S/U

IDC 6505C: Programming for Artists
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: graduate level in School of Art and Art History or consent of instructor.
Fundamental programming concepts that enable the digital artist to take full advantage of the range of computer-mediated interactivity.

IND 5023: Introduction to Architectural Interiors
Credits: 2 Grading Scheme: Letter
Prerequisite: consent of graduate coordinator.
Overview of the profession. Designing interiors to enhance human activity while observing life safety codes and human performance. Examines significant interiors and furniture components.

IND 5106: History of Interior Design I
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of graduate coordinator.
Design philosophy and interior elements in an architectural and sociological context. Record of human achievements expressed in built environment. Foundation for contemporary design and interior preservation practice. Slides, lecture, and discussion.

IND 5136: History of Interior Design II
Credits: 3 Grading Scheme: Letter
Prerequisite: IND 5106 or equivalent.
Continuation of IND 5106. Evolution of contemporary design philosophy. Foundation for contemporary design and interior presentation practice. Nineteenth-century revivals through current developments.

IND 5212C: Architectural Interiors I
Credits: 5 Grading Scheme: Letter
Prerequisite: consent of graduate coordinator. *Corequisite:* IND 5427C and IND 5638.
Developing interior spaces from conceptual phases to final design resolution, based on the needs of people, interior considerations, and exterior influences. Emphasizes three-dimensional design development, process, and detailed graphic representation of designed spaces.

IND 5213C: Introduction to Architectural Interiors Lab
Credits: 5 Grading Scheme: Letter
Prerequisite: consent of graduate coordinator.
Designing micro-interior environments in relation to the architectural setting. Examines human perception, dimension, and spatial activity requirements. Explores the design process and graphic communication of interior design ideas.

IND 5227C: Advanced Architectural Interiors I
Credits: 6 Grading Scheme: Letter
Prerequisite: consent of instructor or graduate coordinator. *Corequisite:* IND 5454C.
Advanced problems with respect to sophisticated clients in urban settings. Ranges from the infrastructure of large urban spaces to the details of individual spaces, including corporate office planning and design of both public and private spaces.

IND 5231C: Architectural Interiors II
Credits: 5 Grading Scheme: Letter
Prerequisite: IND 5212C or consent of instructor or graduate coordinator. *Corequisite:* IND 5434C and IND 5508.
The conceptual design process, design theory, and programmatic concerns included in residential, commercial, and institutional interior design. Emphasizes professional applications and the interior designer as team player, programmer, and problem solver.

IND 5232C: Advanced Architectural Interiors II
Credits: 6 **Grading Scheme:** Letter
Prerequisite: IND 5227C or consent of graduate coordinator. *Corequisite:* IND 5454C.
Advanced problems focusing on multiple phases of the design process through final design and detailing of each project. Final project demonstrates the highest level of design achievement.

IND 5317C: Interior Design Communication Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of graduate coordinator.
Conceptual process, design theory, and programmatic concerns involved in residential, institutional, and commercial interior design. Emphasizes visual communication techniques, including explanation of media, and forms of visual communication and design concepts.

IND 5326: Color Theory Planning and Practice
Credits: 3 **Grading Scheme:** Letter
Explores color through a review of focused research and experiential learning. Examines the art and science of color theory in the context on interior design and allied fields.

IND 5427C: Interior Design Construction Documents
Credits: 4 **Grading Scheme:** Letter
Prerequisite: consent of graduate coordinator.
Systematic overview of construction systems, technologies, and materials. Emphasizes the design of interior systems, and detailing of systems, as an extension of the overall design concept.

IND 5428: Materials for Interior Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of graduate coordinator.
Characteristics, fabrication, and installation of interior materials. Environmental sustainability and indoor air quality. Architectural building and finish materials and furnishings.

IND 5434C: Interior Lighting
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of graduate coordinator.
Introduction to lighting design based on critical awareness of luminous environment and principles and perception of light and color. Graphic exercises in lighting design, documentation, and lighting calculations based on student design project solutions.

IND 5445C: Furniture Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of graduate coordinator.
Materials, joinery, and detailing of furniture for interior spaces. Design of custom furniture.

IND 5454C: Advanced Interior Design Detailing and Construction Documents
Credits: 4 **Grading Scheme:** Letter
Prerequisite: consent of graduate coordinator.
Advanced problems in interior finish systems, such as interior architecture and cabinetry exploration, and production of interior mechanical and millwork drawings and construction documents. Integration of building codes and life safety issues.

IND 5464C: Computer Applications in Three-Dimensional Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of graduate coordinator.
Introduction to microcomputers as tools for illustration, drafting, and design development. Skills and technical knowledge in image processing, two-dimensional drawing, and three-dimensional modeling of interior architecture.

IND 5466: Interior Environmental Technology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of graduate coordinator.
Relation to human sensory reactions, psychological factors, health safety, and satisfaction. Vocabulary and concepts of interior environmental technology related to the process of design.

IND 5508: Business and Professional Practices for Interior Designers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor or graduate coordinator.
The profession of interior design as practiced today. Considers office practices and design project management. Contract documents, legal concerns, management and marketing strategies, personnel practices, and career planning. Ethics/contracting for design services via case studies.

IND 5638: Design Environments and Human Interaction
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of graduate coordinator.
Introduction to significant theories concerning the interaction of people with environments at various scales. Also, the corresponding applied environmental design implications of these theories will be explored. This survey of normative theories, philosophies and doctrines of environment and behavior will serve as an evidence base to support research-based design decisions.

IND 5937: Current Topics in Interior Design
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Framework to support theory, research, and application of interior design processes. Programming and post-occupancy phases through exploration of environment and behavior research and gaming simulation.

IND 6239: Advanced Topics in Interior Design Studio
Credits: 6 Max: 12 **Grading Scheme:** Letter
Advanced design topics, building on student interest and selected faculty experience. Medical facilities, advanced lighting design, facility planning design.

IND 6639: Methods of Interior Design Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Theory and methods related to research in interior design, environment and behavior, and history. Reciprocal interactions between people and the built environment.

IND 6906: Independent Studies and Readings
Credits: 1-3 Max: 9 **Grading Scheme:** Letter

IND 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

IND 6941: Interior Design Internship
Credits: 2-4 Max: 4 **Grading Scheme:** S/U
Prerequisite: IND 5427C, IND 5232C, IND 5508.
Opportunities to work in an architectural and interior design office gaining hands-on professional experience working up to 12 weeks.

IND 6971: Research for Master's Thesis
Credits: 1-6 **Grading Scheme:** S/U

INR 5935: Advanced Topics in International Relations
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: departmental approval.

INR 6036: Globalization, Regionalism, and Governance
Credits: 3 **Grading Scheme:** Letter
Analysis of interplay between globalization and regionalism, and effects on governance.

INR 6039: International Political Economy
Credits: 3 **Grading Scheme:** Letter

INR 6208: Advanced International Relations Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: INR 6607

Examination of contemporary debates about power, sovereignty, anarchy, order and conflict in international relations theory.

INR 6213: Seminar: Politics of the European Union
Credits: 3 **Grading Scheme:** Letter
Predominant political and economic theories that explain and prescribe regional economic cooperation. Sub-theories and models of decision making in European Union. Processes of EU policy making including agenda setting, policy formulation, and implementation. EU legislation in selected policy areas. Salient issues facing EU policy makers.

INR 6249: Inter-American Relations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Consent of instructor.
Addresses selected topics (such as free trade, regional integration, democracy promotion, international migration, drug traffic, transnational crime, etc.) in the light of major theories in International Relations.

INR 6305: Politics of American Foreign Policy Making
Credits: 3 **Grading Scheme:** Letter
Interaction between foreign policy and domestic political variables.

INR 6337: Survey of International Security
Credits: 3 **Grading Scheme:** Letter
Principal problems and issues in the area of international security, considered by examining samples of scholarly literature in the subfield.

INR 6352: International Environmental Relations
Credits: 3 **Grading Scheme:** Letter
Introduction to theories, processes and results of cooperation among states to deal with environmental issues that cross borders. Designing and implementating international environmental institutions and negotiating treaties that create institutions.

INR 6507: International Organization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: INR 6607.
Advanced reading and research. Special focus on international norms, regimes, formal intergovernmental and supranational organizations, and global constitutions.

INR 6607: International Relations Theory
Credits: 3 **Grading Scheme:** Letter
Basic forces, problems, and developments in international politics and organization.

INR 6936: Seminar in Transnational and Global Studies
Credits: 1 **Grading Scheme:** Letter
Seminar on current issues in transnational and global studies.

INR 6938: Seminar in Culture and World Politics
Credits: 3 **Grading Scheme:** Letter
Exploration of the interplay between culture and power in contemporary world politics. Special focus on concepts such as identity, representation and difference and their relation to international conflict and/or order.

IPM 5305: Principles of Pesticides
Credits: 3 **Grading Scheme:** Letter
Basic knowledge of pesticides and their use. Practical working knowledge of pesticides used in agricultural and horticultural settings. Offered spring term.

ISM 5021: Information Systems in Organizations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor. Designed for MBA students.
Introduction for graduate students with minimal microcomputer operation skills. Topics include the range of computer information technology available, language types and procedural languages, applications in organizations, management of resources, and trends. Students use microcomputers in the College's computing laboratories.

ISM 6022: Management Information Systems
Credits: 2 **Grading Scheme:** Letter
Policy and management issues surrounding information systems in today's enterprises. Strategic use, organizational impact, project management, human resource issues, and other topics important to understanding information systems in business.

ISM 6123: Systems Analysis and Design
Credits: 3 **Grading Scheme:** Letter
Examines the various activities performed when developing a new information system or upgrading an existing system.

ISM 6128: Advanced Business Systems Design and Development I
Credits: 2 **Grading Scheme:** Letter
Object-oriented analysis and model specification for business software systems. Articulation of key requirements (data, processes, physical components, deployment) using logical modeling methodologies.

ISM 6129: Advanced Business Systems Design and Development II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ISM 6128 or consent of instructor.
Continuation of ISM 6128. Focuses on object-oriented design of systems. How to translate business requirements into specific task and component requirements.

ISM 6215: Business Database Systems I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ISM 6129.
Fundamentals of data storage and retrieval models for business applications. Data modeling and database design principles. Theoretical foundations and exercises presented for relational data model and SQL.

ISM 6216: Business Database Systems II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ISM 6215.
Continuation of ISM 6215. Focuses on implementation and programming issues.

ISM 6217: Database Management Systems
Credits: 3 **Grading Scheme:** Letter
Designing and developing databases. Understanding the role of databases in meeting business information needs.

ISM 6222: Business Telecom Strategy and Applications I
Credits: 2 **Grading Scheme:** Letter
Survey of networking technologies used in WWW and e-commerce. TCP/IP networks and related security, networking hardware, and Internet software standards.

ISM 6223: Business Telecom Strategy and Applications II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ISM 6222 or consent of instructor.
Introduces traditional telephony. Discusses issues companies face on consolidation of voice and data networks. Technological developments, product announcements, and market activity. Ultimate focus is on strategy of voice/data integration.

ISM 6224: Business Telecom Strategy and Applications III
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ISM 6223 and ISM 6129.
Telecommunications analysis and design. Both tactical and strategic issues concerning integration.

ISM 6226: Business Telecom Strategy and Applications
Credits: 3 **Grading Scheme:** Letter
Introduction and overview of the field of business communications. Understanding telecommunications components and terminology applied to business in this age of electronic communication.

ISM 6236: Business Objects I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ISM 6215 , ISM 6222 , and ISM 6259.

Overview of main tools for business objects in enterprise programming, with hands-on experience. Distributed object models, component architectures, design methodologies and patterns, languages and development environments, and databases and repositories.

ISM 6239: Business Objects II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ISM 6236.
Extends concepts and tools of ISM 6236 to include practical aspects of using business objects in enterprise systems. Focus on overview of ERP systems, proxies, proxy repositories, and wrapping legacy systems with objects.

ISM 6257: Intermediate Business Programming
Credits: 2 **Grading Scheme:** Letter
Application in business systems. Classes, inheritance, polymorphism, interfaces, error handling, multi-threading, database connectivity, and their use in business information systems.

ISM 6258: Advanced Business Programming
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ISM 6257.
Event-driven, component-based programming. GUI components, and client end system design and implementation in distributed systems, as well as database development, networking, security, and object-oriented concepts.

ISM 6259: Business Programming
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ISM 6258.
An advanced system-implementation course to teach client end system design and implementation. Topics include object-oriented systems development, databases, networking, security, and web application development.

ISM 6423: Data Analysis and Decision Support
Credits: 2 **Grading Scheme:** Letter
Overview of various solution methods for data analysis programs such as clustering, classification, and regression that occur in business decision making. How methods support decision making.

ISM 6485: Electronic Commerce and Logistics
Credits: 2 **Grading Scheme:** Letter
Underlying technologies that herald innovations. How to capitalize on new electronic commerce and logistics in business.

ISM 6486: eCommerce Technologies
Credits: 2 **Grading Scheme:** Letter
Database management systems, systems design and Web-page design, human computer interface issues, artificial intelligence methods (such as data mining and expert systems), and intelligent software agents.

ISM 6487: Risks and Controls in eCommerce
Credits: 2 **Grading Scheme:** Letter
Strategic IT planning, policies and control; risk assessment, reliability, benchmarking and monitoring; privacy and security models and technologies; availability, continuity and compliance testing; and threat monitoring.

ISM 6942: Electronic Commerce Practicum
Credits: 2 **Grading Scheme:** Letter
Projects such as developing e-commerce business plans, constructing e-commerce sites, etc.

ISM 7166: Advanced Business Systems Design and Development III
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ISM 6129.
Continuation of ISM 6129. Focus on software project management and development. Exploration of object-oriented project management approach supported by computer-aided software engineering tool.

JOU 5007: History of Journalism
Credits: 3 **Grading Scheme:** Letter
Origin, development, and potentiality of print and broadcast media. Evolution of standards, policies, methods, and controls.

JOU 5705: Issues and the Press
Credits: 3 **Grading Scheme:** Letter
Influence of the press in defining and shaping public concern with major social issues.

JOU 6102: Reporting Workshop
Credits: 3 **Grading Scheme:** Letter
Depth reporting theory and practice.

JOU 6114: Journalist Bootcamp
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Providing a grasp of and hands-on experience in interactive journalism. We will present ways news is gathered and presented on multiple platforms, including the techniques of collaborative journalism, traditional broadcast storytelling and social media sourcing and reporting

JOU 6309: Seminar in Journalism as Literature
Credits: 3 **Grading Scheme:** Letter
Analysis of mass media writing, broadcast programs, and graphics to assess their merits both as journalism and as art. Various periods studied; emphasis on 20th century.

JOU 6344: Journalist Toolkit 1
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MMC 6XXX Journalist Bootcamp
Preparing the student to work as a journalist in today's newsrooms, where the online and digital platforms are at least as important as the traditional print or broadcast platforms.

JOU 6349: Journalist Toolkit 2
Credits: 3 **Grading Scheme:** Letter
Prerequisite: JOU 6344
Gathering information using journalism practices, such as in-person interviews, and learn to use various technologies (including video) to produce journalism stories for online and other digital platforms in this intermediate reporting and production course in which students .

JOU 6502: Newsroom Management
Credits: 3 **Grading Scheme:** Letter
Internal problems of newspaper operation. Status of personnel, effects of technological developments, news decision-making, defining objectivity, improving news coverage.

LAA 5331: Site Design Methodologies
Credits: 3 **Grading Scheme:** Letter
Learn, develop, and refine methodologies to effectively evaluate relevant natural, social, and cultural characteristics of a site and its context as an integral part of the planning and design process.

LAA 5366: Principles of Landscape Architecture
Credits: 5 **Grading Scheme:** Letter
Explores the range of introductory landscape architectural issues. Site design incorporating a mixture of cultural, environmental, and historic topics.

LAA 6231: Landscape Architecture Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor. *Corequisite:* LAA 6656C.
Explores theories pertinent to the practice and study of landscape architecture. Aesthetic and cultural principles and values and related ecological aspects. Designated core course.

LAA 6322: Project Management for Landscape Architects
Credits: 3 **Grading Scheme:** Letter
Two-part exploration of current methods, theories, and approaches to critiquing and evaluating built and proposed environments and their users. Designated core course.

LAA 6342: Landscape Architecture Criticism
Credits: 3 **Grading Scheme:** Letter
Case studies and readings of theories, models, and processes applicable to landscape architectural planning and design. Emphasizes the issues of perception, preference, and other user concerns. Designated core course.

LAA 6349C: Design Communications for Landscape Acrhitects
Credits: 4 **Grading Scheme:** Letter
Prerequisite: Graduate standing or consent of instructor.
Visualization techniques in landscape architectural design and planning, including traditional drawing conventions (plan, section/elevation & perspective) and digital communication and visualization methods.

LAA 6382: Ecological and Environmental Policy
Credits: 3 **Grading Scheme:** Letter
Survey of major environmental policy and law with particular reference to Florida case studies. Designated core course.

LAA 6525L: Advanced Landscape Construction Design
Credits: 4 **Grading Scheme:** Letter
Development of current communication and production techniques related to professional landscape architectural construction documentation.

LAA 6536: Landscape Management
Credits: 3 **Grading Scheme:** Letter
Survey of large and small scale management issues including principles of landscape ecology and site maintenance.

LAA 6656C: Advanced Landscape Architectural Design
Credits: 1-6 Max: 18 **Grading Scheme:** Letter
Complex project design. Emphasizes user issues, ecological concerns, and regional and cultural issues; and determination of form for sustainable environments.

LAA 6713: Cultural Landscapes
Credits: 3 **Grading Scheme:** Letter
Explores the intersection of human and cultural systems as expressed in physical form, with multi-disciplinary explorations of why a landscape looks the way it does, what landscapes “mean”, and how they are active agents/indicators in ongoing changes in cultural products, built environments, and society.

LAA 6716: History of Landscape Architecture
Credits: 3 **Grading Scheme:** Letter
History of man as expressed in urban form, gardens, parks, and public spaces.

LAA 6905: Directed Study
Credits: 1-3 Max: 9 **Grading Scheme:** Letter

LAA 6931: Water Conservation through Site Design and Green Roofs
Credits: 3 **Grading Scheme:** Letter
Exploration of the impacts of development on the natural systems of a site, particularly water resources. Mitigation of these impacts through sustainable site planning and design methodologies.

LAA 6931C: Special Topics
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Development of a current design opportunity. May be in collaboration with a professional office.

LAA 6933: Topics in European Design: Paris, France
Credits: 4 **Grading Scheme:** Letter
Corequisite: LAA 6952C.
Urban form and its relation to history, ecology, and culture.

LAA 6935: Gardens of the World
Credits: 3 **Grading Scheme:** Letter
Explores the garden as a complex expression of human relationships with each other and the larger environment, both physical and cultural.

LAA 6941: Supervised Internship
Credits: 3 **Grading Scheme:** S/U
Prerequisite: required for all students who do not document a landscape architectural experience.
Work is to be supervised by a registered landscape architect. Internship is to be accomplished in summer between first and second years or second and third years. Students, after completion, register in the next fall term for credit.

LAA 6952C: European Landscape Architecture Studio
Credits: 5 **Grading Scheme:** Letter
Corequisite: LAA 6933.
Studio to explore classical and ecological design methodologies in European landscape.

LAA 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

LAA 6979: Terminal Project
Credits: 1-6 **Grading Scheme:** S/U
This option, in lieu of thesis, is available for a design project that because of magnitude or design complexity does not adapt to thesis format.

LAE 6298: Literacy & Language Instruction
Credits: 3 **Grading Scheme:** Letter
Prepares preservice teachers to teach language arts integrated with writing & children's literature. The study combines theory & practice in language/writing development, differential instruction & assessment for diverse students & using literature for language & writing instruction.

LAE 6319: Language Arts in the Elementary School
Credits: 3 **Grading Scheme:** Letter
Speaking, listening, writing, and language study in the elementary classroom.

LAE 6339: Curriculum, Methods, and Assessment in Secondary English Language Arts
Credits: 3 **Grading Scheme:** Letter
Prerequisite: 30 hours of upper-division English. Designed for Proteach students only.
Introduction to the theory and practice of teaching English.

LAE 6348: Teaching Multiliteracies
Credits: 3 **Grading Scheme:** Letter
Application of theory and methods in teaching multiple modes of literacy.

LAE 6365: Language Arts: Language and Composition
Credits: 3 **Grading Scheme:** Letter
Methods and materials for teaching language and composition in the secondary school. This course and LAE 6366, in conjunction, comprise methods and materials for teaching English in the secondary school.

LAE 6366: Language Arts: Literature
Credits: 3 **Grading Scheme:** Letter
Theory and method for teaching literature in the secondary school. This course and LAE 6365, in conjunction, comprise methods and materials for teaching English in the secondary schools.

LAE 6407: Early Childhood Children's Literature
Credits: 3 **Grading Scheme:** Letter
Prerequisite: a course in children's literature.
Methods of involving young children (birth through kindergarten) with literature and the role of literature in the home and school.

LAE 6446: Multicultural Literature for Children and Adolescents
Credits: 3 **Grading Scheme:** Letter
Examines diverse cultures and theories in multicultural literature.

LAE 6447: Immigrant Experiences in Children's and Adolescent Literature
Credits: 3 **Grading Scheme:** Letter

Guide students' exploration of immigrant issues in children's literature. Develop a better understanding of diverse cultures represented in schools across the United States. Critique literature to determine how different cultures are represented in children's books.

LAE 6455: International Children's Literature
Credits: 3 **Grading Scheme:** Letter
Examine and develop curriculum for children's literature from around the world.

LAE 6505: Applied Preschool Language Disorders: Diagnosis and Treatment
Credits: 3 **Grading Scheme:** Letter
Seminar and practicum in diagnoses and treatment of preschool children with language learning disabilities.

LAE 6616: Seminar in Children's Literature
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Prerequisite: LAE 3005.
Trends and issues in children's literature and teaching literature. Topics rotate.

LAE 6635: Teaching Adolescent Literature in the Secondary School
Credits: 3 **Grading Scheme:** Letter
Explores what adolescent literature is and examines the theory and practice of teaching it in grades 7-12.

LAE 6714: Children's Literature in the Childhood Curriculum
Credits: 3 **Grading Scheme:** Letter
Evaluating, selecting, and using fiction, biography, poetry, and informational books for instructional, informational, and recreational purposes.

LAE 6861: Technology and Media Literacy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LAE 6366.
Methods and materials for integrating technology and media literacy in secondary English classrooms.

LAE 6865: Teaching Media Literacy with the Internet
Credits: 3 **Grading Scheme:** Letter
Application of literacy theory and pedagogy to teaching multimodal internet texts.

LAE 6939: Literacy, Family, and Culture
Credits: 3 **Grading Scheme:** Letter
Examines various literacy patterns of students with non-mainstream cultural, social, and linguistic backgrounds; explores the impact of home literacy on school learning.

LAE 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

LAE 6945: Practicum and Assessment for Teachers of Secondary School English
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of department chair.
Directed experiences focused on applying instructional strategies, ssessing student progress, and reflecting on ethical issues. Includes experiences in field and laboratory work.

LAE 6946: Children's Literature in Educational Settings
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LAE 3005.
Field studies in library or school settings with high involvement in children's literature.

LAE 6947: Writing Theories & Practices
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: English major.

LAE 7006: Language Acquisition and Education
Credits: 3 **Grading Scheme:** Letter

First language acquisition and implications for curriculum and instruction.

LAE 7519: Language and Inquiry
Credits: 3 **Grading Scheme:** Letter
Examines inquiry and its implications for curriculum and instruction.

LAE 7715: Research in Children's Literature
Credits: 3 **Grading Scheme:** Letter
Research and research methodologies in children's literature and teaching literature.

LAE 7934: Seminar in Composition Theory and Practice
Credits: 3 **Grading Scheme:** Letter
Examines the theory of composition, and research on the impact of writing.

LAE 7936: Seminar in English Language Arts
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Contemporary developments and research in English language arts and education.

LAH 5438: Modern Mexico
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Topics in Mexican history from independence in 1821 to the present. Emphasizes the Diaz dictatorship and the Mexican Revolution. Not open to students who have taken LAH 4433 or equivalent.

LAH 5475: Caribbean, Nineteenth and Twentieth Centuries
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
A social history of the modern caribbean. Slave emancipation and decolonization; race relations and black consciousness; labor, culture, and economic change. Not open to students who have taken LAH 4472.

LAH 5476: Caribbean History to 1800: Slavery, Colonization, and International Conflict
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Social, economic, and political history of the West Indies and the Circumcaribbean region to around 1800. Emphasizes slave societies. Not open to students who have taken LAH 4471.

LAH 5527: Andean Nations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Anthropological and political history of the postcolonial Andean region, including the republics of Venezuela, Colombia, Ecuador, Peru, and Bolivia.

LAH 5607: History of Amazonia
Credits: 3 **Grading Scheme:** Letter
Introduction to the history of the Amazon region. Places the region in the wider context of Latin American history and Atlantic history from the pre-colonial era to the 1980s.

LAH 5637: Brazil Since 1750
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
History of Brazil from the Portuguese era of reform to the military regime of 1964-85.

LAH 5933: Topics in Caribbean History
Credits: 3 **Grading Scheme:** Letter
Introduction to historiography of the Caribbean. Pre-Columbian times to the present.

LAH 5934: Topics in Latin American History
Credits: 3 **Max: 16** **Grading Scheme:** Letter

LAH 6934: Seminar in Colonial Spanish America
Credits: 3 Max: 6 Grading Scheme: Letter

LAH 6936: Seminar in History of Brazil
Credits: 3 Grading Scheme: Letter

LAH 6938: Seminar in Modern Spanish America
Credits: 3 Grading Scheme: Letter

LAS 6008: Ecological Principles
Credits: 3 Grading Scheme: Letter
Prerequisite: None.
Reviewing key concepts in ecology and placing them in the context of conservation and development issues faced by society. The course is designed for students who as professionals will use ecological knowledge rather than those who will conduct ecological research.

LAS 6220: Issues and Perspectives in Latin American Studies
Credits: 3 Grading Scheme: Letter
Overview of the economic and political history of Latin America, the history of thought about Latin American development problems, and US-Latin American relations during the 19th and 20th centuries.

LAS 6290: Tropical Conservation and Development
Credits: 3 Max: 6 Grading Scheme: Letter
Patterns and trends of tropical resource use and conservation analyzed against sustainability criteria. Socioeconomic, biological, and political factors addressed with emphasis on global linkages.

LAS 6291: Conservation and Development Skills
Credits: 3 Max: 6 Grading Scheme: Letter
Development of technical knowledge and interpersonal skills necessary for conservation and development professionals. Professional presentations, facilitation, workshop organization, and negotiation skills.

LAS 6292: Tropical Conservation and Development Research Methods
Credits: 3 Max: 6 Grading Scheme: Letter
Introduction to field research methods for studies focused on natural resource use and management by local populations in tropical regions. Emphasizes participatory approaches and integration of natural and social science tools.

LAS 6293: Design and Methods of Research in Latin American Studies
Credits: 3 Grading Scheme: Letter
Readings and exercises introducing the main quantitative and qualitative strategies that social scientists use to carry out research in Latin America.

LAS 6295: Latin American Business Environment
Credits: 2 Grading Scheme: Letter
Prerequisite: M.B.A. core.
Examination of the contemporary political economy of Latin America from a business perspective. Analysis of economic, social, political, and cultural factors affecting business and finance in the region. Special attention to recent market reforms and regional integration.

LAS 6296: Latin American Business Topics
Credits: 2-4 Max: 4 Grading Scheme: Letter
Prerequisite: M.B.A. core and LAS 6295.
Examination of various economic, management, finance, and legal topics affecting business and finance in Latin America.

LAS 6905: Individual Work
Credits: 1-3 Max: 9 Grading Scheme: Letter
Reading or research in topics focusing on a Latin American area, but cutting across disciplines.

LAS 6938: Seminar in Modern Latin American Studies
Credits: 3 Max: 9 Grading Scheme: Letter
Prerequisite: Latin American area concentration. *Corequisite:* required seminar for M.A. students in LAS.

Analyses of Latin American Studies with special focus on development and democracy in Latin America and the different perspectives and approaches within LAS to understand these issues. Different course sections are taught under this number, including Cuba, Change, and Continuity; Mexican Icons; and Research Design and Methods.

LAS 6940: Tropical Conservation and Development Practicum
Credits: 3 Max: 12 Grading Scheme: S/U
Design and organize an independent service-oriented project, beyond thesis research, on- or off-campus, illustrating leadership and collaboration, engaging others in workshops, outreach, and other practical activities.

LAS 6943: Development Theory and Practice in Latin America
Credits: 3 Max: 6 Grading Scheme: Letter
Rotating topics surrounding the inter-relationship of core fields of study of development in Latin America, including health sciences, natural sciences, social sciences, and management. Introduces the basic core competencies and practical skills required of a development practitioner.

LAS 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

LAT 6425: Latin Prose Composition
Credits: 3 Grading Scheme: Letter
Translating English into Latin and imitation of various Latin prose styles.

LAW 7493: LL.M. Research: Selected Topics in Environmental & Land Use Law
Credits: 1-3 Max: 3 Grading Scheme: Letter
Prerequisite: Students must be enrolled in the Environmental & Land Use Law LLM Program to register for this course
Involving substantial independent research/writing project under supervision of faculty member with special interest in particular topic. Student develops research topic with supervising faculty member; faculty member determines credits awarded based on research difficulty, topic and final written product of 20 pages per credit. Repeatable to 6 total credits.

LAW 7602: Taxation of Property Transactions
Credits: 3 Grading Scheme: Letter
Tax problems of individual taxpayers. Problems incident to the sale, exchange, and other disposition of property, including recognition and characterization concepts.

LAW 7604: Timing Issues in Taxation
Credits: 2 Grading Scheme: Letter
Aspects of federal income tax dealing with timing issues in income taxation, including tax accounting methods, transactional versus annual reporting, tax problems arising out of time value of money principles, and problems in the reporting of error corrections in taxation.

LAW 7611: Corporate Taxation I
Credits: 3 Grading Scheme: Letter
Tax considerations in corporate formations, distributions, redemptions, and liquidations, including Subchapter C and Subchapter S corporations. Consideration of alternatives relating to the sales of corporate businesses.

LAW 7613: Corporate Taxation II
Credits: 2-3 Max: 3 Grading Scheme: Letter
Prerequisite: LAW 7601 or consent of instructor.
Corporate reorganizations; corporate acquisitions and divisions, including transfer or inheritance of losses and other tax attributes; corporate penalty taxes; provisions for consolidated returns.

LAW 7614: U.S. International Tax I
Credits: 2-3 Max: 3 Grading Scheme: Letter
Tax definition of resident. Distinction between domestic and foreign entities. Taxation of business and nonbusiness income of foreign persons. Taxation of income from trades or businesses carried on by foreign persons in the U.S. Special rules on U.S. real property interests. Branch profits and branch interest taxes.

LAW 7615: U.S. International Tax II
Credits: 2 Grading Scheme: Letter

The foreign tax credit; special rules on controlled foreign corporations; foreign currencies; and cross-border transfers in nonrecognition transactions.

LAW 7617: Partnership Taxation
Credits: 3 **Grading Scheme:** Letter
Tax meaning of "partnership"; formation transactions between partner and partnership, determination and treatment of partnership income; sales or exchange of partnership interest; distributions; retirement; death of a partner, drafting the partnership agreement.

LAW 7623: Taxation of Gratuitous Transfers
Credits: 2 or 3 at option of department **Grading Scheme:** Letter
Federal estate, gift, and generation-skipping transfer taxes.

LAW 7625: Income Taxation of Trusts and Estates
Credits: 2 **Grading Scheme:** Letter
Taxation of income of trusts and estates, including simple and complex trsuts, annuities, property distributions, income in respect of decedent, grantor trusts.

LAW 7626: Estate Planning
Credits: 2 **Grading Scheme:** Letter
Planning lifetime and testamentary private dispositions of property, postmortem planning; analysis of small and large estates; eliminating and offsetting complicating and adverse factors; selection of fiduciary and administrative provision.

LAW 7632: Deferred Compensation
Credits: 2 **Grading Scheme:** Letter
Tax consequences of compensation in forms other than cash paid contemporaneously with performance of services, including nonqualified deferral compensation devices, and qualified pension and profit-sharing plans.

LAW 7633: Tax Exempt Organizations
Credits: 2 **Grading Scheme:** Letter
Study of exemption from federal income tax accorded to a variety of public and private organizations, and tax treatment of contributions to such organizations; public policies underlying exemption from tax and deductibility of contributions.

LAW 7640: Civil Tax Procedure
Credits: 2 **Grading Scheme:** Letter
Legal and procedural aspects of federal tax administration, collection and litigation.

LAW 7641: Procedures in Tax Fraud Cases
Credits: 2 **Grading Scheme:** Letter
Criminal offenses and methods of proof; investigative authority of the IRS; summons enforcement proceedings; search warrants and grand jury subpoenas; constitutional defenses to the compulsory production of evidence; the attorney-client privilege and other objections available to taxpayers and third parties.

LAW 7650: State and Local Taxation
Credits: 2 **Grading Scheme:** Letter
Nature and purpose of state taxation, comparison of property and excise taxes; uniformity of taxation; assessment and collection procedures; remedies available to taxpayers.

LAW 7660: Tax Policy
Credits: 2 **Grading Scheme:** Letter
Examines the principal criteria used in choosing forms of taxation. The impact of tax provisions on type and location of business and investment activities. Content may vary.

LAW 7680: Comparative Taxation
Credits: 2 **Grading Scheme:** Letter
A comparative study of tax systems of the world, including income and wealth transfer taxes and taxes on consumption. Basic structural features and policies.

LAW 7681: Consumption Taxation
Credits: 2 **Grading Scheme:** Letter

Value-added taxes of various countries and other types of consumption taxes; personal consumption taxes and flat tax.

LAW 7682: Income Tax Treaties
Credits: 2 **Grading Scheme:** Letter
Bilateral income tax conventions between countries to alleviate double taxation of income from international investments and activities and to provide for exchanges of tax information and consultation between tax authorities.

LAW 7683: Transfer Pricing
Credits: 2 **Grading Scheme:** Letter
International transactions between related entities in connection with tax requirement that such transactions be priced as if between unrelated persons.

LAW 7801: Introduction to the Legal System of the United States for LL.M. in Comparative Law, Part II
Credits: 1-2 Max: 2 **Grading Scheme:** Letter
Prerequisite: For LL.M. in comparative law program students only. *Corequisite:* Requires approval by the program director.
Continuing coverage of legal education, professionalism and the legal system of the United States, conducted over one or two full semesters. Typically, it will be conducted over two semesters with one teaching hour per semester week. Alternately, it will be taught as a two-credit course with two teaching hours per semester week.

LAW 7805: Legal Writing and Research for LL.M. in Comparative Law
Credits: 1-2 Max: 2 **Grading Scheme:** Letter
Prerequisite: For LL.M. in comparative law program students only. *Corequisite:* Requires prior approval by program director.
Intensive three week introduction to professional legal writing in American legal English taught by a legal writing professor; supplemented by research instruction by librarians. Requires prior approval by program director.

LAW 7905: Independent Study
Credits: 1-3 Max: 4 **Grading Scheme:** S/U

LAW 7906: Directed Research for LL.M. in Comparative Law
Credits: 1-2 Max: 2 **Grading Scheme:** Letter
Prerequisite: Open to LLM in Comparative Law students only. *Corequisite:* Requires approval by the program director.
Legal research to be completed under the supervision of a faculty member conversant the with topic selected and culminating in a paper.
Requires approval of the program director.

LAW 7910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

LAW 7911: Federal Tax Research
Credits: 1-2 Max: 2 **Grading Scheme:** Letter
Substantial research and writing project on a federal tax subject; instruction in tax research techniques.

LAW 7916: Research Methods and Environmental Land Use Law
Credits: 1 Max: 2 **Grading Scheme:** Letter
Rotating topics assisting students with the design of their LLM written projects, by guiding the students on topic selection, research methods, and trends in recent research.

LAW 7931: Current Federal Tax Problems
Credits: 1-2 Max: 6 **Grading Scheme:** Letter
Significant current developments in tax law, often with emphasis on policy considerations. Variable content.

LAW 7932: Introduction to the Legal System of the United States for LLM in Comparative Law, Part I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Open only to LLM in Comparative Law Students. *Corequisite:* Requires approval by the program director.
Intensive 3-week introduction to the comparative method and to legal education, professionalism and the legal system of the United States. Requires approval by the program director.

LEI 5121: Outdoor Recreation and Park Management
Credits: 3 **Grading Scheme:** Letter

History and current issues of outdoor recreation, preservation, and conservation policy in U.S. Review of government and private roles in providing outdoor recreation opportunities. Synthesis of social science research on outdoor recreation behavior and implementation of strategies utilizing current research in park management operations to improve visitor experiences.

LEI 5188: Trends in Leisure Studies
Credits: 3 **Grading Scheme:** Letter
Introduction to issues and trends pertinent to leisure, recreation, and tourism. Influence of social, demographic, and environmental changes on leisure behavior examined drawing on relevant theories, empirical research, and contemporary articles to frame analysis.

LEI 6108: Contemporary Theories of Recreation and Leisure
Credits: 3 **Grading Scheme:** Letter
Understanding of leisure and recreation as they relate to social, psychological, and economic constructs. Examination of current studies of leisure behavior. Investigation of both holistic and particular dimensional viewpoints and approaches in determination of leisure behavior.

LEI 6325: Ecotourism
Credits: 3 **Grading Scheme:** Letter
Examination of tourism development in hospitality and tourism industry. Emphasis on planning and impacts to area. Case studies used to understand planning and development issues in various destinations worldwide emphasizing how tourism policy affects destination.

LEI 6326: Sport Tourism
Credits: 3 **Grading Scheme:** Letter
Analysis of the interconnectedness of sport and tourism for behavioral, historical, economic, management, marketing, environmental, and policy perspectives.

LEI 6336: Tourism Planning and Development
Credits: 3 **Grading Scheme:** Letter
Examination of development in hospitality and tourism industry. Case studies used to understand planning and development issues in various destinations around the world. Emphasis on impact of tourism policy on area.

LEI 6351: Heritage Tourism
Credits: 3 **Grading Scheme:** Letter
Theory, practice, history, terminology and current issues of cultural heritage tourism planning and management. Basic survey of cultural and heritage components: motives and behaviors of heritage tourist attractions (museums, arts, festivals/events, and landscapes), interpretation, economics, and policies.

LEI 6439: Campus Recreation Administration and Programming
Credits: 3 **Grading Scheme:** Letter
In-depth examination of operations, innovation, and development of campus recreation offerings at community college, university, and military levels. Facility construction and maintenance, personnel management, and fiscal responsibility for diverse audience, primarily from director's perspective.

LEI 6513: Administrative Procedures in Leisure Services
Credits: 3 **Grading Scheme:** Letter
Understanding fundamentals of management and organization behavior theory underlying provision of tourism, recreation, and park facilities and services. Influence of external environment on management procedures emphasized.

LEI 6514: Administrative Issues in Recreation, Parks, and Tourism
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LEI 6513
Integration of prior courses through an in-depth study and discussion of the critical issues and concerns that influence provision of recreation, parks, and tourism services. Specific issues reflect students' concentration and interest, as well as recent developments in administrative practice.

LEI 6515: Legal Issues in Recreation, Parks, and Tourism
Credits: 3 **Grading Scheme:** Letter

Comprehensive study of legal, safety, and risk management issues relevant to field of recreation. Identification of implications for theoretical and applied research in recreation law and risk management; foundation of legal concepts and issues; implications for management of risk and improvement of safety; and impact of law on policy formation and decision-making.

LEI 6557: Recreation Management/Development in the Coastal Zone
Credits: 3 **Grading Scheme:** Letter
Introduction to the coastal environment as a predominant setting for recreation activity and development. Examines specific recreational problems associated with coastal zone management within the framework of coastal resources. Survey of public-private issues, planning concerns, and user conflicts common in the coastal zone.

LEI 6562: Advanced Marketing for Recreation, Parks, and Tourism
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LEI 6895.
Examination of multidimensional marketing functions common to complex recreation, park, and tourism organizations. Emphasis on strategic planning in marketing and its use by recreation, parks, and tourism organizations. Class project in tourism marketing helps develop more in-depth understanding and appreciation of application of marketing to local agency.

LEI 6704: Issues in Therapeutic Recreation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LEI 3703, 4713, 4711.
In-depth examination of therapeutic recreation. Societal structures and the systems that services are provided in. Challenges to growth of the field. Administration, practice, and research issues.

LEI 6895: Tourism Theory and Concepts
Credits: 3 **Grading Scheme:** Letter
Analysis of theories, concepts, and issues related to tourism. Topics include sociocultural impacts of tourism, tourist roles, definitions of tourism, tourist motivations, issues of inequality, terrorism and tourism, sex tourism, and tourism and urban regeneration.

LEI 6903: Readings in Recreation, Parks, and Tourism
Credits: 1-3 **Max: 6** **Grading Scheme:** S/U
Prerequisite: Intended for master's students.
Selected independent, in-depth readings on a specific topic. Readings will be supervised and evaluated.

LEI 6905: Directed Independent Study
Credits: 1-5 **Max: 10** **Grading Scheme:** Letter
Individual projects under faculty guidance.

LEI 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

LEI 6931: Special Topics in Recreation, Parks, and Tourism
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: Intended for master's students.

LEI 6935: Seminar in Recreation, Parks, and Tourism
Credits: 3 **Max: 6** **Grading Scheme:** S/U
Prerequisite: Intended for master's students.
Discussion of research topics, including contemporary issues in recreation, parks, and tourism.

LEI 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

LEI 6944: Practicum in Leisure Studies
Credits: 1-6 **Max: 6** **Grading Scheme:** Letter

LEI 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

LEI 7170: Foundations of Leisure Behavior

Credits: 3 **Grading Scheme:** Letter
Advanced examination of sociological, socio-psychological, and philosophical literature in leisure studies. Topics include leisure definitions debate; influence of gender, race, class, and age on leisure; time crunch and commodification of leisure; and role of leisure in 21st century society.

LEI 7708: Conceptual Issues in Therapeutic Recreation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Theoretical foundations and research efficacy of therapeutic recreation.

LEI 7901: Recreation, Parks, and Tourism in Higher Education
Credits: 3 **Grading Scheme:** Letter
Prerequisite: required for all doctoral students.
Examines current trends and issues impacting tourism, recreation, and sport management in higher education. Topics include curriculum development, accreditation, distance learning, university organization and governance, university economics, faculty responsibilities, and life in the academy.

LEI 7904: Advanced Readings in Recreation, Parks, and Tourism
Credits: 1-3 Max: 6 **Grading Scheme:** S/U
Prerequisite: intended for doctoral students.
Selected independent in-depth readings on specific topics. Supervised and evaluated.

LEI 7905: Advanced Independent Study in Recreation, Parks and Tourism
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Prerequisite: intended for all doctoral students.
Individual projects completed under faculty guidance.

LEI 7910: Advanced Supervised Research
Credits: 1-5 **Grading Scheme:** S/U

LEI 7933: Advanced Special Topics in Recreation, Parks, and Tourism
Credits: 1-3 Max: 6 **Grading Scheme:** Letter
Prerequisite: intended for doctoral students.

LEI 7936: Advanced Seminar in Recreation, Parks, and Tourism
Credits: 3 Max: 6 **Grading Scheme:** S/U
Prerequisite: intended for doctoral students.
Discussion of research topics, including contemporary issues.

LIN 5657: Gender and Language
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 3010.
Language in the construction of cultural, sex, and gender roles within a culture. A focal point is the grammaticalization of gender in languages of the world including non-Indo-European languages, and of the interactions of these grammatical structure with gender stereotypes. Consequences for linguistic science.

LIN 6039: Studies in Etymology: The Roots of English
Credits: 3 **Grading Scheme:** Letter
Prerequisite: 1 year of foreign language (preferably Latin or French).
Word formation and change in form and meaning, linguistic (Indo-European, Germanic) background of English, sociocultural history of English in England, and input from classical sources.

LIN 6084: Introduction to Graduate Research
Credits: 3 **Grading Scheme:** Letter
Scholarly and scientific approaches to study of linguistics. Scientific method, theory development, data processing, scholarly writing, and structure of research proposals.

LIN 6128: Historical Linguistics
Credits: 3 **Grading Scheme:** Letter

Prerequisite: LIN 6323, LIN 6501.
Principles and methods of historical and comparative linguistics, development of competing models for language change and linguistic relatedness. Examples and problems from a broad spectrum of the world's languages.

LIN 6129: Issues in Historical Linguistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 6341, LIN 6520, LIN 6128.
Advanced diachronic linguistics. The mutual interdependence of diachronic and synchronic analyses of language.

LIN 6165: Field Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 3201.
Developing the basic linguistic skills of discovering the structure of a language previously unknown to the investigator, starting with paper and pencil. Students learn to listen and interact with a native speaker, to construct questions, to organize and analyze data, to construct and test hypotheses, and to write up discoveries. Emphasizes ethics as a requisite of good science.

LIN 6208: Phonetics for Linguists
Credits: 3 **Grading Scheme:** Letter
Understanding of issues in experimental phonetics and appreciation of research techniques in the acoustic, physiological, and perceptual study in speech.

LIN 6226: Advanced Phonetics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 4205 or LIN 6208 or SPA 3011.
Exposes students to advanced issues in linguistic phonetics, and to experimental phonetic methods and designs.

LIN 6323: Phonology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 3201.
Phonemics, syllabic and prosodic phenomena, neutralization, distinctive features, morphophonemic alternation, phonological systems and processes. Terminology and notational conventions of generative phonology. Problems from a variety of languages.

LIN 6341: Issues in Phonology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 6323.
Theoretical approaches to major problems of phonological theory and/or its relationship to areas such as morphology and SLA. Emphasis on linguistic argumentation and independent research.

LIN 6402: Morphology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 3460.
Theory of word structure, derivation, and inflection. The position of morphology in a grammar, the relationship between morphology and the rest of the grammar, predictions of various theories of morphology. Examples and problems from a wide variety of the world's languages.

LIN 6410: Issues in Morphology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 6402.
Technical articles from a variety of twentieth-century schools. Prominent inquiries include the place of morphology in grammar, its relationship with other components, and whether a unified theory of morphology can be constructed.

LIN 6501: Syntax
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 3460.
The generative-transformational model of syntax: phrase structure, lexicon, case and agreement, movement, government, and anaphora. Emphasiezs problem solving and linguistic argumentation.

LIN 6520: Issues in Syntax

Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 6501.
Further investigation of the generative-transformational model of syntax: advanced clause structure, binding theory, constraints on movement, and logical form.

LIN 6562: Discourse Grammar
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 6501.
Recent developments in studying the relationships between sentence grammar and discourse. Subject and theme, relativization and subordination, pronoun and anaphora, transitivity, tense and aspect, information structure, and discourse basis for grammatical categories. Synthesis of topics into a systematic framework.

LIN 6571: Structure of Specific Language
Credits: 3 **Grading Scheme:** Letter
Prerequisite: introductory linguistics course.
Linguistic examination of Aymara, Cakchiquel, Eskimo, Armenian, Bulgarian, Polish, Turkish, Quechua, Sanskrit, Tamil, or another rarely taught language.

LIN 6601: Sociolinguistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 6323, LIN 6501.
Major approaches to language in context: ethnographic, sociological, linguistic. Applications of sociolinguistics to applied linguistics, social sciences, and education. Collection and analysis of data.

LIN 6622: Bilingualism
Credits: 3 **Grading Scheme:** Letter
Psycholinguistic and sociolinguistic aspects of bilingualism, with implications for education.

LIN 6642: Psychological Linguistics
Credits: 3 **Grading Scheme:** Letter
Scientific study of language as expressive behavior. Detailed examination of experimental research on linguistic and paralinguistic correlates of personality.

LIN 6707: Psycholinguistics
Credits: 3 **Grading Scheme:** Letter
Explores basic issues in psycholinguistic research, including language production, comprehension, acquisition, and development.

LIN 6708C: Methods in Psycholinguistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 6702; STA 2023 or consent of instructor.
Hands-on experience designing and conducting psycholinguistic experiments and analyzing experimental data.

LIN 6720: Second Language Acquisition
Credits: 3 **Grading Scheme:** Letter
Neurolinguistic, psycholinguistic, and sociolinguistic bases of second language acquisition in childhood and adulthood.

LIN 6741: Applied English Grammar
Credits: 3 **Grading Scheme:** Letter
Survey of English grammar based on the principles of second language acquisition and social interaction, with implications for teachers.

LIN 6773: Topics in Computational Linguistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Overview of the field of natural language processing and computational linguistics.

LIN 6796: Cognitive Neuroscience of Language
Credits: 3 **Grading Scheme:** Letter

Overview and critical evaluation of brain imaging techniques and issues in language and brain research, covering speech perception, word recognition, reading syntax, discourse processing, production, language acquisition, and bilingualism.

LIN 6804: Semantics I
Credits: 3 **Grading Scheme:** Letter
Truth conditional semantics as opposed to pragmatics. Basic notions in classical logic since logic is assumed in truth conditional semantics.

LIN 6826: Introduction to Formal Pragmatics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Introduces Pragmatics, the study of utterance meanings determined by situated uses of language and linguistic communication as a social activity. Explores the role of linguistic and extra-linguistic contexts in the production and interpretation of utterances. Topics include deictic and anaphoric expressions, sense and reference, presupposition, implicature, speech acts and coherence.

LIN 6856: Semantics II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 6804
Introduction to doing formal semantics for linguists, based on the theory of Richard Montague and theories developed within his approach.

LIN 6905: Individual Study
Credits: 1-3 **Max: 12** **Grading Scheme:** Letter

LIN 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

LIN 6932: Special Topics
Credits: 3 **Max: 27** **Grading Scheme:** Letter

LIN 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

LIN 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

LIN 7118: History of Linguistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 6323, LIN 6501.
The history of accounting for language data as evidenced by grammar-writing from Panini to the twentieth century, with primary focus on the development of linguistic thought in Europe and America.

LIN 7641: Seminar in Language Variation
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Possible topics include variation theory, conversational interaction, language contact, bilingualism, and pidgins and Creoles.

LIN 7725: Topics in Second Language Acquisition
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: LIN 6720.
Focused topic in the area of second language acquisition.

LIN 7885: Discourse Analysis and Pragmatics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: LIN 6601.
Methods of discourse analysis research and face-to-face discourse and pragmatics.

LIN 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U

Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

LIN 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

LIT 5335: Approaches to Children's and Adolescent Literature
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: at least 1 upper-division survey in children's or adolescent literature.
Exploration of controversies, trends, and critical problems.

LIT 6037: Studies in Verse
Credits: 3 Max: 12 **Grading Scheme:** Letter

LIT 6047: Studies in Drama
Credits: 3 Max: 12 **Grading Scheme:** Letter

LIT 6236: Postcolonial Studies
Credits: 3 Max: 09 **Grading Scheme:** Letter
Postcolonial literature and theory, including theories of colonialism and globalization, as well as the literature of Africa, Asia, the Caribbean, Australia, New Zealand, and Canada as they pertain to colonialism and its legacies.

LIT 6308: Studies in Comics and Animation
Credits: 3 Max: 12 **Grading Scheme:** Letter
Explores comics and comics theory, including intersections with visual rhetoric in graphic novels, manga, anime, animation, and other forms, from a variety of theoretical approaches.

LIT 6309: Communications and Popular Culture
Credits: 3 **Grading Scheme:** Letter
Study of the origins and qualities of the popular arts in modern society.

LIT 6327: Studies in Folklore
Credits: 3 Max: 12 **Grading Scheme:** Letter

LIT 6357: African-Amer. or African Diaspora Lit./Cultures
Credits: 3 Max: 12 **Grading Scheme:** Letter

LIT 6358: Theoretical Approaches to Black Cultural Studies
Credits: 3 Max: 9 **Grading Scheme:** Letter
Explorations of theory and black writing and the variety of theoretical approaches.

LIT 6855: Issues in Cultural Studies
Credits: 3 Max: 12 **Grading Scheme:** Letter

LIT 6856: Cultural Studies: Interventions
Credits: 3 Max: 12 **Grading Scheme:** Letter
Praxes, perspectives, and limitations of cultural and theoretical studies within the multiple contexts of their production.

LIT 6857: Cultural Studies: Movements
Credits: 3 Max: 12 **Grading Scheme:** Letter
Theories and histories of cultural groups, classification, or communities in various media.

LIT 6934: Variable Topics
Credits: 1-5 Max: 12 **Grading Scheme:** Letter
Studies in topics not normally offered in the regular curriculum, including intensive study of topics within a literary period, extensive study of motifs crossing several periods, and studies in various national or ethnic literatures (African, Afro-American, Jewish, Scots).

LNW 5325: Roman Elegiac Poetry

Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate student status or consent of instructor.
Readings in Latin from one or all of the following: Catullus, Tibullus, Propertius, Ovid, or other Latin elegiac poetry.

LNW 5655: Roman Poets: Horace
Credits: 3 Max: 6 **Grading Scheme:** Letter
Horace's poetry and metrics.

LNW 5665: Roman Poets: Vergil
Credits: 3 Max: 6 **Grading Scheme:** Letter
The poetic art of Vergil and its literary, historical, and political background.

LNW 5675: Roman Poets: Ovid
Credits: 3 Max: 6 **Grading Scheme:** Letter
Ovid's poetic art against its literary, historical, and political background.

LNW 5931: Comparative Study of Latin and Greek Literature
Credits: 3 Max: 6 **Grading Scheme:** Letter
Study by genre types (content varies).

LNW 6105: The Roman Tradition
Credits: 3 **Grading Scheme:** Letter
Synoptic survey of Roman literature.

LNW 6225: The Ancient Roman Novel
Credits: 3 Max: 6 **Grading Scheme:** Letter
Readings from Petronius and/or Apuleius.

LNW 6335: Roman Oratory and Rhetoric
Credits: 3 Max: 6 **Grading Scheme:** Letter
Theory and practice of Roman oratory and rhetoric through Latin readings in Cicero, Seneca, and Quintilian, and other sources.

LNW 6365: Studies in Roman Satire
Credits: 3 Max: 6 **Grading Scheme:** Letter
Readings from Horace, Persius, Petronius, Juvenal, Martial.

LNW 6385: Roman Historians
Credits: 3 Max: 9 **Grading Scheme:** Letter
Readings from major historians: Sallust, Caesar, Livy, Tacitus, Suetonius, and others.

LNW 6495: Late Latin Literature
Credits: 3 **Grading Scheme:** Letter
Readings from one or more of the following: Vulgate, Christian Church Fathers, Historia Apollonii, Peregrinatio Aetheriae, Harrington's Medieval Latin.

LNW 6905: Individual Work
Credits: 1-4 Max: 10 **Grading Scheme:** Letter
Readings and reports in language and literature.

LNW 6933: Special Topics in Latin Literature
Credits: 3 Max: 9 **Grading Scheme:** Letter
Prerequisite: graduate standing or consent of instructor.
Intensive study of particular author, genre, period, or subject.

LNW 6935: Proseminar in Classics
Credits: 3 **Grading Scheme:** Letter
Introduction to the study of classical literature, history of scholarship, bibliographies, areas of the discipline.

LNW 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

LNW 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

LNW 7979: Advanced Research
Credits: 3-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

LNW 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

MAA 5104: Advanced Calculus for Engineers and Physical Scientists I
Credits: 3 **Grading Scheme:** Letter

MAA 5105: Advanced Calculus for Engineers and Physical Scientists II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAA 5104.

MAA 5228: Modern Analysis I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: advanced calculus.
Topology of metric spaces, numerical sequences and series, continuity, differentiation, the Riemann-Stieltjes integral, sequences and series of functions, the Stone-Weierstrass theorem, and the Lebesgue theory.

MAA 5229: Modern Analysis II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAA 5228.

MAA 5404: Introduction to Complex Variables for Engineers and Physical Scientists
Credits: 3 **Grading Scheme:** Letter

MAA 6236: Mathematical Analysis for Statisticians
Credits: 3 **Grading Scheme:** Letter
Coreq: STA 6326. Numerical sequences and series, limits, continuity, differentiation, integration, series of functions. Applications to probability and statistics stressed.

MAA 6406: Complex Analysis I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAA 5229.
Rapid survey of properties of complex numbers, linear transformations, geometric forms and necessary concepts from topology. Complex integration. Cauchy's theorem and its corollaries. Taylor series and the implicit function theorem in complex form. Conformality and the Riemann-Caratheodory mapping theorem. Theorems of Bloch, Schottky, and the big and little theorems of Picard. Harmonicity and Dirichlet's problems.

MAA 6407: Complex Analysis II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAA 6406.

MAA 6616: Analysis I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAA 5229.
Fundamentals of measure and integration theory, including L^p spaces and the Radon-Nikodym theorem. Introduction to functional analysis: Banach spaces, Hilbert spaces, and the theory of linear operators.

MAA 6617: Analysis II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAA 6616.
Continuation of MAA 6616 Analysis I.

MAA 7526: Advanced Topics in Functional Analysis I
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: MAA 6617, 6332.
Algebraic and topological approach to current material and methods in analysis.

MAA 7527: Advanced Topics in Functional Analysis II
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: MAA 7526.

MAD 6206: Combinatorial Theory I
Credits: 3 Grading Scheme: Letter
Matching theory, Ramsey's theorem, lattice theory, Mobius inversion, generating functions. Polya's theorem, matroids, applications, block designs, graph theory.

MAD 6207: Combinatorial Theory II
Credits: 3 Grading Scheme: Letter
Prerequisite: MAD 6206.

MAD 6406: Numerical Linear Algebra
Credits: 3 Grading Scheme: Letter
Prerequisite: MAS 3114, 4105, or 4124; and programming language.
Topics most useful in applications with emphasis on numerical techniques: systems of linear equations, positive definite and toeplitz systems, least squares problems, singular value decomposition, and eigenvalues. Numerical stability and efficiency of algorithms as well as effect of perturbations on the problem. Companion to MAD 6407.

MAD 6407: Numerical Analysis
Credits: 3 Grading Scheme: Letter
Prerequisite: MAA 4212, MAA 5105, or MAA 5229; and programming language.
Numerical techniques to solve systems of nonlinear equations to approximate functions, to compute derivatives, to evaluate integrals, and to integrate systems of differential equations. Introduction to numerical techniques for partial differential equations. Companion to MAD 6406.

MAD 7396: Topics in Combinatorial Theory I
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: MAS 5312.
Topics chosen from among graph theory, coding theory, matroid theory, finite geometries, projective geometry, difference methods, and Latin squares.

MAD 7397: Topics in Combinatorial Theory II
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: MAD 7396.

MAE 5327: Middle School Mathematics Methods
Credits: 3 Grading Scheme: Letter
Mathematics materials, planning, and presentation.

MAE 5332: Secondary School Mathematics Methods and Assessment
Credits: 3 Grading Scheme: Letter
Prerequisite: preparation in the subject area equivalent to the requirements for high school certification.
Patterns of mathematics curriculum; practices in teaching mathematics; preparing, selecting, and using instructional materials; assessment techniques.

MAE 5347: Teaching K-8 Mathematics for Understanding
Credits: 3 Grading Scheme: Letter
Prerequisite: MAE4310 or consent of instructor.
Instructional strategies to support young learners' mathematical understanding.

MAE 5395: Multicultural Mathematics Methods
Credits: 3 Grading Scheme: Letter

Prerequisite: MAE 4310 or MAE 5318.
Mathematics education methods from a multicultural perspective.

MAE 5945: Secondary School Mathematics Practicum
Credits: 3 Max: 6 Grading Scheme: Letter
Directed experiences emphasizing instructional strategies, selecting instructional materials, sequencing student activities, using instructional moves, and diagnosing student progress. Field and laboratory settings.

MAE 6313: Problem Solving in School Mathematics
Credits: 3 Grading Scheme: Letter
Analyzes problem solving as an underlying theme in elementary mathematics for preservice teachers. Emphasizes development of pedagogical content knowledge in elementary school mathematics.

MAE 6615: Individualizing Instruction in Mathematics
Credits: 3 Grading Scheme: Letter
Organizing a continuous progress program: objectives, diagnostic testing, student placement, record keeping, evaluation, and reporting. The role of the teacher and team teaching. Developing a bank of materials, games, and activities for an individualized mathematics program.

MAE 6641: Readings and Research in Mathematics Education
Credits: 3 Max: 6 Grading Scheme: Letter
Examines readings and research that represent past, current, and future trends.

MAE 6916: Inquiry in Mathematics Teaching
Credits: 3 Grading Scheme: Letter
Prerequisite: EDE 6325 Teacher Inquiry/Action Research
Promoting reflective practices in teaching mathematics, this online course will be centering around a self-directed classroom inquiry project. The course first solidifies expertise in key topics in mathematics education. It then moves to the teacher's development, implementation, and evaluation of the classroom inquiry project in his/her classroom.

MAE 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: consent of graduate adviser.

MAE 6943: Internship in College Teaching
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: consent of graduate adviser.

MAE 7899: Mathematics Education Seminar
Credits: 3 Grading Scheme: Letter
Prerequisite: MAE 6138.
Issues and problems in mathematics education. Investigating and planning research relevant to selected problems.

MAN 5141: Leadership Skills
Credits: 1 Grading Scheme: S/U
Corequisite: master's students in business administration.
Concepts of leadership theory and methods to improve skills.

MAN 5245: Organizational Behavior
Credits: 3 Grading Scheme: Letter
Prerequisite: designed for M.B.A. students.
Relationships among the individual administrator and supervisors, the employees supervised, and associates at a comparable level in the organization.

MAN 5246: Organizational Behavior
Credits: 2 Grading Scheme: Letter
Designed for M.B.A. students. Behavior of individuals, groups, and organizations. Understanding organizations, how they work, and the people in them. Concepts presented in relation to core managerial competencies.

MAN 5265: Managing Groups and Teams

Credits: 1 **Grading Scheme:** Letter, S/U
Designed for master's students in business. Development of critical team skills and techniques to improve team processes and effectiveness.

MAN 5501: Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: QMB 5305. Designed for MBA students.
Introduction to the general class of problems associated with managing production facilities.

MAN 5502: Production and Operations Management
Credits: 2 **Grading Scheme:** Letter
Prerequisite: QMB 5305. Core course designed for traditional MBA students.
Introduction to POM, which focuses on design and control of productive systems within organizations.

MAN 6107: Motivation in Organizational Setting
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAN 5245 or consent of instructor.
Theory and research on motivational processes relevant to, and applied to, individual human behavior in complex organizations.

MAN 6128: Management Skills and Personal Development
Credits: 3 **Grading Scheme:** Letter
Explores the interpersonal skills needed to develop effective managers.

MAN 6149: Developing Leadership Skills
Credits: 2 **Grading Scheme:** Letter
Designed for master's students in business administration. Concepts of leadership theory and methods to improve skills.

MAN 6257: Power and Politics in Organizations
Credits: 1-3 **Max: 3** **Grading Scheme:** Letter
Prerequisite: consent of instructor. Designed for advanced master's students in business administration.
Links between theory and practice in the use of power and political skills in organizations.

MAN 6266: Managing Groups and Teams in Organizations
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MAN 5246 or equivalent.
Composing, developing, and motivating teams. Inter- and intra-team processes. Assessing barriers to effectiveness. Interventions to overcome team problems.

MAN 6286: Managing Strategic Processes and Change in Organizations
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MAN 5246 or equivalent.
Organizational and managerial issues. Strategic decision-making. Managing research and development as a strategic resource. Simulation and experimentation. Organizational change. Interactions among organizational strategy, structure, and culture.

MAN 6296: Designing Effective Organizations
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MAN 5246 or equivalent.
The nature of the firm. History of organizational design. Contemporary designs for vertical integration, diversification, low cost, differentiation, and mixed strategies. Organizational design problems.

MAN 6321: Human Resource Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Techniques for managing personnel functions such as recruitment, selection, performance evaluation, training, compensation, and labor relations.

MAN 6331: Compensation in Organizations
Credits: 2 **Grading Scheme:** Letter

Designed for M.B.A. students. Relevant practical and theoretical information regarding design of reward systems that support organizational strategies.

MAN 6351: Training and Development in Organizations
Credits: 2 **Grading Scheme:** Letter
Designed for M.B.A. students. Human resource management issues related to training and development. Methods for identifying training needs, developing content, conducting sessions, and evaluating effectiveness of programs according to organizational and individual objectives. Special topics such as developing management careers, identifying and developing management talent, and organizational change and development.

MAN 6365: Organizational Staffing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAN 5245.
Overview of human resource selection. Recruitment, job analysis, psychometrics, criterion measurement, development and evaluation of selection devices, and practical applications.

MAN 6366: Organizational Staffing
Credits: 2 **Grading Scheme:** Letter
Designed for M.B.A. students. Personnel selection. Foundations of job analysis, measurement, and selection techniques. Psychometric principles, analyzing job requirements, and assessing relevant human characteristics. Assessing individual contributions to organizational effectiveness.

MAN 6385: Strategic Human Resource Management
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MAN 5246 or equivalent.
Organizational human resource management. How organizations use human resources effectively to achieve organizational goals.

MAN 6446: Negotiations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: designed for M.B.A. students.
Theory and skills of negotiation and conflict resolution.

MAN 6447: Art and Science of Negotiation
Credits: 2 **Grading Scheme:** Letter
Designed for advanced master's students in business administration. Theory and processes of negotiation as practiced in variety of settings. Understanding behavior of individuals, groups, and organizations in competitive situations.

MAN 6508: Management of Service Operations
Credits: 2 **Grading Scheme:** Letter
Case studies and problems, including systems design, operation, and control. Emphasizes waiting-line systems.

MAN 6511: Production Management Problems
Credits: 2 **Grading Scheme:** Letter
Problems in the management of industrial enterprise;. Management principles and mathematical analysis applied to manufacturing. Product development and production. Materials and production control. Employee relations.

MAN 6528: Principles of Logistics/Transportation Systems
Credits: 2 **Grading Scheme:** Letter
Prerequisite: QMB 6755.
Logistics management in current business environment.

MAN 6537: Managing Technology in Organizations
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MAN 5246 or equivalent.
Issues in developing, diffusing, and adopting new technologies. Interplay of technology, organizations, and work. Interplay of developing, transferring, and adopting new technologies. Research and development of new products and processes. Technology transfer. Diffusion of innovation.

MAN 6573: Purchasing and Materials Management
Credits: 2 **Grading Scheme:** Letter
Industrial/institutional purchasing cycle for operating supplies, raw materials, components, and capital equipment in the context of materials management organizational concepts. Basic principles, policies, and procedures for requirement determination; procurement decision process; purchasing function; and materials management concept, organization, and philosophy.

MAN 6575: Purchasing and Supplier Relationship Management
Credits: 3 **Grading Scheme:** Letter
Basic concepts and tools for purchasing and supply-chain management. Procurement cycle, information flow, supplier selection, and internet procurement.

MAN 6581: Project Management
Credits: 2 **Grading Scheme:** Letter
Organizational role of the manager. Ways of structuring project organizations. Fundamentals of scheduling. Time and cost tradeoffs. Budgeting and cost estimation. Monitoring.

MAN 6586: Project Management
Credits: 3 **Grading Scheme:** Letter
Principles, techniques, and methods used for effective project management.

MAN 6598: Logistics and Distribution Management
Credits: 3 **Grading Scheme:** Letter
Activities that make products available to consumers at convenient locations, in the required quantities, and at minimum cost to the company.

MAN 6599: Tactical Logistics Planning
Credits: 3 **Grading Scheme:** Letter
Distribution value chain planning, tactical logistics decisions in vehicle routing, inventory management, and value chain contracts.

MAN 6617: International Operations/Logistics
Credits: 2 **Grading Scheme:** Letter
Global delivery/distribution channels, coordinating production/delivery operations in international markets, optimizing use of transportation networks, and designing information/communications systems that span supply chain.

MAN 6619: International Logistics
Credits: 3 **Grading Scheme:** Letter
Strategic issues in managing international supply chains, managing the exchange rate, and the operating risks in global supply chains.

MAN 6627: Cross Cultural Negotiation
Credits: 2 **Grading Scheme:** Letter
Theory and processes of negotiation as practiced in multicultural environments. Fundamental elements of deal making and dispute resolution.

MAN 6635: International Aspects of Human Resource Management
Credits: 2 **Grading Scheme:** Letter
Designed for master's students in business administration. Perspectives of a multinational firm.

MAN 6636: Global Strategic Management
Credits: 2 **Grading Scheme:** Letter
Designed for master's students in business administration. Strategic issues facing global and multinational organizations.

MAN 6637: Global Strategic Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: designed for master's students in business administration.
Analyzes how firms compete in the multinational and global environment.

MAN 6721: Business Policy

Credits: 3 **Grading Scheme:** Letter
Prerequisite: all MBA required courses. Designed for M.B.A. students. Taken the last semester before graduation.
Integrating and applying the various functional and support areas of business administration. Business policy making and administration from the general manager's perspective.

MAN 6724: Strategic Management
Credits: 2 **Grading Scheme:** Letter
Designed for M.B.A. students and taken the last semester before graduation. Complex strategic questions that confront general managers. Approaches learned in other courses combined with material particular to strategic management. Approaches used to formulate and implement overall strategies that allow firms to obtain and sustain competitive advantages while creating shareholder wealth.

MAN 6905: Individual Work in Management
Credits: 1-5 Max: 10 **Grading Scheme:** Letter
Prerequisite: departmental approval.
Reading and/or research in management.

MAN 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

MAN 6930: Special Topics
Credits: 1-3 Max: 12 **Grading Scheme:** Letter
Prerequisite: consent of instructor/department.
Topics not offered in other courses and of special current significance.

MAN 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

MAN 6957: International Studies in Management
Credits: 1-4 Max: 12 **Grading Scheme:** S/U
Prerequisite: admission to approved study abroad program, and departmental approval.

MAN 6958: International Study Program
Credits: 1-6 Max: 6 **Grading Scheme:** S/U
Designed for master's students in business administration. Integrative experience in international business through onsite visits to major industries and related governmental and nongovernmental organizations.

MAN 6973: Project in Lieu of Thesis
Credits: 1-4 Max: 4 **Grading Scheme:** Letter

MAN 7108: Seminar in Research Concepts and Methods in Management
Credits: 1-3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Design, execution, and evaluation of research in organizational behavior, human resource management, strategic management, and organization theory.

MAN 7109: Seminar in Motivation and Attitudes
Credits: 1-3 **Grading Scheme:** Letter
Various motivation theories, including expectancy and equity theories. Job satisfaction and other work attitudes, and their effects on individuals and organizations.

MAN 7146: Seminar in Leadership
Credits: 1-3 Max: 3 **Grading Scheme:** Letter
Theoretical and empirical work in leadership theory. Various theories including Ohio State studies, trait theory, LPC theory, path-goal theory, substitutes for leadership, and transformational/charismatic leadership theory.

MAN 7207: Seminar on Foundations of Organizational Theory
Credits: 1-3 **Grading Scheme:** Letter
Classical models of organizations as coordination and control mechanisms. Organizational boundaries, political processes, and contingency theory.

MAN 7208: Seminar in Contemporary Approaches to Organizations
Credits: 1-3 **Grading Scheme:** Letter
Recent organizational views such as population ecology, economic approaches to organizational design and control, organizations and technology, and network firms.

MAN 7267: Seminar on Groups and Teams Research
Credits: 1-3 **Grading Scheme:** Letter
Emerging research on groups and teams in organizations. Classic and contemporary theories and research on team composition and team performance.

MAN 7275: Organizational Behavior
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Individual and group behavior.

MAN 7328: Seminar on Staffing and Selection
Credits: 1-3 **Grading Scheme:** Letter
Theory and methods that organizations use to staff their positions.

MAN 7778: Seminar in Strategic Adaptation to Environment
Credits: 1-3 **Grading Scheme:** Letter
How organizations make decisions to cope effectively with their environments. Theory and research on how firms operate in their environments, such as theories of the firm, resource and knowledge-based views of organizations, and various strategic choices.

MAN 7779: Strategic Processes and Structure in Organizations
Credits: 1-3 **not repeatable for credit** **Grading Scheme:** Letter
Theories and research on how organizations implement strategic choices, covering decision making, corporate governance and control, strategy/structure issues, compensation strategies, and strategic change.

MAN 7933: Seminar in Management
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Research topics and literature in strategic aspects of decision making.

MAN 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

MAN 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

MAP 5304: Intermediate Differential Equations for Engineers and Physical Scientists
Credits: 3 **Grading Scheme:** Letter

MAP 5345: Introduction to Partial Differential Equations
Credits: 3 **Grading Scheme:** Letter

MAP 5489: Modeling in Mathematical Biology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: undergraduate course in ordinary differential equations.
Mathematical models of biological systems. Models of growth, predator-prey populations, competition, chemostat, epidemics, excitable systems, and analytical tools such as linearization, phase-plane analysis, Poincare-Bendixson theory, Lyapunov functions, and bifurcation analysis.

MAP 6208: Numerical Optimization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAD 6406 and MAD 6407 or consent of instructor.

Unconstrained and constrained optimization, linear and nonlinear programming, gradient, multiplier, and quasi-Newton methods. Penalty, multiplier, and projection methods for constrained problems.

MAP 6217: Introduction to Calculus of Variations for Engineers and Physical Scientists
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 5304, MAS 5157 or equivalent.
Extremum problems, first variation. Euler equation problems with fixed and movable boundaries. Lagrange multiplier methods for problems with constraints, canonical form, second variation, applications to physics and engineering.

MAP 6327: Applied Differential Equations I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAA 5229.
Theory and methods for solving linear and nonlinear systems of differential equations and partial differential equations. Applications and computer techniques included.

MAP 6356: Partial Differential Equations I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAA 5229, MAP 5345 or MAP 6506.
Cauchy-Kowalewski theorem, first order equations, classification of equations, hyperbolic equations, elliptic equations, parabolic equations, hyperbolic systems, nonlinear hyperbolic systems, existence theory based on functional analysis. Applications to physical sciences.

MAP 6357: Partial Differential Equations II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 6356.

MAP 6375: Numerical Partial Differential Equations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAD 6406 and MAD 6407 or consent of instructor.
Introduction to partial differential equations and fundamental concepts. Parabolic equations: finite differences, consistency, convergence and stability, 2- and 3-dimensional problems. Elliptic equations: finite differences, solution to linear equations, boundary integral equation methods. Hyperbolic equations: finite differences and method of characteristics. Introduction to finite elements. Methods of lines.

MAP 6376: Finite Element Method
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAD 6406 and MAD 6407 or consent of instructor.
Variational formulations of partial differential equations, finite element approximations; addresses theoretical framework and numerical issues. Finite element spaces in one, two, and three dimensions. Error analysis. Nonconforming finite element spaces. Isoparametric approximations to boundary conditions.

MAP 6467: Stochastic Differential Equations and Filtering Theory I
Credits: 3 **Grading Scheme:** Letter
Introduction to random functions; Brownian motion process. Ito's stochastic integral; Ito's stochastic calculus; stochastic differential equations. Linear filtering; Kalman filtering; nonlinear filtering theory.

MAP 6468: Stochastic Differential Equations and Filtering Theory II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 6467.

MAP 6472: Probability and Potential Theory I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAA 5229 or STA 6326.
Random variables, independence and conditioning. Laws of large numbers and the Central Limit Theorem. Stochastic processes, martingales, Gaussian processes, Markov processes, potentials and excessive functions.

MAP 6473: Probability and Potential Theory II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 6472

MAP 6487: Biomathematics Seminar I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAC 2312, MAP 2302, STA 6326 or MAP 4102.
Stochastic processes, differential equations, and reaction-diffusion equations used to model various biological processes. Among the applications covered are the following: population dynamics, epidemiology, genetics, enzyme kinetics, cell differentiation and morphogenesis, nerve impulse generation, and aggregation of slime mold. The course is designed to benefit graduate students in biological sciences, as well as mathematics.

MAP 6488: Biomathematics Seminar II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 6487.
Continuation of MAP 6487.

MAP 6505: Mathematical Methods of Physics and Engineering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAA 5404, MAP 5304, MAP 5345, MAS 5157 or equivalent.
Orthogonal functions; theory of distributions; integral equations; eigenfunctions and Green's functions; special functions; boundary and initial value problems, with emphasis on potential theory (Laplace and Poisson equations); the wave equation; and the diffusion equation.

MAP 6506: Mathematical Methods of Physics and Engineering II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 6505.

MAP 6941: Internship in Applied Mathematics
Credits: 1-5 Max: 9 **Grading Scheme:** Letter
Prerequisite: consent of supervisory committee chair.
Mathematical research on projects sponsored by a university laboratory or an off-campus industrial internship program.

MAP 7436: Seminar in Applied Mathematics I
Credits: 3 Max: 6 **Grading Scheme:** Letter
Various topics in applications of mathematics both classical and in areas of current research.

MAP 7437: Seminar in Applied Mathematics II
Credits: 3 Max: 6 **Grading Scheme:** Letter

MAR 5805: Problems and Methods in Marketing Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ACG 5065, QMB 5303. Designed for MBA students.
Concepts and techniques for resolving marketing management problems through the case method.

MAR 5806: Problems and Methods in Marketing Management
Credits: 2 **Grading Scheme:** Letter
Prerequisite: ACG 5065, QMB 5305.
Concepts and techniques for resolving marketing management problems through the case method.

MAR 6157: International Marketing
Credits: 2 **Grading Scheme:** Letter
Designed for M.B.A. students. Analysis and strategies for international environment.

MAR 6158: International Marketing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAR 5805. Designed for M.B.A. students.
Analysis and strategies for marketing in the international environment.

MAR 6207: Marketing Channel Management
Credits: 2 **Grading Scheme:** Letter
Elements and management of marketing distribution channels. An inter-organizational system for making goods, services, and concepts available to businesses and/or consumers and enhancing their time, place, and possession utilities.

MAR 6237: The Art and Science of Pricing
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MBA students.
Providing students with a good understanding of the strategy and tactics for an effective pricing decision. By the end of the course, students will be able to explain underlying mechanisms for the current pricing practices and apply their knowledge in improving pricing decisions.

MAR 6256: Strategy and Tactics of Pricing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MBA students.
Providing students with a good understanding of the strategy and tactics for an effective pricing decision. By the end of the course, students will be able to explain underlying mechanisms for the current pricing practices and apply their knowledge in improving pricing decisions.

MAR 6335: Building and Managing Brand Equity
Credits: 2 **Grading Scheme:** Letter
Prerequisite: QMB 5304, QMB 5305, MAR 5805.
Product and brand management decisions needed to build, measure, and manage branded equity. Focal objectives are to increase understanding of important issues in planning and evaluating brand strategies and to provide the appropriate theories, models, and other tools to make better branding decisions.

MAR 6456: Business-to-Business Marketing
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MAR 5805.
Strategy concepts for marketing products and services to other businesses; institutions such as hospitals and universities, and government. Role of marketing strategy as part of overall business strategy. Developing and launching new products, managing channels of distribution and sales forces, and building and maintaining alliances and partnerships.

MAR 6508: Customer Analysis
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MAR 5806. Designed for M.B.A. students.
Theory and research in the behavioral and social sciences applied to individual and aggregate behavior of consumers.

MAR 6646: Marketing Research for Managerial Decision Making
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAR 5805 and QMB 5303. Designed for M.B.A. students.
Examination of approaches and methods of marketing research with particular attention given to the perspective of the marketing manager.

MAR 6648: Marketing Research for Managerial Decision Making
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MAR 5806 and QMB 5305. Designed for M.B.A. students.
Examination of approaches and methods with particular attention given to the perspective of the marketing manager.

MAR 6722: Web-Based Marketing
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Master's students in Warrington College of Business Administration and for students who either pursue a career in online business or have general interest in the current marketing environment. Designed for MBA students.
Provides an understanding of the current online marketing environment and the strategies and tactics of web-based marketing.

MAR 6725: Introduction to Electronic Commerce
Credits: 3 **Grading Scheme:** Letter

MAR 6816: Advanced Marketing Management (MBA)
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAR 5805. Designed for M.B.A. students.
Advanced case course dealing with the wide range of strategic problems faced by the marketing manager.

MAR 6818: Advanced Marketing Management

Credits: 2 **Grading Scheme:** Letter
Prerequisite: MAR 5806.
Advanced cases dealing with the wide range of strategic problems faced by the marketing manager.

MAR 6833: Product Development and Management
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Intended for masters students
Management of new product development process including identifying new product opportunities, product concept testing, market feasibility analysis, prototype development, market testing, and commercialization.

MAR 6834: Marketing of Science and Technology
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MAR 5806 or consent of instructor.
Applying special marketing techniques and strategies to discoveries, inventions, and innovations embodied in products, services, and intellectual property. Emphasizes the particular characteristics of engineering- and science-driven market offerings.

MAR 6835: Marketing of Science and Technology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAR 5805.
Applying specialized marketing techniques and strategies to discoveries, inventions, and innovations embodied in products, services, and intellectual property. Focuses on particular characteristics of engineering- and science-driven market offerings.

MAR 6837: Consumer-Centered Product Design
Credits: 3 **Grading Scheme:** Letter
Project-based. Elaboration on product-development model introduced in core marketing course. Focus on intersection of marketing, engineering, and design.

MAR 6861: Customer Relationship Management
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MAR 5806.
Conceptual foundations, analytical techniques and marketing tactics for managing customer relationships.

MAR 6862: Customer Relationship Management
Credits: 3 **Grading Scheme:** Letter
Acquiring, building, and maintaining mutually beneficial relationships with customers. The customer as a financial asset that companies should measure, manage, and maximize.

MAR 6905: Individual Work
Credits: 1-4 **Max: 8** **Grading Scheme:** Letter
Prerequisite: departmental approval.
Reading and/or research.

MAR 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

MAR 6930: Special Topics in Marketing
Credits: 1-4 **Max: 16** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Selected topics in marketing management, research, or theory.

MAR 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

MAR 6957: International Studies in Marketing
Credits: 1-4 **Max: 12** **Grading Scheme:** S/U
Prerequisite: admission to approved study abroad program and departmental approval.

MAR 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

MAR 6973: Project in Lieu of Thesis
Credits: 3 **Grading Scheme:** S/U

MAR 7507: Perspectives on Consumer Behavior
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing or consent of instructor.
In-depth analysis of the field. Critically examines various theoretical and methodological approaches through marketing and consumer behavior literatures. Students must develop an original research project.

MAR 7576: Consumer Preference Formation and Change
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAR 7507 or consent of instructor.
Individual and social influences on attitude formation, change, and resulting behavior. Attitudes as evaluative responses to interplay of motivational and informational influences. Conceptual framework for analysis of nature and origin of value in consumer judgments.

MAR 7588: Consumer Information Processing and Decision Making
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAR 7507 or consent of instructor.
In-depth treatment of consumer information processing and choice behavior as a function of psychological and environmental factors. Underlying concepts and theories of individual judgment and decision making; critical evaluation of research in this area.

MAR 7589: Judgment and Decision Making
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Literature review related to psychology of judgment and decision making. Discussion of normative and descriptive theories of decision making and empirical evidence that speaks to those theories.

MAR 7622: Design of Marketing Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Design, execution, analysis, and interpretation of experiments and empirical methods in marketing.

MAR 7626: Multivariate Statistical Methods in Marketing
Credits: 3 **Grading Scheme:** Letter
Review of application of multivariate methods including multiple regression; factor discriminant and cluster analysis; and conjoint measurement to summarize and analyze marketing data.

MAR 7636: Research Methods in Marketing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: admission to Ph.D. in marketing or consent of instructor.
Experimental and quasi-experimental design; procedures for laboratory and field experiments; statistical conclusion, internal, external, and construct validity in research design; reliability and validity in measurement; creativity in hypothesis generation and theory testing in behavioral research.

MAR 7666: Marketing Decision Models
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ECO 7408 and departmental approval.
Development and implementation of model-based approaches to marketing decision making. Model-based analysis of advertising, pricing, promotion, distribution. Research project.

MAR 7667: Building Mathematical Models in Marketing
Credits: 3 **Grading Scheme:** Letter
Various issues and approaches for building and analyzing mathematical models of marketing phenomena and related decision problems.

MAR 7786: Marketing Literature
Credits: 3 **Grading Scheme:** Letter

Prerequisite: admission to Ph.D. in marketing or consent of instructor.
Survey of academic marketing literature, with special focus on conceptual and empirical studies of marketing strategy and marketing program variables.

MAR 7925: Workshop in Marketing Research
Credits: 3 Max: 9 Grading Scheme: Letter
Prerequisite: consent of department.
In-depth analysis of current research topics. Emphasis on research programs of leading scholars. Students critically appraise the rationale, strengths, and weaknesses of each study.

MAR 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

MAR 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

MAS 5157: Vector Analysis
Credits: 3 Grading Scheme: Letter

MAS 5311: Introductory Algebra I
Credits: 3 Grading Scheme: Letter
Prerequisite: MAS 4105 and 4302.
The basic algebraic systems: groups, rings, vector spaces, and modules. Linear transformations, matrices, and determinants.

MAS 5312: Introductory Algebra II
Credits: 3 Grading Scheme: Letter
Prerequisite: MAS 5311.

MAS 6331: Algebra I
Credits: 3 Grading Scheme: Letter
Prerequisite: MAS 5312.
Solvable and nilpotent groups, Jordan-Holder theorem, abelian groups, Galois theory, Noetherian rings, Dedekind domains, Jacobson radical, Jacobson density theorem, Wedderburn-Artin theorem.

MAS 6332: Algebra II
Credits: 3 Grading Scheme: Letter
Prerequisite: MAS 6331.

MAS 7215: Theory of Numbers I
Credits: 3 Grading Scheme: Letter
Prerequisite: 2 of MAA 6407, MAA 6617, MAS 6332.
Introduction to theory of numbers; theorems on divisibility; congruence, number-theoretic functions; primitive roots and indices; quadratic reciprocity law; Diophantine equations and continued functions.

MAS 7216: Theory of Numbers II
Credits: 3 Grading Scheme: Letter
Prerequisite: MAS 7215.

MAS 7396: Advanced Topics in Algebra I
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: MAA 6407, MAA 6617, MAS 6332 or MTG 6347.
Current topics in algebra.

MAS 7397: Topics in Algebra II
Credits: 3 Grading Scheme: Letter

MAT 6905: Individual Work

Credits: 3 Max: 9 Grading Scheme: Letter

MAT 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

MAT 6932: Special Topics in Mathematics
Credits: 3 Max: 9 Grading Scheme: Letter
Prerequisite: consent of graduate adviser, who should be consulted well in advance of registration.

MAT 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

MAT 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

MAT 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

MCB 5205: Microbiology of Human Pathogens
Credits: 3 Grading Scheme: Letter
Surveying advanced topics and current scientific literature related to human host-pathogen interactions and microbial pathogenesis, focusing on emerging bacterial and viral pathogens as agents of human disease, biosecurity, molecular identification methods, spread of multi-drug resistance among bacterial pathogens, drug discovery and alternative treatment research.

MCB 5252: Microbiology, Immunology, and Immunotherapeutics
Credits: 4 Grading Scheme: Letter
Prerequisite: CHM 2210, 2211, and consent of instructor.
Microbiology and immunology for pharmacy students. Microorganisms and infection, control with antimicrobials, host immune response, immune disorders.

MCB 5305L: Microbial Genetics and Biotechnology Laboratory
Credits: 2 Grading Scheme: Letter
Prerequisite: MCB 3023/3023L and 4303 or PCB 4522 with grade of C or higher.
Methods for mutagenesis, gene transfer and genetic mapping, plasmid isolation, restriction enzyme use, construction of chimeric (recombinant) plasmids, phage isolation and preparation.

MCB 5408: Anaerobic Microbiology and Biotechnology
Credits: 3 Grading Scheme: Letter
Prerequisite: MCB 3023/3023L, and BCH 4024 or CHM 4207.
Structure, physiology, metabolism, and biotechnology of anaerobes.

MCB 5458: Energy Transformation in Microorganisms
Credits: 3 Grading Scheme: Letter
Prerequisite: C or better in MCB 3020L; CHM 4207, BCH 3025, or 4024.
Energy transformations of dissimilatory and assimilatory processes in microorganisms with emphasis on regulation and energy cycles. Applications to microbial energy transformations to low energy technology.

MCB 5505: General Virology
Credits: 3 Grading Scheme: Letter
Prerequisite: MCB 3020/3020L and 4203 with grade of C or higher.
Basic information on families of viruses from humans, plants, insects, animals, and bacteria. Medical, clinical, diagnostic, biotechnological, and molecular aspects of these viruses.

MCB 6317: Molecular Biology of Gene Expression
Credits: 1 Grading Scheme: Letter

Synthesis, processing, transport, and translation of RNA in microorganisms and eukaryotes. Additional topics include epigenetic regulation of gene expression.

MCB 6318: Comparative Microbial Genomics
Credits: 1 **Grading Scheme:** Letter
Prerequisite: PCB 4522 and a working knowledge of basic bioinformatic tools.
Methods to allow experimental scientists to efficiently use genomic and post-genomic data that is publicly available. Examples taken primarily from the field of microbial metabolism and regulation.

MCB 6355: Microbial/Host Defense
Credits: 1 **Grading Scheme:** Letter
Prerequisite: MCB 4203 and PCB 5235: Immunology or equivalents, with the minimum grade of a C.
Principles of host defense to microbial invasion in a context of cellular biology involving both plants and animals.

MCB 6409: Microbial Cell Structure and Function
Credits: 3 **Grading Scheme:** Letter
Prerequisite: undergraduate biochemistry and microbiology and consent of instructor.
Review of current knowledge concerning structure, function, and biosynthesis of microbial cells.

MCB 6417: Microbial Metabolism and Energetics
Credits: 1 **Grading Scheme:** Letter
Prerequisite: MCB 4403 and BCH 4024 or CHM 3218 or equivalent.
Principles of energy and biosynthetic metabolism in aerobic and anaerobic microorganisms. Current biotechnology which incorporates these principles.

MCB 6457: Metabolic Regulation
Credits: 1 **Grading Scheme:** Letter
Prerequisite: MCB 4403 and BCH 4024 or CHM 3218 or equivalent.
Environmental sensing and mechanisms of microbial response. Molecular signaling, regulation of genetic information at posttranscriptional and transcriptional levels, effects on metabolism and physiology.

MCB 6465: Microbial Metabolic Engineering
Credits: 1 **Grading Scheme:** Letter
Prerequisite: MCB 4403 and BCH 4024 or CHM 3218 or equivalent.
Principles of anaerobic fermentation and its role in production of fuels and chemicals from various feedstocks including lignocellulosic biomass. Evaluation of methods of depolymerization of complex carbohydrate feedstocks to simple sugars for fermentation.

MCB 6485: Advanced Techniques in Microbiology and Cell Science
Credits: 2-4 Max: 4 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Application of advanced techniques to experimental research in biochemistry, cell biology, and microbiology.

MCB 6772: Advanced Topics in Cell Biology
Credits: 1 **Grading Scheme:** Letter
In each semester a specific topic in cell biology with microbiological interest will be considered in a comparative discussion of animal and plant systems.

MCB 6905: Experimental Microbiology
Credits: 1-8 Max: 12 **Grading Scheme:** Letter, H
Prerequisite: eight credits in microbiology and cell science.
Application of physical, chemical and biological techniques to experimental problems in microbiology. Individual laboratory study.

MCB 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

MCB 6930: Seminar
Credits: 1 Max: 8 **Grading Scheme:** S/U

Attendance required of all graduate majors at all research presentations.

MCB 6937: Special Topics in Microbiology
Credits: 1-4 Max: 12 Grading Scheme: Letter
Contemporary research in a particular aspect of general microbiology.

MCB 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

MCB 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

MCB 7922: Journal Colloquy
Credits: 1 Max: 8 Grading Scheme: Letter
Critical presentation and discussion of recent original articles in the microbiological literature. Attendance required.

MCB 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

MCB 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

MET 5504: Weather and Forecasting
Credits: 3 Grading Scheme: Letter
Prerequisite: familiarity with basic meteorology.
Skill development in predicting and discussing daily weather patterns using meteorological instruments to collect data and analyze weather events.

MET 6530: Hurricanes
Credits: 3 Grading Scheme: Letter
Prerequisite: familiarity with basic meteorology.
Meteorological and climatological concepts related to hurricanes. Forecasting current activity; researching past storms; and analyzing storm structure, damage, and future trends.

MET 6565: Seminar in Atmospheric Teleconnections
Credits: 3 Grading Scheme: letter
Atmospheric teleconnections are recurring large-scale patterns of pressure and circulation anomalies. They can influence temperature, rainfall, storm tracks, and jet stream location/ intensity. We will examine how these patterns were discovered, how the index that characterizes the phase of each teleconnection is calculated, and the weather associated with different phases.

MET 6752: Atmospheric Data Analysis
Credits: 3 Grading Scheme: Letter
Prerequisite: MET 5504 or MET 6530, or consent of instructor.
How atmospheric data is collected and analyzed both for meteorologic and climatologic-scale research. Learn where to obtain various types of data and how to analyze data to answer specific research questions.

MHF 5107: Introduction to Set Theory
Credits: 3 Grading Scheme: Letter
Basic axioms and concepts of set theory, axiom of choice, Zorn's lemma, Schroder-Bernstein theorem, cardinal numbers, ordinal numbers, and the continuum hypothesis.

MHF 5207: Foundations of Mathematics
Credits: 3 Grading Scheme: Letter
Models and proofs. Foundations of the real and natural number systems. Algorithms. Turing Machines, undecidability and independence. Examples and applications in algebra, analysis, geometry, and topology.

MHF 6306: Mathematical Logic I
Credits: 3 **Grading Scheme:** Letter
Languages, models, and theories; Godel's completeness and incompleteness theorems; formal number theory and axiomatic set theory; applications to other areas of mathematics.

MHF 6307: Mathematical Logic II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHF 6306.

MHS 5005: Introduction to Counseling
Credits: 3 **Grading Scheme:** Letter

MHS 6000: Assessment and Treatment of Family Violence
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 6401.
Clinically oriented, research-based overview of assessing and treating family violence.

MHS 6020: Counseling in Community Settings
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 7800.

MHS 6061: Spiritual Issues in Multicultural Counseling
Credits: 3 **Grading Scheme:** Letter
Spiritual/religious/transpersonal issues expressed in counseling from both client and counselor perspective.

MHS 6071: Diagnosis and Treatment of Mental Disorders
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 6400, MHS 6401.

MHS 6200: Assessment in Counseling
Credits: 3 **Grading Scheme:** Letter
Prerequisite: course in basic statistics.

MHS 6340: Career Development
Credits: 3 **Grading Scheme:** Letter

MHS 6401: Counseling Theories and Applications
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 5005.

MHS 6421: Play Counseling and Play Process with Children
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 6401.

MHS 6428: Multicultural Counseling
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 6401.

MHS 6430: Introduction to Family Counseling
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 6401, MHS 7800.

MHS 6440: Marriage Counseling
Credits: 3 **Grading Scheme:** Letter

MHS 6450: Substance Abuse Counseling
Credits: 3 **Grading Scheme:** Letter

MHS 6464: Introduction to Disaster Mental Health Counseling
Credits: 3 **Grading Scheme:** Letter

Prerequisite: Mental health professional licensure OR state certfication in school counseling
Providing an overview of the history, theories, and interventions associated with disaster mental health counseling. Special attention will be paid to working with culturally diverse individuals and other vulnerable client populations. Topics will include characteristics and outcomes of natural and human-made disasters, traumatic stress, and compassion fatigue.

MHS 6466: Trauma and Crisis Intervention: Theory and Practice
Credits: 3 **Grading Scheme:** Letter
Theories and practice models related to trauma and crisis intervention.

MHS 6467: Disaster Mental Health Counseling and Vulnerable Populations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Mental Health Professional Licensure OR State Certification in School Counseling AND MHS 6464Disaster Mental Health Counseling, MHS 6468 Multicultural Issues in Disaster Mental Health Counseling, and MHS 6469 Traumatic Stress and Disaster Mental Health Counseling.
Treatment planning for children, the elderly, and clients with physical and mental disabilities during disaster response. Specific attention will be paid to contextualizing clients' needs within a historical, cultural, and social context. Specific tools for individual, family, and community interventions will be covered.

MHS 6468: Multicultural issues in disaster mental health counseling
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Mental health professional licensure or state certification in school counseling and MHS 6464
Focusing on counselor efficacy and expediency during service provision to culturally diverse disaster-affected communities. Course content covers culturally diverse perspectives on resilience and coping, counselor expectations as barriers to competence, and systemic oppression.

MHS 6469: Traumatic Stress and Disaster Mental Health Counseling
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Mental health professional licensure OR state certification in school counseling AND MHS 6464 Introduction to Disaster Mental Health Counseling and MHS 6468 Multicultural Issues in Disaster Mental Health Counseling
Extending the counselor education curriculum by providing professional development training for licensed/certified mental health professionals. This course is positioned in the latter segment of the disaster mental health counseling sequence, following the introductory and multicultural courses.

MHS 6471: Sexuality and Mental Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 6400, MHS 6401.

MHS 6480: Developmental Counseling Over the Life Span
Credits: 3 **Grading Scheme:** Letter

MHS 6495: Counseling Lesbian, Gay, Bisexual, and Transgender Clients
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 5005, MHS 6401; or EDA 6931 Diversity Issues in Higher Education and EDA 6931 Theory and Assessment of Student Development.
Explores lesbian, gay, bisexual, and transgender (LGBT) identity formation and theory, vocabulary, resources, and developmental life stages.

MHS 6500: Group Counseling: Theories and Procedures
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 6401.

MHS 6602: Educational Mediation
Credits: 3 **Grading Scheme:** Letter
Negotiation and mediation in educational and other settings.

MHS 6705: Professional, Ethical, and Legal Issues in Marriage and Family Counseling
Credits: 3 **Grading Scheme:** Letter

MHS 6720: Professional Identity and Ethics in Counseling
Credits: 3 **Grading Scheme:** Letter

MHS 6831: Supervision for a Split Internship
Credits: 3 Max: 6 **Grading Scheme:** S/U
Prerequisite: adviser's consent, completion of practicum sequence, and written application to internship coordinator at least 6 weeks before registering. *Corequisite:* MHS 7804, MHS 7807, SDS 7820, or 7802.
Required first enrollment for students participating in internship over two semesters.

MHS 6905: Individual Work
Credits: 1-4 Max: 12 **Grading Scheme:** Letter
Prerequisite: consent of instructor and graduate coordinator; approval of proposed project.

MHS 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

MHS 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

MHS 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

MHS 7402: Brief Therapy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: 24 graduate-level credits in counseling and/or psychology, successful completion of practicum.
Examines contemporary theories of brief counseling and psychotherapy. Survey of theories, emphasizing application and research.

MHS 7407: Advanced Counseling Theories
Credits: 3 **Grading Scheme:** Letter
Prerequisite: enrollment in doctoral program.
Advanced preparation in individual, group, career, multicultural, and ecosystemic (marriage and family) theories of counseling.

MHS 7431: Advanced Family Counseling
Credits: 4 **Grading Scheme:** Letter
Prerequisite: MHS 6430.

MHS 7600: Consultation Procedures
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MHS 7800. *Corequisite:* registration in practicum or internship.

MHS 7610: Practicum in Counseling Supervision
Credits: 4 Max: 8 **Grading Scheme:** S/U
Prerequisite: MHS 6401, adviser's consent, and written application to practicum coordinator at least 6 weeks before registration. Open only to advanced doctoral students.

MHS 7730: Seminar in Counseling Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: satisfactory completion of EDF 6403.
Issues in designing and implementing counseling and psychotherapy dissertation research.

MHS 7740: Research in Counseling
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 6200.

MHS 7800: Practicum in Counseling
Credits: 4 **Grading Scheme:** S/U
Prerequisite: MHS 6401, adviser's consent, and written application to practicum coordinator at least 6 weeks before registration.

MHS 7804: Group Supervision in Agency Counseling
Credits: 3 Max: 15 Grading Scheme: S/U
Prerequisite: written application to practicum/internship coordinator at least 6 weeks before registration. *Corequisite:* MHS 7800, 6805; SDS 7380 or MHS 6831.
Clinical aspects of intervention for children and adults who have langugae disabilities, focusing on identification, diagnosis, and treatment of emergent literacy and language disorders.

MHS 7805: Practicum in Agency Counseling
Credits: 3 Grading Scheme: S/U
Prerequisite: MHS 5005, MHS 6200, MHS 6401, MHS 6500, MHS 6720. *Corequisite:* MHS 6071, 6420, MHS 6430.

MHS 7806: Practicum in Marriage and Family Counseling
Credits: 3 Grading Scheme: S/U
Prerequisite: MHS 5005, MHS 6200, MHS 6401, MHS 6500, MHS 6720. *Corequisite:* MHS 6071, 6420, MHS 6430.

MHS 7807: Group Supervision in Marriage and Family Counseling
Credits: 3 Max: 15 Grading Scheme: S/U
Prerequisite: written application to practicum/internship coordinator at least 6 weeks before registration. *Corequisite:* MHS 7800, MHS 7806; SDS 7830 or MHS 6831.

MHS 7830: Internship in Counseling and Development-600 Hours
Credits: 5 Max: 15 Grading Scheme: S/U
Prerequisite: adviser's consent, completion of all practica required for M.Ed. or Ed.S. degree, and written application to internship coordinator at least 6 weeks before registering.

MHS 7840: Internship in Counselor Education
Credits: 6 Max: 12 Grading Scheme: S/U
Prerequisite: written application to internship coordinator at least 6 weeks before registration. Open only to advanced doctoral students.

MHS 7946: Internship in Agency Program Management
Credits: 6 Max: 12 Grading Scheme: S/U
Prerequisite: written application to internship coordinator at least 6 weeks before registration. Open only to advanced doctoral students.

MHS 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Prerequisite: research for doctoral students before admission to candidacy.
Designed for students with a master's degree in the field of study or for students who have been admitted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

MHS 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

MMC 5005: Mass Communication History
Credits: 3 Grading Scheme: Letter
Origin, development, and potentiality of print and electronic media. Evolution of standards, policies, methods, controls.

MMC 5006: Introduction to Multimedia Communication
Credits: 3 Grading Scheme: Letter
Prerequisite: No prerequisites. Open to Graduate Students Only.
Introducing media, journalism and communication themes, issues and how to's of an integrated approach to new multi-media communications to ensure the brand message reaches its intended audience. Taking a real-world viewpoint, students examine the various channels available to communication professionals.

MMC 5015: Electronic Publishing
Credits: 3 Grading Scheme: Letter
Services and technology of major forms of electronic publishing and videotex. Nature and economics of information. Impact of new mass communication technologies.

MMC 5206: Advanced Law of Mass Communication
Credits: 3 **Grading Scheme:** Letter
Problems of constitutional law, libel, privacy, and governmental regulation. Not open to students who have taken MMC 4200 or equivalent.

MMC 5277: Web Design Principles
Credits: 4 **Grading Scheme:** Letter
Completing the course will allow students to be comfortable creating, coding and posting basic HTML and CSS files to the Internet. Gaining a foundational knowledge of website creation and apply it to the planning, design and development of your own web page over the course of the semester.

MMC 5306: International Communication
Credits: 3 **Grading Scheme:** Letter
Analysis and comparison of print and electronic communication systems among nations and cultures; barriers and stimuli to international communications; mass media in national development.

MMC 5315: Survey of Foreign Correspondence
Credits: 3 **Grading Scheme:** Letter
Nature and history of foreign correspondence. Impact on nations and international relations.

MMC 5427: Research Methods in Digital Communcation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Teaching research techniques crucial for understanding Web audiences. Specific tools and techniques of applied research are discussed and students do a research project.

MMC 5708: Foundations of Intercultural Communication
Credits: 3-4 **Max: 4** **Grading Scheme:** Letter
Theory and practice of intercultural communication.

MMC 6202: Legal Problems of Mass Communication
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MMC 5206 or previous research or equivalent.
Constitutional interpretation, conflicts between media and rights of others, regulation, the nature of jurisprudence.

MMC 6278: Advanced Web Topics II
Credits: 4 **Grading Scheme:** Letter
Prerequisite: MMC 5326--Digital Design, MMC 6936 Web Design Principles, VIC 5325 --Digital Imagery, VIC 5315 --Corporate Brand Identity, COM 6338 --Advanced Web Design 1
This class will be teaching students about the concept of the semantic web, the features of HTML5 and CSS3 that are used professionally, and the concept of "progressive enhancement". It will also explore, in depth, JavaScript, the integration of third-party APIs, jQuery, and some of the essential jQuery plugins.

MMC 6307: Seminar in International Communication
Credits: 4 **Max: 8** **Grading Scheme:** Letter
Prerequisite: MMC 5306 or equivalent, and consent of instructor.
Specialized or regional aspects of international communication; in-depth investigation of particular concepts and research literature. Student research required.

MMC 6400: Mass Communication Theory
Credits: 3 **Grading Scheme:** Letter
Structure, content, process, effects of communication; contributions of other disciplines; barriers to effective communication; use of research concepts.

MMC 6402: Seminar in Mass Communication Theory
Credits: 4 **Max: 16** **Grading Scheme:** Letter
Prerequisite: MMC 6400, MMC 6421, or equivalents, statistics, and consent of instructor.
Specialized aspects of mass communication theory; in-depth investigation of particular concepts and research literature. Student research required.

MMC 6405: Seminar in Mass Communication and Public Opinion
Credits: 4 **Grading Scheme:** Letter
Prerequisite: MMC 6400, MMC 6421 or equivalents, and consent of instructor.
Conceptualizations of public opinion as a collective process. The role of mass communication in describing and shaping perceptions of public opinion. Student research required.

MMC 6409: Science/Health Communication
Credits: 3 **Grading Scheme:** Letter
Overview of the field of mass communication. Nexus of scientists, journalists, public information officers and audiences. Topics include science literacy, framing of science, issues, public involvement, and the impact of science communication on policy.

MMC 6417: Seminar in Mass Media and Health
Credits: 3 **Grading Scheme:** Letter
Mass communication and health communication theories examined as they related to intended and unintended effects on individual behavior and on public health policy. Focus on effects other than those associated with mass mediated public health campaigns.

MMC 6421: Research Methods in Mass Communication
Credits: 3 **Grading Scheme:** Letter
Introduction to experiments, surveys, content analysis, sampling, measurement. Laboratory applications.

MMC 6423: Content-Analysis Methods
Credits: 3 **Grading Scheme:** Letter
Sampling, category construction, calculation of intercoder reliability, and analysis of data. Evaluation of content analysis methods and opportunity to undertake project using this methodology. Focus on analysis of mass media messages, but includes content analysis of other communication content.

MMC 6426: Seminar in Qualitative Research
Credits: 4 **Grading Scheme:** Letter
Theory and application in social science and communication. Qualitative data analysis, evaluation, ethical considerations, and writing.

MMC 6428: Collaborative Communication Research
Credits: 4 Max: 8 **Grading Scheme:** Letter
Experience in conducting team research. Student-faculty teams select and work through projects with intent to produce scholarly work for conference presentation, publication, or research grant proposal.

MMC 6429: News and Numbers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Learn to develop and evaluate how numbers and statistics are employed in news-related content. Students will learn to critique and interpret public opinion polls. Employing various story platforms, students will work to create data-driven material in an applied media setting.

MMC 6560: Seminar in History of Mass Communication
Credits: 4 Max: 8 **Grading Scheme:** Letter
Prerequisite: JOU 5007, MMC 5005, or equivalent, and consent of instructor.
Reading, critical study. Advanced investigative report on an approved research subject.

MMC 6612: New Media and a Democratic Society
Credits: 3 **Grading Scheme:** Letter
Relationships among new media, citizens, and governments; effects of Internet on democracy and globalization; role of journalism in democratic society.

MMC 6615: Race, Class, Gender, and Media
Credits: 3-4 not repeatable for credit **Grading Scheme:** Letter
Examination of race, class, and gender portrayals in media, from critical and cultural studies perspectives.

MMC 6618: Survey of Political Communication

Credits: 3 **Grading Scheme:** Letter
Role of communication in political process, including study of news coverage of political events, political advertising, political debates, international political communication, and politics and new technologies.

MMC 6619: Seminar in Political Advertising
Credits: 3 **Grading Scheme:** Letter
Role of advertising in politics. Political advertising theories, research on negative advertising, political advertising and women candidates, international political advertising, and news media coverage of political advertising.

MMC 6660: Mass Communication and Society
Credits: 3 **Grading Scheme:** Letter
Rights, responsibilities, ethics of communication media; government and media; economic, political, and social determinants of media content.

MMC 6665: Seminar in First Amendment Theory
Credits: 4 **Grading Scheme:** Letter
Prerequisite: MMC 5206L or equivalent, and consent of instructor.
Investigation into meaning and purpose of press, speech, petition, and assembly clauses of First Amendment. Offered in fall semester, even-numbered years.

MMC 6666: Seminar in Research in Mass Communication Law
Credits: 4 **Grading Scheme:** Letter
Prerequisite: MMC 5206 or equivalent, and consent of instructor.
Investigation of legal research techniques for the mass communication scholar and of literature of a particular mass media law topic. Offered in fall semester, odd-numbered years.

MMC 6667: Seminar in Advanced Topics in Mass Communication Law
Credits: 4 **Grading Scheme:** Letter
Prerequisite: MMC 6666 or LAW 5792 or equivalent, and consent of instructor.
Execution of individual or group research project on specialized topic under close supervision of instructor. Offered in spring semester, even-numbered years.

MMC 6668: Seminar in Public Policy Toward Mass Media
Credits: 4 **Grading Scheme:** Letter
Prerequisite: MMC 5206 and RTV 5702 or equivalents, and consent of instructor.
Examination and application of major theoretical perspectives of public policy-making as they apply to the American mass media.

MMC 6706: Covering the Arts
Credits: 3 **Grading Scheme:** Letter
This course focuses on fundamentals of arts coverage and marketing arts journalism pieces. It also includes critiques of arts journalism and provides an overview of current trends in the business of the arts. The class features tours of local arts venues and multiple guest speakers from the arts community.

MMC 6725: Social Media and Society
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MMC 6XXX Digital Communication Theory
MMC 5427 Research Methods in Digital Communications
MMC 6XXX Introduction to Multimedia Communication
MMC 6XXX Introduction to Social Media
This course explores questions such as: What impact does tweeting, status-updating, blogging, etc. have on society? How is the public's use of social media changing the way we work, study, socialize, vote, invest, pursue interests? What are the effects on our health, our political systems, our relationships and our careers?

MMC 6726: Social Media and Virtual Worlds
Credits: 3 **Grading Scheme:** Letter

Prerequisite: MMC 6XXX Digital Communication Theory
MMC 5427 Research Methods in Digital Communications
MMC 6XXX Introduction to Multimedia Communication
MMC 6XXX Introduction to Social Media
Introducing research and communication uses of 3D virtual environments and online games. using Second Life as a virtual platform, students will be required to create an online persona and be trained on navigating, building and communicating in the environment.

MMC 6727: Social Media Metrics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MMC 6XXX Digital Communication Theory
MMC 5427 Research Methods in Digital Communications
MMC 6XXX Introduction to Multimedia Communication
MMC 6XXX Introduction to Social Media
Students gain clear foundation in marketing strategy and apply it to social media marketing. Examine international case studies and determine if social media drive incremental sales volume and earnings. Understand what the drivers of value are for a brand and how social media messages differ from messages in traditional media.

MMC 6728: Branding Using Social and Mobile Media
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MMC 6XXX Digital Communication Theory
MMC 5427 Research Methods in Digital Communications
MMC 6XXX Introduction to Multimedia Communication
MMC 6XXX Introduction to Social Media
Special attention focusing on how online tools can enhance and strengthen a product or service's brand strategy. Using current case studies and step-by-step process, students will be learning to maximize the online efforts while maintaining brand continuity and consistency.

MMC 6730: Social Media Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MMC 6XXX Digital Communication Theory
MMC 5427 Research Methods in Digital Communications
MMC 6XXX Introduction to Multimedia Communication
MMC 6XXX Introduction to Social Media
Practicing necessary skills for creating high-touch customer experiences, driving community across multiple social media platforms.

MMC 6905: Individual Work
Credits: 1-3 **Max: 9** **Grading Scheme:** Letter
Reading or research.

MMC 6910: Supervised Research
Credits: 1-3 **Max: 5** **Grading Scheme:** S/U

MMC 6920: Communication Proseminar
Credits: 1 **Grading Scheme:** S/U
Required at beginning of each student in the law track. Introduction to mass communication and graduate study.

MMC 6929: Communication Colloquium
Credits: 2 **Max: 8** **Grading Scheme:** S/U
Provides common grounding in subjects across doctoral students' research approaches. Students enroll in the fall during the first year.

MMC 6930: Seminar in Mass Communication Teaching
Credits: 3 **Grading Scheme:** Letter
Research and training for teaching and supervision of student mass media.

MMC 6936: Special Topics in Mass Communication
Credits: 1-3 **Max: 12** **Grading Scheme:** Letter

Prerequisite: Consent of instructor or graduate adviser.

MMC 6949: Professional Internship
Credits: 1-3 Max: 3 Grading Scheme: S/U
Training in an approved mass communication office; instructor receives reports from on-site supervisor.

MMC 6951: Masters Project Seminar
Credits: 1 Grading Scheme: Letter
Working through the process of creating a masters-level project that will showcase professional skills and serve as a capstone for a masters program. The class will assist with with conceptualizing and producing a professional quality journalism project by the last semester of the masters program.

MMC 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U
Prerequisite: consent of instructor.

MMC 6973: Project in Lieu of Thesis
Credits: 1-9 Grading Scheme: S/U
Prerequisite: consent of instructor.
Developing, testing, and evaluating an original mass communication project.

MMC 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

MMC 7980: Research for Doctoral Dissertation
Credits: 1-12 Grading Scheme: S/U

MTG 5316: Introduction to Topology I
Credits: 3 Grading Scheme: Letter
Basic axioms and concepts of point-set topology, compactness, connectedness, separation axioms, metric spaces, metrization. Tietze extension theorem. Urysohn lemma, Tychonoff theorem, fundamental group.

MTG 5317: Introduction to Topology II
Credits: 3 Grading Scheme: Letter
Prerequisite: MTG 5316.

MTG 5411: Introduction to Fractal Geometry
Credits: 3 Grading Scheme: Letter
Prerequisite: advanced calculus or consent of instructor.
Introduction to techniques for generating and analyzing fractal sets. Hausdorff dimension, self-similarity, and iterated function systems. If time permits, Brownian paths, Julia sets, and Mandelbrot set.

MTG 5412: Introduction to Dynamical Systems and Chaos
Credits: 3 Grading Scheme: Letter
Prerequisite: advanced calculus or consent of instructor.
Introduction to nonlinear dynamical systems and chaos. One-dimensional systems, bifurcation theory, symbolic dynamics, Sarkovskii's theorem, Schwarzian derivative, Bernoulli shifts and subshifts of finite type, and kneading theory. If time permits, toral automorphisms, Henon map and complex dynamics.

MTG 6256: Differential Geometry I
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Foundations of the theory of smooth manifolds, vector fields, and differential forms. Topics chosen from a list including differential topology, Lie groups, symplectic geometry, Riemannian geometry, and applications to physics.

MTG 6257: Differential Geometry II
Credits: 3 Grading Scheme: Letter

Prerequisite: MTG 6256.

MTG 6346: Topology I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MTG 5317.
A basic introduction to advanced topology. Topics covered include general topology, algebraic topology, homotopy theory and topology of manifolds.

MTG 6347: Topology II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MTG 6346.

MTG 6401: Ergodic Theory and Dynamical Systems I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MTG 5317, MAA 6617, or consent of instructor.
Periodic points, recurrence, nonwandering and chain recurrent sets, topological conjugacy, minimal sets. Topological entropy, metric entropy. Measure preserving transformations, ergodicity, mixing. Birkhoff's ergodic theorem. Bernouilli shifts. Anosov diffeomorphisms, structural stability, hyperbolic sets. Basic sets, symbolic dynamics, Markov partitions. Lyapunov exponents, KAM (Kolmogorov, Arnold, Moser) theory.

MTG 6402: Ergodic Theory and Dynamical Systems II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MTG 6401.
Continuation of MTG 6401.

MTG 7396: Advanced Topics in Topology I
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: MTG 6347.
Topics change yearly.

MTG 7397: Advanced Topics in Topology II
Credits: 3 **Max: 6** **Grading Scheme:** Letter

MUC 5315: Introduction to Electroacoustic Music
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MUC 2102 or equivalent.
Survey of techniques, history, literature, and materials of electroacoustic music.

MUC 6444: Composition of Electronic Music
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MUC 4311 or MUC 5315.
Experimental electroacoustic art music composition using interactive software and digital recording.

MUC 6445: Electroacoustic Music Composition: Digital I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MUC 4401 or MUC 6444 or consent of instructor.
Introduction to direct-digital software synthesis systems through flowcharting, programming, and instrument design. Focuses on using Csound software.

MUC 6446: Electroacoustic Music Composition--Digital II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MUC 6445 or consent of instructor.
Continuation of MUC 6445. Composition and research in direct-digital software synthesis systems. Includes advanced instrument design, algorithmic composition, and interactive digital signal processing.

MUC 6900: Secondary Graduate Composition
Credits: 3 **Max: 15** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Individual music composition instruction for graduate students in music.

MUC 6930: Graduate Composition
Credits: 3 Max: 6 Grading Scheme: Letter
Composition of chamber works for instrumental and/or vocal ensembles.

MUC 6932: Composition Seminar
Credits: 1-3 Max: 12 Grading Scheme: Letter
Identifying problematic techniques in developing compositional craft for research, presentation, and discussion.

MUC 7447: Advanced Seminar in Electroacoustic Music
Credits: 3 Grading Scheme: Letter
Prerequisite: MUC 6446 or consent of instructor.
Composition and research in advanced topics in computer music.

MUC 7931: Advanced Graduate Composition
Credits: 3 Max: 18 Grading Scheme: Letter
Composition for large instrumental and/or vocal ensembles.

MUC 7938: Seminar in Digital Sound Processing, Control, and Composition
Credits: 3 Grading Scheme: Letter
Prerequisite: MUC 6646 or consent of instructor.
Topics in current research and digital audio theory, languages, algorithms, and applications for electroacoustic music.

MUE 6080: Historical and Philosophical Foundations of Music Education
Credits: 3 Grading Scheme: Letter
Historical development and philosophy. Compares the U.S. with other countries and cultures. Individuals, associations and institutions that shape the music education program.

MUE 6385: Music in Higher Education
Credits: 3 Grading Scheme: Letter
Various aspects and programs of music in higher education for persons who intend to teach in or administer departments of music.

MUE 6444: Materials and Methods of String Class Teaching
Credits: 2 Grading Scheme: Letter
Survey of materials and methods suitable for public school string classes and orchestras.

MUE 6497: Public School Orchestral Literature
Credits: 2 Grading Scheme: Letter
Survey of materials suitable for various educational levels.

MUE 6647: Trends in Teaching and Learning Music
Credits: 3 Grading Scheme: Letter

MUE 6785: Research in Music Education
Credits: 3 Grading Scheme: Letter
Materials and specialized techniques of research in music education.

MUE 6790: Capstone Project for Music Education
Credits: 3 Grading Scheme: letter, S/U
Prerequisite: Advanced standing in the graduate program; MUE 6785 ; permission of instructor
Completing an original research project that addresses an identified issue or need within the field of music education.

MUE 6931: Instructional Design in Music Education
Credits: 3 Grading Scheme: Letter
Explores the ways in which artistic forms of understanding and reflection can be useful in designing and evaluating education programs.

MUE 7746: Measurement and Evaluation of Music
Credits: 3 Grading Scheme: Letter
Prerequisite: MUS 6685.

Examines methods and techniques for measuring and evaluating learning in music.

MUE 7938: Music Education Seminar
Credits: 3 **Grading Scheme:** Letter
Contemporary issues and problems in music education. Investigating and planning research relevant to selected problems.

MUG 6105: Graduate Conducting
Credits: 3 **Max: 15** **Grading Scheme:** Letter
Conducting larger works from the standard repertoire for band, orchestra, and chorus.

MUG 7106: Advanced Graduate Conducting
Credits: 3 **Max: 15** **Grading Scheme:** Letter
Prerequisite: MUG 6105.
For conducting emphasis. Conducting major works for band, orchestra, and chorus. Emphasizes analysis and interpretation.

MUH 5219: Graduate Music History Review
Credits: 3 **Grading Scheme:** Letter
Credit earned will not apply to the credit-hour requirement of any graduate degree offered in the School of Music.

MUH 5505: Introduction to Ethnomusicology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Field research. Using oral, written, and media sources. Transcription and analysis. Interpretative techniques.

MUH 5684: Introduction to Historical Musicology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: successful completion of the complete undergraduate music history sequence; graduate student status; and successful completion of the music history entrance exam or the review course.
Critical approaches to the history of the discipline, fundamental concepts and methodologies, and significant musicological writings representing style periods and conceptual issues.

MUH 6545: The Guitar in Latin American Culture
Credits: 3 **Grading Scheme:** Letter
Cultural view of Latin American peoples through the sounds of the guitar, focusing on the history of modern classical guitar and its role in mediating Iberian and Latin American music.

MUH 6548: Seminar in Caribbean Music
Credits: 3 **Grading Scheme:** Letter
Examines historical, social, and aesthetic dimensions of Caribbean music and music making.

MUH 6549: Seminar in Brazilian Music
Credits: 3 **Grading Scheme:** Letter
Examines historical, social, and aesthetic dimensions of Brazilian music and music making.

MUH 6635: Seminar in American Music
Credits: 3 **Grading Scheme:** Letter
History and literature of American music from the landing of the pilgrims to the present.

MUH 6665: History of Opera
Credits: 3 **Grading Scheme:** Letter
Historical development of opera and its literature from the Florentine Camerata to the present.

MUH 6671: Seminar in Renaissance Music
Credits: 3 **Grading Scheme:** Letter
Selected topics from the Renaissance era for research and study.

MUH 6672: Seminar in Baroque Music
Credits: 3 **Grading Scheme:** Letter
Selected topics from the Baroque era for research and study.

MUH 6673: Seminar in Classical Music
Credits: 3 **Grading Scheme:** Letter
Selected topics from the Classical era for research and study.

MUH 6674: Seminar in Nineteenth-Century Music
Credits: 3 **Grading Scheme:** Letter
Selected topics from the nineteenth century for research and study.

MUH 6675: Seminar in Twentieth-Century Music
Credits: 3 **Grading Scheme:** Letter
Selected topics from the 20th century for research and study.

MUH 6931: Nationalism in Music
Credits: 3 **Grading Scheme:** Letter
Historical development of nationalist movements in music. Emphasizes the 19th and 20th centuries.

MUH 6935: Special Topics in Music History
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MUH 5219 or passing grade on music history diagnostic exam.
Centering around topics of current interest or of special interest to students or instructors. Topics or focus may vary from semester to semester.

MUH 7411: Medieval and Renaissance Notation
Credits: 3 **Grading Scheme:** Letter
Practical, theoretical, and reportorial study of notation from ca. 1000-1600.

MUH 7938: Musicology Seminar
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Prerequisite: MUS 6716.
Contemporary issues and selected topics in musicology.

MUL 6435: String Literature
Credits: 3 **Grading Scheme:** Letter
Survey of solo study materials suitable for preparatory departments affiliated with conservatories and universities.

MUL 6486: Piano Literature
Credits: 3 **Grading Scheme:** Letter
Survey of piano literature from Baroque to present.

MUL 6495: Graduate Organ Literature
Credits: 3 **Grading Scheme:** Letter
An historical survey of the major trends and styles of organ composition from the Renaissance to the present.

MUL 6555: Survey of Wind Literature
Credits: 3 **Grading Scheme:** Letter
Literature for chamber and larger wind ensembles from Baroque to present.

MUL 6565: Chamber Music Literature
Credits: 3 **Grading Scheme:** Letter
Survey of music literature for chamber ensemble from Baroque to present.

MUL 6645: Choral Literature
Credits: 3 **Grading Scheme:** Letter
Survey of choral music from Renaissance to present.

MUN 6010: Graduate Ensemble
Credits: 1 **Max: 3** **Grading Scheme:** Letter
For graduate students holding positions of leadership and participating in music ensembles.

MUN 6125: Concert Band

Credits: 1 Max: 4 Grading Scheme: Letter
Performance of general and popular band literature.

MUN 6135: Symphonic Band
Credits: 1 Max: 4 Grading Scheme: Letter
Performance of traditional and contemporary band literature.

MUN 6145: Symphonic Wind Ensemble
Credits: 1 Max: 4 Grading Scheme: Letter
Performance of wind ensemble literature.

MUN 6215: University Orchestra
Credits: 1 Max: 4 Grading Scheme: Letter
Standard orchestra literature.

MUN 6315: University Choir
Credits: 1 Max: 4 Grading Scheme: Letter
Advanced choral group providing specialized study performance opportunities for vocally qualified students.

MUN 6325: Women's Chorale
Credits: 1 Max: 4 Grading Scheme: Letter
Vocal training and public performance of standard female chorus repertoire.

MUN 6335: Men's Glee Club
Credits: 1 Max: 4 Grading Scheme: Letter
Vocal training and public performance of standard male chorus repertoire.

MUN 6445: Percussion Ensemble
Credits: 1 Max: 4 Grading Scheme: Letter
Study and performance of ensemble literature for percussion instruments.

MUN 6495: Steel Drum Ensemble
Credits: 1 Max: 8 Grading Scheme: Letter
Prerequisite: consent of instructor.
Rehearsal, performance and historical aspects of steel drum.

MUN 6496: World Music Ensemble
Credits: 1 Max: 4 Grading Scheme: Letter
Rehearsal and performance of folk and traditional music of the world.

MUN 6497: New Music Ensemble
Credits: 1 Max: 15 Grading Scheme: Letter
Prerequisite: consent of instructor.
Rehearsal and performance of repertoire for small ensembles written in the 20th and 21st centuries.

MUN 6715: Jazz Band
Credits: 1 Max: 4 Grading Scheme: Letter
Standard and experimental jazz ensemble. Jazz laboratory.

MUR 6206: Survey of Hymnody
Credits: 3 Grading Scheme: Letter
Historical development of hymns in liturgical use, the scope of hymnic literature, and the major trends in hymnal compilation and editing.

MUR 6705: Sacred Music Literature
Credits: 3 Grading Scheme: Letter
The development of congregational and choral song from the early church to the present. Survey of instrumental forms in worship music.

MUS 5911: Directed Study

Credits: 1-3 Max: 12 Grading Scheme: S/U
Prerequisite: may not count toward completion of degree requirements.
Allows graduate students changing their degree concentration to acquire knowledge and skills not acquired in previous programs.

MUS 6685: Psychology of Music
Credits: 3 Grading Scheme: Letter
Cultural influences, learning conditions, biological constraints, psychoacoustical phenomena, and musical taste. Measuring and predicting musical taste and ability.

MUS 6716: Methods of Musical Research and Bibliography
Credits: 3 Grading Scheme: Letter
Materials and specialized techniques of research in musicology.

MUS 6905: Projects and Problems
Credits: 1 to 3 Max: 12 including MUS 7905 Grading Scheme: Letter
Approved problems for study and research.

MUS 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

MUS 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

MUS 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

MUS 6973: Individual Project
Credits: 1-10 Max: 10 Grading Scheme: S/U
Creative project or graduate recital in lieu of written thesis. Project or recital must be acceptable to the candidate's supervisory committee and to the Graduate School.

MUS 7656: Teaching Music and the Creative Process
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate composition major or consent of instructor.
Examines the creative process, appropriate pedagogical applications, and curricular implications.

MUS 7905: Projects and Problems
Credits: 1 to 3 Max: 12 including MUS 6905 Grading Scheme: Letter
For doctoral students. Approved problems for study and research.

MUS 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

MUS 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

MUT 6051: Graduate Music Theory Review
Credits: 3 Grading Scheme: Letter
Review of core materials in preparation for graduate course in music theory.

MUT 6445: Advanced Counterpoint
Credits: 3 Grading Scheme: Letter
Prerequisite: MUT 4411, 4421.
Emphasizes advanced harmonic techniques and fugal writing.

MUT 6531: Figured Bass and Continuo Performance

Credits: 3 **Grading Scheme:** Letter
Theoretical principles and practical application of figured bass realization and continuo performance practice techniques.

MUT 6565: Late Nineteenth- and Twentieth-Century Styles
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MUT 6629.
Analysis of exemplary works of the late 19th and 20th centuries.

MUT 6576: Contemporary Styles
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MUT 6629.
Recent trends in music through score study and analysis, composition exercises, and supplementary readings.

MUT 6624: Seminar in Set Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MUT 6629.
Advanced study in set theory for analysis of music.

MUT 6627: Seminar in Reductive Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MUT 6629.
Advanced study in reductive approach to analysis of music.

MUT 6629: Analytical Techniques
Credits: 3 **Grading Scheme:** Letter
Study of analytical systems and methodology emphasizing style analysis and the integration of all elements of music.

MUT 6751: Pedagogy of Music Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MUT 6629.
Techniques and art of teaching music theory and conditions for effective learning.

MUT 6936: Music Theory Seminar
Credits: 1-3 **Max: 12** **Grading Scheme:** Letter
Prerequisite: MUT 6629.
Selected topics from current research for study, presentation, and discussion.

MUT 7316: Advanced Orchestration
Credits: 3 **Grading Scheme:** Letter
Analysis of 19th- and 20th-century compositions for full orchestra. Orchestration of original scores and arrangements for full orchestra.

MUT 7585: Seminar in Musical Style
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MUT 6629.
Analysis of exemplary works from the Medieval period to the early 19th century.

MUT 7760: History of Music Theory
Credits: 3 **Grading Scheme:** Letter
The study of musical theories, primarily through readings, from ancient Greece to the present.

MVK 5156: Improvisational Keyboard Skills and Related Technology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: upper-division and graduate keyboard majors and minors, or consent of instructor.
Improvisational skills, electric keyboard technology, and musical styles outside the classical realm.

MVK 6605: Organ Pedagogy
Credits: 3 **Grading Scheme:** Letter
Principles, methods, and practices currently used in the teaching of organ.

MVK 6651: Piano Pedagogy
Credits: 3 **Grading Scheme:** Letter
Introduction to teaching basic piano performance and literature.

MVK 6661: Advanced Piano Pedagogy
Credits: 3 **Grading Scheme:** Letter
Teaching materials for the intermediate and advanced student; methodologies of piano technique.

MVO 6250: Secondary Music Performance
Credits: 3 Max: 15 **Grading Scheme:** Letter
Offered in piano, voice, organ, harpsichord, historical instruments, conducting, carillon, and all standard band and orchestral instruments.

MVO 6460: Music Performance
Credits: 3 Max: 9 **Grading Scheme:** Letter
Offered in piano, voice, organ, harpsichord, historical instruments, conducting, carillon, and all standard band and orchestral instruments.

MVO 7460: Music Performance
Credits: 3 Max: 9 **Grading Scheme:** Letter
For doctoral students. Offered in piano, voice, organ, harpsichord, historical instruments, conducting, carillon, and all standard band and orchestral instruments.

MVS 6651: String Pedagogy I
Credits: 3 **Grading Scheme:** Letter
Survey of Suzuki violin pedagogy from Unit IA (Pre-Twinkle) through Unit IV (Vivaldi A Minor Concertos).

MVV 6651: Vocal Pedagogy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SPA 3101 or equivalent.
Study and teaching of vocal techniques.

NEM 5004C: Graduate Survey of Nematology
Credits: 3 **Grading Scheme:** Letter
Morphology, anatomy, development, feeding habits, life cycles, disease cycles, and control of nematodes that parasitize plants and animals. Role of plant parasitic nematodes in disease complexes and as vectors of plant viruses. "Free-living" nematodes that inhabit oceans, fresh water, and soil.

NEM 5707C: Plant Nematology
Credits: 3 **Grading Scheme:** Letter
Identification of plant parasitic nematodes, diseases they cause, interactions with other plant parasites, and management schemes to control population densities.

NEM 6101C: Nematode Morphology and Anatomy
Credits: 2 **Grading Scheme:** Letter
Morphology, anatomy, and function of structures, organs, and systems.

NEM 6102: Nematode Systematics and Molecular Phylogeny
Credits: 2 **Grading Scheme:** Letter
Prerequisite: NEM 6942 (Nematode Diagnosis)
Theory and practice of using molecular evidence, particularly DNA sequence data, for addressing diverse systematic and evolutionary questions will be explored. Morphological, molecular, and basic bioinformatics tools will be addressed.

NEM 6102L: Nematode Systematics and Molecular Phylogeny Laboratory
Credits: 2 **Grading Scheme:** Letter
Corequisite: NEM6102 (Nematode Systematics and Molecular Phylogeny)
Morphological, molecular, and basic bioinformatics tools used in nematode species identification will be explored. Emphasising basic molecular techniques, such as DNA extraction and quantification, restriction enzyme digestion, polymerase chain reaction and agarose gel electrophoresis.

NEM 6103: Insect Parasitic Nematodes
Credits: 1 **Grading Scheme:** Letter
Insect-parasitic nematodes in all taxons, including their pathogenicity, life cycles, etc. Steinernematidae and Heterohibditidae emphasized.

NEM 6104L: Insect Parasitic Nematodes Laboratory
Credits: 1 **Grading Scheme:** Letter
Corequisite: NEM 6103.
Field survey and pathogenicity experiments, survival mechanisms determined, selected nematodes produced in vivo, and DNA extracted and sequenced.

NEM 6201: Nematode Ecology
Credits: 3 **Grading Scheme:** Letter
Population and community ecology of plant-parasitic and other soil-inhabiting nematodes. Mathematical descriptions and relationships will be emphasized where appropriate.

NEM 6708: Field Plant Nematology
Credits: 2 **Max: 4** **Grading Scheme:** Letter
Field trips to various agricultural research stations and production areas in Florida to learn plant symptoms and current research methods.

NEM 6905: Problems in Nematology
Credits: 1-4 **Max: 8** **Grading Scheme:** Letter

NEM 6931: Nematology Seminar
Credits: 1 **Max: 6** **Grading Scheme:** Letter, S/U
Presentation and discussion of current research, research topics.

NEM 6932: Special Topics in Nematology
Credits: 1-4 **Max: 4** **Grading Scheme:** S/U
Reports and discussions.

NEM 6934: Selected Studies in Nematology
Credits: 1-4 **Max: 4** **Grading Scheme:** Letter
Current issues with subject matter variable.

NEM 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

NEM 6942: Nematode Diagnostics
Credits: 2 **Grading Scheme:** Letter
Diagnosing nematode problems from soil and plant samples.

NEM 6943: Nematode Internship
Credits: 1-3 **Max: 6** **Grading Scheme:** S/U
Diagnosing complex plant disorders caused by nematodes and other factors.

NEM 6944: Nematode Extension Internship
Credits: 1-3 **Max: 6** **Grading Scheme:** S/U
Diagnosing nematode damage to plants in field or greenhouse.

NEM 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

NEM 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

NEM 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

NGR 5934: Cultural Influences on Health Care
Credits: 2 **Grading Scheme:** Letter

NGR 6002C: Advanced Health Assessment
Credits: 4 **Grading Scheme:** Letter
Prereq or coreq: NGR 6140. Required core course. Diverse clients across the life span. Emphasizes data analysis and diagnostic reasoning.

NGR 6006: Principles of Clinical Outcomes Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6140, NGR 6727, NGR 6850. *Corequisite:* NGR 6726, NGR 6771
Provides the student with knowledge of health care management, utilizing principles of evidence-based practice. Emphasis on on health promotion and disease prevention with selected clients and client populations across the life span.

NGR 6052C: Adult Nursing: Diagnostics and Procedures
Credits: 1 **Grading Scheme:** Letter
Prerequisite: NGR 6002C, NGR 6101, NGR 6140, NGR 6636. Prereq *Corequisite:* or coreq: NGR 6241, NGR 6241L or NGR 6245L , NGR 6172, NGR 6850.
Selected advanced practice nursing interventions used in caring for acutely ill adults.

NGR 6054C: Advanced Neonatal Health Assessment and Diagnostic Reasoning
Credits: 4 **Grading Scheme:** Letter
Prerequisite: NGR 6140.
Symptom/health problem assessment in the neonate. Interpretation of screening and diagnostic tests to formulate a differential diagnosis.

NGR 6101: Theory and Research for Nursing
Credits: 3 **Grading Scheme:** Letter
Critical examination of theory and research from nursing and related fields. Emphasis on relationships among theory, research, and practice.

NGR 6140: Physiology and Pathophysiology for Advanced Nursing Practice
Credits: 4 **Grading Scheme:** Letter
Required core course. Human physiology, including normal changes throughout the life span, pathophysiology, and their implications for nursing.

NGR 6172: Pharmacotherapeutics for Advanced Practice Nursing
Credits: 4 **Grading Scheme:** Letter
Prerequisite: NGR 6002C, NGR 6140. Required core course.
Selection and management of clinical drug applications in advanced nursing practice in primary care settings.

NGR 6230C: Acute Care Nurse Practitioner: Diagnostics and Procedures for the Critically Ill
Credits: 1 **Grading Scheme:** Letter
Prerequisite: NGR 6002C, NGR 6101, NGR 6140, NGR 6636. Prereq *Corequisite:* or coreq: NGR 6052C, NGR 6241, NGR 6241L or NGR 6245L , NGR 6172, NGR 6850.
Necessary nursing skills in caring for the critically ill in acute-care settings.

NGR 6240: Primary Care for Adults
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6140, NGR 6002C.
Required core course. Primary care and nursing management of adults experiencing common alterations in their health.

NGR 6241: Adult Nursing: Common Health Problems
Credits: 4 **Grading Scheme:** Letter
Prerequisite: NGR 6002C, NGR 6636, NGR 6101, NGR 6140. Prereq *Corequisite:* or coreq: NGR 6052C, NGR 6172, NGR 6241L or NGR 6245L , NGR 6850.

Advanced nursing management of common health problems. Caring for adults with single and multisystem diseases in acute and outpatient settings.

NGR 6241L: Adult Nurse Practitioner: Common Health Problems Laboratory
Credits: 2 **Grading Scheme:** S/U
Prerequisite: NGR 6002C, NGR 6636, NGR 6101, NGR 6140.
Prereq or coreq:NGR 6052C, NGR 6172, NGR 6241, NGR 6850. Advanced nursing management of common health problems in adults with single and multisystem diseases in acute and outpatient settings. Clinical application by nurse practitioners.

NGR 6243: Acute Care Nurse Practitioner: Critically Ill Adult
Credits: 4 **Grading Scheme:** Letter
Prerequisite: NGR 6052C, NGR 6230C, NGR 6241, NGR 6241L. *Corequisite:* NGR 6243L.
Caring for physiologically unstable adults with multiple complex health problems requiring critical care and emergency stabilization.

NGR 6243L: Acute Care Nurse Practitioner: Critically Ill Adult Laboratory
Credits: 2 **Grading Scheme:** S/U
Prerequisite: NGR 6052C, NGR 6230C, NGR 6241, NGR 6241L. *Corequisite:* NGR 6243.
Advanced management of critically ill adults. Clinical application. Focuses on caring for physiologically unstable adults.

NGR 6244: Adult Nursing: Chronic Health Problems
Credits: 2 **Grading Scheme:** Letter
Prerequisite: NGR 6052C, NGR 6241: Adult Nursing: Common Health Problems, NGR 6241L. *Corequisite:* NGR 6244L or NGR 6246L , NGR 6255.
Advanced nursing management of chronic health problems. Focuses on caring for adults with multisystem health problems requiring ongoing management in acute and out-patient settings.

NGR 6244L: Adult Nurse Practitioner: Chronic Health Problems Laboratory
Credits: 2 **Grading Scheme:** S/U
Prerequisite: NGR 6052C, NGR 6241, NGR 6241L. *Corequisite:* NGR 6244, NGR 6255.
Advanced nursing management of health problems in adults. Clinical application. Focuses on providing adult care in acute and outpatient settings.

NGR 6247: Complex High Prevalence Illnesses Of Adults
Credits: 4 **Grading Scheme:** Letter
Prerequisite: NGR 6244, NGR 6244L *Corequisite:* NGR 6247L
Provides the students with in depth knowledge of the advanced nursing practice management of complex high prevalence illness in the United States.

NGR 6247L: Complex High Prevalence Illnesses Of Adults
Credits: 3 **Grading Scheme:** S/U
Prerequisite: NGR 6244, NGR 6244L *Corequisite:* NGR 6247
Provides the student with clinical experiences necessary for the management of complex high prevalence illnesses in adults managed in both acute and out-patient settings.

NGR 6248: Adult Acute Care Nurse Practitioner 3
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6243, NGR 6243L *Corequisite:* NGR 6248L
Provides the student with in-depth knowledge of advanced nursing practice management of acutely and critically ill adults from diverse populations.

NGR 6248L: Adult Acute Care Nurse Practitioner 3
Credits: 3 **Grading Scheme:** S/U
Prerequisite: NGR 6243, NGR 6243L *Corequisite:* NGR 6248, current ACLS certification
Clinical experiences allow the student to apply safe, cost effective, legal and ethical management strategies to the care of post-pubescent adults with complex health problems from diverse backgrounds. The focus of this course is care of adults with complex endocrine, neurologic, gastrointestinal, and commonly occurring health care problems.

NGR 6255: Advanced Nursing Care of Older Adult

Credits: 2 **Grading Scheme:** Letter
Prerequisite: NGR 6241: Adult Nursing: Common Health Problems, NGR 6241L, NGR 6172. *Corequisite:* NGR 6244: Adult Nursing: Chronic Health Problems, NGR 6244L.
Health care problems that result from normal and pathologic aging. Emphasize on gaining the knowledge needed to prevent, diagnose, and manage both acute and chronic age-related health problems.

NGR 6301: Advanced Child Health Nursing I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6002C, NGR 6636, NGR 6101, NGR 6140, and NGR 6172 *Corequisite:* NGR 6172 , NGR 6372C , and NGR 6301L
Management of child health care, including wellness promotion, illness prevention, and treatment of common health problems in children from newborns through young adulthood.

NGR 6301L: Advanced Child Health Nursing I
Credits: 3 **Grading Scheme:** S/U
Prerequisite: NGR 6002C NGR 6636, NGR 6140, and NGR 6172 *Corequisite:* NGR 6172 , NGR 6372C , and NGR 6301
Clinical experiences in primary health care settings necessary for the management of primary child health care.

NGR 6302: Advanced Child Health Nursing II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6301, NGR 6301L *Corequisite:* NGR 6302L
Management of complex acute and chronic illnesses in children from newborns through young adulthood.

NGR 6302L: Advanced Child Health Nursing II
Credits: 3 **Grading Scheme:** S/U
Prerequisite: NGR 6301 NGR 6301L *Corequisite:* NGR 6302
Clinical experiences in a variety of settings necessary for the management of complex acute conditions and chronic illnesses in children.

NGR 6307: Advanced Child Health Nursing III
Credits: 4 **Grading Scheme:** Letter
Prerequisite: NGR 6302 NGR 6302L *Corequisite:* NGR 6307L
Management of selected chronic illnesses and disabilities in children from newborns through young adulthood.

NGR 6307L: Advanced Child Health Nursing III
Credits: 3 **Grading Scheme:** S/U
Prerequisite: NGR 6302, NGR 6302L *Corequisite:* NGR 6307
Clinical experiences in a variety of health care settings for the management of children with chronic illnesses and disabilities.

NGR 6320C: Neonatal Care I
Credits: 2 **Grading Scheme:** Letter
Prereq or coreq: NGR 6101, NGR 6054C, NGR 6140, 6630. Advanced theory and care of low-risk neonates.

NGR 6321C: Neonatal Care II
Credits: 6 **Grading Scheme:** Letter
Prerequisite: NGR 6320C. *Corequisite:* NGR 6371, NGR 6850.
Advanced theory and care of high-risk and critically ill neonates.

NGR 6323C: Neonatal Care III
Credits: 5 **Grading Scheme:** Letter
Prerequisite: NGR 6321C.
Advanced theory and care of high-risk infants with complex and chronic health problems.

NGR 6350: Family Nurse Practitioner: Women, Adolescents, And Children
Credits: 4 **Grading Scheme:** Letter
Prerequisite: NGR 6241, NGR 6241L, and NGR 6052C *Corequisite:* NGR 6350L
Clinical experiences necessary for the management of community-based family health care, including wellness promotion, illness prevention, and treatment of acute and chronic health problems in adults, including pregnant women, adolescents and/or children form diverse backgrounds.

NGR 6350L: Family Nurse Practitioner: Women, Adolescents, And Children
Credits: 2 **Grading Scheme:** S/U
Prerequisite: NGR 6241, NGR 6241L, and NGR 6052C *Corequisite:* NGR 6350
This lab provides the student with clinical experiences necessary for the management of community-based family health care, including wellness promotion, illness prevention, and treatment of acute and chronic health problems in adults, including pregnant women, adolescents and/or children form diverse backgrounds.

NGR 6360C: Nurse-Midwifery Care I
Credits: 7 **Grading Scheme:** Letter
Prerequisite: NGR 6002C, NGR 6140, NGR 6172, NGR 6240.
Management of women seeking gynecological, antepartal, intrapartal, or postpartal care and care of newborns.

NGR 6361C: Nurse-Midwifery Care II
Credits: 6 **Grading Scheme:** Letter
Prerequisite: NGR 6360C.
Management of at-risk women seeking gynecological, antepartal, intrapartal, or postpartal care and at-risk infants.

NGR 6364: Seminar: The Nurse Midwife
Credits: 2 **Grading Scheme:** Letter
Prereq or coreq:NGR 6361C. Required for nurse-midwifery students. Analyzing and synthesizing role behaviors of the nurse-midwife as a clinical specialist in selected settings.

NGR 6371: Pharmacotherapeutics for Advanced Neonatal Nursing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6320C, NGR 6054C, NGR 6140.
Selection and management of drug therapy and monitoring therapeutic responses in the neonate.

NGR 6372C: Advanced Pediatric Procedures and Diagnostics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6002C, NGR 6101, NGR 6140, NGR 6636 *Corequisite:* NGR 6301, NGR 6301L
Theoretical knowledge and emphasizes psychomotor skills necessary to provide selected advanced practice nursing interventions utilized in the care of infants, children and adolescents in a variety of settings.

NGR 6500C: Individual and Family Therapy for Psychiatric-Mental Health Nursing
Credits: 6 **Grading Scheme:** Letter
Prereq or coreq: NGR 6002C, NGR 6101, NGR 6140, NGR 6172, NGR 6538, NGR 6636. Assessment, prevention and/or treatment and rehabilitation of clients with major psychiatric disorders and their families.

NGR 6501C: Group Therapy and Community Interventions for Psychiatric-Mental Health Nursing
Credits: 6 **Grading Scheme:** Letter
Prerequisite: NGR 6500C.
Current theories in group therapies for adult clients with dysfunctional interpersonal patterns and communities with dysfunctional patterns.

NGR 6538: Psychopharmacology for Psychiatric Nursing
Credits: 3 **Grading Scheme:** Letter
Prereq or coreq: NGR 6172. Knowledge base for prescribing and managing psychotropic medications in treating psychiatric disorders.

NGR 6612: Family Nurse Practitioner: Complex Family Health Care (Focus On Gerontology)
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6350 and NGR 6350L *Corequisite:* NGR 6612L
Management of adults with age-related changes and complex health comorbidities.

NGR 6612L: Family Nurse Practitioner: Complex Family Health Care (Focus On Gerontology)
Credits: 4 **Grading Scheme:** S/U
Prerequisite: NGR 6350 and NGR 6350L *Corequisite:* NGR 6612

This lab provides the student with clinical experiences in the primary care management of older adults experiencing age-related changes in function and complex health comorbidities, and the management of children, adolescents, and adults experiencing health problems and/or women experiencing pregnancy.

NGR 6636: Wellness Promotion and Disease Prevention
Credits: 3 **Grading Scheme:** Letter
Required core course. Theory and research to promote and preserve wellness lifestyles in client populations using epidemiological principles, disease risk appraisal and reduction, and other tools.

NGR 6726: Management of the Care Environment II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6081 , NGR 6727. *Corequisite:* NGR 6005 , NGR 6771, NGR 6850.
Functions of the health care team in maintaining high-quality care.

NGR 6727: Management of the Care Environment I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: NGR 6880 , NGR 6002C, NGR 6770. *Corequisite:* NGR 6081 , NGR 6893 .
Functions of health care systems and organizational structure.

NGR 6740: Role Transition: Issues in Advanced Practice Nursing
Credits: 2 **Grading Scheme:** Letter
Prerequisite: 1 clinical course, NGR 6893 .
Analysis of current practice issues and roles of nurses in advanced practice.

NGR 6770: Leadership/Role of Clinical Nurse Leader
Credits: 2 **Grading Scheme:** Letter
Prerequisite: admission to the CNL track of the M.S.Nsg. program. *Corequisite:* NGR 6880 , NGR 6893 .
Introduction to the role of a clinical nurse leader.

NGR 6771: Clinical Nurse Leader Role Seminar
Credits: 2 **Grading Scheme:** Letter
Prerequisite: NGR 6081 , NGR 6727; *Corequisite:* coreq: NGR 6005 , NGR 6726.
Synthesis of concepts presented within clinical nurse leader curriculum.

NGR 6773: Clinical Nurse Leader Residency/Internship
Credits: 1-3 Max: 3 **Grading Scheme:** S/U
Prerequisite: all required courses in the CNL track.
Full-time residency experience provides an opportunity for immersion in the CNL role.

NGR 6815: Foundations of Qualitative Research in Nursing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6101 or equivalent, and NGR 6850 or equivalent.
Introduction to philosophical, historical, and theoretical bases.

NGR 6840: Applied Statistical Analysis I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6850 or equivalent and doctoral statistics orientation.
Advanced procedures for data analysis and statistical inference in nursing research.

NGR 6845: Applied Statistical Analysis II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6840.
Analysis and application of advanced multivariate statistical procedures to develop design for individual research questions.

NGR 6850: Research Methods and Utilization for Nursing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6101.
Knowledge and skills to critique theory and research from nursing and related fields as a basis for evidence-based practice.

NGR 6892: Health Care Policy and Organizational Delivery

Credits: 2 **Grading Scheme:** Letter
Required core course. Overview of health care policy. Framework for understanding and evaluating organizational implications of health care delivery.

NGR 6905: Individual Study
Credits: 1-3 Max: 6 **Grading Scheme:** Letter

NGR 6930: Special Topics in Nursing
Credits: 1-3 Max: 6 **Grading Scheme:** Letter

NGR 6941: Practicum in Nursing
Credits: 3 or 6 Max: 6 **Grading Scheme:** S/U
Prerequisite: satisfactory completion of core and clinical courses. Required for all students.

NGR 6944: Individual Clinical Practice
Credits: 1-4 Max: 6 **Grading Scheme:** S/U
Prerequisite: enrollment in or completion of graduate-level courses in clinical nursing.
Additional opportunities for advanced nursing practice. Objectives to be developed collaboratively by the student and faculty.

NGR 6970: Research for Master's Project
Credits: 1-4 **Grading Scheme:** S/U

NGR 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

NGR 7003: Advanced Diagnostic Reasoning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 7827.
Students engage in inductive or inferential processes to derive diagnoses using data sets and information technology.

NGR 7115: Philosophy of Nursing Science
Credits: 3 **Grading Scheme:** Letter
Critical examination of the meaning, method, and logical structures of science and nursing sciences. Emphasizes the logical methodological analyses of aims, methods, criteria, concepts, laws, and theories.

NGR 7124: Theory Development in Nursing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 7115.
Analysis of existing paradigms, theories, and theoretical models, derived or tested through research in nursing.

NGR 7176: Advanced Topics in Pharmacotherapeutics in Nursing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6140, NGR 6172.
Complex care issues related to pharmacotherapeutics as an integral part of overall treatment.

NGR 7700: Leadership and Role Development in Advanced Nursing Practice
Credits: 3 Max: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6636.
Knowledge and skills needed to manage change, empower others, and influence political processes.

NGR 7709: Nurse Scientist and Scholar I
Credits: 1 Max: 2 **Grading Scheme:** S/U
The goal of the seminar is to socialize students into the roles and activities of research scholars and members in a global community of scholars.

NGR 7814: Field Methods for Health Related Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6815.
Data collection methodologies used in qualitative nursing research.

NGR 7816: Quantitative Research Design and Measurement in Nursing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6101 or equivalent and NGR 6850 or equivalent.
Evaluation of quantitative research methods and designs with attention to internal and external validity.

NGR 7827: Outcomes Research and Evaluation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 7871, PHC 6050.
Measurement and evaluation of the end results of clinical nursing care practices and interventions.

NGR 7831: Quality Indicators in Nursing Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6001, NGR 6101.
Evaluation activities that support creation and management of knowledge in nursing systems.

NGR 7871: Nursing Informatics and Data
Credits: 3 **Grading Scheme:** Letter
Prerequisite: NGR 6101.
Technological applications for nursing.

NGR 7882: Ethical Theories and Rational Decision Making in Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: admission to doctoral program or consent of instructor.
Analyzing ethical theories and testing the applicability of theory in nursing.

NGR 7891: Health Policy and Finance in Advanced Nursing Practice
Credits: 3 **Grading Scheme:** Letter
Health policy development, analysis, and implementation.

NGR 7940L: Residency in Advanced Nursing Practice
Credits: 3 or 6 **Grading Scheme:** S/U
Prerequisite: NGR 7003. *Pre- Corequisite: or Coreq:NGR 7970L.*
Concentrated clinical experience for the role of advanced nursing practitioner.

NGR 7970L: Advanced Nursing Project
Credits: 1-3 **Grading Scheme:** S/U
Pre- or coreq: NGR 7003. Terminal project. Student demonstrates synthesis of learning and expertise in clinical practice commensurate with a Doctor of Nursing Practice degree.

NGR 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

NGR 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

OCP 5293: Coastal Processes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: EGN 3353C (or CWR 3201), MAP 2302 or equivalent.
Coastal wave and water level fluctuations, littoral transport; tidal inlet dynamics, estuarine hydrodynamics, and sediment transport; techniques of measurements.

OCP 6050: Physical Oceanography
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 2302, EGN 3353C (or CWR 3201).
Structure of ocean basins; physical and chemical properties of sea water; basic physical laws used in oceanography; ocean current; thermohaline effects; numerical models; heat budget.

OCP 6165: Ocean Waves I: Linear Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 2302, EGN 3353C (or CWR 3201).
Ocean wave classification, solution of the linearized boundary value problem; simple harmonic waves; shoaling effects; internal waves.

OCP 6165L: Ocean Waves Laboratory
Credits: 1 **Grading Scheme:** Letter
Laboratory for linear wave theory. Basic measurement techniques and properties of water waves.

OCP 6167: Ocean Waves II: Nonlinear Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: OCP 6165: Ocean Waves I: Linear Theory.
Perturbation development of nonlinear water wave theories; regions of validity of various theories; dynamics and kinematics of nonlinear wave trains composed of single and multiple fundamental components.

OCP 6168: Data Analysis Techniques for Coastal and Ocean Engineers
Credits: 3 **Grading Scheme:** Letter
Data editing, fundamentals of spectral analysis, subsurface and surface signal analysis, directional spectral analysis.

OCP 6169: Random Sea Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: OCP 6165.
Mathematical presentation of random seas; wave spectral analysis, spectral formulations; joint prediction of wave height and period, directionality of random seas, bispectral analysis; principles of hindcasting and forecasting seas.

OCP 6295: Estuarine and Shelf Hydrodynamics I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: OCP 6050.
Kinematics and dynamics of estuaries, small scale motions, tidal hydrodynamics, nontidal circulations, shelf waves, estuary and shelf interactions, mathematical models.

OCP 6297: Coastal and Estuarine Sediment Transport
Credits: 3 **Grading Scheme:** Letter
Sediment properties including size, mineralogy and plasticity, cohesion and flocculation; settling velocity and initiation of motion; coarse and fine sediment transport; wave-sediment interaction; fluid mud rheology and transport; consolidation; sedimentation in estuaries and at coasts.

OCP 6298: Coastal Sediment Transport Processes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CWR 6236, OCP 6165.
Physical sedimentation processes, including boundary layer hydrodynamics, suspended sediment dynamics, and bedload mechanics under wave and current conditions.

OCP 6364: Engineering Water Wave Models
Credits: 3 **Grading Scheme:** Letter
Prerequisite: OCP 6165.
Theory and practical aspects of spectral, diffractive, and Boussinesq water wave models.

ORH 5026C: Advanced Annual and Perennial Gardening
Credits: 3 **Grading Scheme:** Letter
Prerequisite: for graduate students who have not taken ORH 4808C.
Identification, selection, use, and management of annuals, perennials, herbs, and ornamental grasses in the landscape.

ORH 5086: Advanced Golf and Sports Turf Management
Credits: 2 **Grading Scheme:** Letter
Prerequisite: for graduate students who have not taken ORH 4223.
Golf course and sports turf management.

ORH 5282: Orchid Biology and Culture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: for graduate students who have not taken ORH 4280; or consent of instructor.
Orchid plants and flowers, including nomenclature, breeding, seed culture, harvesting, and handling.

ORH 5322C: Palm Biology and Culture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: for graduate students who have not taken ORH 4321C; or consent of instructor.
Biology, vegetative and reproductive morphology, identification, container, liner, and field production of palms.

ORH 5817C: Advanced Florida Native Landscaping
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ORH 1520 or 3513.
Introduction to nomenclature, effective use, and design elements of plants native to Florida.

ORH 7941: Doctor of Plant Medicine: Internship in Environmental Horticulture
Credits: 1-6 **Max: 10** **Grading Scheme:** S/U
Environmental horticulture internship in an industrial or academic setting.

OTH 5002: Foundations of Occupational Therapy
Credits: 3 **Grading Scheme:** Letter
Foundations, development, and professional ethics, values and responsibilities of profession.

OTH 5113C: Practicum in Applied Therapeutic Activities
Credits: 1 **Grading Scheme:** Letter
Occupational therapy activity programs in community projects.

OTH 5115C: Therapeutic Skills II: Areas of Occupation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: OT graduate student.
Pre-activity and activity techniques for participation in human occupation.

OTH 5324: Psychosocial Intervention
Credits: 4 **Grading Scheme:** Letter
Prerequisite: OT graduate student.
Historical and current models for application of occupational therapy to psychosocial problems.

OTH 5435: Therapeutic Skills I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Basic skills in assessment and intervention with biomechanical factors.
Intended for OT graduate students. Addresses the evaluation and treatment of biomechanical factors in Occupational Therapy.

OTH 5722: Professional Development in Occupational Therapy
Credits: 1 **Grading Scheme:** S/U
Prerequisite: Graduate student in the Master in Occupational Therapy Program.
Provides structured learning experiences that facilitate professional development and the transition to professional roles.

OTH 5726C: Service Delivery and OT Management
Credits: 2 **Grading Scheme:** Letter
Prerequisite: OT graduate status.
Basic principles of management and systems in providing occupational therapy to individuals and organizations.

OTH 5770C: Research for Occupational Therapy
Credits: 3 **Grading Scheme:** Letter
Prerequisite: OT graduate student.
Principles and skills necessary for critical review of the occupational therapy literature.

OTH 5812: Practicum I
Credits: 2 **Grading Scheme:** LetterS/U
Prerequisite: OT graduate student.

Initial practicum site experience to aid socialization process into roles and styles of occupational therapists.

OTH 5816: Practicum II
Credits: 3 **Grading Scheme:** LetterS/U
Prerequisite: OT graduate student.
Second of series designed to acquaint future professionals with practice skills such as documentation and activity analysis.

OTH 5848: Internship I
Credits: 6 **Grading Scheme:** S/U
Initial full-time experience under direct supervision of licensed occupational therapist.

OTH 5849: Internship II
Credits: 6 **Grading Scheme:** S/U
Second full-time experience under direct supervision of licensed occupational therapist.

OTH 6008: Neuroscience of Human Occupation
Credits: 6 **Grading Scheme:** Letter
Theoretical explanations of occupation in human functioning. Contemporary concepts of brain function that support occupation with emphasis on sensory, motor, and cognitive processes.

OTH 6106: Assistive Technology and Occupational Performance
Credits: 6 **Grading Scheme:** Letter
Technology and strategies to support health and performance of daily occupations and to foster independent living and risk/injury reduction. Lifestyle and health consulting.

OTH 6275: Wellness and Disease Prevention of Chronic Conditions: Application in Occupational Therapy
Credits: 3 **Grading Scheme:** Letter
Vascular, nerve, and orthopedic disorders, tumors and trauma physiology and pathophysiology, and occupational therapy prevention and intervention.

OTH 6424: Application of Motor Learning and Motor Control in Occupational Therapy
Credits: 3 **Grading Scheme:** Letter
Review of neuroanatomy and musculoskeletal fundamentals of motor control. Discussion of acquisition and teaching of motor tasks to patient populations who suffer from motor control problems.

OTH 6425L: Relation of Body Image and Perceptual Dysfunction to Occupation
Credits: 2-3 **Max: 3** **Grading Scheme:** Letter
Prerequisite: registered occupational therapist or consent of instructor.

OTH 6539: Occupational Therapy Theory
Credits: 3 **Grading Scheme:** Letter
Preparation for entry-level position through introduction of basic principles of management and systems.

OTH 6635: Principles of Occupational Therapy Screening and Evaluation I
Credits: 3 **Grading Scheme:** Letter
Introduction to principles of tests and measurement and outcomes-based assessment relevant to infants, children, and adolescents.

OTH 6636: Principles of Occupational Therapy Screening and Evaluation II
Credits: 4 **Grading Scheme:** Letter
Prerequisite: OTH 6635.
Builds on OTH 6635. Application of screening and evaluation principles to evaluation process and learning to administer tools to adult population.

OTH 6641: Occupational Therapy Interventions I
Credits: 4 **Grading Scheme:** Letter
Occupational therapy theory and treatment as it relates to infants, children, adolescents, and their families.

OTH 6642: Occupational Therapy Interventions II
Credits: 6 **Grading Scheme:** Letter

Prerequisite: OTH 6641.
Basic interventions for adults through elders using ICIDH systems as framework. Planning and applied treatment approaches including acquisition, restorative, and compensatory strategies.

OTH 6707: OT Manager
Credits: 6 **Grading Scheme:** Letter
Leadership development, developing independent practice for consultation, client and professional advocacy, case management, and business entrepreneurship.

OTH 6708: Issues in Occupational Therapy Practice I
Credits: 2 **Grading Scheme:** Letter
Current health care issues.

OTH 6709: Issues in Occupational Therapy Practice II
Credits: 2 **Grading Scheme:** Letter
Forum for debating viewpoints regarding current practice issues relevant to occupational therapy.

OTH 6720: Trends and Issues in Health Care
Credits: 6 **Grading Scheme:** Letter
Managed health care, public policy, and intervention within social and behavioral contexts. Effects on occupational therapy service delivery.

OTH 6750: Single System Design
Credits: 2 **Grading Scheme:** Letter
Prerequisite: OTH 4935/5702/OTH 5770C.
Single system design and its application to occupational therapy programmatic research.

OTH 6760C: Protocol for Occupational Therapy
Credits: 3 **Grading Scheme:** S/U
Prerequisite: graduate-level statistics course.
Individual instruction in protocol design for research projects; procedures for submitting research to appropriate human participation review bodies.

OTH 6763: Evidence Based Practice
Credits: 6 **Grading Scheme:** Letter
Concepts and strategies for assessment of practice outcomes and program evaluation.

OTH 6765: Seminar in Occupational Therapy Theory
Credits: 4 **Grading Scheme:** Letter
Review of work of major occupational therapists. Theoretical perspectives include occupation-based theories and theories of Reilly, Fidler, Mosely, Llorens, Ayres, Kielhofner, and Allen.

OTH 6771: Applied Research I
Credits: 2 **Grading Scheme:** Letter
Introduction to qualitative research methods.

OTH 6772: Applied Research II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: OTH 6771.
Continuation of OTH 6771. Experience with integral components of research, data collection, and research writing.

OTH 6780: Applied Research in Occupational Therapy
Credits: 3 **Grading Scheme:** S/U
Prerequisite: OTH 6771.
Continuation of OTH 6771 with emphasis on completion of a research project and its oral and written dissemination.

OTH 6861: Specialty Internship
Credits: 2-9 Max: 9 **Grading Scheme:** S/U
Prereq or coreq: OTH 6780. Field experience in clinical, community, educational, and administrative settings approved by the department.

OTH 6905: Individual Work
Credits: 1-10 Max: 10 Grading Scheme: Letter
Project related to teaching, research, administration, or clinical practice.

OTH 6907: Professional Development Project
Credits: 6 Grading Scheme: Letter
Concepts and strategies for assessment of practice outcomes and program evaluation. Independent design, implementation, and reporting of an independent project.

OTH 6933: Special Topics in Occupational Therapy
Credits: 2-9 Max: 9 Grading Scheme: Letter
Selected topics in theory and research in occupational therapy.

OTH 6971: Research for Master's Thesis
Credits: 1-6 Grading Scheme: S/U

PAD 5935: Advanced Topics in Public Administration
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: prior departmental approval.

PAD 6108: Public Administration Theory
Credits: 3 Grading Scheme: Letter
Public administration, with emphasis on the units of analysis and contributions of each approach to general understanding of the field.

PAD 6227: Public Budgeting and Finance
Credits: 3 Grading Scheme: Letter
Decision making; budget planning and formulation.

PAD 6434: Leadership and Ethics in Public Agencies
Credits: 3 Grading Scheme: Letter

PAD 6946: Internship in Government
Credits: 3 Grading Scheme: S/U
Prerequisite: departmental approval.

PCB 5046C: Advanced Ecology
Credits: 3 Grading Scheme: Letter
Prerequisite: basic ecology and one course in statistics; physics, chemistry, and physiology desirable.
Ecological research skills, emphasizing design of field studies and data analysis. Offered fall term in odd-numbered years.

PCB 5065: Advanced Genetics
Credits: 4 Grading Scheme: Letter
Prerequisite: AGR 3303 or PCB 3063 and BCH 4024 or BCH 5045. For graduate students in any life science discipline.
Examines genetic principles including gene and gene function; recombination and linkage; molecular markers, multipoint linkage analysis, and positional cloning; and quantitative, population, developmental, and non-Medalian genetics. Offered in fall term.

PCB 5136L: Techniques in Microbial and Cell Biology
Credits: 3 Grading Scheme: Letter
Prerequisite: B grade or higher in MCB 3020L, CHM 3120/3120L.
A laboratory in experimental bacteriology and cell biology. Emphasis on experimental approaches and techniques used in study of cells and microorganisms. Experiments in microscopy, cell fractionation, metabolism, physiology, genetics, and regulation.

PCB 5235: Immunology
Credits: 3 Grading Scheme: Letter
Prerequisite: C grade or higher in MCB 3020L.
Immune system of vertebrate animals. The cellular and molecular events involved in immune responsiveness and resistance to infectious diseases.

PCB 5235L: Experiments in Immunology
Credits: 1 **Grading Scheme:** Letter
Prerequisite: MCB 3020L. *Corequisite:* PCB 5235.
Basic seriological procedures in immunology.

PCB 5307C: Limnology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: PCB 4044C, CHM 2046.
Biological, chemical, and physical dynamics of inland waters.

PCB 5338: Principles of Ecosystem Ecology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BSC 2010 or BSC 2011, and PCB 3034C or PCB 4044C.
Examines principles that govern the structure and function of terrestrial ecosystems. Ecosystem Ecology is the study of flows of energy and materials between organisms and their environment.

PCB 5356: Tropical Ecology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: elementary biology or consent of instructor.
Global overview of tropical environments, natural history, biological communities, and their structure and function. Addresses basic and applied ecological issues in the tropics.

PCB 5415C: Behavioral Ecology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: ZOO 3513C, 4472C, PCB 4044C, 4674, or consent of instructor.
Theoretical and empirical bases for behavioral adaptations.

PCB 5459: Morphometrics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PCB 4044C, 4674, STA 3024, or equivalents.
Quantitative methods of morphological analysis, with applications in ecological, evolutionary, and physiological biology. Emphasizes multivariate techniques.

PCB 5530: Plant Molecular Biology and Genomics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: undergraduate molecular biology or biochemistry.
Integrated overview of the fundamental mechanisms enabling plant growth, development, and function, and approaches to study these at molecular level. Topics include replication, repair, transcription, translation, cell cycle, transformation, gene tagging, structural genomics, proteomics, and metabolomics. Offered in fall term.

PCB 5615: Molecular Evolution and Systematics
Credits: 4 **Grading Scheme:** Letter
Prerequisite: PCB 3063, graduate standing, or consent of instructor.
Patterns and processes of change at the molecular level in populations, species, and higher taxonomic groups, and their systematic implications.

PCB 6049: Seminar in Ecology
Credits: 1-3 Max: 9 **Grading Scheme:** Letter
Rotating seminar: various topics in ecology.

PCB 6176: Electron Microscopy of Biological Materials
Credits: 2 **Grading Scheme:** Letter
Prerequisite: MCB 3020 or equivalent.
Use of the electron microscope, including fixation, embedding, sectioning, freeze-etching, negative staining, and use of vacuum evaporator.

PCB 6176L: Laboratory in Electron Microscopy
Credits: 2 **Grading Scheme:** Letter
Corequisite: PCB 6176 and consent of instructor.

Laboratory training in using electron microscopes, ultramicrotomes, vacuum evaporators, and freeze-etch machines.

PCB 6377C: Physiological Ecology of Vertebrates
Credits: 4 **Grading Scheme:** Letter
Prerequisite: course in physiology.
Physiological mechanisms that influence distribution and ecological relations, water conservation, and energy exchange in vertebrates.

PCB 6447C: Community Ecology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: PCB 4044C or equivalent, and consent of instructor.
The evolutionary ecology of communities; conceptual and quantitative approaches to community structure; statistics independent projects.

PCB 6496C: Stream Ecology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: ENY 3005C, PCB 4044C or 3043C, CHM 2046, PHY 2054.
Physical, chemical, and biological interrelationships in flowing fresh water.

PCB 6528: Plant Cell and Developmental Biology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PCB 5530 and PCB 5065 or equivalent.
Cellular and developmental biology of plants. Lecture format with frequent discussion of recent papers. Topics include signal transduction, organelles, protein trafficking, and developmental mechanisms. Offered in spring term.

PCB 6555: Introduction to Quantitative Genetics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6166.
Intended for students of all disciplines who are interested in genetic principles and biometric evaluation of characters that exhibit continuous variation in natural populations or breeding programs.

PCB 6675C: Evolutionary Biogeography
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Permission of instructor.
Interpretation of biological data sets in a biogeographical context. Topics and methods in historical and ecological biogeography will be discussed.

PCB 6695: Seminar in Evolutionary Biology
Credits: 1 **Max: 5** **Grading Scheme:** Letter
Prerequisite: PCB 4674.
Current thinking. New topic each time offered. Recently published book or symposium proceedings on newly emerging research theme. Supplementary material drawn from evolutionary biology journals. Directed readings.

PCB 6815: Hormone Regulation of Invertebrate Behavior
Credits: 3 **Grading Scheme:** Letter
Survey and analysis of invertebrate behaviors regulated by hormones. Invertebrates considered include arthropods, coelenterates, helminths, and molluscs.

PCB 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

PCB 6937: Special Topics in Plant Molecular and Cellular Biology
Credits: 1-4 **Max: 8** **Grading Scheme:** Letter
Prerequisite: graduate course work in genetics, biochemistry, or molecular biology areas.
Contemporary research.

PCB 6971: Research for Master's Thesis
Credits: 1-6 **Grading Scheme:** S/U

PCB 7922: Journal Colloquy in Plant Molecular and Cellular Biology

Credits: 1 Max: 8 Grading Scheme: Letter
Prerequisite: Required for PCMB majors.
Critical discussion and presentation of recent journal articles in the area of plant molecular and cellular biology.

PCB 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

PCB 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

PCO 6057: Psychology of Counseling I
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate status in the counseling psychology program.
Theory, research, and skills in therapeutic approaches to counseling psychology.

PCO 6058: Psychology of Counseling II
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate status in counseling psychology program.
Theory, research, and skills in short-term approaches to counseling psychology.

PCO 6059: Psychology of Counseling III
Credits: 3 Grading Scheme: Letter
Prerequisite: PCO 6058.
Theory, research, and skills in psychodynamic approaches to counseling psychology.

PCO 6278: Diversity and Multiculturalism in Counseling Psychology
Credits: 3 Grading Scheme: Letter
Overview of development of mutlicultural counseling theory, research, and practice. Historical background, multicultural counseling competencies, cultural identity development and worldview, spiritual issues, understainding oppression (e.g., racisim, sexism, heterosexism, able-ism), case conceptualization, MCC organizaitonal development, ethical guidelines for working with diverse populations, and MCC skills development.

PCO 6316C: Psychological Assessment I
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Consideration of basic assessment theory and of fundamental theories of intelligence and intellectual assessment, including practicum-type administration of intelligence tests.

PCO 6317C: Psychological Assessment II
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Fundamental theories of personality and individual assessment of personality, including practicum-type administration of personality tests.

PCO 6931: History and Contemporary Issues in Counseling Psychology
Credits: 3 Grading Scheme: Letter
Introduction to foundations of counseling psychology and its research. Contemporary literature of discipline.

PCO 6939: Seminar: Current Topics in Counseling Psychology
Credits: 3 Max: 15 Grading Scheme: Letter
Prerequisite: MHS 6401 or consent of instructor.
Emphasis on theoretical background and implications for applied work.

PCO 7217: Professional Ethics and Skills in Counseling Psychology
Credits: 3 Grading Scheme: Letter
Prerequisite: graduate student status in counseling psychology or consent of instructor.

Professional issues, ethics, relationships, and skills pertaining to practice of counseling psychology.

PCO 7247: Group Counseling/Psychology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate student status and consent of instructor; coreq: enrollment in counseling practicum.
Process of group counseling and psychotherapy as well as the counselor's role in the facilitation of group process.

PCO 7537: Vocational Psychology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate student status and consent of instructor.
Examines major theories and research. Emphasizes vocational assessment.

PCO 7944: Practicum in Counseling Psychology
Credits: 1 Max: 12 **Grading Scheme:** Letter
Prerequisite: PCO 7217.
For second-year doctoral students in counseling psychology, 12 hours per week of on-site clinical work plus individual and group supervision.

PCO 7945: Advanced Practicum in Counseling Psychology
Credits: 1 Max: 4 **Grading Scheme:** Letter
Prerequisite: PCO 7217, 7947.
For advanced students in counseling psychology. On-site clinical work at approved mental health agencies: 12 to 15 hours per week of work including individual and group supervision.

PCO 7949: Internship in Counseling Psychology
Credits: 1 Max: 12 **Grading Scheme:** Letter
Prerequisite: written application to the Counseling Psychology Internship Coordinator.
Full-time or equivalent work in a university or community agency where counseling functions are carried out under supervision. Open only to students in the counseling psychology program.

PEQ 5127: Advanced Instructors of Adapted Aquatics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor/adviser.
The art and science of effectively teaching aquatics to special populations. Aquatics teaching methods for individuals with physical, mental/emotional, sensory, medical, and health disabilities.

PET 5655C: Medical Aspects of Individuals with Disabilities
Credits: 3 **Grading Scheme:** Letter
Teaching exercise therapy and adapted physical education to individuals of all ages with physical, mental, and health disabilities.

PET 5936: Special Topics/Seminars
Credits: 1-3 **Grading Scheme:** Letter

PET 6426: Advanced Curriculum in Movement Pedagogy
Credits: 3 **Grading Scheme:** Letter
Array of methods used in instruction of and through movement.

PET 6615: Special Physical Education Assessment and Curriculum Techniques
Credits: 3 **Grading Scheme:** Letter
Evaluating and teaching physical education to exceptional populations, and administering various assessment and curriculum instruments.

PET 6706: Research on Teaching Physical Education
Credits: 3 **Grading Scheme:** Letter
In-depth study of research on teaching, and applying research-based knowledge to teaching physical education.

PET 6716: Risk Management in Sport and Physical Activities
Credits: 3 **Grading Scheme:** Letter
Theory and techniques for research and practical application.

PET 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

PET 6934: Seminar in Special Physical Education
Credits: 3 Max: 6 Grading Scheme: Letter
Theory and practical experience in the field of special physical education.

PET 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

PET 6947: Graduate Internship in Exercise and Sport Sciences
Credits: 3-9 Max: 9 [only 5 can count toward degree] Grading Scheme: S/U
Prerequisite: completion of 2 terms of course work applicable to specialization; permission of adviser, written application, and site approval.
On-site full-time practical experience in field of study.

PET 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

PGY 5246: Biophotography
Credits: 3 Grading Scheme: Letter
Laboratory, field, and darkroom techniques in 35mm still photography for biological research publications, posters, and slide presentations.

PHA 5171: Pharmaceutical Biotechnology
Credits: 3 Grading Scheme: Letter
Principles of recombinant DNA technology needed to interact and communicate as a pharmaceutical scientist in biotechnology. Recombinant peptide and protein drugs including protein purification, stability, quality control, and dosage form design. Offered fall term.

PHA 5270: Health Care and Patient Safety
Credits: 3 Grading Scheme: Letter
Provides an overview of applicable federal, state, local, and health and safety laws relevant to the practice of health care risk management and patient safety.

PHA 5271: Health Care Risk Management
Credits: 3 Grading Scheme: Letter
Introduction to the concept of risk management in health care settings, describing its development, role of the health care risk manager, and connection between risk management, quality improvement and corporate compliance.

PHA 5272: Risk Management, Liability and Compliance
Credits: 3 Grading Scheme: Letter
Applicable standards of health care risk management, including the principles of malpractice and insurance, the conduct of malpractice litigation, and the settlement of malpractice claims.

PHA 5475: Synthesis of Prodrugs
Credits: 3 Grading Scheme: Letter
Prerequisite: introductory organic chemistry, medicinal chemistry, pharmaceutics.
An outline of synthetic and physical chemical approaches to solving drug delivery, bioavailability, activity, potency, toxicity, and acceptability problems.

PHA 5531: Neurotoxicology
Credits: 2 Grading Scheme: Letter
Prerequisite: biochemistry, physiology, and consent of instructor.
Survey of major classes of agents known to cause toxic effects in central and peripheral nervous systems. Compounds' mechanism of action. Experimental techniques for evaluating neurotoxicity.

PHA 6115: Equilibria, Complexations, and Interactions of Drugs
Credits: 3 Grading Scheme: Letter

Models for drug interactions in solution. Physical chemistry characteristics of drugs and their complexes in pharmaceutical systems.

PHA 6116: In Vivo and In Vitro Stability of Drugs
Credits: 3 **Grading Scheme:** Letter
Effects of various disease states, age, genetic differences, stress, nutrition, and drug interactions on drug metabolism. Offered fall term in even-numbered years.

PHA 6118: Molecular Diversity
Credits: 2 **Grading Scheme:** Letter
Combinatorial and high throughput methods to generate leads for drug discovery and accelerated drug development.

PHA 6125: Pharmacokinetics and Biopharmaceutics
Credits: 3 **Grading Scheme:** Letter
Compartmental analysis with computers. Offered spring term in even-numbered years.

PHA 6170C: Pharmaceutical Product Formulation
Credits: 3 **Grading Scheme:** Letter
Rationale and design of pharmaceutical dosage forms. Offered fall term in odd-numbered years.

PHA 6183: Pharmaceutical Gene Delivery
Credits: 3 **Grading Scheme:** Letter
Designed for graduate students researching gene delivery. Lectures on vector design and construction including review of related molecular biology and cell biology. Lectures on gene delivery systems (both viral and nonviral vectors) and their applications. Recent progress of gene therapy for human diseases including student presentations. Offered in odd-numbered years.

PHA 6185: Pharmaceutical Drug Development
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor. Open to graduate students and advanced Pharm.D. students.
Drug development from discovery to post-market surveillance. Good manufacturing process (GMP), good clinical practice (GCP), and good laboratory practice (GLP); intellectual property, regulatory agencies, generic approvals, and case studies.

PHA 6206: Introduction to Pharmaceutical Microeconomics
Credits: 3 **Grading Scheme:** Letter
Introducing students to the fundamentals of microeconomic theory from the perspective of pharmaceutical markets. This course will cover the main elements of microeconomic theory, focusing on the behavior of individuals and firms and the interaction among these agents in both competitive and non-competitive pharmaceutical markets. The class will focus on concepts such as consumer choice, opportunity costs, supply and demand, elasticity, competition, monopoly and oligopoly and the application of these concepts to the markets for pharmaceutical products and services.

PHA 6227: Institutional Pharmacy Leadership I
Credits: 3 **Grading Scheme:** Letter
Addresses leadership topics relevant to institutional pharmacy with an emphasis on case study analysis. Topics include leading people, leading the pharmacy enterprise, leading change and innovation, providing leadership in safety and quality, and information technology and systems.

PHA 6228: Institutional Pharmacy Leadership II
Credits: 3 **Grading Scheme:** Letter
Addresses leadership topics relevant to institutional pharmacy with emphasis on case-study analysis. Topics include leadership in effective financial management, building presence with executive leadership, leading for results, and gaining leadership skills through self-development.

PHA 6235: Advanced Pharmaceutical Law
Credits: 2 **Grading Scheme:** Letter
Study of the federal Food, Drug, and Cosmetics Act and various state and local laws applicable to drug manufacturers, wholesalers, distributors, and drug-related products, including analyses of recent court decisions.

PHA 6236: Health Sciences Liability Law

Credits: 2 **Grading Scheme:** Letter
Liability of health sciences practitioners, including hospitals, physicians, pharmacists, nurses, medical technologists, and dentists.

PHA 6250: Patient Responsibility in Health Care
Credits: 3 **Grading Scheme:** Letter
This course examines the ways in which patients can accept responsibility for promoting good outcomes of the therapeutic modalities that the health care professionals and institutions provide. The focus is on how patients can foster a productive relationship with health care providers and institutions, and how they can participate actively in efforts to prevent failures of quality in the provision of health care.

PHA 6264: Pharmacoeconomics and Health Technology Assessment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6200 or STA 6126 or equivalent, HSC 6506 or 5103 or equivalent, or consent of instructor.
Introduction to major analytical techniques used in economic evaluation of medical technologies.

PHA 6265: Introduction to Pharmaceutical Outcomes and Policy I
Credits: 3 **Grading Scheme:** Letter
Introduces students to the breadth of research issues in Pharmaceutical Outcomes and Policy, including legal, educational, regulatory and financial aspects of medication use; patient and provider behavior in medication use; the structure of pharmaceutical supply chain; and patient safety and risk management.

PHA 6266: Introduction to Pharmaceutical Outcomes and Policy II
Credits: 2 **Grading Scheme:** Letter
Introduction to drug distribution systems, pharmacoepidemiology, economic evaluation of drugs, and databases regarding medication use.

PHA 6268: Pharmacoepidemiology and Patient Safety
Credits: 3 **Grading Scheme:** Letter
Exposure to research methodologies in pharmacoepidemiology relevant to drug safety, drug effectiveness, and outcome assessment. Emphasizing observational study designs, including patient follow-up studies, case-control and cohort designs.

PHA 6269: Pharmaceutical Products and Public Policy
Credits: 3 **Grading Scheme:** Letter
Relationships among pharmaceutical manufacturers, institutions, managed care, professions, and the public. The government's role in assuring high quality pharmaceutical products and services. Quality controls managed by the public and by industry. Congressional oversight of medication development, production, and use.

PHA 6273: Structure, Process, and Outcomes of Regulation
Credits: 3 **Grading Scheme:** Letter
The role of the legislative, executive and judicial branches of state and federal government in the establishment of standards for pharmacy practice and drug distribution. Special emphasis on the administrative rule making process. The purpose of government agencies, the approach to standards setting by each type of agency, and the effects of regulation on public health.

PHA 6274: Federal Regulations of Drugs and Pharmacy
Credits: 3 **Grading Scheme:** Letter
The Federal Food, Drug and Cosmetic Act, regulations promulgated by the Food and Drug Administration, and judicial interpretations of controversies in this area. Federal regulation of drug research, new drug approval, drug marketing and drug distribution. The balance sought by the FDA and other federal agencies in the protection of the public from unsafe and/or ineffective drugs, without unnecessarily restricting access to therapies.

PHA 6275: Federal Regulations of Controlled Substances
Credits: 3 **Grading Scheme:** Letter
The Federal Controlled Substances Act, regulations promulgated by the Drug Enforcement Administration, and judicial interpretations of controversies in this area. The "closed-system" of controlled substance distribution created under federal law. Federal restrictions on the manufacture, distribution and use of drugs that are subject to abuse. Treatment programs for the disease of addiction.

PHA 6276: Regulating Pharmaceutical Access and Costs

Credits: 3 **Grading Scheme:** Letter
Regulation to expand access and control costs of health care. The obligation to provide care. State and federal regulation of private health insurance and managed care. Implications of EMTALA, ERISA, HIPAA, and COBRA. Introduction to Medicare and Medicaid. Technology assessment, drug pricing and price controls. Intellectual property protections and market exclusivity periods.

PHA 6277: Ethics in Drug Development Production and Use
Credits: 3 **Grading Scheme:** Letter
Governments, health professionals, patients and research institutions look to the field of ethics for guidance on how decisions should be made in the treatment of patients and in research. A process for ethical decision making. Basic theories and principles of biomedical ethics, with emphasis on utilitarianism. Application of principles to subjects such as informed consent, abortion/contraception, physician-assisted dying, experimentation with human subjects, and confidentiality.

PHA 6278: State Regulation of Drugs and Pharmacy
Credits: 3 **Grading Scheme:** Letter
State, federal, and nongovermental regulation of health care professions and practice sites. Regulatory responses to professional misconduct. Role of professional self-regulation. Consumerism and state regulation.

PHA 6279: Pharmaceutical Outcomes and Policy Seminar
Credits: 1 Max: 3 **Grading Scheme:** S/U
Development, reasons for, and possible approaches to resolving a contemporary issue in health outcomes or policy. Students analyze particular aspects of the issue and present results for class discussion.

PHA 6280: Medicare and Medicaid
Credits: 3 **Grading Scheme:** Letter
Costs and financing of Medicare and Medicaid. Eligibility, program administration, benefits, and relationships between state and federal agencies.

PHA 6281: Practices and Procedures of Administrative Agencies
Credits: 3 **Grading Scheme:** Letter
Organization, responsibilities, administrative practices, procedures, and politics of FDA and CMS.

PHA 6282: Pharmaceutical Policy Process
Credits: 3 **Grading Scheme:** Letter
Focuses on the national pharmaceutical policy-making process by examining how legislative proposals are developed and influenced, the enactment of laws, and the administrative rule making which clarifies and fills in details not found in what legislative bodies produce. Several players in this process are examined, including the roles of the Executive Branch, administrative agencies such as The Centers for Medicaid and Medicaid Services and The Food and Drug Administration, the Congress, Federal courts, interest groups like the Pharmaceutical Research and Manufacturer's Association, and groups representing pharmacists, physicians, and patients.

PHA 6283: Commercial Applications of Pharmacoeconomics
Credits: 3 **Grading Scheme:** Letter
Fundamental methods of pharmacoeconomic analysis. Focuses on the theory, methods, and application of technology assessment in health care. Applications will be drawn from a variety of health care settings, including pharmaceuticals.

PHA 6286: Pharmaceutical Microeconomics
Credits: 3 **Grading Scheme:** Letter
Introduction to basic microeconomic principles as they are applied to pharmaceuticals. Elucidation of the economic tools and the fundamental concepts of choice, opportunity costs, supply and demand, elasticity, utility maximizing behavior, competition, monopolies and oligopolies in the healthcare market.

PHA 6287: Pharmaceutical Health Economics
Credits: 3 **Grading Scheme:** Letter
Examines economic principles and issues of health care and pharmaceuticals in the United States. Topics examined include health care structure and financing, market failures, human capital, and producer and consumer behavior.

PHA 6288: Critical Review of Research Methods
Credits: 3 **Grading Scheme:** Letter

Research design and methodology utilized in clinical research with a focus on understanding each component of the research process, including how to formulate a research question, develop hypotheses, analyze instruments, collect relevant data, data analysis, and critically interpret the results, while preserving the ethical guidelines for human subject research.

PHA 6289: Regulating Clinical Research
Credits: 3 **Grading Scheme:** Letter
Introduces history and current regulatory environment of human subjects research as a background to regulatory frameworks and contemporary issues structuring the development of clinical medical research, including federal regulations of Departments of Health and Human Services and those of the Food and Drug Administration, as well as non-federal sources of regulation.

PHA 6290: Pharmaceutical Fraud and Abuse
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Understanding of federal fraud, waste and abuse laws and regulations related to health care. Fraud, waste, and abuse laws and regulations are the focus of many different health care laws and regulations with the number growing each year. This course will introduce students to these laws and regulations and allow them to distinguish among the different regulations. The course will also focus on areas where health care entities can prevent violations of fraud, waste, and abuse.

PHA 6291: Pharmaceutical Health Care Systems
Credits: 3 **Grading Scheme:** Letter
Emphasizes designing a prescription benefit program meeting the needs of a reformed health care system; negotiating the health care system as the advocate for patients who are from special populations; and presenting to lawmakers a compelling argument for reform.

PHA 6354: Natural Medicinal Products
Credits: 3 **Grading Scheme:** Letter
Chemistry of compounds derived from plants and animals.

PHA 6356: Structure Determination of Complex Natural Products
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 5235 or consent of instructor.
Rigorous structure determination of natural products, using modern spectroscopic methods. Become able to elucidate the structure of any organic small molecule.

PHA 6416: Pharmaceutical Analysis I
Credits: 3 **Grading Scheme:** Letter
Theory and applications of relevant analytical techniques for analysis of drugs in biological samples. Offered spring term in odd-numbered years.

PHA 6417: Pharmaceutical Analysis II
Credits: 3 **Grading Scheme:** Letter
Absorption, fluorescence, phosphorescence, and spectroanalysis of drugs and related compounds.

PHA 6425: Drug Biotrans and Molecular Mechanisms of Toxicity
Credits: 3 **Grading Scheme:** Letter
Prerequisite: introductory organic chemistry, biochemistry.
Enzymology and mechanisms of drug biotransformation pathways. Examples of drugs and other xenobiotics that exhibit toxicity related to biotransformation.

PHA 6427: Pharmacogenetics of Drug Metabolism
Credits: 2 **Grading Scheme:** Letter
Examination of factors that affect drug disposition and response including genetics, as well as, additional factors such as environment, diet, age, and concurrent drug therapy and health status. Students will acquire an understanding of pharmacogenetics/pharmacogenomics in the context of variability in drug disposition and the application of pharmacogenetics to drug development and drug treatment.

PHA 6432: Fundamentals of Pharmaceutical Chemistry
Credits: 1 **Grading Scheme:** Letter

This is a foundation course whose aims are providing an introduction to the principles of Pharmaceutical chemistry, including an understanding of drug structure-activity relationships, prediction of the physico-chemical properties of a drug, basic knowledge of the major pathways of drug metabolism, and factors that can contribute to drug-drug interactions.

PHA 6440: Seminar in Drug Discovery
Credits: 1 Max: 8 Grading Scheme: Letter, S/U
Weekly presentations of research topics related to drug design and discovery.

PHA 6444: Pharmaceutical Chemistry I
Credits: 3 Grading Scheme: Letter
Students are shown how to predict the solubilities, structure-activity relationships, basic synthesis routes for selected structures, metabolism and pharmacological activity/potency of various drug classes. In particular, anticoagulants, ACE inhibitors, glucocorticoid steroids, nitrate esters, adrenergics, cholinergics, diuretics, anesthetics, antihyperlipidemics, muscle relaxants, anxiolytics, antidepressants, sedative hypnotics and vitamins are covered.

PHA 6447: Drug Design
Credits: 3 Grading Scheme: Letter
Prerequisite: organic chemistry, biochemistry, pharmacology, or consent of instructor.
Relevant disciplines and their effect on new drug development, from discovery of a new active lead compound to final refinement as a commercial product.

PHA 6448: High Throughput Drug Discovery
Credits: 2 Grading Scheme: Letter
Prerequisite: organic chemistry, biochemistry, or consent of instructor.
Introduction to combinatorial chemistry, multi-compound based technologies, and their use in screening bioassays to discover lead compounds.

PHA 6449: Pharmacogenomics
Credits: 2 Grading Scheme: Letter
Prerequisite: biochemistry, PHA 6425, or consent of instructor.
Contemporary experimental approaches in pharmacogenomics research design.

PHA 6471: Synthetic Medicinal Chemistry
Credits: 3 Grading Scheme: Letter
Review of acid and base properties of pharmacologically active molecules. Review of mechanisms of synthetic reactions, and their applications.

PHA 6508: Systems Physiology and Pathophysiology I
Credits: 5 Grading Scheme: Letter
Prerequisite: Upper level undergraduate Anatomy and Physiology
Systems Physiology and Pathophysiology-I is the first of a two-course sequence that aims to provide graduate students with an integrated knowledge base in the physiological functions of the human body and pathological changes pertinent to the development and progression of various diseases. As an integral component of the Ph. D. curriculum, the two courses will provide students with a solid understanding of human pathophysiology in preparation for their dissertation research.

PHA 6509: Systems Physiology and Pathophysiology II
Credits: 5 Grading Scheme: Letter
Prerequisite: Upper level undergraduate Anatomy and Physiology
Systems Physiology and Pathophysiology-I is the second of a two-course sequence that aims to provide graduate students with an integrated knowledge base in the physiological functions of the human body and pathological changes pertinent to the development and progression of various diseases. As an integral component of the Ph. D. curriculum, the two courses will provide students with a solid understanding of human pathophysiology in preparation for their dissertation research.

PHA 6512L: Experiential Research Training in Pharmacodynamics
Credits: 1-4 Max: 4 Grading Scheme: Letter
Prerequisite: PHA 6521C.
Research rotations. Practical overview of hypothesis development and testing, research design and application of statistical analysis.

PHA 6521C: Research Techniques in Pharmacodynamics
Credits: 1 **Grading Scheme:** Letter

PHA 6522L: ICBR Molecular Techniques Laboratory
Credits: 2 **Grading Scheme:** S/U

PHA 6535: Principles of Nucleotide Activity
Credits: 2 **Grading Scheme:** Letter
This course will be introducing the students to the chemical structure of DNA and RNA; the synthetic processes for DNA and RNA synthesis; biochemical reactions and pathways for nucleotide synthesis; DNA replication, transcription and translation; covalent and reversible interactions of nucleic acids with small molecules and proteins and an overview of techniques for the analysis of nucleic acids.

PHA 6540: Neurochemical Foundation of Pharmacodynamics
Credits: 3 **Grading Scheme:** Letter
Introduction to neurochemical mechanisms involved in drug action. Overview of neurotransmitter biochemistry along with receptor pharmacology. Emphasis on both methodological and theoretical aspects of neurotransmitter metabolism and function.

PHA 6543: Pharmaceutical Chemistry II
Credits: 3 **Grading Scheme:** Letter
Showing students how to predict the solubilities, structure-activity relationships, basic synthesis routes for selected structures, metabolism and pharmacological activity/potency of various drug classes. In particular antidiabetics, anticonvulsants, H1 and H2 antagonists, analgetics, nonsteroidal antiinflammatory drugs, hormones, antibiotics, antiviral agents, and antineoplastic agents are covered.

PHA 6630: Medication Therapy Management: A Hematologic Focus
Credits: 3 **Grading Scheme:** letter
Prerequisite: The student must have successfully completed Foundations of MTM I (PHA 6631) and Foundations of MTM II (PHA 6632).
Introducing the student to principles of medication therapy management in patients with hematologicdisorders.

PHA 6631: Foundations of Medication Therapy Management I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: All students have a prior pharmacy degree.
Core elements of medication therapy management (MTM), physical assessment skills, communication techniques, and methods of literature evaluation needed for successful provision of MTM services.

PHA 6632: Foundations of Medication Therapy Management II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: All students have a prior pharmacy degree.
Business elements of medication therapy management (MTM), MTM practice models, documentation systems, business plan development, and basic financial principles needed for the successful provision of MTM.

PHA 6633: Medication Therapy Management: A Cardiovascular Focus
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHA 6631 and PHA 6632
Principles of medication therapy management in patients with cardiovascular disorders.

PHA 6634: Medication Therapy Management: An Endocrine Focus
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHA 6631 and PHA 6632
Principles of medication therapy management in patients with endocrine disorders.

PHA 6635: Medication Therapy Management: A Renal Focus
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHA 6631 and PHA 6632
Principles of medication therapy management in patients with renal disorders.

PHA 6636: Medication Therapy Management: A Gastrointestinal Focus
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Foundations of MTM I and Foundations of MTM II
Principles of medication therapy management in patients with gastrointestinal disorders.

PHA 6637: Medication Therapy Management: A Psychiatric Focus
Credits: 3 **Grading Scheme:** letter
Prerequisite: The student must have successfully completed Foundations of MTM I (PHA 6631) and Foundations of MTM II (PHA 6632)
Introducing the student to principles of medication therapy management in patients with psychiatric disorders.

PHA 6638: Medication Therapy Management: A Neurologic Focus
Credits: 3 **Grading Scheme:** letter
Prerequisite: The student must have successfully completed Foundations of MTM I (PHA 6631) and Foundations of MTM II (PHA 6632)
Introducing the student to principles of medication therapy management in patients with neurologic disorders.

PHA 6639: Medication Therapy Management: A Respiratory Focus
Credits: 3 **Grading Scheme:** letter
Prerequisite: The student must have successfully completed Foundations of MTM I (PHA 6631) and Foundations of MTM II (PHA 6632).
Introducing the student to principles of medication therapy management in patients with respiratory disorders.

PHA 6717: Measurement in Pharmacy Administration Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6217 or equivalent.
Examination of some of the techniques adapted from the social sciences for research in the field of pharmacy administration.

PHA 6793: Evidentiary Basis of Pharmaceutical Use
Credits: 3 **Grading Scheme:** Letter
The overall goal of the course is to familiarize students with methods and tools to evaluate the medical literature. Students will be exposed to an array of study designs and analytic methods. In clinical cases, students evaluate strengths and weaknesses of the published literature and use evidence to support their recommendations about the appropriate use of pharmaceuticals.

PHA 6796: Study Design in Pharmaceutical Outcomes & Policy Research
Credits: 3 **Grading Scheme:** Letter
Methods for evaluation and improvement of drug therapy outcomes including critical appraisal of drug and clinical service literature with special focus on patient and medication safety.

PHA 6798: The Use and Abuse of Statistics in Drug Regulation
Credits: 3 **Grading Scheme:** Letter
Explores statistical methods used to make inferences about data obtained in clinical trials. This course demonstrates how statistics are used to rule out the possibility that the conclusions of a research project are the result of chance. Potential problems in the use of statistics are reviewed. The course examines published research articles reporting results that are not supported by the statistical tools used in the described study. The student is taught how to engage in critical analysis of the statistics in a proposed scientific study.

PHA 6799: Patient Safety Program Evaluation
Credits: 3 **Grading Scheme:** Letter
Explores the methodologies through which patient safety data are collected and evaluated. The use of existing databases on patient safety will be examined. The course includes design of a patient safety study, the evaluation of data, and the use of results from program evaluation to implement improvements to ongoing programs.

PHA 6805: Applied Data Interpretation and Reporting of Findings in Pharmacy
Credits: 3 **Grading Scheme:** Letter
Develops research skills including generation of questions; hypotheses testing; and testing, interpretation, and reporting of findings.

PHA 6806: Pharmacoeconomic Modeling

Credits: 3 **Grading Scheme:** letter
Prerequisite: PHA 6283
Providing an introduction to methods and techniques for conducting pharmacoeconomic studies, including classifying disease, identifying pharmaceutical products from prescription claims, risk adjustment, practical decision analysis, Markov modeling, and indirect treatment comparisons.

PHA 6840: Medicinal Chemistry of Drugs of Abuse
Credits: 3 **Grading Scheme:** Letter
Pharmacological effects of commonly encountered licit and illicit pharmaceutical compounds.

PHA 6851: Forensic Analysis of DNA
Credits: 3 **Grading Scheme:** Letter
Techniques for isolation of DNA from cells. Spectroscopic techniques. Hydrodynamic and electrophoretic separation methods. Sequence determination. Statistical analysis and forensic significance.

PHA 6852: Mammalian Molecular Biology
Credits: 3 **Grading Scheme:** Letter

Focus on the principles of modern molecular biology and biochemistry and expand on the concepts you may have already encountered in other classes in this program. The content will also include the applications of experimental techniques and procedures routinely used in this field.

PHA 6853: Biological Evidence and Serology
Credits: 3 **Grading Scheme:** Letter
Overview of crime scene investigation as it pertains to biological evidence. Crime scene safety. Collecting and preserving evidence. Identifying, analyzing, and interpreting biological stains.

PHA 6854: Forensic Immunology
Credits: 3 **Grading Scheme:** Letter
Antibody formation, antigen structure. Complement mediated reactions. Hypersensitivity. Immunoelectrophoretic techniques in forensic science.

PHA 6855: Forensic Genetics
Credits: 3 **Grading Scheme:** Letter
Principles of inheritance. Genetic polymorphisms and forensic implications, population genetics and paternity testing.

PHA 6856: Blood Spatter and Distribution
Credits: 3 **Grading Scheme:** Letter
Blood spatter creation and interpretation. Recording, collection, and processing of bloodstains and blood spatter evidence.

PHA 6860: Prevention of Pharmaceutical Crimes
Credits: 3 **Grading Scheme:** Letter
Introduces the student to the current legal environment associated with criminal conduct related to the use of pharmaceutical products and strategies for reducing the risk that pharmaceutical products will be used to intentionally harm a person as the instrumentality of a criminal act, including actions by a health care provider that can be considered criminal and outside the practice of health care.

PHA 6891: Introduction to Pharmacoepidemiology
Credits: 3 **Grading Scheme:** Letter
Explores basic epidemiology principles with a particular focus on how they are applied to pharmaceuticals. Provides a basic understanding of causation, measure disease occurrence and causal effect, biases in study design, data analysis and use of epidemiology in clinical settings.

PHA 6892: Practices and Procedures of the IRB
Credits: 3 **Grading Scheme:** Letter
Describes the nuts and bolts of how Institutional Review Boards operate. Topics discussed include IRB membership, IRB authority, criteria for IRB approval of research or exemption from review, and suspension or termination of IRB approved research. The process of risk/benefit decision making is reviewed. The constituencies served by the IRB are examined. Current issues in IRB practice are discussed. Practical information about the week-to-week management of an IRB is explained.

PHA 6893: Research Ethics
Credits: 3 **Grading Scheme:** Letter
Introduce the student to the ethical issues that must be addressed in clinical research with human subjects. It will include an introduction to the primary theories and methods of ethical reflection and analysis, the conceptual distinctions and continuities between ethical and legal / policy questions, and illustrate the background to current issues with selected cases from the history of human subjects research.

PHA 6894: Introduction to Graduate Studies
Credits: 1 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
time management, intellectual property, research notebooks, laboratory leadership, grantsmanship, preparing presentations, publishing and professionalism.

PHA 6896: Preclinical Drug Evaluation
Credits: 2 **Grading Scheme:** Letter
Prerequisite: general Biology (Diversity of Life), Microbiology, General Chemistry, Organic Chemistry Biochemistry, and Physiology, Pharmacology.
Introduction to the study of preclinical methods used in the screening of important categories of clinically useful drugs, including direction on writing effective animal protocols for research.

PHA 6899: Advanced OB/GYN and Pediatric Pharmacoepidemiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Biostatistics, Epidemiology Methods, and permission of the instructor
Introducing the student to current drug safety issues in OB/GYN and pediatric drug treatment practice. The discussion will focus on methodological consideration specific to observational data research in these special populations, including but not limited to assessing drug exposure, small exposure populations, outcome validation of rare events, biases, confounding, data extraction from electronic health records, and primary source verification as relevant to pediatrics and OB/GYN.

PHA 6905C: Research Procedures in Medicinal Chemistry
Credits: 1-4 **Max: 12** **Grading Scheme:** Letter

PHA 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

PHA 6934: Seminar in Medicinal Chemistry
Credits: 1 **Max: 3** **Grading Scheme:** Letter, S/U
Weekly presentation and discussion of research reports based on college programs or literature.

PHA 6935: Selected Topics in Pharmacy
Credits: 1-4 **Max: 12** **Grading Scheme:** Letter
Open to all departments in the College of Pharmacy.

PHA 6936: Advanced Topics in Pharmaceutical Sciences
Credits: 1 **Max: 4** **Grading Scheme:** Letter
Written and oral presentation of research designs, protocols, papers, and critical appraisals with discussion and critical review of such topics.

PHA 6937: Topics in Pharmaceutical Administration
Credits: 2 **Grading Scheme:** Letter
Analysis of special topics and recent developments in pharmaceutical administration, including innovations in the distribution of drugs and health-care services.

PHA 6938: Research Seminar
Credits: 1 **Max: 3** **Grading Scheme:** Letter
Seminar required of graduate students in the College of Pharmacy.

PHA 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

PHA 6971: Research for Master's Thesis

Credits: 1-15 **Grading Scheme:** S/U

PHA 7939: Journal Colloquy in Pharmacodynamics
Credits: 1 Max: 8 **Grading Scheme:** Letter
Critical presentation and discussion of recent original articles.

PHA 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

PHA 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

PHC 6000: Epidemiology Methods I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6001, PHC 6050 or PHC 6052, or departmental approval.
Overview of epidemiology methods used in research studies that address disease patterns in community- and clinic-based populations.

PHC 6001: Principles of Epidemiology in Public Health
Credits: 3 **Grading Scheme:** Letter
Epidemiology methods frequently used to study disease patterns in community and clinic-based populations. Includes distribution and determinants of health-related states or events in specific populations and application to control of health problems.

PHC 6002: Epidemiology of Infectious Diseases
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6001, and PHC 6052 or PHC 6050: Statistical Methods for Health Sciences Research I or departmental approval.
Epidemiology, prevention, and control of infectious diseases affecting local, national, and global community health; epidemiologic methods used in disease surveillance and measures used in slowing or preventing spread of disease.

PHC 6003: Epidemiology of Chronic Diseases and Disability
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6001, and PHC 6052 or PHC 6050 or departmental approval.
Overview of epidemiology of chronic diseases and disabilities prevalent in various populations. Introduces contemporary methods for surveillance including risk factors, etiology, and changes over time.

PHC 6006: An Introduction to One Health Problem Solving
Credits: 2 **Grading Scheme:** Letter
Infectious disease surveillance, diagnostic tools, outbreak investigations, vaccine trials, public health interventions, biodefense, emerging infectious diseases, and analytic approaches to infectious disease prevention and control.

PHC 6008: Cardiovascular Epidemiology
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6800, consent of instructor.
Survey of major cardiovascular diseases including a review of design and methods for studying natural history, prevention, and treatment process.

PHC 6010: Data Management and Statistical Computing for Epidemiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: knowledge of statistics and personal computers.
Database design, data management, efficient data collection, and computer-based methods for statistical design and analysis.

PHC 6011: Epidemiology Methods II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6000 and PHC 6052, or departmental approval.

Analytic methods in epidemiology with a foundation in applied epidemiological analysis and experience in peer-review productivity based on secondary data analysis.

PHC 6014: Epidemiology, Prevention, and Control of Chronic Diseases II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6001 and PHC 6003 or equivalent.
Survey of major chronic diseases not covered in PHC 6003. Emphasizes recent epidemiology research and findings.

PHC 6016: Social Influences in Public Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6000, PHC 6001, PHC 6410, or consent of instructor.
Social determinants of population health, including acute and chronic disease outcomes, and health behavior. Introduces methodological approaches to the field of social epidemiology with specific attention to measurement issues.

PHC 6020: Clinical Trial Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6208/STA 6209, STA 6326/STA 6327, or equivalent
Basic statistical concepts and methods used in clinical trials and the statistical principles and methods including phase I to IV clinical trials.

PHC 6034: Epidemic Investigation
Credits: 2 **Grading Scheme:** Letter
Prerequisite: GMS 6800, GMS 6801, consent of instructor.
Principles of infectious disease investigation and features of all types of outbreaks. Problem-solving exercises of classic and current epidemics.

PHC 6036: Environmental Infectious Diseases: A Molecular Approach
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Providing students with an overview of environmental microbiology and review the latest tools in microbial ecology. The course will emphasize innovative methods in studying microbial diversity. The course is designed for students preparing for careers in public health.

PHC 6050: Statistical Methods for Health Sciences Research I
Credits: 3 **Grading Scheme:** Letter
Appropriate use of data summarization and presentation of basic statistical methods, including ANOVA, nonparametric methods, inference on discrete data, inference on survival data, and regression methods for continuous, binary, and survival data. SPSS statistical software. Required core course for students in public health management and policy and social and behavioral science concentrations.

PHC 6050C: Biostatistical Methods I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: basic knowledge of data analysis, linear algebra, and calculus III, and consent of instructor.
Biostatistical data analysis using linear models; theory and practice of regression and analysis of variance in the health sciences.

PHC 6051: Biostatistical Methods II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor and Biostatistical Methods I.
Biostatistical data analysis using generalized linear models, generalized linear mixed models, semiparametric and nonparametric regression, and neural networks; theory and practice in the health sciences.

PHC 6052: Introduction to Biostatistical Methods
Credits: 3 **Grading Scheme:** Letter
Introduction to the concepts and methods of biostatistical data analysis. Topics include descriptive statistics, probability, standard probability distributions, sampling distributions, point and confidence interval estimation, hypothesis testing, power and sample size estimation, one- and two-sample parametric and non-parametric methods for analyzing continuous or discrete data, and simple linear regression. SAS statistical software for data management, statistical analysis and power calculations. Required core course for students in biostatistics, environmental health, and epidemiology concentrations.

PHC 6053: Regression Methods for the Health and Life Sciences
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6052 or equivalent. For graduate students in fields other than statistics.
Introduction to a wide range of regression methods. Primary topics are multiple linear regression, logistic regression, and Poisson regression.

PHC 6055: Biostatistical Computing Using R
Credits: 1 **Grading Scheme:** Letter
Prerequisite: PHC 6053 or equivalent. Students must also have access to a laptop for in-class use.
Provide an environment for learning how to input, store, modify, display and analyze data using R. Developing basis R programming skills including working with vectors, lists, arrays and matrices, writing functions and using R to simulate data.

PHC 6063: Biostatistical Consulting
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Biostatistical Methods I and II or consent of the instructor. *Corequisite:* All faculty teaching this course have completed at least 18 graduate semester hours in the teaching discipline and hold at least a master's degree.
Providing training for M.S. and Ph.D students in Biostatistics on the statistical aspects of research problems.

PHC 6080: SAS for Public Health - Data
Credits: 1 **Grading Scheme:** Letter
Prerequisite: PHC 6052 or equivalent.
Input, storage and modification of data using SAS.

PHC 6081: SAS for Public Health - Analysis
Credits: 1 **Grading Scheme:** Letter
Prerequisite: PHC 6052 or equivalent.
Frequently-used SAS procedures to conduct common statistical analyses.

PHC 6102: Introduction to Public Health Administrative Systems
Credits: 3 **Grading Scheme:** Letter
Overview of the public health system, including public health concepts and practices, health care delivery and financing. Focus on understanding the organization and administration of health services, structure and functions of the U.S. public health system, and health insurance programs.

PHC 6103: Systems Thinking for Public Health
Credits: 3 **Grading Scheme:** Letter
Conceptual and empirical tools for understanding and managing complex organizations and interacting with other large systems that impact public health. Simulated work experiences show intended and unintended consequences of interventions in complex systems.

PHC 6104: Evidence-Based Management of Public Health Programs
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6102 or equivalent.
Practical guidance on how to choose, administer, and evaluate evidence-based programs and policies in public health settings.

PHC 6105: Health Promotion Policy and Practice
Credits: 3 **Grading Scheme:** Letter
Structure and function of local, state, and federal programs including official agencies, voluntary agencies, and health-related private-sector activities related to current emphases on health promotion and chronic disease control.

PHC 6107: Introduction to Veterinary Public Health
Credits: 1 **Grading Scheme:** S/U
Prerequisite: admission to DVM/MPH program, or consent of instructor.
Seminar introducing DVM/MPH students to veterinary public health.

PHC 6146: Public Health Program Planning and Evaluation
Credits: 3 **Grading Scheme:** Letter

Second of two courses providing skills to develop and implement public health programs. Focuses on six steps in the rational planning process. Emphasizes evidence-based public health principles, organizational influences, and other contemporary themes of program planning.

PHC 6153: Public Policy and Aging
Credits: 3 **Grading Scheme:** Letter
Examines policies relevant to older residents, such as national and state initiatives, presidential and gubernatorial leadership, implementation processes and consequences in policy process. Focuses on developing effective skills in public policy process and understanding major initiatives and policies of Social Security, Medicare, Medicaid, and the Older Americans Act.

PHC 6162: Public Health Grant Writing
Credits: 2 **Grading Scheme:** Letter
Problems encountered in the design and execution of public health population-based and intervention studies.

PHC 6183: Disaster Preparedness and Emergency Response
Credits: 3 **Grading Scheme:** Letter
Online introduction to disaster preparedness and responding to disasters. Training on the Incident Command System (ICS), the National Incident Management System (NIMS), and the Federal Emergency Management Agency (FEMA) minimum responder credential requirements.

PHC 6194: Spatial Epidemiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: All of the following courses: PHC 6000 , PHC 6011 , PHC 6052 , PHC 6053 (or equivalent).
Spatial Epidemiologic research methods, with major focus on Geographic Information Systems (GIS) and Exploratory Spatial Data Analysis (ESDA) applied to public health issues.

PHC 6195: Health information for Diverse Populations: Theory & Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate status or consent of instuctor.
Social and behavioral science is a core area in public health. This is an introductory course that examines basic concepts and social scientific research in persuasive communication to gain an understanding how individuals process and respond to public health information.

PHC 6220: Overview of Long-Term Care
Credits: 3 **Grading Scheme:** Letter
The range of health and supportive services for older individuals in the continuum of long-term care, especially Alzheimer's disease. Emphasizes developing community programs and services for maintaining the elderly in their own homes.

PHC 6251: Assessment and Surveillance in Public Health
Credits: 3 **Grading Scheme:** Letter
Knowledge, skills, and methods for conducting community assessments and surveillance to inform design of social and behavioral interventions.

PHC 6301: Aquatic Systems and Environmental Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6313
Physical and chemical nature of water, effects of contaminant and other stressors in different aquatic ecosystems. Taxonomic and ecological summary of aquatic biota, from algae and invertebrates to vertebrates and pathogens.

PHC 6309: Environmental Justice Issues in Public Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: departmental approval.
Key components as they relate to public health. Environmental justice refers to the tenet that certain populations bear a disproportionate burden of environmental hazards.

PHC 6312: Water Quality and Human Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6313

Relationship between water quality and human health and how water quality of determines human health in developed and developing world.

PHC 6313: Environmental Health Concepts in Public Health
Credits: 2 to 3 **Grading Scheme:** Letter
Survey of major topics in environmental health. Sources, routes, media, and health outcomes associated with toxic agents in the environment. Effects of agents on disease, water and air quality, food safety, and land resources. Current legal framework, policies, and practices.

PHC 6317: Risk Communication for Public Health Practice
Credits: 2 **Grading Scheme:** S/U
Techniques for effective and productive risk communication in public health, environmental health, risk assessment and environmental regulatory activities.

PHC 6346: Occupational and Environmental Health Among Agriculture Workers
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Providing the student with an overview of occupational and environmental health with a special emphasis on zoonotic infection risks to animal workers. Approaches for occupational disease processes, surveillance, industrial hygiene risk factor analyses, prevention and control will be presented. The course is designed to prepare for careers in occupational health.

PHC 6370: Public Health Biology
Credits: 3 **Grading Scheme:** Letter
Biological basis of public health issues. Covers background material in biology, chemistry, biochemistry, molecular biology, genetics, and immunology to allow students to understand biological mechanisms of disease prevention and progression at a molecular level. Emphasis on infectious diseases, genetic illnesses, cancer, environmental illnesses, and vaccines.

PHC 6403: Adolescence, Risk Taking and Health
Credits: 3 **Grading Scheme:** Letter
Introduction to primary determinants and outcomes associated with adolescent risk behaviors. Emphasis on substance use, sexual behaviors, injury, violence and the interactive nature of risk taking behaviors.

PHC 6404: Gender, Sexuality, and Health
Credits: 3 **Grading Scheme:** Letter
Survey of the dynamics of sexual health issues through public health and gender health studies. Review of intervention strategies to improve sexual health.

PHC 6405: Theoretical Foundations of Public Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6410
Providing an in-depth review of social and behavioral science theories used in public health, includes systems and multi-level perspectives on health behavior. Prepares public health students to satisfy MPH competencies in social and behavioral sciences.

PHC 6410: Psychological, Behavioral, and Social Issues in Public Health
Credits: 3 **Grading Scheme:** Letter
Health behavior from an ecological perspective; includes primary, secondary and tertiary prevention across a variety of settings; incoporates behavioral science theory and methods.

PHC 6413: Critical Incidents and Violence in Communities
Credits: 3 **Grading Scheme:** Letter
Public health viewpoint of prevention and community response to critical incidents such as human-made and natural disasters, domestic violence, school and workplace violence, bio-terrorism, and farm accidents.

PHC 6418: Foundations in Aging and Public Health Policy and Epidemiology
Credits: 3 **Grading Scheme:** Letter
General overview of varied aspects of public health and aging, including biopsychosocial, environmental, and policy issues impacting the social welfare of older adults.

PHC 6419: Biomedical and Psychologicial Aspects of Very Late Life

Credits: 3 **Grading Scheme:** Letter
Biological and psychological aging in the very old. Emphasizes normal development in later life, development in the oldest, and definitions and assessment of "successful aging." Also, "terminal decline" and the psychological changes associated with death.

PHC 6421: Public Health Law and Ethics
Credits: 3 **Grading Scheme:** Letter
Case study approach to legal foundations of American public health system and legal and ethical issues that arise from balancing individual liberties with the government's interest in protecting all citizens' well-being.

PHC 6441: Health Disparities in the United States
Credits: 3 **Grading Scheme:** Letter
Determinants that influence health outcomes of the most disadvantaged populations in the U.S., with special attention to racial, ethnic, and gender status.

PHC 6445: Global Public Health and Development II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6764
Second in series of two global public health and development courses created specifically for the new Master's in Development Practice (MDP) program. Practical approaches for identification, design, planning, monitoring, and evaluation of global public health interventions in their broader development context.

PHC 6447: Ecology of HIV/Aids in the Rural South
Credits: 3 **Grading Scheme:** Letter
Casual factors, responses, and outcomes associated with HIV/AIDS in the rural south. Using ecological framework to explore and understand mulitlevel factors associated with (1) risk and protective behaviors; (2) testing and disclosure of HIV status; (3) availability and sources of social support; (4) need for and use of medical, psychological, and social services; and (5) the development and use of culturally appropriate interventions.

PHC 6512: Environmental Management of Vector-Borne Diseases
Credits: 3 **Grading Scheme:** Letter
Planning, organization, implementation, and monitoring the activities for control of environmental factors or their interaction with man to prevent or minimize vector propagation and man-vector-pathogen contact.

PHC 6515: Introduction to Entomology Zoonotic Diseases and Food Safety
Credits: 3 **Grading Scheme:** Letter
Prerequisite: General microbiology, principles of infectious dieases, or epidemiology of infectious diseases.
Methods for conducting studies of mosquitoes and ticks, controlling zoonotic diseases, and modern food safety techniques in meat, dairy, and produce production.

PHC 6517: Public Health Concepts in Infectious Diseases
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6001 and PHC 6002.
Topics and methods used in modern infectious disease epidemiology.

PHC 6519: Zoonotic Diseases in Humans and Animals
Credits: 3 **Grading Scheme:** Letter
Introduction of graduate and professional students to major zoonotic diseases in both human and animal presentations. Epidemiology, means of prevention and control, available diagnostics, available treatments, and associated human and animal regulations for each disease. Delivered online in 15 modules.

PHC 6520: Foodborne Diseases
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6001 Principles of Epidemiology
Discussing major pathogens associated with foodborne diseases, their epidemiology, and approaches to outbreak investigation and control of foodborn illness. Teaching/learning methods include lectures, case studies, readings, and an individual project.

PHC 6530: Public Health Issues of Mothers and Children
Credits: 3 **Grading Scheme:** Letter

Maternal and child health problems, specific local, state, and federal programs and policies, health and health care access disparities. Emphasis on importance of evidenced-based public health practice.

PHC 6543: Community Practice of Behavioral Health Risk Prevention
Credits: 3 **Grading Scheme:** Letter
Applying skills to community-based prevention including behavioral health programming such as needs assessment, strategies for interagency collaboration, curriculum development, piloting, and evaluating programs, dissemination, and sustainability.

PHC 6544: Health Behavior Interventions in Practice
Credits: 3 **Grading Scheme:** Letter
Reviews models and develops interventions for existing health problems at community and individual levels. Focuses on overcoming barriers to service use and to treatment.

PHC 6561: Public Health Labroratory Techniques
Credits: 1 **Grading Scheme:** Letter
Prerequisite: Biosafety and bloodborne pathogen training program: http://ufbiosafety.classroom24-7.com/
Laboratory techniques used in emerging infectious respiratory disease research and epidemiologic surveillance.

PHC 6585: Health Promotion and Disease Prevention
Credits: 3 **Grading Scheme:** Letter
History, current theories, and application of methodologies of health promotion and disease prevention.

PHC 6586: Interventions for Public Health
Credits: 3 **Grading Scheme:** Letter
Second of three courses designed to provide skills to develop and implement public health programs. Empirical literature describing the efficacy of public health interventions including well-known large-scale trials. Both qualitative and quantitative intervention approaches.

PHC 6700: Social and Behavioral Research Methods
Credits: 3 **Grading Scheme:** Letter
Research methods and their specific applications to public health issues.

PHC 6702: Exposure Measurement and Assessment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: at least one undergraduate course in biostatistics or statistics. *Corequisite:* access to a computer with Excel, SPSS, or SAS.
Develop skills to design exposure studies applicable to public health investigations, veterinary health investigations, and health risk assessments.

PHC 6706: Health-Medical Outcomes Research and Measurement: A Policy Applications Perspective
Credits: 3 **Grading Scheme:** Letter
Prerequisite: departmental approval.
Conceptualizing and developing health status measures and using them to assess outcomes and effectiveness of medical care. A broad perspective from a public health viewpoint.

PHC 6711: Measurement in Epidemiology and Outcomes Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6001 and PHC 6050 or equivalent.
Major designs and principles of measurement for epidemiology and health services outcomes research, with emphasis on use of primary data collection.

PHC 6716: Survey Research Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHC 6001, PHC 6050; and STA 6207 or equivalent, or permission of instructor.
Introduction to population surveys typical in descriptive (surveillance) and analytic epidemiology research.

PHC 6717: Theory and Methods in Public Health Disability Research
Credits: 2-3 **Max: 3** **Grading Scheme:** Letter
Prerequisite: PHC 6001 and PHC 6050 or equivalent.

Interplay of epidemiology, disability, and public health in America. Theoretical framework and applied research methods for disability research.

PHC 6722: Environmental and Global Health Research Methods Rotation
Credits: 1-4 Max: 4 Grading Scheme: Letter
This course will be providing opporunities for Ph.D students to gain first-hand experience observing the implementation of research methods that they will need to employ during the course of their dissertation research. The objective of this course is providing the student with one-on-one instruction at the hands of department faculty in the application of research methods that the instructors are currently using in their own research.

PHC 6762: International Public Health
Credits: 3 Grading Scheme: Letter
Overview of international public health, with special attention to economically disadvantaged populations and those affected by pandemics and by emerging and re-emerging diseases.

PHC 6764: Global Public Health and Development I
Credits: 3 Grading Scheme: Letter
First in series of two global public health and development courses. Public health and anthropologic principles, methods, and study designs.

PHC 6900: Environmental and Global Health Journal Club
Credits: 1 Grading Scheme: Letter
Discussing and developing high quality written and oral critiques of recent literature from top peer-reviewed journals on three diseases with global impact that have key environmental drivers, dengue, TB, and Chagas disease. Developing critical thinking and writing skills in evaluating the scientific literature.

PHC 6905: Independent Study
Credits: 1-6 Max: 6 Grading Scheme: Letter
Prerequisite: consent of instructor.

PHC 6912: Special Project: Independent Research
Credits: 1-9 Max: 9 Grading Scheme: S/U
Prerequisite: consent of instructor.
Student must undertake significant responsibility for all or part of a research project of particular interest.

PHC 6913: Biostatistics Project
Credits: 1-9 Max: 9 Grading Scheme: S/U
Prerequisite: Biostatistics students only.
Develop a research project and assume responsibility for statistical analysis of a public health application. Required final paper and oral presentation.

PHC 6917: Supervised Research Project
Credits: 1-6 Max: 6 Grading Scheme: S/U
Prerequisite: consent of instructor.

PHC 6930: Integrated Public Health Seminar
Credits: 3 Grading Scheme: Letter
Integrating, synthesizing, and applying material learned to unique public health problems that require multiple specialties for solution.

PHC 6931: Seminar in Contemporary Public Health Issues
Credits: 1 Grading Scheme: S/U
Introduction to key interdisciplinary, cross-cutting topics essential to the contemporary practice of public health. Written and oral reports.

PHC 6933: Special Project: Public Health Scholarly Paper
Credits: 1-6 Max: 6 Grading Scheme: Letter
Prerequisite: consent of instructor and 24 credits of major course work.

In lieu of research project or internship, scholarly paper must integrate appropriate research literature and public health principles to address a contemporary public health issue.

PHC 6937: Special Topics in Public Health
Credits: 1-6 Max: 6 Grading Scheme: Letter

PHC 6938: Oral and Craniofacial Epidemiology
Credits: 3 Grading Scheme: Letter
Prerequisite: PHC 6001 and PHC 6050 or equivalent. PHC 6000 and STA 6166 are recommended, but not required.
Introduction to epidemiology of oral and craniofacial diseases. Principles and methods of epidemiologic research in this field.

PHC 6945: Public Health Practicum
Credits: 1-6 Max: 6 Grading Scheme: S/U
Prerequisite: approval of practicum site and consent of instructor.

PHC 6946: Public Health Internship
Credits: 1-9 Max: 9 Grading Scheme: S/U
Prerequisite: consent of instructor.
Fieldwork at approved site. Focus on practical application of skills in student's concentration area.

PHC 6947: Occupational Health Field Research Experience
Credits: 3-5 Max: 5 Grading Scheme: Letter
Prerequisite:
PHC 6001 Principles of Epidemiology in Public Health
PHC 6313 Environmental Health Concepts in Public Health
The field research experience is providing an opportunity for MHS students to work in a public health, occupational health, or agricultural health setting. Each placement is different, but all placements depend upon completion of most concentration coursework, the ability to work with minimal supervision, and permisson of the student's faculty advisor.

PHC 7000: Epidemiology Seminar II: Critical Evaluation, Research Proposals, and Methods
Credits: 3 Grading Scheme: Letter
Prerequisite: PHC 6000, PHC 6011, and Epidemiology Seminar I.
Epidemiology and health policy research. Constructing research ideas and developing them into full proposals. Discussion of auxiliary methods based on students' planned dissertation topics.

PHC 7013: Bias in Observational Research
Credits: 3 Grading Scheme: Letter
Prerequisite: PHC 6000 PHC 6011 STA 6166 and a graduate level regression course or equivalent.
Identifying sources of bias in observational data analysis. Statistical methods for bias adjustment in theory and in practice, with emphasis on confounding, missing data, and measurement error.

PHC 7038: Psychiatric Epidemiology
Credits: 3 Grading Scheme: Letter
Prerequisite: PHC 6000 and PHC 6011
Concepts, history, measures, methods and analytical techniques to study the risks, prevalence and incidence, course, comorbidities, and consequences of major mental disorders, in general and specific populations internationally.

PHC 7056: Analysis of Longitudinal Data
Credits: 3 Grading Scheme: Letter
Prerequisite: STA 6326, STA 6327 (or equivalent), STA 6207, STA 6208 (or equivalent), and STA 6246 (or equivalent).
Likelihood-based and semiparametric methods for longitudinal data. Methods to deal with missing data in both settings.

PHC 7065: Critical Skills in Epidemiological Data Management
Credits: 2 Grading Scheme: Letter
Prerequisite: PHC 6052 and PHC 6000 or the equivalent
and PhD student status
This course will be focusing on gettnig back to the basics with data including; data entry; assesments for data accuracy and consistency; perparation of project flow logs, code books, and final databases for statistical analysis; preparation of project data reports; data summarization; and responsible management of human subject data.

PHC 7066: Large Sample Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6326 and STA 6327 (or equivalent).
Detailed introduction to large sample theory and its application in univariate and multivariate parametric and nonparametric estimation.

PHC 7587: Theory Development and Testing in Behavioral & Community Public Health
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Doctoral student in BSCH or consent of instructor.
The purpose of this class will be allowing students the opportunity to review and orally present on a psychosocial constuct that is relevant to their own public health research goals and familiarize students with the process of theory development.

PHC 7727: Grant Writing Skills in Epidemiology and Clinical Research
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Epidemiology Methods II
This course provides practical instruction in the grant process, with a specific focus on National Institutes of Health (NIH) procedures. It provides the student with experience in writing parts of the grant application and in reviewing other's grant applications. It also contains a Mock Grant Review session to assist students in understanding the process and content of grant review.

PHC 7901: Epidemiology Literature Review and Critique (Journal Club)
Credits: 1 Max: 3 **Grading Scheme:** S/U
Prerequisite: PhD candidacy status or permission from the instructor
Preparing students to perform peer-review and to think critically. In weekly class discussion sessions, students will review peer-reviewed, published research studies that demonstrate innovative or faculty epidemiologic content or methods. Feedback will be given by student peers and faculty.

PHC 7902: Epidemiology Supervised Research Writing Circle
Credits: 1 **Grading Scheme:** Letter
Prerequisite: PhD student status or permission of the instructor *Corequisite:* Conducting mentored doctoral research
Practice reviewing and critiquing research studies.

PHC 7907: Social and Behavioral Science Journal Club
Credits: 1 **Grading Scheme:** Letter
Discussing recent literature from top peer-reviewed journals on specific health behaviors or health outcomes. Students will be presenting 4 journal articles. The purpose is to think about health behaviors or health outcomes from a multidisciplinary perspective.

PHC 7910: International Field Epidemiology
Credits: 3 **Grading Scheme:** S/U
Prerequisite: PHC 6011 Epidemiology Methods II
This is an independent study for a student who whishes to accomplish a primary data collection effort internationally.

PHC 7916: National Field Epidemiology
Credits: 1-3 Max: 3 **Grading Scheme:** S/U
Prerequisite: PHC 6011 Epidemiology Methods II
This applied epidemiology field experience is designed as an opportunity for doctoral students to integrate their growing expertise in epidemiology in a field research experience among a population in the United States.

PHC 7934: Seminar I: Epidemiology Past, Present, and Future
Credits: 2 **Grading Scheme:** Letter
Prerequisite: PhD standing
The principal goals of this doctoral seminar include becoming familiar with major programs of research in epidemiology, discussing findings and implications od classic/prominent epidemiologic studies, reviewing the strengths and weakness of major epidemiologic study designs, and applying knowledge of epidemiologic study design to students' formulation of their own research studies.

PHC 7935: Critical Thinking in Environmental and Global Health
Credits: 1 **Grading Scheme:** letter

Prerequisite: PHC 6313 Environmental Health Concepts in Public Health
and
PHC 6702 Exposure Measurement and Assesment
Providing students with the critical thinking and integrative skills necessary to understand contemporary environmental health problems, critically understand the existing literature, develop research and assessment questions, and identify appropriate methodological tools to address the questions. The course is offered as a weekly seminar that revolves around a focal reading, followed by additional bcakground reading and discussion.

PHC 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

PHC 7980: Research for Doctoral Dissertation
Credits: 1 Max: 15 **Grading Scheme:** S/U

PHH 5405: Modern Philosophy I
Credits: 3 **Grading Scheme:** Letter
Close reading of central text of the rationalists in the early modern period, especially Descartes, Spinoza, and Leibniz.

PHH 5406: Modern Philosophy II
Credits: 3 **Grading Scheme:** Letter
Close reading of central texts of the empiricists in the modern period, especially Locke, Berkeley, and Hume.

PHH 5605: Studies in Continental Philosophy
Credits: 3 **Grading Scheme:** Letter
Close reading of central texts of the major figures in the European continental tradition, such as Husserl, Heidegger, and Sartre.

PHH 6105: Seminar in Ancient Philosophy
Credits: 3 Max: 18 **Grading Scheme:** Letter
Prerequisite: PHP 5005 or PHP 5015, depending on topic.
Advanced study of particular topics or themes in the philosophy of Greek and Roman antiquity.

PHH 6425: Seminar in Modern Philosophy
Credits: 3 Max: 18 **Grading Scheme:** Letter, S/U
Prerequisite: PHH 5406 or consent of instructor.
Advanced study of particular topics or themes in philosophy of the seventeenth and eighteenth centuries. S/U option only if admitted to candidacy.

PHI 5135: Graduate Logic
Credits: 3 **Grading Scheme:** Letter
Propositional calculus, quantificational logic through completeness, and an introduction to modal logic.

PHI 5225: Philosophy of Language
Credits: 3 **Grading Scheme:** Letter
Advanced survey of central issues in contemporary philosophy of language, such as the theory of meaning, compositionality, reference, truth, and logical form.

PHI 5325: Philosophy of Mind
Credits: 3 **Grading Scheme:** Letter
Advanced survey of central issues in contemporary philosophy of mind, such as approaches to the mind-body problem, theories of mental content and consciousness, mental causation, and methodology in psychology.

PHI 5365: Epistemology
Credits: 3 **Grading Scheme:** Letter
Advanced survey of central issues in contemporary epistemology such as major theories of knowledge, justification, and truth.

PHI 5405: Philosophy of Science
Credits: 3 **Grading Scheme:** Letter

Advanced survey of central issues in the philosophy of science, such as the nature of the scientific method, and the differences between the natural and social sciences.

PHI 5425: Philosophy of Social Science
Credits: 3 **Grading Scheme:** Letter
Advanced survey of the central issues in the philosophy of social science, such as reduction, covering laws, rational reconstruction, interpretation, and causation.

PHI 5505: Metaphysics
Credits: 3 **Grading Scheme:** Letter
Advanced survey of issues in contemporary metaphysics, such as existence, identity, universals and abstract objects, the nature of particulars, modalities, and causation.

PHI 5665: Ethical Theory
Credits: 3 **Grading Scheme:** Letter
Advanced survey of central issues in ethical theory, such as consequentialism and deontology, theories of justice, and moral skepticism.

PHI 5905: Individual Work
Credits: 1-6 **Max: 6** **Grading Scheme:** Letter
Prerequisite: Consent of instructor, graduate coordinator, and chair.
Problem, author, or topic not treated in available courses.

PHI 5934: Topics in Philosophy
Credits: 3 **Max: 18** **Grading Scheme:** Letter
Prerequisite: Admission to the graduate program in philosophy or approval of instructor.
Rotating topics may focus upon any area of philosophy not covered by other 5000-level courses.

PHI 5935: Proseminar
Credits: 3 **Grading Scheme:** S/U
Mandatory for entering students. Methods of inquiry and research.

PHI 6105: Seminar in Logic
Credits: 3 **Max: 18** **Grading Scheme:** Letter, S/U
Prerequisite: PHI 5135.
Advanced seminar in logic, covering topics in model theory and recursion theory, beyond level of PHI 5135, including a careful treatment of Godel's incompleteness theorems and a modest study of undecidability. S/U option available if student admitted to Ph.D. candidacy.

PHI 6226: Seminar in Philosophy of Language
Credits: 3 **Max: 18** **Grading Scheme:** Letter, S/U
Advanced study of particular topics or themes in the philosophy of language, such as compositionality, pragmatics, speech act theory, semantics of attitude reports or deflationary theories of truth. S/U option available if student admitted to Ph.D. candidacy.

PHI 6306: Seminar in Epistemology
Credits: 3 **Max: 18** **Grading Scheme:** Letter, S/U
Prerequisite: PHI 5365 or PHP 5785.
Advanced study of particular topics in epistemology, such as epistemic justification, skepticism, or foundationalism. S/U option available if student admitted to Ph.D. candidacy.

PHI 6326: Seminar in Philosophy of Mind
Credits: 3 **Max: 18** **Grading Scheme:** Letter, S/U
Advanced study of particular topic or theme in philosophy of mind, such as theories of mental representation, the mind-body explanatory gap, nativism, or the problem of mental causation. S/U option available if student admitted to Ph.D. candidacy.

PHI 6406: Seminar in Philosophy of Science
Credits: 3 **Max: 18** **Grading Scheme:** Letter, S/U
Prerequisite: PHI 5136 and PHI 5405.

Advanced study of particular topics or themes in the philosophy of science, such as the scientific explanation, laws, and theories of space and time. S/U option available if student admitted to Ph.D. candidacy.

PHI 6506: Seminar in Metaphysics
Credits: 3 Max: 18 Grading Scheme: Letter, S/U
Advanced study of particular topics or themes in contemporary metaphysics, such as identity, Platonism and nominalism, the nature of particulars, necessity and possibility, events and facts, and the nature of causation. S/U option available if student admitted to Ph.D. candidacy.

PHI 6667: Seminar in Ethics
Credits: 3 Max: 18 Grading Scheme: Letter, S/U
Advanced study of particular topics or themes in ethical theory, such as noncognitivism, moral realism, virtue ethics, and consequentialism. S/U option available if student admitted to Ph.D. candidacy.

PHI 6787: Seminar in Continental Philosophy
Credits: 3 Max: 18 Grading Scheme: Letter, S/U
Prerequisite: PHH 5505, PHH 5406, or PHH 5405.
Advanced study of particular topics or figures of the 20th-century continental tradition. S/U option available if student admitted to Ph.D. candidacy.

PHI 6905: Individual Work
Credits: 1-9 Max: 9 Grading Scheme: Letter
Prerequisite: Consent of instructor, graduate coordinator, and chair.
Advanced study of author or topic not treated in available courses.

PHI 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

PHI 6934: Special Topics
Credits: 1-4 Max: 18 Grading Scheme: Letter, S/U
Special research topics falling outside of the scope of other research seminars. S/U option available if student admitted to Ph.D. candidacy.

PHI 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

PHI 6971: Research for Master's Thesis
Credits: 1-9 Grading Scheme: S/U

PHI 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Prerequisite: consent of the graduate committee.
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

PHI 7980: Research for Doctoral Dissertation
Credits: 1-12 Grading Scheme: S/U

PHP 5005: Ancient Philosophy I
Credits: 3 Grading Scheme: Letter
Examination of central themes in Plato's thought through close reading of several major dialogues.

PHP 5015: Ancient Philosophy II
Credits: 3 Grading Scheme: Letter
Historical and critical study of major aspects of Aristotle's logic, epistemology, physics, metaphysics, and philosophy of mind, through a close reading of central texts.

PHP 5785: Foundations of Analytic Philosophy
Credits: 3 Grading Scheme: Letter

Foundational readings in analytic philosophy from Frege to Quine.

PHP 6415: Seminar in Kant
Credits: 3 Max: 18 Grading Scheme: Letter, S/U
Prerequisite: PHH 5406 or consent of instructor.
Intensive examination of the first *Critique* and selections from other major works. S/U option available if student admitted to Ph.D. candidacy.

PHP 6795: Seminar in Analytic Philosophy
Credits: 3 Max: 18 Grading Scheme: Letter, S/U
Advanced study of the work of a particular philosopher or philosophical problem from the analytic perspective. S/U option available if student admitted to Ph.D. candidacy.

PHP 6930: Seminar in a School or Thinker
Credits: 3 Max: 18 Grading Scheme: Letter, S/U
Advanced study of the work of one or more, usually pre-twentieth century, thinkers. S/U option available if student admitted to Ph.D. candidacy.

PHT 5156: Exercise Physiology
Credits: 3 Grading Scheme: Letter
Prerequisite: M.H.S. student.
Metabolic, muscular, cardiovascular, and pulmonary responses to acute and chronic exercise with application to patient populations.

PHT 6125C: Concepts in Clinical Biomechanics
Credits: 3 Grading Scheme: Letter
Prerequisite: PHT 6105C
Analyzes joint biomechanics and forces acting on those joints during human motion. Describes their relationship to injury and rehabilitation.

PHT 6127C: Control of Gait and Posture
Credits: 3 Grading Scheme: Letter
Influence of central and peripheral mechanisms on control of gait posture in healthy and patient populations.

PHT 6167C: Applied Neurophysiology for Physical Therapy
Credits: 3 Grading Scheme: Letter
Prerequisite: PHT 6166C.
Neurophysiological basis of movement, posture, sensation, and special sensory systems with functional application to physical therapy evaluation and treatment.

PHT 6236C: Neurological Dysfunction as Applied to Physical Therapy
Credits: 4 Grading Scheme: Letter
Advanced peripheral and central nervous system neurology, evaluation, and therapeutic methods for neurological dysfunction.

PHT 6316: Neurological Aspects of Orthopedic Rehabilitation
Credits: 3 Grading Scheme: Letter
Current concepts of neuroscience and motor control and their implications to orthopedic rehabilitation. Recent and relevant literature. Emphasizes incorporating both basic and clinical science evidence in designing therapeutic interventions.

PHT 6615L: Research Instrumentation in Physical Therapy
Credits: 3 Grading Scheme: S/U
Current theory and practical application of techniques for the understanding and design of research projects related to physical therapy.

PHT 6718: Neuroplasticity: A Foundation for Neurorehabilitation
Credits: 3 Grading Scheme: Letter
Evidence for plasticity after injury or disease. Factors that influence recovery. Medical approach to enhancing recovery. Potential approaches in physical rehabilitation to facilitate and optimize plasticity.

PHY 5277: Physics of Accident Reconstruction and Biomechanics

Credits: 2 **Grading Scheme:** Letter
Prerequisite: undergraduate mechanics; calculus.
Introduction, with emphasis on forces experienced in accidents and associated damage to tissue and bone.

PHY 5905: Individual Work
Credits: 1-4 **Max: 12 including PHY 6905** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Assigned reading and problems program, special topics, or development of special experimental or theoretical problems. Work selected according to student's needs and interests.

PHY 6246: Classical Mechanics
Credits: 3 **Grading Scheme:** Letter
Review of Lagrangian formulation and special relativity. Hamiltonian mechanics, canonical transforms and Hamilton-Jacobi theories, action angle variables, rigid rotators, normal modes, mechanics of continuous media. Fluid mechanics.

PHY 6346: Electromagnetic Theory I
Credits: 3 **Grading Scheme:** Letter
Electrostatics, special function expansions, magnetostatics, linear media, time dependent Maxwell theory, wave propagation and dispersion, diffraction, scattering, radiation, relativistic covariance, applications.

PHY 6347: Electromagnetic Theory II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHY 6346.
Continuation of PHY 6346.

PHY 6536: Statistical Mechanics I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHY 6645 and PHY 6246.
Equilibrium ensembles for classical and quantum systems, fluctuations, applications to normal fluids, phase transitions and critical phenomena, plasmas.

PHY 6555C: Cryogenics
Credits: 4 **Grading Scheme:** Letter
Prerequisite: PHY 3101 and consent of instructor.
Production and use of cryogenic fluids; temperature measurement and control; use of cryogenics in science and industry, superconducting magnet and power generator, and electronics. Hands-on experience.

PHY 6645: Quantum Mechanics I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAP 5304, PHY 4605.
Hilbert space, Heisenberg and Schrodinger dynamics, invariance properties and symmetry operations, spin, perturbation, and variational methods.

PHY 6646: Quantum Mechanics II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHY 6645.
Time dependent perturbation theory, scattering theory, identical particles and second quantization, Dirac equation.

PHY 6648: Quantum Field Theory I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHY 6646.
The Poincare group; the Dirac equation; quantization of free fields; the scattering matrix; applications.

PHY 6905: Individual Work
Credits: 1-4 **Max: 12 including PHY 5905** **Grading Scheme:** Letter
Treatment of an experimental or theoretical problem or topic assigned on the basis of student's needs and interests.

PHY 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

PHY 6920: Departmental Colloquium
Credits: 1 Max: 14 Grading Scheme: S/U
Summary presentation of contemporary topics by visiting and local researchers.

PHY 6932: Seminar in Molecular and Computational Physics
Credits: 1 Max: 10 Grading Scheme: S/U
Prerequisite: senior or graduate standing.
Invited speakers on topics of current interest in computation and theory in dynamics, and molecular and solid state physics.

PHY 6943: Internship in College Teaching
Credits: 2,4,6 Max: 6 Grading Scheme: Letter
Prerequisite: graduate standing.
Required for Master of Science in Teaching students, but available for students needing additional practice and direction in college-level teaching.

PHY 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

PHY 7097: Advanced Topics in Theoretical Physics
Credits: 3 Max: 10 Grading Scheme: Letter
Special studies in mathematical methods and applications of current interest at the forefront of one or more specialties in theoretical physics.

PHY 7669: Quantum Field Theory II
Credits: 3 Grading Scheme: Letter
Prerequisite: PHY 6648.
Path integral quantization; perturbation theory; renormalization; quantization of gauge fields; applications.

PHY 7939: Special Topics
Credits: 2 Max: 12 Grading Scheme: Letter
Assigned reading program, seminar, or lecture series in a rapidly advancing specialty of physics.

PHY 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

PHY 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

PHZ 5155C: Physical Modeling and Simulation
Credits: 3 Grading Scheme: Letter
Principles and applications of physical modeling and computer simulation. Fundamental interactions among particles such as atoms, molecules, condensed matter, and planets. Introduction to variety of simulation techniques in modern research.

PHZ 5245: Introduction to Magnetic Resonance
Credits: 3 Grading Scheme: Letter
Prerequisite: PHY 2049 and 3101 or consent of instructor.
Elementary introduction to basic principles of magnetic resonance and its applications to nuclear magnetic resonance (NMR), electron paramagnetic resonance (EPR), ion cyclotron resonance (ICR), and magnetic resonance imaging (MRI).

PHZ 5354: Introduction to Particle Physics
Credits: 3 Grading Scheme: Letter
Prerequisite: consent of instructor.
Descriptive survey of particle and nuclear phenomena and states: conserved quantities and quantum numbes, invariance principles.

PHZ 5405: Introduction to Solid-State Physics
Credits: 3 Grading Scheme: Letter

Prerequisite: PHY 4605 or consent of instructor.
Descriptive survey of solid-state phenomena and basic methods. Crystal structure, lattice modes, electronic states, thermal, optical, and magnetic properties.

PHZ 6156: Computer Methods in Physics
Credits: 2 **Grading Scheme:** Letter
Prerequisite: elementary FORTRAN.
Numerical techniques useful in the solution of physical problems. Appropriate utilization of computation; aspects of contemporary methods in computational physics, especially advanced version of FORTRAN.

PHZ 6166: Qualitative Methods of Theoretical Physics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHY 6246, PHY 6346, PHY 6536, PHY 6645, or consent of instructor.
Hands-on experience in formulating and analyzing theoretical problems using scaling, approximate mathematical methods, principles of symmetries, etc. Some workshops.

PHZ 6247: Chemical Physics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHY 6645 or consent of instructor. Identical to CHM 6520.
Intermolecular forces, molecular dynamics; electromagnetic properties of molecular systems; solid surfaces; theoretical and computation methods.

PHZ 6355: Elementary Particle Physics I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHY 6646.
Dirac and Klein-Gordon equations, Feynman diagrams, scattering amplitudes; the standard model of weak, electromagnetic, and strong interactions; phenomenology of high energy physics.

PHZ 6358: Standard Model of Elementary Particles I
Credits: 3 **Grading Scheme:** Letter
Nonabelian gauge theory, Glashow-Weinberg-Salam model of electromagnetic and weak interactions. Spontaneous symmetry breaking and Higgs mechanism, theory of weak processes focusing on quantum corrections and their physical consequences.

PHZ 6391: Seminar in Astrophysics
Credits: 1 **Max: 12** **Grading Scheme:** S/U

PHZ 6392: Seminar in Particle Physics
Credits: 1 **Max: 12** **Grading Scheme:** S/U

PHZ 6426: Solid State I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHY 6536.
Quantum theory of crystalline solids: Bloch theorem, electronic structure, thermodynamic and transport properties of metals, lattice dynamics, electronic interactions in solids, semiconductors and insulators.

PHZ 6493: Seminar in Condensed Matter Physics
Credits: 1 **Max: 12** **Grading Scheme:** S/U

PHZ 6607: Special and General Relativity
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHY 6246.
Special relativity, tensor analysis, covariant electromagnetism and hydrodynamics; general relativity, Riemannian geometry, gravity as curvature, exact solutions; relativistic astrophysics, cosmology.

PHZ 7357: Elementary Particle Physics II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHZ 6355.
Continuation of PHZ 6355. Extensions of the standard model. Calculations of QCD corrections.

PHZ 7359: Standard Model of Elementary Particles II

Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHZ 6358.
Strong interactions, perturbation study of quantum chromodynamics (QCD) of quarks and gluons. Chiral description of long-range QCD, supersymmetric extensions of standard model, grand unification

PHZ 7427: Solid State II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHZ 6426.
Physics of collective phenomena in condensed matter systems: electron-electron and electron-phonon interactions, magnetism, superconductivity, and quantum transport.

PHZ 7428: Modern Condensed Matter Physics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHZ 6426.
Green's functions and many-body perturbation theory, with applications to topics in modern condensed matter physics. Superconductors, quantum magnetism, quantum transport, quantum hall effect. Other modern techniques and numerical methods.

PHZ 7429: Phases of Condensed Matter
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHZ 6426 or consent of instructor.
Focus on structural properties, transitions and properties of topological defects in crystalline solids, liquid crystals, incommensurate crystals, quasicrystals, magnetically ordered systems, and random fractals.

PHZ 7608: Special and General Relativity II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PHZ 6607.
Relativistic stars, black holes, gravitational radiation; advanced topics in general relativity and cosmology.

PKG 5003: Advanced Distribution and Transport Packaging
Credits: 3 **Grading Scheme:** Letter
Containment, protection, and preservation related to transporting and distributing packaging products. Methods for efficient scheduling and directing transport and delivery of packages.

PKG 5006: Advanced Packaging Principles
Credits: 3 **Grading Scheme:** Letter
Prerequisite: chemistry, physics, or biology.
Modern lab instruments and procedures employed for packaging used to solve problems from packaging industry.

PKG 5105: Advanced Consumer Products Packaging
Credits: 3 **Grading Scheme:** Letter
Major packaging methods, materials, forms, and strategies used for consumer products. Packaging plans with associated mock-ups for proposed consumer product are prepared as specific team projects.

PKG 5206C: Advanced Package Decoration
Credits: 3 **Grading Scheme:** Letter
Major decoration methods used for packaging. Student teams create original graphic designs and execute designs on 200 containers.

PKG 5256C: Advanced Analytical Packaging Methods
Credits: 3 **Grading Scheme:** Letter
Materials, uses, functions, and production processes of packaging. Historical, societal, and technological drivers of packaging.

PKG 6100: Advanced Computer Tools for Packaging
Credits: 3 **Grading Scheme:** Letter
Label design, bar code technology, spreadsheets, visual basic programming, 3D package design, and distribution efficiency analysis.

PKG 6905: Individual Work in Packaging

Credits: 1-6 Max: 6 Grading Scheme: Letter
Special problems in packaging sciences.

PKG 6932: Special Topics in Packaging Sciences
Credits: 1-6 Max: 6 Grading Scheme: Letter
Lectures, laboratory, and/or special projects.

PLP 5005C: General Plant Pathology
Credits: 4 Grading Scheme: Letter
Prerequisite: Course in biology or botany.
Microorganisms and environmental factors that cause disease in plants. Symptoms and losses caused by plant diseases. Principles of plant disease development, diagnosis, and control. Genetics and epidemiology of plant diseases. Offered fall semester.

PLP 5102: Theory and Practice of Plant Disease Control
Credits: 3 Grading Scheme: Letter
Prerequisite: PLP 3002C/PLP 5005C or equivalent.

PLP 5115C: Citrus Pathology
Credits: 3 Grading Scheme: Letter
Prerequisite: PLP 3002C/PLP 5005C.
Symptoms, disease cycles, and control measures for major citrus diseases; emphasis on diagnosis using biological, chemical, and biochemical techniques. Offered at CREC, Lake Alfred, fall semester in even-numbered years.

PLP 5155: Microbiological Control of Plant Diseases and Weeds
Credits: 3 Grading Scheme: Letter
Prereq or coreq: course in plant pathology. Principles and practice. Genetics of biological control. Commercial, environmental, and regulatory aspects of biological control. Offered fall semester in even-numbered years.

PLP 5656C: Mycology
Credits: 5 Grading Scheme: Letter
Prerequisite: BOT 2011C, 3303C, or PLP 3002C/PLP 5005C.
Morphology, development, and taxonomy of fungi with field and laboratory exercises emphasizing the ecology and economic importance. Offered fall semester in even-numbered years.

PLP 6223C: Viral Pathogens of Plants
Credits: 3 Grading Scheme: Letter
Prerequisite: PLP 3002C/PLP 5005C, BCH 5045, and a course in plant pathology, which may be taken as a corequisite.
Principles of plant virology; symptomatology, transmission, insect vector relationships, properties of viruses, purification, electron microscopy, morphology, serology, and control of viral diseases.

PLP 6241C: Bacterial Plant Pathogens
Credits: 3 Grading Scheme: Letter
Prerequisite: PLP 3002C/PLP 5005C, MCB 3020.
Relationships of bacterial plant pathogens and interactions with their hosts. Offered spring semester in even-numbered years.

PLP 6262C: Fungal Plant Pathogens
Credits: 3 Grading Scheme: Letter
Prerequisite: PLP 3002C/PLP 5005C or PLP 5656C.
History, ecology, genetics, physiology, taxonomy, and management of plant pathogenic fungi.

PLP 6291: Plant Disease Diagnosis
Credits: 3 Grading Scheme: Letter
Prerequisite: PLP 3002C/PLP 5005C, PLP 6262C.
Methods used in diagnosing plant diseases caused by fungi, bacteria, viruses, and abiotic conditions. Offered fall semester.

PLP 6303: Host-Parasite Interactions II
Credits: 3 Grading Scheme: Letter
Prerequisite: PLP 6502.

Genetic and molecular interactions of hosts and parasites with emphasis on plant disease resistance. Offered spring semester of even-numbered years.

PLP 6404: Epidemiology of Plant Disease
Credits: 4 **Grading Scheme:** Letter
Prerequisite: PLP 3002C/PLP 5005C.
Principles of ecology of plant diseases with emphasis on the effects of the climatic environment on the development of disease in populations of plants and the implications with regard to the strategy of disease control. Offered spring semester in odd-numbered years.

PLP 6502: Host-Parasite Interactions I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PLP 3002C/PLP 5005C and one course each in biochemistry and genetics.
Genetics and molecular biology of host-parasite interactions with emphasis on mechanisms of pathogenesis. Offered fall semester in odd-numbered years.

PLP 6621C: Pop Genetics Microbes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PLP 5005C , or SWS 5305C , or PCB 4674 or equivalent, or PCB 3063 or equivalent, or consent of instructor.
Students will learn to use DNA sequence or marker data to describe population genetic variation and infer evolutionary processes, with emphasis on plant pathogen populations. Topics to be covered include: sampling strategies, marker types, genealogical inference, defining population and geographic structure, and coalescent-based methods for inferring demographic processes.

PLP 6905: Problems in Plant Pathology
Credits: 1-4 Max: 6 **Grading Scheme:** Letter
Study of any field of plant pathology including diseases of all major crop groups.

PLP 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

PLP 6921: Colloquium in Principles of Plant Pathology
Credits: 1 Max: 4 **Grading Scheme:** Letter

PLP 6932: Seminar in Plant Pathology
Credits: 1 Max: 4 **Grading Scheme:** S/U
Discussion of the literature, techniques, and research pertaining to plant pathology.

PLP 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

PLP 6942: Professional Internship in Plant Disease Clinic
Credits: 3 **Grading Scheme:** S/U
Prerequisite: PLP 6262C and PLP 6291.
Practical training, under supervision of faculty member, in diagnosing plant diseases and formulating recommendations for their management or control.

PLP 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

PLP 7946: Plant Pathology Internship
Credits: 1-10 Max: 10 **Grading Scheme:** S/U
Off-campus internship.

PLP 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

PLP 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

PLS 5222C: Propagation of Horticultural Crops
Credits: 3 **Grading Scheme:** Letter
Prerequisite: for students who have not taken PLS 3221.
Theoretical and practical applications of macro- and micropropagation techniques for higher plants.

PLS 5241C: Advanced Plant Micropropagation
Credits: 4 **Grading Scheme:** Letter
Prerequisite: PLS 3221 or consent of instructor.
Practical application of plant tissue for clonal propagation of horticultural crops.

PLS 5405: Advanced Composting Technology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: for graduate students who have not taken PLS 4404C; or consent of instructor.
Humification of organic matter under controlled conditions.

PLS 5632C: Integrated Weed Management
Credits: 3 **Grading Scheme:** Letter
Overview of weed science principles and practices, emphasizing strategies for southeastern cropping systems. Situations unique to the State of Florida. Offered fall term.

PLS 5652: Advanced Weed Science
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PLS 4601.
Classification, mode of action, principles of selectivity, and plant responses to herbicides. Weed, crop, environmental, and pest management associations in developing herbicide programs. Focus on practical principles. Offered fall term in odd-numbered years.

PLS 6623: Weed Ecology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PCB 3043C, PLS 4601, or equivalent.
Characteristics of weedy species. Ecological principles emphasizing interactions of weeds with their environment and neighboring plants, in crop and various noncrop habitats. Offered spring term in even-numbered years.

PLS 6626: Invasive Plant Ecology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PCB 4043C, equivalent general ecology course, or permission of instructor
Mechanisms and hypotheses to explain non-native plant invasions. Impacts of invasions on communities and ecosystems, including natural and agricultural areas, management approaches, design and analysis of experiments.

PLS 6655: Plant/Herbicide Interaction
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PLS 4601 and BOT 3503.
Herbicide activity on plants: edaphic and environmental influences, absorption and translocation, response of specific physiological and biochemical processes as related to herbicide mode of action. Offered spring term in odd-numbered years.

PMA 5205: Citrus Pest Management
Credits: 3 **Grading Scheme:** Letter
Arthropod and nematode pests of citrus. Ecological principles of host and pest community relationships. Pest identification, biology, and interactions with citrus. Pest monitoring, diagnosis, and management.

PMA 6228: Field Techniques in Integrated Pest Management
Credits: 2 **Grading Scheme:** Letter
Practical aspects of pest management, emphasizing sampling, diagnostics, decision making processes, and informational resources available to IPM practitioner.

POS 5935: Advanced Topics in Political Science

Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: departmental approval.

POS 6045: Seminar in American Politics
Credits: 3 Grading Scheme: Letter
Introduction to major conceptual approaches to the American political system and to the history of the study of American politics.

POS 6048: American Political Development
Credits: 3 Grading Scheme: Letter
Development from founding to the present.

POS 6127: State Government and Politics
Credits: 3 Grading Scheme: Letter
The bibliography, methodology, and research topics of American state and local governments.

POS 6146: Urban Politics
Credits: 3 Grading Scheme: Letter
Explores processes, actors, and institutions in local U.S. politics. Briefly examines significant issue areas including fiscal crisis, racial conflict, and education.

POS 6157: Community Analysis
Credits: 3 Grading Scheme: Letter
Development of social, economic, and political profiles in understanding trends, projections, and public policy alternatives.

POS 6196: Patrons, Clients, Corruption, and Accountability
Credits: 3 Grading Scheme: Letter
Prerequisite: CPO 2001
Examining how communities, associations, organizations, political parties, or states are governed.

POS 6207: Political Behavior
Credits: 3 Grading Scheme: Letter
Examines participation, political culture, and public opinion including classic and current research.

POS 6208: Empirical Political Research
Credits: 3 Grading Scheme: Letter
Prerequisite: POS 6207.
Criticism/evaluation of research, hypothesis formulation, concept development, measurement, secondary data analysis, and microcomputer statistical analysis. Original empirical research paper on some aspect of political behavior.

POS 6272: Political Participation
Credits: 3 Grading Scheme: Letter
Social, political, and institutional factors that affect patterns of electoral and non-electoral political participation in the U.S. and other societies.

POS 6274: Political Campaigning
Credits: 3 Grading Scheme: Letter
Overview of tasks and challenges, including strategy, uses of campaign polls, organization, management, communication, and mobilization.

POS 6278: Advanced Campaign Strategy
Credits: 3 Grading Scheme: Letter
Prerequisite: POS 6274.
Strategy implications of media production on campaigns, party management, direct mail, polling, and fundraising.

POS 6279: The Politics of Direct Democracy
Credits: 3 Grading Scheme: Letter
Theory and practice of direct democracy in American states, including processes of initiative, referendum, and recall.

POS 6292: Religion and Politics

Credits: 3 **Grading Scheme:** Letter
Interplay between religion and politics from the perspective of relevant social science approaches.

POS 6427: Legislative Process
Credits: 3 **Grading Scheme:** Letter
Examines the role of legislative institutions in American government.

POS 6453: Political Parties and Interest Groups
Credits: 3 **Grading Scheme:** Letter
Examines the structure and functions of political parties and interest groups in the United States.

POS 6458: Politics of Campaign Finance
Credits: 3 **Grading Scheme:** Letter
History, theories, and practice of campaign finance in American politics.

POS 6476: Bureaucratic Politics in the U.S.
Credits: 3 **Grading Scheme:** Letter
Examining how public bureaucracies in the U.S. relate to one another and their political environments. Topics include the growth of the administrative sector, regulatory federalism, representative bureaucracy, and political control of the bureaucracy.

POS 6707: Qualitative Research Methods for Political Science
Credits: 3 **Grading Scheme:** Letter
Survey of methods focusing on concept formation, case selection, and data collection suitable for research designs based on small number of case studies.

POS 6712: Empirical Theories of Politics
Credits: 4 **Grading Scheme:** Letter
Developing theory as part of empirical inquiry, particularly as related to dissertations. Attributes that make a theory compelling and useful. Major traditions of empirical theory in political and social sciences. Assistance in creating theory.

POS 6716: Scope and Epistemologies of Political Science
Credits: 3 **Grading Scheme:** Letter
Overview of development of political science as discipline and pluralistic introduction to epistemological perspectives that characterize field.

POS 6736: The Conduct of Inquiry
Credits: 3 **Grading Scheme:** Letter
Empirical research methodology in political science.

POS 6737: Political Data Analysis
Credits: 3 **Grading Scheme:** Letter
Introduction to quantitative methods and techniques.

POS 6747: Topics in Political Research Methodology
Credits: 3 **Grading Scheme:** Letter
Review of recent applications of advanced research methods to different types of political science data.

POS 6757: Survey Research
Credits: 3 **Grading Scheme:** Letter
Methods of survey research in context of field investigation: formulating research hypotheses, constructing measurement instruments, and collecting and analyzing data.

POS 6909: Individual Work
Credits: 1-4 **Max: 12** **Grading Scheme:** Letter

POS 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

POS 6933: Special Topics

Credits: 1-3 Max: 6 Grading Scheme: Letter

POS 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

POS 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

POS 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

POS 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

POT 5935: Advanced Topics in Political Theory
Credits: 3 Max: 6 Grading Scheme: Letter
Prerequisite: departmental approval.

POT 6016: Ancient Political Thought
Credits: 3 Grading Scheme: Letter
Intensive exploration of Classical Greek and Roman thinkers and texts.

POT 6056: Modern Political Thought
Credits: 3 Grading Scheme: Letter
Close reading of political theorists and themes from the Renaissance through the 19th century. Emphasizes thinkers regarded as central to the development of republicanism, absolutism, liberalism, democracy, conservatism, and feminism.

POT 6067: Contemporary Political Theory
Credits: 3 Grading Scheme: Letter
Close reading of one or more twentieth-century contemporary political philosophers whose works have made major impacts on field (e.g. Arendt, Foucault, Habermas).

POT 6306: Liberalism and Its Critics
Credits: 3 Grading Scheme: Letter
Close reading of selected texts by leading defenders of liberalism and influential theoretical standpoints questioning liberal orthodoxy. Communitarianism, multiculturalism, Marxism, democratic theory, feminism, and critical race theory.

POT 6314: Democratic Theory
Credits: 3 Grading Scheme: Letter
Brief look at some classical theorists and critics of democracy (Plato, Rousseau, Tocqueville, Marx). Focus on contemporary debates in democratic theory. Participation, deliberation, representation, and multiculturalism.

POT 6416: The Marxist Tradition and its Critics
Credits: 3 Grading Scheme: Letter
Examines the seminal works of Karl Marx and a selection of influential contemporary texts challenging and transforming the Marxist tradition.

POT 6505: Politics and Theory
Credits: 3 Grading Scheme: Letter
Investigation of the nature of political theory and normative issues in politics.

POT 6516: Political Judgment
Credits: 3 Grading Scheme: Letter
Investigation of the nature of political judgment from historical, conceptual, and empirical perspectives in western thought.

POW 6276: Twentieth-Century Brazilian Novel
Credits: 3 Grading Scheme: Letter

Readings in narrative from 1920s avant-garde and 1930s neoregionalism to 1950s and 1960s instrumentalism. Various manifestations of late-century prose fiction.

POW 6385: Brazilian Lyric
Credits: 3 **Grading Scheme:** Letter
Theory and practice of poetry including Modernist legacy, experimental trends, political verse, song, youth movements, and contemporary phenomena.

POW 6386: Brazilian Drama
Credits: 3 **Grading Scheme:** Letter
Theory of dramatic literature and theatre, from its origins in the 19th century through Modernism and contemporary practices.

POW 6905: Individual Work
Credits: 1-3 Max: 9 **Grading Scheme:** Letter
Available only by special arrangement with program coordinator or graduate adviser.

POW 6930: Rotating Topics in Brazilian or Portuguese Literature
Credits: 3 Max: 9 **Grading Scheme:** Letter
Diverse themes of the Lusophone world, including Portuguese Modernism, Brazilian northeast, Afro-Brazilian world, culture of dictatorship, popular music, science fiction, postmodernism, or focus on major authors (Machado de Assis, Guimaraes Rosa, Clarice Lispector).

PPE 6059: Seminar in Personality
Credits: 3 Max: 9 **Grading Scheme:** Letter
Personality development and dynamics.

PSB 5445: Drug Use and Abuse
Credits: 3 **Grading Scheme:** Letter
Prerequisite: 6 hours of psychology.
Objective, informational approach to the commonly used and abused drugs. Psychological, physiological, social, medical, legal, and historical aspects.

PSB 5935: Seminar in Physiological Psychology
Credits: 1-3 Max: 10 **Grading Scheme:** Letter, S/U
Prerequisite: PSB 3004 or 3054 and STA 3023.
Selected topics in behavioral neuroscience.

PSB 6082: Neuroethology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PSB 3004, 3054, or PSB 6087 and consent of instructor.
Focuses on cellular mechanisms underlying fundamental aspects of behavior, including the production and coordination of movement, sensory processing and sensorimotor integration. Electrophysiological studies of invertebrate and simple vertebrate behaviors.

PSB 6087: Advanced Physiological Psychology
Credits: 3 **Grading Scheme:** Letter
Thorough review of basic concepts in physiological psychology, advanced concepts including methodology and recent progress in selected areas of neuroscience and psychobiology.

PSB 6088L: Behavioral Neurobiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PSB 6087.
Behavioral studies involving physiological manipulations and measures, and criticism of the scientific inferences therein.

PSB 6099: Survey of Physiological and Comparative Psychology
Credits: 2-3 Max: 3 **Grading Scheme:** Letter
Prerequisite: graduate status.
Empirical and theoretical foundations of physiological and comparative psychology.

PSB 7248: Neurobehavioral Relations

Credits: 3 **Grading Scheme:** Letter
Prerequisite: PSB 6087.
Theories and data on the central nervous system basis for higher order function. Emphasis will be on arousal, purposeful behavior, and learning.

PSB 7249: Seminar in Neural Mechanisms and Behavior
Credits: 3 **Grading Scheme:** Letter
Prerequisite: PSB 6087.
Recent and specialized topics in brain-behavior relations.

PSY 6608: History of Psychology
Credits: 2-3 Max: 3 **Grading Scheme:** Letter

PSY 6905: Individual Work
Credits: 1-3 Max: 10 **Grading Scheme:** Letter
Reading or research areas in psychology.

PSY 6910: Supervised Research
Credits: 1-3 Max: 5 **Grading Scheme:** S/U

PSY 6930: Topics in Psychology
Credits: 1-3 Max: 9 **Grading Scheme:** Letter

PSY 6939: Seminar: The Teaching of Psychology
Credits: 1-3 Max: 10 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Examination of general techniques of teaching with emphasis on interpersonal nature of teaching, course planning, textbooks, testing and evaluation, and lecturing within the framework of general introductory psychology course. Videotaped lecturers.

PSY 6940: Supervised Teaching
Credits: 1-3 Max: 5 **Grading Scheme:** S/U

PSY 6971: Research for Master's Thesis
Credits: 1-6 **Grading Scheme:** S/U

PSY 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

PSY 7980: Research for Doctoral Dissertation
Credits: 1-12 **Grading Scheme:** S/U

PUP 5935: Advanced Topics in Public Policy
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: departmental approval.

PUP 6006: Policy Evaluation
Credits: 3 **Grading Scheme:** Letter
Examines methodologies appropriate for analyzing public policies.

PUP 6007: Policy Process
Credits: 3 **Grading Scheme:** Letter
General examination of public policy formulation and implementation. Special emphasis upon political and economic determinants and relationship to social theory.

PUP 6009: Public Policy Analysis
Credits: 3 **Grading Scheme:** Letter

Analytic approach to understanding economic and political tools used to formulate solutions to public problems such as environmental quality, business regulation, public education, health care, and welfare.

PUP 6015: Comparative Policy Analysis
Credits: 3 **Grading Scheme:** Letter
Approaches to analyzing policy, with a comparative perspective.

PUP 6315: Race, Gender, and Politics
Credits: 3 **Grading Scheme:** Letter
Politics and cultural discrimination, political power, political behavior, and public policy.

PUR 5507: Persuasion Theory and Research
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Introduction to the principal theories and empirical research programs exploring how communication, particularly from public relations efforts, impacts persuasion.

PUR 6005: Theories of Public Relations
Credits: 3 **Grading Scheme:** Letter
Theories that dominate the field. Evolution of theories, their critiques, and current standing.

PUR 6006: Public Relations Foundations
Credits: 3 **Grading Scheme:** Letter
Roles and responsibilities of public relations professionals and the function of public relations in institutions and society.

PUR 6403: Crisis and Risk Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Theories, applications and issues of crisis/risk management, exploring the difference between crisis-prone and crisis-prepared organization.

PUR 6416: Public Relations and Fund Raising
Credits: 3 **Grading Scheme:** Letter
Applying public relations theories and concepts to the practice-centered study of fundraising in nonprofit organizations. Principles and processes of building relationships with donors and of designing and implementing programs in annual giving.

PUR 6446: Public Relations and Philanthropy
Credits: 3 **Grading Scheme:** Letter
Applying public relations theories and concepts to the practice-centered study of philanthropy, organizations, and the role of each in society. Effective strategies for managing relationships between philanthropic organizations and stakeholders.

PUR 6506: Public Relations Research
Credits: 3 **Grading Scheme:** Letter
Applied research methods for strategic management of public relations. Emphasis on using formative research for planning and implementing programs/campaigns and evaluative research for measuring effectiveness.

PUR 6607: Public Relations Management
Credits: 3 **Grading Scheme:** Letter
Application of strategic management to development of public relations plans and programs. Emphasis on theoretical framework for relationship management in public relations.

PUR 6608: International Public Relations
Credits: 3 **Grading Scheme:** Letter
Factors to assist conceptualization and execution of international public relations activities. Explores the relationship between environmental variables and international public relations practices. Review of empirical evidence about public relations practices in other countries and methodological issues pertaining to conducting research.

PUR 6934: Problems in Public Relations
Credits: 3 **Grading Scheme:** Letter
Special topics, case studies, community relations, and theory-based analysis of public relations problems.

QMB 5303: Managerial Statistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Basic statistics, calculus. Designed for M.B.A. students.
Basic concepts and methods of probability and statistics, stressing applications in analyzing and solving business problems.

QMB 5304: Introduction to Managerial Statistics
Credits: 2 **Grading Scheme:** Letter
Basics of modeling and analyzing problems that involve business decision making under uncertainty. Techniques for organizing and formulating decision problems. Probability theory and some basic statistical concepts and procedures.

QMB 5305: Advanced Managerial Statistics
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Designed for M.B.A. students.
Builds on QMB 5304. Basic concepts in collection, analysis, and interpretation of data, emphasizing the capabilities of different statistical methods and business applications. Focuses on how business decisions can be informed by statistical analysis and how to apply computer software tools to business decisions.

QMB 6358: Statistical Analysis for Managerial Decisions I
Credits: 2 **Grading Scheme:** Letter
Data-application techniques for managerial problems; difficulties that can arise in applying the techniques and interpreting results. Experience using computerized procedures; may require substantial amount of case analysis.

QMB 6359: Statistical Analysis for Managerial Decisions II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: QMB 6358 or consent of instructor.
Data application techniques with emphasis placed on relationships that occur over time. Substantial amount of case analysis, as well as applications programming using industry standard software products.

QMB 6607: Decision Processes Under Uncertainty I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Introduction to statistical decision theory, including the vonNeuman-Morgenstern behavioral axioms, forms, techniques for assessing probabilities, and penalty functions, with managerial and economic applications.

QMB 6616: Business Process Analysis
Credits: 3 **Grading Scheme:** Letter
Critical business analytical approaches, including linear programming, project scheduling, waiting-line theory, and time-series analysis.

QMB 6693: Quality Management and Control Systems
Credits: 2 **Grading Scheme:** Letter
Prerequisite: QMB 5305 or equivalent or consent of instructor.
Philosophy of total quality management and technical aspects of quality design and measurement systems.

QMB 6697: Optimization in Simulation Modeling I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Use of simulation techniques in managerial decision problems, including random number generation and search procedures for determining optimal policies.

QMB 6755: Managerial Quantitative Analysis I
Credits: 2 **Grading Scheme:** Letter
Survey of deterministic models for managerial decision making. Emphasizes mathematical programming.

QMB 6756: Managerial Quantitative Analysis II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: QMB 6755.

Using deterministic and stochastic models for decision making. Integer and nonlinear programming, goal programming, multiple-objective linear programming, and decision theory. Applied problem solving and case studies, using appropriate software.

QMB 6905: Individual Work in Information Systems and Operations Management
Credits: 1-5 Max: 10 Grading Scheme: Letter
Prerequisite: consent of department.
Reading and/or research.

QMB 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

QMB 6930: Special Topics in Information Systems and Operations Management
Credits: 1-4 Max: 16 Grading Scheme: Letter
Variable content. In-depth study of topics not offered in other courses or topics of special current significance.

QMB 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

QMB 6941: Internship
Credits: 1-4 Max: 6 Grading Scheme: S/U
Career-related experience that is not attainable in a classroom situation. Participation in such an internship will give employers an opportunity to identify earlier those students they may wish to employ upon graduation.

QMB 6957: International Studies in Quantitative Methods
Credits: 1-4 Max: 12 Grading Scheme: S/U
Prerequisite: admission to an approved study abroad program and permission of department.

QMB 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

QMB 7931: Special Topics in Information Systems and Operations Management
Credits: 1-4 Max: 9 Grading Scheme: Letter
Prerequisite: consent of instructor.
Recent literature and state-of-the-art theory and methods in both the decision and the information sciences.

QMB 7933: Seminar in Information Systems and Operations Management
Credits: 1-4 Max: 9 Grading Scheme: Letter
Prerequisite: consent of instructor.
Historical foundations and evolutionary development of concepts in decision and information sciences, emerging problems and future trends.

QMB 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

QMB 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

RCS 6601: Forensic Rehabilitation Consultation I
Credits: 3 Grading Scheme: Letter
Prerequisite: Must be accepted into Forensic Vocational Rehabilitation Graduate Certificate Program within the Department of Behavioral Science & Community Health at the University of Florida (the following are our requirements for admissions into the FVR Graduate Certificate Program):
-Minmum Requirements for acceptance:
*Master's degree in Rehabilitation Counseling (or equivalent); or are in the final stages of their educational program.
*A GPA of 3.0 or better

Providing the foundational legal knowledge necessary for Forensic Rehabilitation Consultation, including ethical decision making principles, common conflicts encountered and learning legal processes. Finally, economic principles of the forensic rehabilitation consultant and case development methods/ business practices will be discussed.

RCS 6602: Forensic Rehabilitation Consultation II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Must be accepted into Forensic Vocational Rehabilitation Graduate Certificate Program within the Department of Behavioral Science & Community Health at the University of Florida (the following are our requirements for admissions into the FVR Graduate Certificate Program):
-Minmum Requirements for acceptance:
*Master's degree in Rehabilitation Counseling (or equivalent); or are in the final stages of their educational program.
*A GPA of 3.0 or better
*Completion of the following course: Forensic Rehabilitation Consultation I
Interpreting and applying the applicable sections of the Federal Rules of Evidence for expert testimony and evidence. Preparing students for expert testimony and understanding coutroom etiquite. Finally, students will be able to competently testify as to his/her expert opinions and methedology.

RED 5046: Foundations of Reading in Grades PreK-12
Credits: 3 **Grading Scheme:** Letter
Examination of diverse cultures and theories in multicultural literature.

RED 5316: Reading in the Primary Grades
Credits: 3 **Grading Scheme:** Letter
Advanced issues related to the emergence and development of literacy in young children.

RED 5337: Reading in the Secondary School
Credits: 3 **Grading Scheme:** Letter
Patterns of reading instruction in the secondary school; methods of teaching reading for teachers of all subject areas; preparing, selecting, and using instructional materials; selected field or micro-teaching experiences.

RED 5355: Reading Instruction in the Intermediate Grades
Credits: 3 **Grading Scheme:** Letter
Emphasizes materials and methods for teaching reading to students in the upper elementary grades, middle, and junior high schools.

RED 6346: Seminar in Reading
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Variable topics on reading and literacy.

RED 6520: Classroom Literacy Assessment and Instruction
Credits: 3 **Grading Scheme:** Letter
Prerequisite: minimum of 1 introductory reading instruction course.
Using classroom assessment information to guide literacy instruction.

RED 6546C: Diagnosis of Reading Difficulties
Credits: 3 **Grading Scheme:** Letter
Individual assessment techniques for locating difficulties in literacy acquisition.

RED 6548C: Remediation of Reading Difficulties
Credits: 3 **Grading Scheme:** Letter
Prerequisite: RED 6546C.
Advanced procedures and practices for remediating reading difficulties in the classroom and clinic.

RED 6647: Trends in Reading
Credits: 3 **Grading Scheme:** Letter
Understanding current trends and issues in literacy education.

RED 6941: Practicum in Diagnosis and Remediation of Reading Difficulties

Credits: 3 **Grading Scheme:** Letter
Diagnosis and remediation of reading difficulties with at-risk K-12 learners.

RED 7019: Foundations of Literacy
Credits: 3 **Grading Scheme:** Letter
Foundational understanding of theories and discussions related to (and research methods involved in) studying literacy and literacy education.

RED 7817: Understanding Reading Difficulties
Credits: 3 **Grading Scheme:** Letter
Prerequisite: RED 6546C, RED 6548C.
Examines reading difficulties from various perspectives, including cognitive, sociocultural, and linguistic.

REE 6045: Introduction to Real Estate
Credits: 2 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Real estate finance, appraisal, and law.

REE 6058: Construction Considerations in Real Estate
Credits: 2 **Grading Scheme:** letter
A critical element of real estate finance, valuation, development, and investment decision making is the utilizing research data, technologies, tools, and software applications to provide support for assumptions and strategic decisions. However, it is difficult to provide adequate exposure to any of these tools and technologies in the context of a two hour graduate module. This course is providing in-depth exposure to widely used commercial real estate data sources, research tools, and software applications. These tools will be used and applied in a number of course throughout the program and in practice after graduation.

REE 6105: Real Estate Appraisal
Credits: 2 **Grading Scheme:** Letter
Prerequisite: REE 6045 or REE 6395.
Tools and techniques used in the fee appraisal business to estimate market value of real property. Emphasis on commercial appraisal using actual case studies.

REE 6206: Primary Mortgage Markets and Institutions
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Master of Science-Finance students or FIN 5437 and FIN 5439 (REE 6045 is highly recommended).
Introduces firms, institutions, practices, and legal issues involved in housing finance. Also potential variation in home mortgage product design and issues that dictate mortgage choice.

REE 6208: Secondary Mortgage Markets and Securitization
Credits: 2 **Grading Scheme:** Letter
Prerequisite: REE 6045 or REE 6206 or Master of Science-Finance students or FIN 5437 and FIN 5439.
High-level overview of secondary markets for mortgage debt and mortgage-backed securities in U.S. Considers instruments, decisions, problems, and current issues.

REE 6315: Real Estate Market and Transaction Analysis
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Master of Science-Real Estate or MBA students.
Application of analytical process for analyzing market potential of both developed and undeveloped real estate. Broadened historic perspective on modern city and understanding of how to apply analytical framework to real estate market analysis. Process and documents associated with acquiring and disposing of commercial real estate areas discussed.

REE 6395: Investment Property Analysis
Credits: 2 **Grading Scheme:** Letter
Prerequisite: REE 6045 or Master of Science-Finance students or FIN 5437 and FIN 5439 (REE 6045 is highly recommended).
Introduction to major concepts, principles, analytical methods, and tools useful for investment and finance decisions regarding commercial real estate assets. Property acquisition analysis, leasing, effects of debt financing and taxes, risk and return considerations.

REE 6397: Real Estate Securities and Portfolios
Credits: 2 **Grading Scheme:** Letter
Prerequisite: REE 6045 or REE 6395 or Master of Science-Finance students or FIN 5437 and FIN 5439.
Securitized equity real estate investment topics, including real estate investment trusts. Emphasis on multiple property valuation and decision making.

REE 6705: Geographic Information Systems and Location Analysis
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Graduate standing.
Examines many traditional ways of analyzing and evaluating location. Introduces relevant data sources, GIS software and numerical and statistical techniques for computer-based study of spatial relationships.

REE 6737: Real Estate Development
Credits: 2 **Grading Scheme:** letter
Prerequisite:
REE 6045 and REE 6395
Exploring of the fundamental concepts and techniques involved in the real estate development process by recognizing forces that transform existing real estate to its highest and best use. Providing a decision-making framework, understanding of the process and management decisions during the real estate development activities.

REE 6905: Individual Work in Real Estate
Credits: 1-6 Max: 7 **Grading Scheme:** Letter
Prerequisite: permission of department and Director of Graduate Studies.
Reading and/or research in real estate.

REE 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

REE 6930: Special Topics in Real Estate
Credits: 1-4 Max: 16 **Grading Scheme:** Letter
Selected topics in real estate research, theory, or of special current significance.

REE 6935: Real Estate Case Studies
Credits: 1-2 Max: 5 **Grading Scheme:** Letter
Prerequisite: Master of Science-Real Estate or joint MSRE/JD students.
Project- and case-oriented approach, using "real world" projects and data. Introduction to data sources and computer programs widely used in the industry.

REE 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

REE 6948: Capstone Seminar and Applied Project
Credits: 2 **Grading Scheme:** Letter
Prerequisite: REE 6208.
Establishes direct link between concepts developed in prior courses and current industrial practices. Presentations by professionals on current issues and industry practices. Students develop an applied project case.

REE 6957: International Studies in Real Estate
Credits: 1-4 Max: 12 **Grading Scheme:** S/U
Prerequisite: admission to approved study abroad program and permission of department.

REE 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

REE 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

REL 6347: American Buddhism
Credits: 3 **Grading Scheme:** Letter
Exploration of relationship between Buddhism and American culture.

REL 6368: Islam in Asia
Credits: 3 **Grading Scheme:** Letter
Survey of the spread, development, and diversification of Muslim societies across Asia.

REL 6397: Hindu Sacred Texts and Their Ritual Context
Credits: 3 **Grading Scheme:** Letter
Focuses on the notion of aural revelation, and exploration of social and ritual context of sacred text. Traditions of recitation, music, verbal, and performative commentaries associated with transmission of holy words.

RLG 5143: Religion and Social Change
Credits: 3 **Grading Scheme:** Letter
Religion's role in social movements and other forms of cultural, economic, and political transformation.

RLG 5195: Topics in Religion and Society
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Examines the interaction between religious bodies and the structures of the societies in which they function, with particular attention to the United States.

RLG 5297: Topics in Biblical Studies
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Examines methods of interpreting particular texts or themes chosen from Hebrew scriptures or the Christian New Testament.

RLG 5338: Topics in Asian Religions
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Examines religious traditions that are indigenous to India, China, or Japan.

RLG 5365: Studies in Islam
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Historical study of development of selected doctrines, institutions, and practices, using primary and interpretive material.

RLG 5396: Religion and Animals
Credits: 3 **Grading Scheme:** Letter
Examines the place of animals in the cosmologies and ethical systems of the world's diverse religions.

RLG 5495: Topics in Religious Thought
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Investigation of particular themes in a religious tradition or the comparative approach to intellectual dimensions of religious communities.

RLG 5549: Studies in Christianity
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Historical study of the development of selected Christian practices, doctrines, and institutions, using primary sources and interpretative material.

RLG 5696: Topics in Jewish Thought
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Themes, issues, and personalities in the Jewish tradition, from the biblical period through modern times.

RLG 5906: Individual Work
Credits: 1-5 **Max: 12** **Grading Scheme:** Letter
Study of chosen materials under the individual direction of a member of the Graduate Faculty. Plan of study and method of evaluation must be pre-approved by the supervisory committee.

RLG 5937: Topics in Religious Studies
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Issues and methods in the study of religion. Generally more than one religious tradition is studied.

RLG 6035: Method and Theory I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing. Required of all religion graduate students.
Examines classical formulations of approaches to studying religion and to developing religious studies as an academic discipline.

RLG 6036: Method and Theory II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: RLG 6035 and graduate standing. Required of all religion graduate students.
Study of religion in light of recent challenges in the humanities and social sciences. Special attention to the concept of religion and its origins in Christian culture of Western Europe; and to the engagement of religion in colonial culture.

RLG 6095: Utopias and Dystopias
Credits: 3 **Grading Scheme:** Letter
Ideal societies and their roles in religious movements, ideologies, and communities.

RLG 6107: Core Seminar in Religion and Nature
Credits: 3 **Grading Scheme:** Letter
Religious dimensions of relationships between what humans call "nature" and "culture."

RLG 6125: Religion and Politics in the Americas
Credits: 3 **Grading Scheme:** Letter
Relationship between socio-political change and religion in the Americas from the pre-colonial period to the present.

RLG 6126: Religion in the Americas
Credits: 3 **Grading Scheme:** Letter
Origins and interactions of religions in the Americas.

RLG 6129: Hindu Traditions in America
Credits: 3 **Grading Scheme:** Letter
Exploration of cultural, religious, and social issues.

RLG 6137: Religion in North America
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Examines religious bodies in the United States, from historical, sociological, and theological perspectives.

RLG 6138: New Religious Movements
Credits: 3 **Grading Scheme:** Letter
New, emerging, or alternative religious groups likely to receive the pejorative label of cult; types of leadership, organization, ritual, and ideology of such groups.

RLG 6167: Radical Environmentalism
Credits: 3 **Grading Scheme:** Letter
Critically examines the emergence and social impact of radical environmental groups.

RLG 6181: Ethics and the Natural Sciences
Credits: 3 **Grading Scheme:** Letter
Perspectives on the intersection of ethics and natural sciences, focusing on bioethics and health care, evolution, ecology, and ethology.

RLG 6183: Religion and Environmental Ethics
Credits: 3 **Grading Scheme:** Letter
Explorations in classic and contemporary theories and applications of environmental ethics, with special attention to religion.

RLG 6187: Nature in Asian Religions
Credits: 3 **Grading Scheme:** Letter
Explores themes such as interconnectedness and interdependence, nonexclusivity, and biocentrism in ethical systems of religious traditions of Asia.

RLG 6196: Globalizing the Sacred
Credits: 3 **Grading Scheme:** Letter

Examines the ways that religion shapes the current multifaceted episode of globalization.

RLG 6310: Religion and Nature in South Asia
Credits: 3 **Grading Scheme:** Letter
Examines how the different religious traditions of South Asia understand the natural world and how these traditions respond to contemporary environmental issues.

RLG 6319: Interpreting Asian Religions
Credits: 3 **Grading Scheme:** Letter
Critical assessment of the world-religions model for interpreting Asian religions.

RLG 6339: Women in the Hindu Tradition
Credits: 3 **Grading Scheme:** Letter
Classical Hindu typologies of womanhood compared to alternative modern and contemporary models.

RLG 6346: Buddhist Traditions
Credits: 3 **Grading Scheme:** Letter
Comprehensive survey of main traditions.

RLG 6385: Native Religions in the Americas
Credits: 3 **Grading Scheme:** Letter
Indigenous religious communities and traditions in North, Central, and South America.

RLG 6387: Religions in Latin America
Credits: 3 **Grading Scheme:** Letter
Important historical developments and contemporary expressions of religions in Latin America.

RLG 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

RLG 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

RLG 6957: Overseas Studies in Religion
Credits: 1-3 **Max: 9** **Grading Scheme:** S/U

RLG 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U
Required of all candidates for the M.A. degree.

RLG 7979: Advanced Research
Credits: 1-15 **Grading Scheme:** S/U
Prerequisite: consent of graduate coordinator.
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been admitted to a doctoral program. Not appropriate for students who have been admitted to candidacy.

RLG 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

RSD 6110: Rehabilitation Science Theory and Application I
Credits: 3 **Grading Scheme:** Letter
Philosophical and theoretical foundations. History of the development of rehabilitation services and funding. Evolution of health care systems in the U.S.

RSD 6112: Rehabilitation Science Theory and Application II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: RSD 6110.
Current issues and trends, social and political influences, ethical issues, and professional roles and credentialing as they relate to rehabilitation science and service delivery.

RSD 6114: Rehabilitation in the United Kingdom
Credits: 3 **Grading Scheme:** Letter
Prerequisite: certified rehabilitation professional.
Comparative study through on-site visits in the United Kingdom.

RSD 6400: Models and Principles of Motor Learning and Control: Application in Rehabilitation Science
Credits: 3 **Grading Scheme:** Letter
Major themes, theoretical frameworks, and principles drawn from motor learning and control research that influence evidence-based therapeutic practice and research.

RSD 6700: Rasch Measurement: Introduction and Application
Credits: 3 **Grading Scheme:** Letter
Prerequisite: for doctoral students.
Applying Rasch measurement to social and health science data. Rasch pertains to Item Response Theory approaches used to analyze educational, survey, self-report, and clinical data; and is a precursor to computerized adaptive testing.

RSD 6705: Research Methods in Rehabilitation
Credits: 4 **Grading Scheme:** Letter
Prerequisite: graduate-level statistics.
Research measurement and theory applied to rehabilitation. Research design.

RSD 6706: Scientific Writing for the Rehabilitation Professional
Credits: 3 **Grading Scheme:** S/U
Corequisite: Scientific writing project.
A systematic approach to scientific writing using the student's scientific project (article, chapter, grant, other) as a focus for participation.

RSD 6900: College Classroom: Teaching Process and Practice
Credits: 3 **Grading Scheme:** Letter
Information and skills required for successful teaching faculty in college classroom.

RSD 6905: Individual Work
Credits: 1-4 **Max: 12** **Grading Scheme:** Letter
Prerequisite: RSD 6112, consent of adviser, and project approval.
Special project or research.

RSD 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

RSD 6930: Special Topics in Rehabilitation Science
Credits: 1-4 **Max: 9** **Grading Scheme:** Letter
Prerequisite: RSD 6112, RSD 6705.

RSD 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

RSD 7979: Advanced Research
Credits: 1-4 **Max: 12** **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study of for student who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

RSD 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

RTV 5702: Telecommunication Regulation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: undergraduate or graduate law course, or consent of instructor.
The legal structure of radio, television, cable, satellite, and new media forms; the Communication Act, and the Federal Communications Commission.

RTV 6105: Writing for Electronic Media
Credits: 3 **Grading Scheme:** Letter
Instruction and training in news gathering, writing, interviewing and reporting. Special emphasis is placed on improving writing skills, basic news production, and actual radio reporting assignments. Students receive practical experience in the combined WRUF-WUFT-FM newsrooms.

RTV 6309: Advanced TV Reporting
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Grade of B- in JOU 6349 .
Advanced course in news writing, editing and processing for television news.

RTV 6508: Audience Analysis
Credits: 3 **Grading Scheme:** Letter
Methods of audience analysis. Survey research, sampling, and program content analysis. Analysis of secondary audience data.

RTV 6801: Telecommunication Management
Credits: 3 **Grading Scheme:** Letter
Management principles of the telecommunications industry, with practical and theoretical application for television, radio, film, online, and other electronic media sectors.

RTV 6807: Telecommunication Outlet Systems and Practices
Credits: 3 **Grading Scheme:** Letter
Structural and procedural elements of broadcast stations, cable systems, and other local radio-television facilities. Review of research and models in telecommunications administration, economic planning and control, merchandising and positioning, sales and advertising.

RTV 6973: Project in Lieu of Thesis
Credits: 1-9 **Grading Scheme:** S/U
Prerequisite: consent of instructor.
Development, testing, and evaluation of an original electronic media product, audience research, or management analysis.

SCE 5316: Inquiry-Based Science Teaching
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SCE 4310.
Inquiry into science content pedagogy and practice in elementary classrooms.

SCE 5355: Foundations of Science Teaching
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SCE 4310 or equivalent.
Transforming unifying science themes into teaching and learning activities appropriate for K-8 classrooms.

SCE 6045: Environmental Education Methods and Materials
Credits: 3 **Grading Scheme:** Letter
Overview of current environmental education teaching approaches, activities, programs, and curricula in school and nonschool settings.

SCE 6117: Science Education in the Elementary School
Credits: 3 **Grading Scheme:** Letter
Current problems, new materials and teaching techniques, research and recent developments in the sciences.

SCE 6246: Science Instruction in Informal Settings
Credits: 3 **Grading Scheme:** Letter
Review of theory and practice research on instructional techniques and curricula for K-12 science instruction in informal settings such as museums, nature centers, zoos, and outdoor school yards.

SCE 6338: Secondary Science Methods and Assessment
Credits: 3 **Grading Scheme:** Letter
Introduction to the theory and practice of teaching secondary school science, emphasizing planning, instruction, and assessment.

SCE 6647: Global Studies Methods in Science Education
Credits: 3 **Grading Scheme:** Letter
Research and best practices for incorporating global studies into the K-college science curriculum.

SCE 6947: Practicum in Secondary Science Teaching and Assessment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of department chair.
Directed experiences emphasizing instructional strategies, selecting instructional materials, sequencing student activities, using instructional moves, and diagnosing student progress. Field and laboratory settings.

SDS 6401: Counseling Skills for Non-Counselors
Credits: 3 **Grading Scheme:** Letter
Counseling skills in dyadic communication and in small groups.

SDS 6411: Counseling with Children
Credits: 3 **Grading Scheme:** Letter
Prereq or coreq: MHS 6401.

SDS 6413: Counseling Adolescents
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 6401.

SDS 6436: Family-School Intervention
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MHS 5005, MHS 6401. *Corequisite:* SDS 6411, SDS 6413.
Examines common patterns of family-school interaction and the major types of family-school interventions used to support children's learning and development including school-wide interventions to engage families, parent and teacher case consultation, and family referral for community services.

SDS 6520: Family, Student Development and Role of Teacher as Adviser
Credits: 3 **Grading Scheme:** Letter
Learning to be advisers to small groups of middle school students concerning personal and academic development.

SDS 6620: Organization and Administration of School Counseling Programs
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SDS 6411.

SDS 6831: Supervision for a Split Internship
Credits: 3 Max: 6 **Grading Scheme:** S/U
Prerequisite: adviser's consent, completion of practicum sequence, and written application to internship coordinator at least 6 weeks before registering. *Corequisite:* MHS 7804, MHS 7807, SDS 7820, or 7802.
Required first enrollment for students participating in internship over 2 semesters.

SDS 6905: Individual Work
Credits: 1-4 Max: 12 **Grading Scheme:** Letter
Prerequisite: consent of instructor and graduate coordinator; approval of proposed project.

SDS 6936: Seminar in Counselor Education
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor. Open to doctoral students in department.

SDS 6938: Special Topics
Credits: 1-4 Max: 12 **Grading Scheme:** Letter
Prerequisite: consent of department chair.

SDS 7800: Practicum in School Counseling
Credits: 3 **Grading Scheme:** S/U
Prerequisite: MHS 7800, SDS 6411; adviser's consent; and written application to practicum coordinator at least 6 weeks before registration. *Corequisite:* MHS 5005, MHS 6401, 6411, 6413, MHS 6421, MHS 6720.

SDS 7820: Group Supervision in School Counseling
Credits: 1 Max: 5 Grading Scheme: S/U
Prerequisite: written application to practicum/internship coordinator at least 6 weeks before registration. *Corequisite:* MHS 7800, SDS 7800 or SDS 7830, or MHS 6831.

SDS 7830: Internship in Counseling and Development-600 Hours
Credits: 5 Max: 15 Grading Scheme: S/U
Prerequisite: adviser's consent, completion of all practica required for M.Ed. or Ed.S. degree, and written application to internship coordinator at least 6 weeks before registration. *Corequisite:* SDS 7802, MHS 7804, MHS 7807, or SDS 7820.

SOP 6099: Survey of Social Psychology
Credits: 2-3 Max: 3 Grading Scheme: Letter
Prerequisite: graduate status.
Empirical and theoretical foundations of social psychology.

SOP 6219C: Advanced Research Techniques in Social-Personality Psychology
Credits: 3 Max: 12 Grading Scheme: Letter
Prerequisite: consent of instructor.

SOP 6409: Seminar: Current Topics in Social-Personality Psychology
Credits: 3 Max: 12 Grading Scheme: Letter

SOP 6419: Seminar: Attitudes and Social Cognition
Credits: 3 Max: 12 Grading Scheme: Letter
Prerequisite: graduate status.
Seminar addressing topics such as attitude change, attribution, social perception, social cognition, etc.

SOP 6509: Seminar: Interpersonal Relations and Group Processes
Credits: 3 Max: 12 Grading Scheme: Letter
Prerequisite: graduate status.
Seminar addressing topics such as impression management, leadership, small group behavior, conflict and accord, and race relations.

SOP 6929: Colloquium on Research in Social-Personality Psychology
Credits: 1-3 Max: 8 Grading Scheme: Letter
Prerequisite: Graduate status & PSY Major.
On-going colloquium series intended for graduate students in social-personality psychology. Provides the opportunity for the presentation and discussion of research initiatives. Credit is variable and depends on the amount of supervised research and project preparation planned by the student and approved by the instructor.

SPA 5051: Clinical Observation in Audiology
Credits: 1 Grading Scheme: Letter
Prerequisite: for beginning graduate students in audiology.
Opportunity to observe various phases of audiologic practice and to accumulate a minimum of 15 hours of observation experience.

SPA 5102: Auditory Anatomy and Physiology
Credits: 2 Grading Scheme: Letter
In-depth coverage of anatomy and physiology of auditory system to support understanding of auditory function in persons with healthy auditory mechanisms and those with specific disorders.

SPA 5128: Speech Perception
Credits: 2 Grading Scheme: Letter
Understanding speech perception in hearing-impaired and/or aged listeners. Auditory and cognitive hypotheses to explain speech-recognition deficits; and clinical and theoretical intervention strategies to alleviate perceptual deficits in these populations.

SPA 5204: Phonological Disorders
Credits: 3 Grading Scheme: Letter

Advanced principles of diagnosis and remediation.

SPA 5211: Voice Disorders
Credits: 3 **Grading Scheme:** Letter
Advanced theory and techniques of diagnosis and remediation.

SPA 5225: Principles of Speech Pathology: Stuttering
Credits: 3 **Grading Scheme:** Letter
Advanced theories and techniques of diagnosis and therapy.

SPA 5245: Communicative Disorders Related to Cleft Palate
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SPA 5204, SPA 5211, 5403.
Lectures and laboratory study of the "team approach" and interdisciplinary aspects of communicative disorders in the cleft palate individual.

SPA 5254: Neurocognitive Language Disorders
Credits: 2 **Grading Scheme:** Letter
Prerequisite: introductory neuroanatomy.
Neurocognitive deficits of language in dementia, traumatic brain injury, and right hemisphere damage.

SPA 5304: Principles of Audiological Evaluation
Credits: 3 **Grading Scheme:** Letter
Advanced procedures in speech audiometry, masking, and audiogram interpretation.

SPA 5315: Peripheral and Central Auditory Disorders
Credits: 2 **Grading Scheme:** Letter
Understanding (1) anatomy and physiology of peripheral and central auditory mechanism, (2) etiology and pathology of peripheral and central hearing loss, and (3) audiological and otologic diagnosis/treatment of hearing loss.

SPA 5401: Speech Pathology Language Disorder
Credits: 3 **Grading Scheme:** Letter
Advanced theory and techniques of diagnosis and remediation of language disorders in infants and preschoolers.

SPA 5405: Language Disorders II
Credits: 3 **Grading Scheme:** Letter
Detailed examination of language intervention programs and nonvocal communication systems.

SPA 5553: Instrumentation and Diagnosis in Speech-Language Pathology
Credits: 2 **Grading Scheme:** Letter
Hands-on experience using instrumentation in diagnosis.

SPA 5563: Psychosocial Aspects of Hearing Loss
Credits: 2 **Grading Scheme:** Letter
Psychological implications of hearing impairment. Specifically psychoeducational/psychosocial and counseling strategies and rehabilitation procedures for patient and family management.

SPA 5646: Speech and Language of the Deaf and Hard of Hearing
Credits: 2 **Grading Scheme:** Letter
Advanced principles and procedures in the assessment and development of speech and language in individuals with hearing loss.

SPA 6008: Medical Aspects of Speech-Language Pathology
Credits: 1 **Grading Scheme:** S/U
Prerequisite: SPA 7946.
Overview of the speech pathologist's role in the medical environment.

SPA 6010: Basic Auditory Sciences
Credits: 3 **Grading Scheme:** Letter

The nature of sound, the structure and function of the auditory system, frequency selectivity, auditory filtering, and the psychoacoustics of pure tones and complex sounds.

SPA 6117: Science of Singing
Credits: 3 **Grading Scheme:** Letter
Intended for voice or CSD majors with interest in singing voice, its production, and its maintenance as instrument of health and beauty. Introduction to anatomy and physiology of speech mechanism and acoustics of voice production.

SPA 6133L: Hearing Aid Analysis Laboratory
Credits: 1 **Grading Scheme:** Letter
Corequisite: SPA 6345.
Advanced analysis and description of the electroacoustical properties of hearing aids.

SPA 6207: Applied Phonological Disorders: Diagnosis and Treatment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: majors only.
Seminar and practicum.

SPA 6211: Applied Voice Disorders: Diagnosis and Treatment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: majors only.
Seminar and practicum.

SPA 6217: Vocal Health and Habilitation
Credits: 3 **Grading Scheme:** Letter
Production of normal voice. Identifying and managing vocal problems specific to the singer or performer.

SPA 6229: Applied Fluency Disorders: Diagnosis and Treatment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: majors only.
Seminar and practicum.

SPA 6233: Speech Motor Control Disorders
Credits: 3 **Grading Scheme:** Letter
Developmental and acquired neurogenic speech disorders and their associated neuropathology, etiology, characteristics, assessment practices, and treatment strategies.

SPA 6270: Auditory Processing Disorders
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SPA 5304, SPA 5102.
Anatomy and physiology of the central auditory nervous system, and disorders of auditory processing that occur in humans. Focuses on evaluation and treatment of auditory processing disorders.

SPA 6305: Pediatric Audiology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SPA 6313.

SPA 6311: Medical Audiology
Credits: 2 **Grading Scheme:** Letter
Differential diagnosis of hearing impairment.

SPA 6312: Advanced Audiology and Neuro-Otology
Credits: 2 **Grading Scheme:** Letter
Prerequisite: SPA 6311.
Medical description, case presentation, and management of hearing loss.

SPA 6317: Vestibular Disorders
Credits: 2 **Grading Scheme:** Letter
Prerequisite: graduate status.

Mechanics and physiology of human balance, contribution of inner ear to balance, disorders of balance, and approaches to diagnostic assessment and rehabilitation.

SPA 6323: Audiologic Rehabilitation for Adults
Credits: 2 **Grading Scheme:** Letter
Explores theoretical and clinical literature. Describes assessment and management strategies.

SPA 6324: Audiologic Rehabilitation for Children
Credits: 2 **Grading Scheme:** Letter
Explores theoretical and clinical literature. Assessment and therapy techniques for children.

SPA 6340: Amplification I
Credits: 2 **Grading Scheme:** Letter
Theoretical and applied understanding of current technology in amplification systems for the hearing impaired. Seminar format (2/3) and clinical laboratory activities (1/3).

SPA 6341: Amplification II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: SPA 6340.
Digital and programmable technology in hearing aids.

SPA 6342: Amplification III
Credits: 2 **Grading Scheme:** Letter
Theoretical and applied understanding of current and future technology in amplification systems. Recent advances in programmable and digital hearing aids. Hearing aid selection procedures for special populations. Assistive learning devices. Classroom amplification systems.

SPA 6410: Adult Language Disorders
Credits: 3 **Grading Scheme:** Letter
The nature of acquired aphasia and related disorders. Applying neurolinguistic and neuropsychological models to methods of assessment and treatment.

SPA 6416: Applied Neurogenic Disorders: Diagnosis and Treatment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: majors only.
Seminar and practicum.

SPA 6430: Applied Developmental Disorders: Diagnosis and Treatment in Speech and Language
Credits: 3 **Grading Scheme:** Letter
Prerequisite: majors only.
Seminar and practicum.

SPA 6436: Issues in Autism Spectrum Disorders
Credits: 3 **Grading Scheme:** Letter
Review of related issues including diagnosis, intervention, and current research.

SPA 6506: Clinical Clerkship in Audiology
Credits: 1 Max: 3 **Grading Scheme:** Letter
Beginning-level audiologic practicum.

SPA 6507: Applied Augmentative and Alternative Communication
Credits: 3 **Grading Scheme:** Letter
Introduction to clinical experience through planning, conducting, and writing up diagnostic and therapy sessions with individuals who have little or no functional speech and or writing.

SPA 6521: Practicum in Speech-Language Diagnostics: UFSHC
Credits: 1-6 Max: 6 **Grading Scheme:** Letter
Prerequisite: SPA 5553.

SPA 6524: Practicum in Speech-Language Therapy: UFSHC

Credits: 1-6 Max: 6 Grading Scheme: Letter

SPA 6531: Clinical Practice in Hearing Assessment
Credits: 1-6 Max: 6 Grading Scheme: Letter

SPA 6533: Clinical Practice in Aural Rehabilitation
Credits: 1-6 Max: 6 Grading Scheme: Letter

SPA 6559: Alternative and Augmentative Communication
Credits: 2 Grading Scheme: Letter
Prerequisite: SPA 5403, SPA 5405.
Survey of issues and research into the use of unaided and aided augmentative and alternative communication methods by persons with deficits in speech and writing.

SPA 6564: Communication and Aging
Credits: 3 Grading Scheme: Letter
Characteristics of, and management approaches for, communication disorders found with some frequency in the elderly. Focues on enhancing communication.

SPA 6565: Seminar in Dysphagia
Credits: 3 Grading Scheme: Letter
Anatomy, physiology, and neurology of normal swallow. Review of further diagnostic procedures and treatment protocols.

SPA 6568: Clinical Evaluation in Medical Speech-Language Pathology
Credits: 3 Grading Scheme: Letter
Prerequisite: SPA 6008.
Framework for evaluating communication and swallowing skills of patients at all levels of care across many types of disorders.

SPA 6570: Seminar: Professional Aspects of Speech-Language Pathology
Credits: 3 Grading Scheme: Letter
Administration of speech-language pathology services in varied settings (hospitals, schools, community clinics, private practice, universities) studied from educational, legal, business, and ethical perspectives.

SPA 6581: Special Clinical
Credits: 1-9 Max: 12 Grading Scheme: Letter
Advanced study in specific areas of clinical process.

SPA 6805: Introduction to Graduate Research
Credits: 3 Grading Scheme: Letter
Prerequisite: required of all graduate students specializing in speech-language pathology or audiology.

SPA 6830: Communication Disorders in Medically Complex Pediatric Populations
Credits: 3 Grading Scheme: Letter
Prerequisite: SPA 6008.
Clinical research.

SPA 6905: Individual Study
Credits: 1-3 Max: 9 Grading Scheme: Letter
Prerequisite: consent of instructor.
Supervised study of specialized topic or research project.

SPA 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U
Prerequisite: SPA 6805, and consent of instructor.

SPA 6930: Proseminar in Speech-Language Pathology and Audiology
Credits: 1 Max: 6 Grading Scheme: S/U
Faculty and graduate student research in speech-language pathology, audiology, and related disciplines.

SPA 6935: Applied Reading Disabilities: Diagnosis and Treatment

Credits: 3 **Grading Scheme:** Letter
Prerequisite: majors only.
Seminar and practicum in diagnosis and treatment of developmental reading disabilities.

SPA 6936: Special Topics
Credits: 3 Max: 9 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Theory and research in communication.

SPA 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

SPA 6942: Externship in Speech-Language Pathology
Credits: 7-12 Max: 12 **Grading Scheme:** Letter
Full-time supervised clinical experience in speech-language pathology. Students provide diagnostic and therapeutic services in clinical setting.

SPA 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

SPA 7132C: Clinical Instrumentation for Evaluating Upper Aerodigestive Tract Functions
Credits: 3 Max: 3 **Grading Scheme:** Letter
Introduction to instrumentation used in clinical evaluation and treatment and clinical research. Experiential component.

SPA 7306: Audiologic Assessment in a Medical Setting
Credits: 5 **Grading Scheme:** Letter
Prerequisite: open only to students in the distance learning Au.D. program.
Audiologic and medically related aspects of hearing disorders.

SPA 7318: Clinical Auditory Electrophysiology
Credits: 5 **Grading Scheme:** Letter
Prerequisite: open only to students in the distance learning Au.D. program.
Understanding clinical auditory physiological measures, including auditory-evoked and event-related potentials, otoacoustic emissions, and common clinical protocols applied to auditory disorders.

SPA 7319: Balance Disorders: Evaluation and Treatment
Credits: 5 **Grading Scheme:** Letter
Prerequisite: open only to students in the distance learning Au.D. program.
Understanding how humans maintain balance, the contribution of the inner ear to balance, disorders of balance, and approaches to rehabilitation of these disorders.

SPA 7325: Audiologic Rehabilitation
Credits: 5 **Grading Scheme:** Letter
Prerequisite: open to students in the distance learning Au.D. program.
State-of-the-art information on current philosophies and practice patterns for audiologic habilitation and rehabilitation.

SPA 7348: Principles of Amplification
Credits: 5 **Grading Scheme:** Letter
Prerequisite: open only to students in the distance learning Au.D. program.
Recent information regarding amplification systems.

SPA 7353: Environmental Hearing Conservation
Credits: 5 **Grading Scheme:** Letter
Prerequisite: open only to students in the distance learning Au.D. program.
Recent information regarding the causes of hearing loss, prevention strategies, and basic mechanisms underlying noise-induced hearing loss.

SPA 7354: Seminar in Audiology: Hearing Conservation and Noise Control
Credits: 3 **Grading Scheme:** Letter

SPA 7391: Business and Professional Issues in Audiology
Credits: 5 **Grading Scheme:** Letter
Prerequisite: open only to students in the distance learning Au.D. program.
Overview of the healthcare system, the place of audiology in the system, current issues facing the profession, ethics of audiologic practice, providing reimbursement for services, and personnel management.

SPA 7415: Neurolinguistics of Adult Language Disorders
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SPA 6410, LIN 6932, or consent of the instructor.
Psycho- and neurolinguistic research on acquired language disorders. Theoretical models of language representation and implications for treatment.

SPA 7500: Public School Practicum
Credits: 1-3 Max: 10 **Grading Scheme:** Letter
Prerequisite: majority of preprofessional courses.
Experience in partial fulfillment of department's clinical requirements.

SPA 7523: Practicum in Speech Pathology in a Medical/Dental Setting
Credits: 1-6 Max: 6 **Grading Scheme:** Letter
Prerequisite: SPA 6521, SPA 6524, and consent of department.

SPA 7540: Diagnosis and Treatment of Language and Language-Based Literacy Disorders
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate-level reading course.
Clinical aspects of intervention for children and adults who have language disabilities, focusing on identification, diagnosis, and treatment of emergent literacy and language disorders.

SPA 7566: Counseling Individuals with Hearing Losses
Credits: 5 **Grading Scheme:** Letter
Prerequisite: open only to students in the distance learning Au.D. program.
Recent information about counseling.

SPA 7833: Audiology Research Project
Credits: 3-6 Max: 6 **Grading Scheme:** S/U

SPA 7937: Seminar in Advanced Studies of Language and Literacy Development and Disabilities
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Contemporary theories, research, and clinical applications in the areas of language and literacy for typical and atypical learners.

SPA 7945: Graduate Practicum in Audiology
Credits: 3-6 Max: 15 **Grading Scheme:** Letter
Intermediate clinical practicum for Au.D. students.

SPA 7946: Clinical I: Practicum in Medical Speech and Language Pathology
Credits: 1-10 Max: 10 **Grading Scheme:** Letter
Prerequisite: minimum 50 clock hours of graduate clinical practicum.

SPA 7947: Clinical II: Practicum in Advanced Medical Speech-Language Pathology
Credits: 1-10 Max: 10 **Grading Scheme:** Letter
Prerequisite: minimum 5 hours of SPA 7946 or equivalent.

SPA 7958: Clinical Externship
Credits: 3-12 Max: 36 **Grading Scheme:** Letter
Prerequisite: 12 hours of SPA 7945.

SPA 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U

Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

SPA 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

SPC 6239: Studies in Rhetorical Theory
Credits: 3 Max: 9 **Grading Scheme:** Letter
Examination of ancient, medieval, renaissance, and modern writers who have influenced rhetorical thought, criticism, speaking, and writing.

SPM 5016: Sport Sociology
Credits: 3 **Grading Scheme:** Letter
Advanced principles and applications of social issues, within the sport industry. An in-depth look at how amateur and professional sport business enterprises reflect societal values and issues in the arena of sport.

SPM 5206: Sport Ethics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: 7 or 8 HH/SPM or consent of instructor.
Self-evaluating, examining, and developing philosophy on ethical issues related to sport. Research and discuss major moral and ethical issues related to sport. Opportunities for ethical decision making, using critical analysis.

SPM 5309: Sport Marketing
Credits: 3 **Grading Scheme:** Letter
Marketing information systems, pricing strategies, media relations, promotional methods, and endorsements as they relate to marketing theories. Practical applications and principles.

SPM 5506: Sport Finance
Credits: 3 **Grading Scheme:** Letter
Financial theories and practical applications of sport income and expenditures. Principles and procedures of marketing sports in today's society.

SPM 5936: Current Topics in Sport Management
Credits: 1-3 Max: 9 **Grading Scheme:** Letter
Prerequisite: consent of department chair.
Offered, on request of students, to meet special interests inadequately covered in other courses.

SPM 6006: Contemporary Sport Industry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate status.
Advanced principles and applications.

SPM 6036: Research Seminar in Sport Management
Credits: 3 **Grading Scheme:** Letter
Theoretical and practical research information in sport and exercise program management.

SPM 6106: Management and Planning of Sport and Physical Activity Facilities
Credits: 3 **Grading Scheme:** Letter
Administrative tasks involved in managing, planning, renovating, and maintaining facilities. Effect on program selection and scheduling in sport and fitness.

SPM 6158: Management and Leadership in Sport
Credits: 3 **Grading Scheme:** Letter
Prerequisite: 7 or 8 HH/SPM or consent of instructor.
Principles of leadership and management for sport settings.

SPM 6308: Study of Sport Consumer Behaviors
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate status.

Advanced theoretical and practical information in sport consumer studies.

SPM 6726: Issues in Sport Law
Credits: 3 **Grading Scheme:** Letter
Prerequisite: 7 or 8 HH/SPM or consent of instructor.
Legal effects of regulating and managing amateur and professional sports and wellness programs: injury liability, risk management, constitutional rights of athletes, and contract negotiation.

SPM 6905: Directed Independent Study
Credits: 1-6 **Grading Scheme:** Letter
Individual research projects under faculty guidance.

SPM 6910: Supervised Research
Credits: 1-6 Max: 6 **Grading Scheme:** S/U

SPM 6947: Graduate Internship in Sport Management
Credits: 3 Max: 9 **Grading Scheme:** S/U
Prerequisite: completion of at least 2 semesters of course work applicable to specialization; permission of advisor, written application, and site approval.
On-site full-time practical experience in sport management.

SPM 6948: Advanced Practicum in Sport Management
Credits: 1-3 **Grading Scheme:** Letter
On-site practical experience in sport management.

SPM 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U
Research for master's thesis in sport management.

SPN 6166: Teaching Spanish for the Professions
Credits: 3 **Grading Scheme:** Letter
Practical training and orientation for graduate students. Business Spanish. Issues of Spanish for health care and other professions. Languages across the curriculum. Professional development: technology in the classroom, scholarly networking, and job search.

SPN 6315: Advanced Composition and Syntax
Credits: 3 **Grading Scheme:** Letter
Extensive practice producing various types of academic writing in Spanish. Discursive and grammatical features that distinguish different styles.

SPN 6425: Writing for the Profession
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Current enrollment in graduate program; advanced command of Spanish.
Develop or perfect skills in the writing of academic Spanish. Class hours are divided between theory/practice of the genres and review/practice of advanced rhetorical strategies in Spanish.

SPN 6705: Foundations of Hispanic Linguistics
Credits: 3 **Grading Scheme:** Letter
Introducing theoretical linguistics, exploring research methods employed in the field, and showcasing the research areas represented in the department. The course is divided in three main units: introduction to theoretical linguistics; introduction to research methods; current research. Taught in Spanish.

SPN 6715: Formal Instruction and Acquisition of Spanish
Credits: 3 **Grading Scheme:** Letter
Effects of formal instruction on acquisition of Spanish as a foreign language. Combination of general theoretical issues with analysis of different aspects of teaching and learning Spanish grammar.

SPN 6735: Special Study in Spanish Linguistics
Credits: 3 Max: 12 **Grading Scheme:** Letter
Varying topics of Spanish linguistics relevant to second language acquisition, sociolinguistics, and historical linguistics.

SPN 6785: Advanced Spanish Phonetics
Credits: 3 **Grading Scheme:** Letter
Precise description of Spanish pronunciation. Dialect features and contrastive English phonetics.

SPN 6827: Sociolinguistics of the Spanish-Speaking World
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SPN 6785.
Overview of issues in the contemporary Spanish-speaking world: language variation, language contact, discourse analysis, language attitudes, policy and planning, and social factors in language acquisition and use.

SPN 6835: Spanish and Spanish-American Dialectology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SPN 6785.
Principles and methods applied to study of regional varieties of Spanish in Spain and Spanish America.

SPN 6845: History of the Spanish Language
Credits: 3 **Grading Scheme:** Letter
Phonological, morphological, syntactic, and lexical evolution of Spanish language from Latin.

SPN 6848: Medieval Spanish Linguistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SPN 6845.
In-depth examination of medieval Spanish to familiarize students with all aspects of language, primarily through detailed analysis of nonliterary texts of period.

SPN 6855: Structure of Spanish
Credits: 3 **Grading Scheme:** Letter
Morphological, syntactic, and semantic aspects of the Spanish language.

SPN 6856: Spanish in Contact: Issues in Bilingualism
Credits: 3 **Grading Scheme:** Letter
Structural and sociocultural analysis of the Spanish language in contact with other major languages: Quechua, Aymara, Guarani, Basque, Catalan, English, Portuguese, and African languages.

SPN 6900: Directed Readings in Spanish
Credits: 3 **Max: 6** **Grading Scheme:** S/U
Individualized readings in preparation for Master of Arts comprehensive examinations.

SPN 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U
Required for all graduate teaching assistants in Spanish. Practical training in teaching elementary Spanish courses.

SPN 6945: Practicum in Advanced College Teaching
Credits: 2 **Max: 6** **Grading Scheme:** S/U
Practical training and orientation for advanced doctoral students in teaching upper-division courses. Gain upper-level teaching experience by working closely with a mentor in all areas of the teaching process.

SPS 6052: Issues and Problems in School Psychology
Credits: 3 **Grading Scheme:** Letter
Corequisite: SPS 6941.
History and foundations of school psychology; legal and ethical. Overview of the role and functions of the school psychologist.

SPS 6191: Psychoeducational Assessment I
Credits: 3 **Grading Scheme:** Letter
Corequisite: SPS 6941.
Techniques for assessing intelligence, adaptive behavior, and achievement of children and school-aged adolescents. Emphasizes standardized instruments.

SPS 6192: Psychoeducational Assessment II
Credits: 3 **Grading Scheme:** Letter

Prerequisite: SPS 6191. *Corequisite:* SPS 6941.
Techniques for assessing the social and emotional functioning of the school-aged child; supervised experience in assessment and report writing.

SPS 6193: Academic Assessment & Intervention
Credits: 3 **Grading Scheme:** Letter
Assessment approaches and intervention strategies for students experiencing academic difficulties.

SPS 6195: Developmental Psychopathology
Credits: 3 **Grading Scheme:** Letter
Overview of developmental psychopathology and its relationship to diagnosis and intervention for children and adolescents.

SPS 6197: Psychoeducational Assessment III
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SPS 6191. *Corequisite:* SPS 6941.
Synthesis of sources and techniques of psychoeducational assessment for school-related application and problems.

SPS 6410: Direct Interventions I: Applied Behavior Analysis for School Psychologists
Credits: 3 **Grading Scheme:** Letter
Corequisite: SPS 6941.
Theory and research of applied behavior analysis for school psychologists to provide systematic assessment and treatment.

SPS 6707: Interventions in School Psychology II: Cognitive Behavioral Interventions
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SPS 6410.
Theory and practice of cognitive behavior.

SPS 6708: Interventions in School Psychology III: System Level Interventions for Children and Youths
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SPS 6707.
Theory, empirical research, and clinical issues related to primary prevention and crisis intervention.

SPS 6815: Law and Ethics in Psychology
Credits: 3 **Grading Scheme:** Letter
Knowledge of laws and ethics that impacts psychological practice with emphasis on children and schools.

SPS 6905: Individual Study
Credits: 1-3 **Max: 12** **Grading Scheme:** Letter

SPS 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U
Prerequisite: consent of department chair.

SPS 6937: Special Topics in School Psychology
Credits: 1-3 **Max: 12** **Grading Scheme:** Letter
Prerequisite: consent of instructor.

SPS 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

SPS 6941: Practicum in School Psychology
Credits: 1-4 **Max: 8** **Grading Scheme:** S/U
Prerequisite: consent of instructor.

SPS 6942: School Psychology Practicum II
Credits: 3 **Max: 6** **Grading Scheme:** S/U
Prerequisite: SPS 6941.
Practicum focused on linking assessment and intervention.

SPS 6945: Advanced Practicum in School Psychology

Credits: 3 **Grading Scheme:** S/U
Prerequisite: SPS 6941 and SPS 6942.
Advanced practicum focused on complex case management, specialization area practice, diversity, and peer supervision.

SPS 7205: School Psychology Consultation
Credits: 3 **Grading Scheme:** Letter
Corequisite: SPS 6941.
Concepts, processes, and issues related to the practice of school-based consultation as an intervention technique of school psychologists.

SPS 7931: Seminar in School Psychology
Credits: 1-3 Max: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Issues pertinent to the professional practice of school psychology.

SPS 7949: Internship in School Psychology
Credits: 6 [3 Summer A or B] Max: 18 **Grading Scheme:** Letter
Prerequisite: consent of instructor.

SPS 7979: Advanced Research
Credits: 1-3 Max: 12 **Grading Scheme:** S/U

SPS 7980: Research for Doctoral Dissertation
Credits: 1-15 Max: 15 **Grading Scheme:** S/U
Prerequisite: Admission to candidacy.
Research for doctoral students after admission to candidacy.

SPW 6209: Colonial Spanish-American Literature
Credits: 3 **Grading Scheme:** Letter
Readings, research, and discussion. Literary, historical, and legal 16th-, 17th-, and 18th-century texts in Spanish: Colonial Latin America and dealing with contact among European, neo-European, and Native American cultures.

SPW 6216: Spanish Prose Fiction of the Golden Age
Credits: 3 **Grading Scheme:** Letter
The literary landscape of rampant generic diversity, before novelistic forms solidified. While shepherds in rarified meadows disputed fine points of neo-Platonic love, thieves, prostitutes, and picaros inveighed their way into carriages, salons, and homes of aristocracy. Fiction provided an outlet for political satire, religious allegory, utopian dreaming, and sheer escapism. Readings and lectures in Spanish.

SPW 6236: Spanish-American Narrative from the origins to Criollismo
Credits: 3 **Grading Scheme:** Letter
Narratives of nineteenth-century dealing with issue of nation building and cultural independence after emancipation from Spain (authors include Sarmiento, Gomez de Avellaneda, Mera, Galvan, Issacs, Altamirano).

SPW 6269: Spanish Novel of the Nineteenth Century
Credits: 3 **Grading Scheme:** Letter
Survey of Spanish narrative beginning with romantic cuadros de costumbres and folletin. Emergence of realist and naturalist narrative from 1870s to 1890s. Emphasizes Valera, Galdos, Clarin, and Pardo Bazan.

SPW 6276: Spanish Postwar Narrative
Credits: 3 **Grading Scheme:** Letter
Analysis of significant texts up to the present, through the prism of pertinent critical discourses and historical readings.

SPW 6278: Postwar Spanish Fiction
Credits: 3 **Grading Scheme:** Letter
Contextualized approach to representative works and significant authors of fiction published in Spain after 1939. Critical and historical readings and textual analysis.

SPW 6285: Contemporary Spanish-American Narrative I
Credits: 3 **Grading Scheme:** Letter

Textual production of the 1940s and 1950s including broader cultural characteristics of modernization, development of new narrative modes, and theories of understanding Latin America and literature of this period.

SPW 6286: Contemporary Spanish-American Narrative II
Credits: 3 **Grading Scheme:** Letter
Fiction in the 1960s and after, including the New narrative, the Boom, and the Post-Boom. Broader cultural characteristics. Theories of understanding the area and the literature of the period.

SPW 6306: Spanish-American Theater
Credits: 3 **Grading Scheme:** Letter
Analyzing selected plays and films. Introduction to the history, theory, and practice of theatrical arts in the region. Comparison to theater elsewhere. Focuses on the 20th century.

SPW 6315: Spanish Drama of the Golden Age
Credits: 3 **Grading Scheme:** Letter
Comedia in theory and practice. *Sacramental, entremes, comedia,* religious, and historical drama of 16th- and 17th-century Spain.

SPW 6337: Golden Age Poetry
Credits: 3 **Grading Scheme:** Letter
Analysis of multiple uses of artifice in Renaissance and Baroque Spanish poetry by both major and minor poets.

SPW 6345: Twentieth-Century Spanish Poetry
Credits: 3 **Grading Scheme:** Letter
Introductory survey of major poets. Topics include gender, periodization, aesthetics, historicity, and the relationship of poetry to politics. Close reading of texts in the context of contemporary literary theory.

SPW 6356: Spanish-American Poetry from Romanticism to Vanguardismo
Credits: 3 **Grading Scheme:** Letter
Major movements from the mid-19th century to the 1930s, especially from Modernismo to the present. Seminal works of poets such as Marti, Casal, Cario, Lugones, Mistral, Storni, Huidobro, and Vallejo.

SPW 6357: Contemporary Spanish-American Poetry
Credits: 3 **Grading Scheme:** Letter
Sentral aspects of Spanish-American poetry from Vanguardism to the present. Organized around a specific theme, genre, country, region, theoretical problem, or subperiod.

SPW 6366: Spanish-American Essay
Credits: 3 **Grading Scheme:** Letter
Close reading and critical analysis of texts by major twentieth-century essayists. Themes include affirmation of identity, gender roles, and the definition of ethnic, racial, social, and class categories.

SPW 6535: Spanish Romanticism
Credits: 3 **Grading Scheme:** Letter
Analyzes literary works of Spanish Neoclassical and Romantic periods in light of their social, historical and ideological contexts.

SPW 6545: Spanish Romanticism
Credits: 3 **Grading Scheme:** Letter
Analyzes literary works of Spanish Neoclassical and Romantic periods in light of their social, historical and ideological contexts.

SPW 6606: Cervantes
Credits: 3 **Grading Scheme:** Letter
Situates Don Quijote I, II in the cultural nexus of early modern Spain. Surveys contemporary currents in Cervantine criticism.

SPW 6729: The Generation of 1898
Credits: 3 **Grading Scheme:** Letter
Fin de siecle crisis. The rise of literary modernity and nationalism. Creation of modern intelligentsia in the early 20th century in the works of Unamuno, Costa, Maeztu, Antonio Machado, Baroja, and Valle-Inclan.

SPW 6806: Introduction to Graduate Study and Research

Credits: 3 **Grading Scheme:** Letter
Tools, problems, and methods of literary research.

SPW 6902: Special Study in Spanish or Spanish-American Literature
Credits: 3 Max: 15 **Grading Scheme:** Letter
Selected topic or problem (varied each semester).

SPW 6905: Individual Work
Credits: 1-3 Max: 9 **Grading Scheme:** Letter
Available only by special arrangement with graduate adviser.

SPW 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

SPW 6934: Seminar in Spanish American Literature and Culture
Credits: 3 Max: 9 **Grading Scheme:** Letter
Analyzing themes and directions in contemporary Spanish American literature and culture. Feminist literary and cultural criticism. Reading and discussion of key theoretical texts produced in the U.S., Europe, and Latin America. Graduate students from other disciplines are welcome.

SPW 6938: Seminar in Spanish Literature and Culture
Credits: 3 Max: 9 **Grading Scheme:** Letter
Prereq or coreq: SPW 6806. Variable topics. Close consideration of a single literary or critical or cultural problem arising in the context of Spanish letters or culture.

SPW 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

SPW 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

SPW 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

SRK 6905: Individual Study in Sanskrit
Credits: 1-4 Max: 9 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Graduate reading in Sanskrit language and literature.

SSE 5320: Middle School Social Studies Methods
Credits: 3 **Grading Scheme:** Letter
Examines and applies instructional procedures and materials, focusing on social studies in Grades 6-8.

SSE 5945C: Practicum in Secondary Social Studies Teaching and Assessment
Credits: 3 **Grading Scheme:** Letter
Directed experiences emphasizing instructional strategies, instructional materials, and student assessment. Field and laboratory settings with microteaching assignments.

SSE 6046: Perspectives in Social Studies Education
Credits: 3 **Grading Scheme:** Letter
Seminar analyzing works written by important social studies educators.

SSE 6117: Social Studies Education—Elementary School
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate curriculum course.
Contributions of social education to the total elementary school program, emphasizing social interaction and programs and procedures in the social studies area.

SSE 6133: Secondary School Social Studies Methods and Assessment
Credits: 3 **Grading Scheme:** Letter
Preparing, selecting, and using instructional methods, materials, and assessments in the social studies content area.

SSE 6478: Global Studies Methods in Social Studies
Credits: 3 **Grading Scheme:** Letter
Comprehensive overview of standards-based global issues appropriate for study in Grade 6 to 12 social studies classes.

STA 5106: Computer Programs in Statistical Analysis
Credits: 1 **Grading Scheme:** Letter
Prerequisite: STA 6166.
Using library computer programs to analyze balanced experimental data and for regression analysis.

STA 5223: Applied Sample Survey Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 2023, 4322, STA 6126, or STA 6166.
Designing and analyzing sample surveys. Sources of error. Questionnaire design. Simple random, stratified, systematic, and cluster sampling. Practical application of concepts.

STA 5325: Fundamentals of Probability
Credits: 3 **Grading Scheme:** Letter
Prerequisite: grade of C or better in MAC 2313 and STA 3032 or equivalent.
Topics in probability and statistics, particularly discrete and continuous random variables, sampling distributions, estimation, and hypothesis testing. Applications to engineering and natural science.

STA 5328: Fundamentals of Statistical Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 4321 or equivalent.
Direct continuation of STA 4321/STA 5325. Basic material for distribution theory, sampling distributions, properties of estimators, hypothesis testing, linear regression analysis, and analysis of variance. A good knowledge of calculus is helpful.

STA 5503: Categorical Data Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 3024, 3032, 4210, 4322, STA 6127, or STA 6167. Intended for graduate students not majoring in statistics.
Description and inference using proportions and odds ratios, multi-way contingency tables, logistic regression and other generalized linear models, and loglinear models applications.

STA 5507: Applied Nonparametric Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 2023, 3032, 4210, 4322, STA 6126, STA 6166. Intended for graduate students not majoring in statistics.
Introduction to nonparametric statistics. Includes one- and two-sample testing and estimation methods, one- and two-way layout models, and correlation and regression models.

STA 5701: Applied Multivariate Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 3024, STA 6127, STA 6167, or 4211. Intended for graduate students not majoring in statistics.
Review of matrix theory, univariate normal, t, chi-squared and F distributions, and multivariate normal distributions. Inference about multivariate means, Hotelling's T^2 multivariate analysis of variance, multivariate regression, and multivariate repeated measures. Inference about covariance structure, principal components, factor analysis, and canonical correlation. Multivariate classification techniques, discriminant and cluster analysis. Additional topics at the discretion of the instructor, time permitting.

STA 5715: Applied Survival Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6127 or STA 6167.
Survival analysis data methods, including Kaplan-Meier and Nelson estimators of survival, accelerated failure, proportional hazards models, and frailty and recurrent-event models.

STA 5823: Stochastic Process Methods
Credits: 3 **Grading Scheme:** Letter

Prerequisite: STA 4321 or STA 5325.
Mathematical foundations of elementary stochastic processes, including Poisson processes and Markov chains, branching, and renewal processes.

STA 5856: Applied Time Series Methods
Credits: 3 **Grading Scheme:** Letter
Corequisite: STA 4322 or STA 5328.
Stationarity, autocorrelation, ARMA models, non-stationary processes, ARIMA models, regression with ARMA errors, model-based forecasting, forecasting algorithms.

STA 6092: Applied Statistical Practice
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6207, 6208.
Communication, management, and the organizational, computational, and statistical thinking skills needed for consulting in statistics. Integrating graphic and numeric computing tools, research design concepts, data summary, and statistical inference methods.

STA 6126: Statistical Methods in Social Research I
Credits: 3 **Grading Scheme:** Letter
Descriptive statistics, estimation, significance tests, two-sample comparisons, methods for nominal and ordinal data, regression and correlation, introduction to multiple regression.

STA 6127: Statistical Methods in Social Research II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6126.
Further topics in multiple regression, model building, analysis of variance, analysis of covariance, multivariate analysis of categorical data.

STA 6166: Statistical Methods in Research I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 2023 or equivalent.
Statistical methods based on t, F, and Chi^2 tests. Analysis of variance for basic experimental designs. Factorial experiments. Regression analysis and analysis of covariance.

STA 6167: Statistical Methods in Research II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6166.
Analysis of covariance and general linear model. Factorial, nested, split-plot, and incomplete block designs. Analysis of count data.

STA 6176: Introduction to Biostatistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6207, STA 6326.
Analyzing epidemiological studies. Measures of morbidity and mortality. Methods for rates and proportions, bioassay, and longitudinal data analysis.

STA 6178: Genetic Data Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6327.
Biological and molecular basis. Likelihood ratio test, multinomial distribution and Bailey's theorem. Linkage analysis of qualitative traits. Twin and sibling studies. Computing the kinship coefficient by the matrix method. Mapping quantitative trait loci by EM algorithm. Heritability. Breeding value prediction using flanking markers with variance component analysis. Linkage disequilibrium analysis for gene mapping. Forensic genetics using Bayes' formula. Genetic counseling. Gene pattern matching and constructing evolutionary trees by cluster analysis.

STA 6207: Basic Design and Analysis of Experiments
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6208 Regression Analysis.

Principles of experimental design, completely randomized design (analysis, contrasts, diagnostics), random effects models, factorial experiments (fixed, random, and mixed effect), block designs, Latin squares, split plots, and full and fractional factorial experiments.

STA 6209: Design and Analysis of Experiments
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6207.
Tests of assumptions; block designs; control of two-way heterogeneity; cross over designs; factorial experiments; fractional factorials; analysis of "messy" data.

STA 6226: Sampling Theory and Application
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6327 or consent of instructor.
Theory and application of commonly used sampling techniques; simple random sample, cluster, ratio, regression, stratified, multistage, and systematic samples. Special topics include wildlife surveys, non-sampling error adjustment, categorical data analysis, and practical survey examples.

STA 6246: Theory of Linear Models
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6208, STA 6327, STA 6329.

STA 6326: Introduction to Theoretical Statistics I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAC 2313.
Theory of probability. Probability spaces, continuous and discrete distributions, functions of random variables, multivariate distributions, expectation, conditional expectation, central limit theorem, useful convergence results, sampling distributions, distributions of order statistics, empirical distribution function.

STA 6327: Introduction to Theoretical Statistics II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6326.
Estimation and hypothesis testing. Sufficiency, information, estimation, maximum likelihood, confidence intervals, uniformly most powerful tests, likelihood ratio tests, sequential testing, univariate normal inference, decision theory, analysis of categorical data.

STA 6329: Matrix Algebra and Statistical Computing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAC 3313.
Basic theory of determinants, inverses and generalized inverses, eigenvalues and eigenvectors; applications of partitioned matrices; diagonalization and decomposition theorems; applications in least squares.

STA 6505: Analysis of Categorical Data
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6327 and STA 6207 or consent of instructor.
Varieties of categorical data, cross-classification tables, tests for independence. Measures of association. Loglinear models for multi-dimensional tables. Logit models and analogies with regression. Specialized methods for ordinal data.

STA 6526: Nonparametric Statistics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6327 or consent of instructor.
Inference based on rank statistics. One, two, and k-sample problems. Correlation and regression problems. Analysis of contingency tables. Conditionally distribution-free rank tests. Pitman asymptotic relative efficiency.

STA 6707: Analysis of Multivariate Data
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6208 and facility in a computer language.
Techniques for analyzing multivariate data. Emphasis on MANOVA and tests on the structure of the dispersion matrix. Topics will include discriminant, factor, profile, and cluster analyses.

STA 6826: Stochastic Processes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6327.
Discrete time and state Markov process. Ergodic theory.

STA 6857: Time Series Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 4322 and a basic computer language.
Linear time series model building, spectral density estimation, analysis of nonstationary data, SAS package on Box and Jenkins model building and forecasting. Case studies in recent literature will be discussed.

STA 6866: Monte Carlo Statistical Methods
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6327 and STA 6208, or consent of instructor.
Introduction to Monte Carlo statistics.

STA 6905: Individual Work
Credits: 1-4 Max: 10 **Grading Scheme:** Letter
Prerequisite: departmental approval.
Special topics designed to meet the needs and interests of individual students.

STA 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

STA 6934: Special Topics in Statistics
Credits: 1-3 Max: 12 **Grading Scheme:** Letter
Prerequisite: permission of graduate adviser.

STA 6938: Seminar
Credits: 1 Max: 15 **Grading Scheme:** S/U
Prerequisite: departmental approval.
Special topics of an advanced nature suitable for seminar treatment but not given in regular courses.

STA 6940: Supervised Teaching
Credits: 1-5 Max: 5 **Grading Scheme:** S/U

STA 6942: Internship
Credits: 1-3 Max: 3 **Grading Scheme:** S/U
Prerequisite: STA 6208 or equivalent and consent of graduate coordinator.
Supervised statistical consulting involving planning and/or analyzing research data. Whenever possible, student meets with researcher. Supervision by faculty member or delegated authority and post-internship report.

STA 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

STA 7179: Survival Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6177.
Theoretical introduction to statistical inferential procedures useful for analyzing randomly right censored failure time data.

STA 7249: Generalized Linear Models
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6207, 6208, STA 6327, STA 6246.
Fitting of generalized linear models, diagnostics, asymptotic theory, overdispersion, estimating equations, mixed models, generalized additive models, smoothing.

STA 7334: Limit Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6467.

Review of different models of convergence. Cramer-Wold device. Multivariate CLT. Asymptotic theory of empirical distribution and sample quantiles. Bahadur's representation. Asymptotic theory of sample moments. Delta method and its multiparameter generalization. Variance stabilizing transformation. U-statistics: asymptotic theory and its statistical applications. Hoeffding's decomposition. Asymptotic theory of maximum likelihood estimation. Wald's consistency theorem for MLE. Asymptotic normality and efficiency. Asymptotic theory of GLRTs. Statistical applications: asymptotic theory of categorical data, linear models, and generalized linear models.

STA 7346: Statistical Inference
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6327.
Decision rules and risk functions. Sufficiency, Minimax, and Bayes rules for estimating location and scale parameters.

STA 7347: Advanced Inference
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 7346.
Bayesian statistical inference. Inference using large samples. Relative efficiencies of tests and estimates with special reference to Pitman and Bahadur efficiencies.

STA 7348: Bayesian Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 7346
Theory underlying the Bayesian paradigm. Issues related to selection of priors; Bayesian interference, both exact and asymptotic; Bayesian model selection; high-dimensional problems; and Bayesian robustness.

STA 7466: Probability Theory I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MAA 5228, MAA 6236, or equivalent.
Measure and probability spaces. Random variables. Distribution functions. Abstract Lebesgue and Stieltjes integration. Monotone. Dominated, Cauchy, and mean convergence. Fubini and Radon-Nikodym theorems. Zero-one laws.

STA 7467: Probability Theory II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 7466.
Summability of independent random variables. Laws of large numbers. Convergence in distribution. Characteristic functions. Uniqueness and continuity theorems. The Lindeberg-Feller central limit theorem. Degenerate convergence criterion.

STA 7828: Topics in Stochastic Processes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: STA 6466 and STA 6467.
Branching processes, Brownian motion, continuous state space Markov chains, diffusion processes, Markov chain Monte Carlo, martingales, point processes, renewal processes, stationary processes, stochastic calculus, stochastic differential equations.

STA 7934: Special Topics in Statistics
Credits: 1-9 **Max: 15** **Grading Scheme:** Letter
Prerequisite: Permission of Graduate Coordinator.
Possible Topics: Smoothing Methods, Analysis of Longitudinal Data, Data Mining and Statistical Learning, Mixed Models, Theory and Methods, Resampling Methods, Functional Data Analysis.

STA 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

STA 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

SUR 5365: Digital Mapping
Credits: 3 **Grading Scheme:** Letter

Prerequisite: consent of instructor.
Methods of digital representation of maps, coordinate development, digitizing, stereocompilation, scanning, remote sensing, hardware and software systems, file conversion, integration into GIS systems, and attribute development.

SUR 5385: Remote Sensing Applications
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Review of remote sensing systems, image classification methods, mapping applications, integration of remotely sensed data into GIS systems, application of data for variety of land information systems.

SUR 5391C: Geomatics: Spatial Foundations of GIS
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Application of Geomatics technologies (GPS, Total Station, Level) to create a database. Includes database design, data transfer, and spatial analysis.

SUR 5425: Cadastral Information Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Methods of cadastral mapping for tax and/or GIS applications; interpretation of deed and survey information, the sectional survey system, conflict resolution, cadastral information.

SUR 5525: Least Squares Adjustment Computations
Credits: 3 **Grading Scheme:** Letter
Prerequisite: proficiency in computer language and consent of instructor.
Implementation of least squares solutions for survey-mapping and GIS applications, time and storage optimization; error analysis; initial approximation generation; robust estimations; and computer programming.

SUR 5625: Geographic Information Systems Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: introductory GIS course.
Analytical tools such as software grid modules, database query, map algebra, and distance operators; analytical operations such as database query, derivative mapping, and process modeling; sources and nature of uncertainty and error, and project planning management.

SUR 6375: Terrain Analysis and Mapping
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Digital and visual methods, interpretative techniques to identify landforms, soils, and potential site-analysis problems from aerial photography and digital maps.

SUR 6395: Topics in Geographic Information Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Database development, economic impact of GIS, development of standards, integration of data sets, hardware and software developments, and advances in GIS technology.

SUR 6427: Land Tenure and Administration
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate status.
Origins of property rights, common vs. individual property. Indigenous tenure systems in Africa and Latin America and their evolution. Process and benefits of property formalization.

SUR 6535: GPS-INS Integration
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Background in vector calculus and matrix algebra
Principles of inertial navigation and its integration with GPS; coordinate frames, modeling linear motion and rotational motion, mechanization of inertial navigation sensor measurements, space state representation of system errors and linear state equations.

SUR 6626: GIS Programming and Customization
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Familiarity with ArcGIS and some exposure to programming (specific language not required), to be determined by instructor (approval of instructor required). Course will be departmentally controlled.
Hands-on introduction to the capabilities of a Geographic Information System (GIS) to be expanded through programming.

SUR 6905: Special Problems in Geomatics
Credits: 1-6 Max: 10 **Grading Scheme:** Letter
Individual study of a selected topic in Geomatics as contracted with the instructor at the start of the term.

SUR 6934: Topics in Geomatics
Credits: 1-4 Max: 10 **Grading Scheme:** Letter
Rotating Topic.

SWS 5050: Soils for Environmental Professionals
Credits: 3 **Grading Scheme:** Letter
Fundamentals of soil properties and processes that explain the central role soils play in the environment. Geared to environmental professionals with little knowledge of soil science. Also offered as a distance education course.

SWS 5050L: Soils for Environmental Professionals Laboratory
Credits: 1 **Grading Scheme:** Letter
Corequisite: SWS 5050: Soils for Environmental Professionals or consent of instructor.
Hands-on laboratory experience with many tools and techniques used in soil and water science, in relation to the environment.

SWS 5115: Environmental Nutrient Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 3022 or SWS 5050: Soils for Environmental Professionals.
Consumption, manufacture, properties, and reserves of fertilizer materials. Methods of application, effects on soil reaction, and plant requirements of fertilizer nutrients. Understanding specific fertilizer reactions. Also offered as a distance education course.

SWS 5132: Tropical Soil Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 3022 or SWS 5050.
Characteristics and management of tropical soils. Technologies that minimize industrial inputs.

SWS 5182: Earth System Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None
MAC 2233, PHY 2048, or Similar Would Be Useful But Not A Requirement.
Analysis of global-scale interdependences between climate, biogeochemical cycles and humans using a systems approach.

SWS 5208: Sustainable Agricultural and Urban Land Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 3022 or equivalent course or with instructor approval.
Studying agricultural and urban water quality issues in Florida, their bases, land and nutrient management strategies, and the science and policy behind Best Management Practices (BMPs). Students will learn to evaluate BMP research and analyze its role in determining practices and policies that protect water quality.

SWS 5224: Environmental Biogeochemistry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: BSC 2010 and BSC 2010L or equivalent courses.
CHM 2045 and CHM 2045L or equivalent courses.

Overviewing of the biogeochemical processes affecting elemental cycling (carbon, nitrogen, phosphorus, sulfur) in global environmental systems.

SWS 5234: Environmental Soil, Water, and Land Use
Credits: 3 **Grading Scheme:** Letter

Suitability of soils for different uses. Proper use of soil survey reports, topographic maps, and related information. Relationships between land uses and water behavior in soils and landscapes. Water use and allocation. Also offered as a distance education course.

SWS 5235: South Florida Ecosystems
Credits: 3 **Grading Scheme:** Letter
Five modules address major disciplines of science and interest. Modules focus on broad subject areas critical to understanding this framework and man's interaction with South Florida ecosystems.

SWS 5246: Water Resource Sustainability
Credits: 3 **Grading Scheme:** Letter
Quantitative description of human impacts on hydrologic ecosystems (aquifers, watersheds, coastal zones, lakes, and wetlands). Case studies show the detrimental effects of unsustainable resource use and beneficial management strategies. Also offered as a distance education course.

SWS 5247: Hydric Soils
Credits: 2 **Grading Scheme:** Letter
Concepts, field identification, and delineation of hydric soils. Instruction in accordance with the National Technical Committee for Hydric Soils and with regulatory agencies. Also offered as a distance education course.

SWS 5248: Wetlands and Water Quality
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 2040.
Introduction to natural and constructed wetland ecosystems. Problems associated with eutrophication and water quality. Hydrology, soils, and biogeochemistry. Also offered as a distance education course.

SWS 5305C: Soil Microbial Ecology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 3022 or SWS 5050, MCB 2000C.
Occurrence and activities of soil microorganisms and their influence on soil productivity and environmental quality. Also offered as a distance education course.

SWS 5308: Ecology of Waterborne Pathogens
Credits: 3 **Grading Scheme:** Letter
Prerequisite: MCB 3020 or MCB 4203 or equivalent.
Modern methods for molecular and cultivation-dependent identification of soil- and waterborne pathogens. Risk assessment. Survival strategies, gene regulation, and metabolism of waterborne pathogens outside of their mammalian hosts. Also offered as a distance education course.

SWS 5406: Soil and Water Chemistry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 3022 or SWS 5050; CHM 3120.
Theoretical background and current approaches to agricultural and environmental problems. Also offered as a distance education course.

SWS 5424C: Soil Chemical Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 3120.
Practical and theoretical aspects of instrumentation and techniques commonly used in analyzing soils and plants.

SWS 5551: Soils, Water, and Public Health
Credits: 3 **Grading Scheme:** Letter
Corequisite: Graduate status.
Highlights important instances where soil and water science and public health overlap. Develops skills required for competency in both disciplines.

SWS 5605C: Environmental Soil Physics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 2040, MAC 2312, PHY 2004, SWS 5050.

Transport processes for water, solutes, gases, and heat in the root zone. Important soil properties (physical, chemical, and biological) that influence the transfer processes characterized in the field and laboratory. Also offered as a distance education course.

SWS 5716C: Environmental Pedology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: SWS 3022, SWS 5050, or consent of instructor.
Soils in the environment. Heavily oriented toward field applications of pediogical principles and processes. Also offered as a distance education course.

SWS 5721C: GIS in Land Resource Management
Credits: 3 **Grading Scheme:** Letter
Introduction to basic concepts and use of "Arc GIS" to address land resource management issues. Also offered as a distance education course.

SWS 6134: Soil Quality
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 5050 or consent of instructor.
State-of-the-art studies/knowledge on soil quality. Principle assessment of soil quality with respect to biological production, plant and animal health, food security, and environmental quality. Also offered as a distance education course.

SWS 6136: Soil Fertility
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 4116, 4213C, SWS 5050 or SWS 5406 or EES 4201.
Principles of advanced soil fertility, including soil chemical properties, crop management practices, plant nutritional requirements, soil fertility amendments, and physiological aspects of plant growth.

SWS 6161: Bioavailability of Soil Nutrients
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 3022 or SWS 5050, 4116 or equivalent, or consent of instructor.
Soil water regime, soil chemical reactions, and dynamic nature of root growth and root function as they influence and determine nutrient availability. Also offered as a distance education course.

SWS 6262: Soil Contamination and Remediation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 4213C or equivalent.
Interdisciplinary study on current topics of soil contamination (types, sources, pathways, impacts, and fates) and soil remediation technologies (chemical, physical, biological, and thermal). Also offered as distance education course.

SWS 6323: Advanced Microbial Ecology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 5305C or consent of instructor.
Phylogeny and evolution; diversity of habitat; genetic exchange.

SWS 6325: Rhizosphere Biochemistry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 5305C or SWS 6323 or consent of the instructor.
Signaling and gene regulation in rhizosphere. Roles of plants and microbes in nutrient cycling, plant disease, biocontrol, and bioremediation. Also offered as a distance education course.

SWS 6366: Biodegradation and Bioremediation
Credits: 3 **Grading Scheme:** Letter
Principles of biodegradation of toxic organic chemical; practices in conducting biodegradation studies in soils and water, and in microbial aspects of bioremediation of contaminated soils and water.

SWS 6373: Techniques in Microbial Ecology
Credits: 2 **Max: 4** **Grading Scheme:** Letter
Prerequisite: SWS 5305C or SWS 6323 or equivalent.

Review of techniques for studying in situ gene expression, signaling, gene transfer, and functional and genetic diversity of microbial communities. Lecture and discussion.

SWS 6448: Biogeochemistry of Wetlands
Credits: 3 **Grading Scheme:** Letter
Biogeochemical cycles of carbon, nitrogen, phosphorus, sulfur, and redox cations in wetland soils and sediments, as related to their agronomic, ecological, and environmental significance. Also offered as distance education course.

SWS 6454: Advanced Soil and Water Chemistry
Credits: 3 **Grading Scheme:** Letter
Prerequisite: CHM 3400, or equivalent.
Fundamental principles of surface chemistry as applied to soil and subsurface materials in natural waters. Chemical equilibria in natural systems, aqueous geochemistry, interfacial properties of soil and sedimentary colloids, and sorption of pollutants.

SWS 6456: Advanced Biogeochemistry
Credits: 3 **Grading Scheme:** Letter
Global elemental cycles in terrestrial, wetland, and aquatic systems as related to water quality, carbon sequestration, and climate change.

SWS 6464C: Soil Mineralogy
Credits: 4 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Classification, structure, surface chemistry, equilibria, genesis, weathering, and distribution of soil minerals. Influence of minerals on soil properties.

SWS 6622: Vadose Zone Hydrology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 4602C, MAC 2313, EGM 3311, or equivalent.
Physical concepts for movement and retention of water, solutes, and heat in the water-unsaturated vadose zone with emphasis on agricultural and environmental aspects of water and solutes in soils.

SWS 6717: Soil Genesis and Classification
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 4715C.
Philosophic concept of soil, role of soil models, development and nomenclature of diagnostic horizons, and an analysis of soil taxonomy. Several field trips are required.

SWS 6722: Soil-Landscape Modeling
Credits: 3 **Grading Scheme:** Letter
Prerequisite: SWS 5721C, STA 6166, SWS 5716C, or equivalent, or consent of instructor.
Various concepts and quantitative methods to model and understand spatial distribution of soil properties.

SWS 6905: Special Problems
Credits: 1-4 Max: 8 **Grading Scheme:** Letter
Prerequisite: 15 credits of soil science.
Laboratory, library, and/or field study and research in a particular aspect of soils. Also offered as a distance education course.

SWS 6910: Supervised Research
Credits: 1-5 Max: 5 **Grading Scheme:** S/U
Also offered as a distance education course.

SWS 6931: Seminar
Credits: 1 Max: 3 **Grading Scheme:** Letter
Presentation of literature, methods of proposed thesis research, and selected topics.

SWS 6932: Topics in Soils
Credits: 1-4 Max: 8 **Grading Scheme:** Letter
Prerequisite: SWS 3022.
Also offered as a distance education course.

SWS 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U
Also offered as a distance education course.

SWS 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U
Also offered as a distance education course.

SWS 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy. Also offered as a distance education course.

SWS 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U
Also offered as a distance education course.

SYA 5933: Special Study in Sociology
Credits: 3 Max: 6 Grading Scheme: Letter

SYA 6018: Classical Social Theories
Credits: 3 Grading Scheme: Letter
Sociological theory from its inception in the early 19th century to about 1930. The ideas of Comte, Spencer, Marx, Weber, Simmel, Durkheim, Pareto, Mead, and others.

SYA 6126: Contemporary Sociological Theory
Credits: 3 Grading Scheme: Letter
The study of modern sociological theories, roughly 1930 to the present.

SYA 6305: Methods in Social Research I
Credits: 3 Grading Scheme: Letter
Survey of quantitative and qualitative methods of social research, design, and data collection.

SYA 6306: Methods in Social Research II
Credits: 3 Grading Scheme: Letter
Prerequisite: SYA 6305.
Evaluation and completion of topics and projects from SYA 6305.

SYA 6315: Qualitative Research Methods
Credits: 3 Grading Scheme: Letter
Fieldwork, observation, participant observation, and other qualitative data-collection and analysis techniques.

SYA 6327: Research Problems in Deviance
Credits: 3 Grading Scheme: Letter
Survey of substantive issues related to data sources, analysis methods, and specific research areas.

SYA 6407: Quantitative Research Methods
Credits: 3 Grading Scheme: Letter
Prerequisite: STA 6126.
Applying selected quantitative methods to sociological research problems. Extensive practice applying the methods.

SYA 6905: Individual Work
Credits: 1-4 Max: 3 for M.A. and 6 for post-M.A. Grading Scheme: Letter
Work on subjects not available in currently offered courses.

SYA 6910: Supervised Research
Credits: 1-5 Max: 5 Grading Scheme: S/U

SYA 6942: Applied Social Research Project

Credits: 3 **Grading Scheme:** Letter
Supervised individual or team applied research project.

SYA 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

SYA 7135: Sociology of Knowledge
Credits: 3 **Grading Scheme:** Letter
Variations in the social origin of knowledge and knowledge systems.

SYA 7933: Special Study in Sociology
Credits: 3 Max: 9 **Grading Scheme:** Letter

SYA 7979: Advanced Research
Credits: 1-12 Max: 24 , including SYA 7980, may be counted in 90 hours **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

SYA 7980: Research for Doctoral Dissertation
Credits: 1-15 Max: 24 , including SYA 7979, may be counted in 90 hours **Grading Scheme:** S/U

SYD 6436: Metropolitan Growth and Development
Credits: 3 **Grading Scheme:** Letter
Prerequisite: 8 hours in social sciences.
Examines the main facets of the dynamics of urban growth/decline and how these affect the social order of a given population: population factors, formation/deterioration of community ties, urban housing social control, transportation, and other subjects reflecting the complexity of urban life.

SYD 6517: Seminar in Environment and Society
Credits: 3 **Grading Scheme:** Letter
Survey of sociological topics important for interdisciplinary environmental science.

SYD 6518: Core Issues in Environmental and Resource Sociology
Credits: 3 **Grading Scheme:** Letter
Addressing the origins and current status of Environmental and Resource Sociology (ERS), central theoretical debates among ER sociologists, and focal topics of concern to ER sociologists, with emphasis on ERS topics current among ER sociologists at the University of Florida.

SYD 6706: Racial and Ethnic Relations
Credits: 3 **Grading Scheme:** Letter
Overview of racial-ethnic oppression, stratification, and conflict in the U.S.

SYD 6707: Black and White Americans: Sociological Perspectives
Credits: 3 **Grading Scheme:** Letter
Critical and comprehensive overview of current social science research. Racial images and perspectives, racial attitudes, images in the media, responses to discrimination, and public policies such as affirmative action.

SYD 6806: Gender and Society
Credits: 3 **Grading Scheme:** Letter
Review of recent literature and field research on women, gender, and sexism. Barriers such as everyday discrimination.

SYD 6807: Sociology of Gender
Credits: 3 **Grading Scheme:** Letter
Theoretical and empirical literature about social construction of gender. Overview of key literature.

SYD 6825: Men and Masculinities
Credits: 3 **Grading Scheme:** Letter
How men's life course influences and is affected by the gendered social order. How masculinities are constructed in diverse contexts.

SYD 7808: Reproduction and Gender
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing.
Key reproductive issues in a U.S. context. The gendered nature of the reproductive realm. How cultural and social structures shape individuals' feelings, thinking, and actions in terms of specific reproductive choices.

SYO 6107: American Families
Credits: 3 **Grading Scheme:** Letter
The impact on families of rapid social changes. Racial, class, and ethnic variations. Gender issues and changing family roles. Alternative life styles and the changing nature of families.

SYO 6126: Family Theories
Credits: 3 **Grading Scheme:** Letter
Relationships, families, and households (RFH) from a social science (SS) perspective. Aims to synthesize elements of social theory, social research, and social policy.

SYO 6175: Topics in Family Research
Credits: 3 **Grading Scheme:** Letter
Seminar on major empirical approaches to analyzing family relationships.

SYO 6407: Health Disparities
Credits: 3 **Grading Scheme:** Letter
Health needs of vulnerable populations in the United States of America.

SYO 6427: Health and Aging
Credits: 3 **Grading Scheme:** Letter
Graduate seminar that focuses on the determinants and character of chronic disease epidemiology among adults in the United States.

SYO 6535: Social Inequality
Credits: 3 **Grading Scheme:** Letter
The unequal distribution among individuals and groups of wealth, power, and prestige. The effect of class systems on society. The effect of class membership on individuals. Social mobility.

SYP 6115: Seminar in Symbolic Interaction
Credits: 3 **Grading Scheme:** Letter
A sociological perspective on the self, with special emphasis on the role of language, symbols, and culture in relation to identity, socialization, and social structure.

SYP 6517: Theories of Crime and Deviance
Credits: 3 **Grading Scheme:** Letter
Review and critique of major social and behavioral theories of crime, delinquency, and deviance.

SYP 6545: Sociology of Law
Credits: 3 **Grading Scheme:** Letter
Sociological perspective on law and control in society, development of law, operation of the legal system, the legal profession, social change, power and conflict, and the impact of law and legal sanctions and society.

SYP 6735: Sociology of Aging and the Life Course
Credits: 3 **Grading Scheme:** Letter
Social and personal conditions of post-retirement years. Family and housing patterns, income, leisure, health, group processes, and evaluation of institutional care of the aged.

SYP 6736: Sociology of the Aged
Credits: 3 **Grading Scheme:** Letter
Major sociological issues and concepts related to aging and the aged. Social stratification, family, social norms, social networks, and community. Economic security, health, housing, and retirement.

SYP 6745: Aging and End-of-Life Issues
Credits: 3 **Grading Scheme:** Letter

An exploration of dying well in old age from multiple perspectives, including sociology, psychology, biology, medical sciences, ethics, history, spirituality/religion, and economics.

TAX 5005: Introduction to Federal Income Taxation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: C grade or better in ACG 3482C; and AC standing.
Concepts and applications for all types of taxpayers. Influence of taxation on economic decisions, basic statutory provisions relevant to determining taxable gross income, allowable deductions, tax computations, recognition or nonrecognition of gains and losses on property transactions, and characterization of gains and losses.

TAX 5065: Tax Professional Research
Credits: 2 **Grading Scheme:** Letter
Prerequisite: TAX 5005, 7AC standing.
Use of professional tax literature and technology for problem solving. Case-based to provide experience in dealing with unstructured situations encountered in professional tax practice. Emphasizes problem identification and resolution.

TAX 6015: Taxation of Business Entities I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: TAX 5065, 7AC standing.
First of a 3-course sequence examining taxation of corporations, S corporations, partnerships, and other business entities. Emphasizes tax planning and comparisons of taxation across entity forms, in addition to basic taxation of business entities.

TAX 6016: Taxation of Business Entities II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: TAX 6015, 7AC standing.
Continuation of TAX 6015.

TAX 6017: Taxation of Business Entities III
Credits: 2 **Grading Scheme:** Letter
Prerequisite: TAX 6016, 7AC standing.
Continuation of TAX 6016.

TAX 6526: Advanced International Taxation
Credits: 2 **Grading Scheme:** Letter
Prerequisite: TAX 5065, 7AC standing.
Expansion of introduction to international tax, addressing more complex concepts encountered by U.S. multinationals operating abroad. U.S. taxation of foreign persons with U.S. activities included.

TAX 6726: Executive Tax Planning
Credits: 2 **Grading Scheme:** Letter
Prerequisite: TAX 5065, 7AC standing.
Unique economic and tax planning scenarios faced by highly compensated executives throughout their working lives and as they face retirement and death.

TAX 6877: Multijurisdictional Taxation
Credits: 2 **Grading Scheme:** Letter
Prerequisite: TAX 5065, 7AC standing.
Tax issues involved when business enterprises operate in multiple taxing jurisdictions. Principles of both multi-state and international income taxation (and their overlap).

THE 5238: African-American Theatre History and Practice
Credits: 3 **Grading Scheme:** Letter
Prerequisite: THE 2000 or 2020 or consent of instructor.
Origins and development of theatre by, for, and about Black America from the 18th century to the present.

THE 5287: History of Decor and Architecture for the Stage
Credits: 3 **Grading Scheme:** Letter
Architecture and decor from prehistory to the 19th century as they reflect time and spirit in preparation for play production.

THE 5910: Introduction to Graduate Study in Theatre
Credits: 1 **Grading Scheme:** Letter
Research methods, examination and thesis preparation, and classroom pedagogy for first-year MFA students.

THE 6265: Costume History
Credits: 3 **Grading Scheme:** Letter
Prerequisite: admission to MFA.
Examines the history of fashion and costume, and its relation to the general intellectual, moral, and cultural climate of an era; and how the theatrical designer applies this analysis.

THE 6525: History, Literature, and Criticism I
Credits: 3 **Grading Scheme:** Letter
Readings and discussions of Western and Japanese dramatic literature and criticism from their beginnings to the 18th century.

THE 6526: History, Literature, and Criticism II
Credits: 3 **Grading Scheme:** Letter
Discussions of dramatic literature, performance theory, and stage practice from the 19th century to the modern and postmodern of Western, Indian, Chinese, and African cultures.

THE 6565: Seminar in Creative Process
Credits: 3 **Grading Scheme:** Letter
Specialists in all areas of theatre explore the similarities in their creative thinking and methods.

THE 6905: Individual Study
Credits: 1-9 **Max: 9** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Reading, research, or performance project.

THE 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

THE 6941: Internship
Credits: 1-9 **Max: 9** **Grading Scheme:** S/U
Practical experience in residence with a professional theatre or equivalent.

THE 6950: Applied Theatre
Credits: 1-3 **Max: 9** **Grading Scheme:** Letter
Specialized practical experience achieved through participation in realized productions.

THE 6955: Summer Repertory Theatre
Credits: 3-9 **Max: 9** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Practical experience in repertory theatre, directly applying skills in all areas of theatre production.

THE 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

THE 6973C: Project in Lieu of Thesis
Credits: 1-9 **Max: 9** **Grading Scheme:** S/U
Prerequisite: admission to candidacy.
Creative project in lieu of traditional written thesis.

TPA 5025: Lighting Design I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: admission to MFA or consent of instructor.
Advanced applications. In-depth practice of design concept formulation, use of advanced equipment, and complex scenographic documentation. Introduction to CAD for the lighting designer.

TPA 5047: Costume Design I
Credits: 3 **Grading Scheme:** Letter

Prerequisite: admission to MFA. Development of skills required for costume design.
Emphasizes character and play analysis for the costume designer.

TPA 5067: Scene Design I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TPA 4066; admission to MFA or consent of instructor.
Study and practice of the scenic design process. Developing scenic design techniques for theatre and dance. Emphasizes script analysis for the scenic designer.

TPA 5072: Drawing and Rendering
Credits: 3 **Grading Scheme:** Letter
Prerequisite: admission to MFA.
Application of advanced drawing and painting techniques for theatrical design. Mastering different media through experimentation. Using advanced techniques to enhance visual communication.

TPA 5079: Graduate Scene Painting
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TPA 2075 or admission to MFA.
Advanced techniques in scene painting. Developing textural illusion, and enhancing volume through light and shadow.

TPA 5082: Advanced Theatre Graphics
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TPA 4066; admission to MFA.
Rendering for theatrical design. Traditional techniques, computer aided applications, and model building.

TPA 5236: Costume Technologies Workshop
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Costume crafts work through realized projects. Possible topics: millinery, stage jewelry, masks, prosthetics, wigs, puppetry, footwear, and dyeing.

TPA 6005: Design I
Credits: 2 **Grading Scheme:** Letter
Applying the fundamental techniques of set, light, and costume design to various styles of dramatic literature.

TPA 6006: Design II
Credits: 3 **Grading Scheme:** Letter
Prereq or coreq: TPA 6005. Experience in design under simulated production conditions. Designers working in their major and minor areas of specialization.

TPA 6009: Design Studio
Credits: 3 **Grading Scheme:** Letter
Prerequisite: admission to MFA.
Investigation of design theory, research, concept, and presentation used in production of theatre and dance.

TPA 6026: Lighting Design II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TPA 5025.
In-depth study of processes. Refinement of aesthetic concept, complex productions, state-of-the-art technologies, CAD applications, and lighting for built environment.

TPA 6048: Costume Design II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TPA 5047.
Advanced study. Specialized costume design problems for individual projects.

TPA 6054: Detail Design for Costume Designers
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: TPA 6048 or consent of instructor.

Intensive study and practical application of designing specific motifs and accessories for costumes.

TPA 6069: Scene Design II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TPA 5067 or admission to MFA.
Design work in a variety of genres. Complex multi-set productions.

TPA 6235: Costume Construction
Credits: 3 Max: 9 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Detailed study of patterning and construction techniques used in men's and women's dress. Extensive hands-on work with contemporary and historical garments.

TPA 6237: Pattern Making: Flat Patterning
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Using flat pattern techniques to create garments. Emphasizes period details.

TPA 6243: Pattern Making: Draping
Credits: 3 Max: 6 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Advanced study of draping methods of costume creation. Extensive hands-on work using the sculptural qualities of fabric and clothing.

TPA 6258: Computer Drafting 2D
Credits: 3 **Grading Scheme:** Letter
Prerequisite: admission to MFA.
Study of computer aided drafting for the theatrical designer. Emphasizes techniques for the scenic and lighting designer.

TPA 6357: Programming and Presentation for the Lighting Designer
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TPA 5025, TPA 6026.
Intensive use of high-end software for programming and presenting lighting-design concepts, for the advanced designer.

TPP 5234: Mutli-Cultural Performance Workshop
Credits: 1 **Grading Scheme:** Letter
Character and scene study using original material and a canon of minority and marginalized artists.

TPP 6115: Graduate Acting I: Modern Acting Theory and Practice
Credits: 2-3 **Grading Scheme:** Letter
Diagnostics of analytical and technical skills of acting through exploration of psychological realism through the use of psycho-physical exercises.

TPP 6116: Graduate Acting II: Shakespeare and High Style
Credits: 2-3 **Grading Scheme:** Letter
Analytical, research and technical skills needed to perform plays written in “high verse” with particular focus on the plays of Shakespeare. Students will be directed in the formalist approach to classical performance style. The approach is designed to enhance each student's awareness, development, and capability for heightened performance requirements.

TPP 6145: Graduate Acting III: Period Styles
Credits: 2-3 **Grading Scheme:** Letter
Prerequisite: Admission to the MFA Acting program, TPP 6115 : Graduate Acting I: Modern Acting Theory and Practice , TPP 6116 : Graduate Acting II: Shakespeare and High Style
The stylistic techniques, analysis, and performance of plays from ancient Greek to the early twentieth-century. The course is designed to enhance the imaginative artistry of the student and to develop awareness and capabilities for heightened performance techniques.

TPP 6149: Acting IV: Contemporary Realism
Credits: 2-3 **Grading Scheme:** Letter

Prerequisite: Admission to the MFA Acting program, TPP 6115 : Graduate Acting I: Modern Acting Theory and Practice ,TPP 6116 : Graduate Acting II: Shakespeare and High Style , TPP 6117 Grad Period Styles
Investigating the fundamental principles of acting technique. Over a series of progressive exercises, students continue to discover an effective, dependable, repeatable set of working tools for the actor, derived from the teachings of contemporary acting theorists, to enhance their sense of purposefulness, immediacy and truthfulness in their performance work.

TPP 6225: Professional Seminar: Acting
Credits: 1 **Grading Scheme:** Letter
Performance techniques and methods for film, television, and theatre.

TPP 6237: MFA Company Acting Workshop
Credits: 1-6 Max: 24 **Grading Scheme:** Letter
Stdent actors study, experiment, and produce in a laboratory emphasizing specialized skills and methods; and nonrealistic and period genres.

TPP 6266: Acting for the Camera
Credits: 2-3 **Grading Scheme:** Letter
Prerequisite: Admission to the MFA Acting program Acting I, Acting II, Acting III, Acting IV
Investigating acting technique relative to the specific constraints and demands of the film/television medium. In addition, the class helps to prepare the actor to procure work in the industry through discussions of and explorations focused on the business aspects of being a professional actor.

TPP 6285: Voice and Movement I
Credits: 3 **Grading Scheme:** Letter
Vocal skills, emphasizing versatility, production, power, and strength.

TPP 6286: MFA Voice and Speech II: Shakespeare and High Styles
Credits: 2-3 Max: 3 **Grading Scheme:** Letter
Prerequisite: TPP 6116
Vocal skills unique to the execution of nontraditional and period roles. Continued development of a virtuoso vocal instrument through exploration and experimentation with consonant, structural, and tonal energy. A coherent approach to voice, speech, text, and actor preparation. Emphasis on Verse Drama and Heightened Style.

TPP 6297: The Alexander Technique I
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Admission to the MFA Acting program.
Introducing fundamental principles of the Alexander Technique (AT); a mind-body approach to the use of self as applied to acting.

TPP 6298: The Alexander Technique II
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Admission to the MFA Acting program and TPP 6297 .
Investigating the fundamental principles of the Alexander Technique (AT) introduced in Alexander Technique I. The course includes basic anatomy, developmental movement, breathing and relaxation techniques, and presentations.

TPP 6299: The Alexander Technique III
Credits: 2 **Grading Scheme:** Letter
Prerequisite: Admission to the MFA Acting program, TPP 6297, TPP 6298 .

Providing the opportunity to revisit the Alexander Technique principles in greater depth with an emphasis on applying those AT principles to acting challenges arising in the students' thesis production. This course provides experimental integration of the AT principles with selected acting techniques, and voice and movement techniques with specific consideration to their thesis roles. This graduate level course is designed for 3rd year MFA candidate.

TPP 6385: Directing
Credits: 3 **Grading Scheme:** Letter
Explores the philosophy and psychology of directing and the director. Applied to scene study.

TPP 6515: Graduate Movement Training

Credits: 2-3 **Grading Scheme:** Letter
Prerequisite: Admission to the MFA Acting program, TPP 6115 : Graduate Acting I: Modern Acting Theory and Practice
Helping the actor move freely and explore characterization through movement. This course introduces students to Period Styles and Social Deportment in order to develop awareness and capabilities for heightened performance techn

TPP 6536: Graduate Stage Combat
Credits: 2-3 **Grading Scheme:** Letter
Prerequisite: Admission to the MFA Acting program
Instruction in standard stage combat techniques of Unarmed and Rapier & Dagger. Safety is emphasized in the creation of the illusion of armed and unarmed violence.

TPP 6717: MFA Voice and Speech III: Period Styles
Credits: 2-3 **Grading Scheme:** Letter
Prerequisite:
Admission to the MFA Acting program
Emphasizing specialized voice an speech skills and methods of specific to the style of dramatic literature from ancient Greek to the early twentieth-century.

TPP 6718: MFA Voice and Speech IV: Advanced Vocal Training for the Actor
Credits: 2-3 **Grading Scheme:** Letter
Prerequisite: Admission to the MFA Acting program
Graduate Voice and Speech course emphasizing specialized skills and methods specific to modern and contemporary plays, film and television, and voice-over.

TPP 6946: Performance Practicum
Credits: 3 **Grading Scheme:** Letter
Training in specialized areas of performance.

TSL 5142: ESOL Curriculum, Methods, and Assessment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TSL 3526.
Curriculum, methods, and assessment for second language learners in K-12 classrooms.

TSL 5325: Secondary ESOL Teaching Strategies
Credits: 3 **Grading Scheme:** Letter
Teaching skills to be effective with ESOL students in a mainstream content class.

TSL 6145: Curriculum and Materials Development for ESOL K-12
Credits: 3 **Grading Scheme:** Letter
Developing and adapting standards-based curriculum and materials for L2 oral language and literacy, academic content, and K-12 ESOL instruction.

TSL 6171: TESL I: Materials and Techniques
Credits: 3 **Grading Scheme:** Letter
Theories of TESL teaching methods and materials. Instruction in classroom materials. Observation of ESL classroom procedures.

TSL 6172: TESL II: Materials for Special Purposes
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TSL 6171.
Continuation of TSL 6171. Instruction in designing courses and programs in ESL. Each student will be required to develop a sample ESL course.

TSL 6245: Language Principles for ESOL Teachers
Credits: 3 **Grading Scheme:** Letter
Applied linguistics for teachers. Language-acquisition theories related to learning a second language in school. Connections between language and literacy development and effective instruction for English language learners.

TSL 6373: Methods of Teaching ESOL K-12
Credits: 3 **Grading Scheme:** Letter

Effective oral language and literacy instruction for K-12 English language learners.

TSL 6440: Testing and Evaluation of ESOL
Credits: 3 **Grading Scheme:** Letter
Introduction to assessment issues and experience in developing assessment techniques for learners of English as a second language.

TSL 6700: Issues in ESOL for School Counselors and Psychologists
Credits: 3 **Grading Scheme:** Letter
Gives school counselors and psychologists an overview of key concepts and issues related to ESOL students in K-12 schools.

TTE 5006: Advanced Urban Transportation Planning
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing and consent of instructor.
Analytical techniques for estimating future travel demands; and for for planning transportation facilities and locations. Review of transportation technology and future systems.

TTE 5256: Traffic Engineering
Credits: 3 **Grading Scheme:** Letter
Traffic characteristics, studies and analyses, street operations, level of service analysis, congestion and access management, signs and markings, pedestrians, bicycles, parking, roadway lighting.

TTE 5305: Advanced Transportation Systems Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TTE 4004.
Systems analysis in transportation planning and engineering, including supply, demand, equilibrium, evaluation, and decision analysis.

TTE 5805: Geometric Design of Transportation Facilities
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TTE 4004 or consent of instructor.
Geometric design criteria and controls of highways and intersections.

TTE 5835: Pavement Design
Credits: 2 **Grading Scheme:** Letter
Prerequisite: TTE 4811 or consent of instructor.
Design of flexible and concrete pavements.

TTE 5837: Pavement Management Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TTE 5835.
Evaluation, analysis, design, performance prediction, planning, and maintenance of pavements.

TTE 6205: Freeway Operations and Simulation
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Uninterrupted traffic flow theory. Highway capacity analysis. Microscopic simulation. Freeway management and control methods.

TTE 6207: Advanced Highway Capacity Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TTE 4004 or equivalent.
Procedures defined within the current Highway Capacity Manual (HCM), including analytical chapters for uninterrupted and interrupted flow.

TTE 6259: Urban Streets Simulation and Control
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TTE 4201/TTE 5256.

Principles of simulation modeling and applications. Simulating urban street operations using commercially available packages; traffic signal control and optimization for urban streets; signal control hardware.

TTE 6267: Traffic Flow Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TTE 4201/TTE 5256.
Vehicle-roadway-infrastructure interactions, equations of motion, and car-following; microscopic and macroscopic traffic characteristics and traffic stream models; simulation, queueing theory, and shockwave analysis.

TTE 6306: Computational Methods in Transportation Engineering
Credits: 3 **Grading Scheme:** Letter
Corequisite: TTE 5256.
Applying numeric methods to traffic engineering/analysis. Key issues in implementing a computational methodology into a software format. Fundamentals of developing simulation software.

TTE 6315: Highway Safety Analysis
Credits: 3 **Grading Scheme:** Letter
Statistics and characteristics of accidents, accident reconstruction, accident causation and reduction.

TTE 6505: Discrete Choice Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Theory and models of individual choice behavior, unordered and ordered multinomial choice models, empirical specifications, maximum likelihood estimation, state-of-the-art methods, travel modeling applications.

TTE 6606: Urban Transportation Models
Credits: 3 **Grading Scheme:** Letter
Prerequisite: TTE 5305 or consent of instructor.
Mathematical models for decision making in planning and operations of urban highway and transit systems.

URP 6042: Urban Economy
Credits: 3 **Grading Scheme:** Letter
Principles of urban systems, including analytical techniques such as economic base analysis.

URP 6061: Planning Administration and Ethics
Credits: 3 **Grading Scheme:** Letter
Administration and management of public and private planning offices; ethics of planning profession.

URP 6100: Planning Theory and History
Credits: 3 **Grading Scheme:** Letter
History of planning and the associated development of theory. Synoptic versus disjointed incrementalism and the political setting for comprehensive planning are emphasized.

URP 6122: Alternative Conflict Management
Credits: 3 **Grading Scheme:** Letter
Prerequisite: graduate standing in college or consent of instructor.
General introduction to field. Case studies, simulations, readings, and external experiences.

URP 6131: Growth Management Powers I
Credits: 3 **Grading Scheme:** Letter
Introduction to regulatory and nonregulatory techniques of plan implementation. Relationship of law and politics to the planning process. Police power as the basis for regulation. Mandatory planning and status of adopted comprehensive plans.

URP 6132: Growth Management Seminar
Credits: 3 **Grading Scheme:** Letter
Prerequisite: URP 6131.
Introducing students with an interest in land use planning to the evolution of growth management planning law in Florida.

URP 6203: Planning Research Design
Credits: 1-3 **Max: 3** **Grading Scheme:** Letter

Emphasizes research design, and literature research; student presentations at appropriate stages in thesis work.

URP 6231: Quantitative Data Analysis for Planners
Credits: 3 **Grading Scheme:** Letter
Planning problem formulation, quantitative research skills, and data gathering techniques. Statistical analysis and emphasis on computer applications.

URP 6270: Survey of Planning Information Systems
Credits: 3 **Grading Scheme:** Letter
Introduction to concepts and theory associated with desktop GIS as related to urban (real estate) and regional (environmental) planning.

URP 6271: Planning Information Systems
Credits: 3 **Grading Scheme:** Letter
Advanced work in planning and analysis customizing the use of large databases. Emphasizes development monitoring systems and information systems in planning.

URP 6272: Advanced Planning Information Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: URP 6231 , URP 6270 , or Instructor Permission.
Theoretical and practical knowledge about the structure, use, and architecture of georeference database systems. Spatial relationships between network and area-related systems. Developing and maintaining geographic information systems as related to urban and regional planning.

URP 6274: GPS for Planners: Introduction to Global Positioning System
Credits: 1 **Grading Scheme:** Letter
Basics of digital field collection using GPS. GPS applications, components, concepts, mission planning, data collection in field, navigation, real-time and postprocessing correction using base station data, and exporting GPS to GIS.

URP 6275: Spatial Database Design and Development
Credits: 3 **Grading Scheme:** Letter
Advanced GIS data concepts and practices. Techniques for data creation, quality assurance and quality control, conversion, storage, manipulation, and presentation.

URP 6276: Internet Geographic Information Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: URP 6270
Examines the theoretic and technological background in the emerging technologies in web-based geographic information systems (GIS).

URP 6277: Land Use Visioning and Analysis
Credits: 3 **Grading Scheme:** Letter
Prerequisite: URP 6270 or consent of instructor.
Fundamental data analysis techniques and GIS skills necessary for land use analysis and visioning.

URP 6312: Land Development Planning and Evaluation
Credits: 3 **Grading Scheme:** Letter
Standards, criteria, policies, design techniques, and research systems used in designating proposed general distribution; location and extent of the uses of land and of population densities for all public and private land use categories as established by law, regulation, and social and economic justification at all levels of government in the U.S. and abroad.

URP 6341: Urban Planning Project
Credits: 1-12 **Max: 12** **Grading Scheme:** Letter, H
Projects encompass city wide comprehensive planning examining the interaction of urban and social systems cast in scenarios of future growth and development.

URP 6421: Environmental Impact Statements
Credits: 3 **Grading Scheme:** Letter

Management and decision-making aspects of impact statements under the U.S. Environmental Protection Act, Florida's Land and Water Management Act of 1972, and as a component of a comprehensive planning process.

URP 6424: Sustainable Urbanism in the Americas
Credits: 3 **Grading Scheme:** Letter
Prerequisite: URP 6100 pr permission of the instructor.
An examination of sustainable patterns of growth in several urban environments in the Americas, within the context of specific cities and metropolitan regions. Urban management practices, particularly those related to urban lifestyles and consumption patterns are covered.

URP 6428: Advanced Environmental Planning
Credits: 3 **Grading Scheme:** Letter
Prerequisite:
URP 6421 or URP 6429 or consent of instructor.
The course will examine cutting edge environmental planning theory and practice that aims to collectively manage linked social and ecological systems that are important, complex, and adaptive.

URP 6429: Natural Resources Planning and Management
Credits: 3 **Grading Scheme:** Letter
Natural resources planning, management principles, practices of natural resources, ecosystem, restoration planning, and management at local and regional levels

URP 6526: Health and the Built Environment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
Using connections between urban planning and public health using an environmental health framework on a global, regional, and local scale. Historical connections and emerging issues, such as obesity and physical activity, sustainability, and environmental justice, climate change, social equality, children's health, and the role of land use, environmental and other planning decisions.

URP 6541: Economic Development Planning
Credits: 3 **Grading Scheme:** Letter
Major international and national economic development theory, issues and trends as they affect local economic development planning, methods, and practice.

URP 6542: Urban Land Economics
Credits: 3 **Grading Scheme:** Letter
Review of land economics within the context of urban and regional planning.

URP 6543: Seminar in Capital Improvement Finance
Credits: 1 **Grading Scheme:** Letter
Methods and means of local government finance of capital improvements.

URP 6547: Local Public Finance for Urban Planners
Credits: 3 **Grading Scheme:** Letter
Prerequisite: URP 6042 or consent of instructor.
Role of local governments in the economy with special emphasis in the provision of urban goods and services, the funding sources for urban governments and the decision-making processes about expenditures and revenues.

URP 6601: State Planning
Credits: 3 **Grading Scheme:** Letter
History, development, and administration of state planning in the 20th century with emphasis on recent growth management initiatives.

URP 6603: Development Review
Credits: 3 **Grading Scheme:** Letter
Seminar on practice of local government planning with emphasis on development review and land development regulation.

URP 6610: International Development Planning

Credits: 3 **Grading Scheme:** Letter
Critical examination of institutions that play a role in development issues in poorer nations within the context of international development strategies, exposing students to dominant strategies and emerging perspectives on international development.

URP 6711: Transportation and Land Use Coordination
Credits: 3 **Grading Scheme:** Letter
Prerequisite: URP 6716; URP 6131 *Corequisite:* URP 6716
Explores the connection between land use and transportation by considering how four major sets of actors shape the urban environment: individuals, businesses, the professions and governments.

URP 6716: Transportation Policy and Planning
Credits: 3 **Grading Scheme:** Letter
Introduction to transportation policy planning in urban context. Transportation policy instruments and policy-making processes, critical issues in transportation policy, history of policy in U.S. at federal, state, and local levels.

URP 6718: Bikeways Planning and Design
Credits: 3 **Grading Scheme:** Letter
Planning and designing bicycle paths, greenways, and facilities that form a network for nonmotorized transportation. Oriented toward a systems approach.

URP 6743: Affordable Housing Law
Credits: 3 **Grading Scheme:** Letter
Broad understanding of the affordable housing crisis and the federal, state, and local regulatory schemes employed to correct this deficiency, as well as the legal battles which have served as the basis for such regulations or the challenge thereof. Enhancement of legal drafting skills through the preparation of research memoranda and comprehensive plan language.

URP 6745: Housing, Public Policy, and Planning
Credits: 3 **Grading Scheme:** Letter
Supply, demand, and market relationships. History of government housing policy. Exploration of relationship between housing policy and urban and regional planning.

URP 6746: Topical Debates in Housing
Credits: 3 **Grading Scheme:** Letter
Current housing problems, theories and approaches. Housing needs, available tools, formulation of recommendations, and examination of effects of implementation. Inclusionary zoning, gentrification, and smart growth.

URP 6821: Transportation and Land-Use Modeling
Credits: 3 **Grading Scheme:** Letter
The planning process, modeling and applications for passenger transportation and land-use development of metropolitan areas with respect paid to its contribution to transportation project and policy analysis.

URP 6855: Urban Form in Cities throughout the Americas
Credits: 3 **Grading Scheme:** Letter
Urban form and development theories and how planning interfaces with developmental trends in North, Central, and South America.

URP 6871: Planning and Design I
Credits: 3 **Grading Scheme:** Letter
Lectures, readings, and exercises in planning research and design methods. Emphasis on design graphics and other means of communication.

URP 6872: Planning and Design II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: URP 6101.
Focus on alternative roles and potential contributions from both private and public sector participants, case studies and exercises in formulation of urban design plans for private and public sectors.

URP 6880: Defensible Space and CPTED in Urban Design

Credits: 3 **Grading Scheme:** Letter
Introduction to crime prevention through environmental design (CPTED) and defensible space in urban planning design.

URP 6884: Community Conservation and Revitalization
Credits: 3 **Grading Scheme:** Letter
Community conservation is a major thrust of National Urban Policy. Relates community revitalization and conservation to the methodology of identification of problem areas, planning and replanning for all types of locations, use and adaptive uses. Federal and state assistance, tax incentives, and other programs.

URP 6887: Advanced Defensible Space in Urban Design
Credits: 3 **Grading Scheme:** Letter
Prerequisite: URP 6880/4884
Advanced analysis of Defensible Space, CPTED, and other place-based crime prevention planning theories and practices in distressed communities.

URP 6905: Exploration and Directed Study
Credits: 1-4 **Max: 10** **Grading Scheme:** Letter

URP 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

URP 6920: Colloquium
Credits: 1 **Grading Scheme:** S/U
Introduction to the field; historical and philosophical concepts, processes, and issues related to the profession of planning. For entering MAURP students.

URP 6931: Topical Seminar
Credits: 1-4 **Max: 6** **Grading Scheme:** Letter
Current planning opportunity examined.

URP 6933: Planning Information Seminar
Credits: 1-2 **Max: 2** **Grading Scheme:** Letter
Current GIS topics. Discussions of emerging technologies, creative applications of GIS for particular projects, primers on operating systems, remote sensing, and spatial analysis.

URP 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

URP 6941: Urban Planning Internship
Credits: 1-3 **Max: 3** **Grading Scheme:** S/U
Off-campus internship experience.

URP 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

URP 6979: Terminal Project
Credits: 1-6 **Max: 6** **Grading Scheme:** S/U
This option, in lieu of thesis, accommodates a physical design or plan project which because of its map and graphic content does not fit comfortably within a thesis format.

VIC 5315: Corporate and Brand Identity on the Web
Credits: 3 **Grading Scheme:** Letter
Synthesizing two different but complementary tools of communication: graphic design and assembly (both print and electronic). You will learn fundamental design principles and techniques for effective visual communication.

VIC 5325: Digital Imagery in Web Design
Credits: 4 **Grading Scheme:** Letter
Constructing, deconstructing and further analyzing the impact of visual messages in interactive media. Gaining an understanding of how audiences form meanings, the importance of signs and symbols and how to manipulate images to reflect a point of view.

VIC 5326: Digital Media Layout and Design
Credits: 3 **Grading Scheme:** Letter
Introduction to the skills and concepts that will help create documents for both print and interactivity. The course teaches both the theory and application of design principles. Using Adobe InDesign, students will apply their understanding of these principles to create a portfolio project. While InDesign permits several possible workflows, this course will focus on those that most readily translate into digital design.

VIC 6316: Brand Management
Credits: 3 **Grading Scheme:** Letter
Developing an understanding of the importance of brand equity, how to build, measure, and manage brand equity. It will cover topics in the utilities of branding, steps/process of building brands, methods of measuring brand equity, strategies in managing brand portfolios, and management of brands over time, geographic boundaries, market segments.

VME 5162C: Avian Diseases
Credits: 3 **Grading Scheme:** Letter
Causes, epizootiology, diagnosis, and methods of prevention and control of avian diseases. Not open to students who have taken VME 4162.

VME 5244: Physiology: Organ Systems
Credits: 4 **Grading Scheme:** Letter
Prerequisite: knowledge of general biochemistry.
Emphasizes domestic animals commonly encountered in veterinary medicine. Physiology of nervous, muscle, blood, cardiovascular, respiratory, renal, gastrointestinal, and endocrine systems.

VME 6008: Care of Aquatic Megavertebrates
Credits: 3 **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Care of Florida megavertebrates including dolphins, other cetaceans, manatees, and sea turtles using lectures, tours, and hands-on experience.

VME 6010: Aquatic Animal Conservation Issues
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
An online introduction to some controversial conservation issues, surrounding aquatic species, ranging from invertebrates to marine mammals, culminating in a 5-page grant proposal and review.

VME 6011: Introduction to Aquatic Wildlife Health Issues
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
An online introduction to the natural history, anatomy, physiology, behavior, and health issues of aquatic wildlife: marine mammals, sea turtles, crocodilians, and some fish and invertebrates, culminating in a five- page grant proposal and review.

VME 6051: Cruelty to Animals and Interpersonal Violence
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
The relationship between cruelty to animals and interpersonal violence has been substantiated by as significant body of work in the social sciences. Participants in this course will gain a fundamental knowledge of this connection, examine both qualitative and quantitative studies and case histories of the correlation between cruelty to animals, child abuse, domestic violence, elder abuse, and teen violence. Participants will learn how to recognize the connection between cruelty to animals and human violence and will review a variety of intervention programs for victims and at-risk or offending populations.

VME 6052: Animal Crime Scene Processing
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None.
This course provides the student with formal academic training in basic crime scene processing techniques specialized for the analysis of crime scenes involving injured or deceased animals, or scenes involving acts of animal cruelty. A focus will be on the recognition, documentation, and preservation of various types of physical evidence involving animal abuse, cruelty, neglect and death.

VME 6054: Scientific and Legal Principles of Forensic Evidence
Credits: 3 **Grading Scheme:** Letter
Prerequisite: None
This course will focus on crime scene integrity, crime scene searches, chain of custody issues, courtroom presentation of physical evidence, and expert witness testimony. Emphasis will also be placed on the management of scene personnel, the media, victims, and suspects.

VME 6076C: Andrology
Credits: 2 **Grading Scheme:** Letter
Applied male reproductive physiology, anatomy, and assisted reproduction. Later, student presentations of a chosen in-depth area.

VME 6135: Diseases of Laboratory Animals I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: DVM degree and/or consent of instructor.
Etiology, pathogenesis, clinical signs, gross and microscopic pathology, diagnosis, and control of diseases in laboratory rats, mice, and other rodents. Emphasizes infectious diseases and understanding and preventing complications from disease in modern biomedical research.

VME 6136: Diseases of Laboratory Animals II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: DVM degree and/or consent of instructor.
Etiology, pathogenesis, gross and microscopic pathology, diagnosis, and control of diseases of laboratory primates, rabbits, ferrets, and miscellaneous species. Emphasizes infectious diseases and understanding and preventing complications from disease in modern biomedical research.

VME 6186: Advanced Topics in Disease Pathogenesis
Credits: 2-4 **Max: 10** **Grading Scheme:** Letter
Prerequisite: advanced course in immunology, molecular pathogenesis, or pathology.
Current research on pathogenetic mechanisms of diseases. Molecular and cellular mechanisms of cell injury and death, repair, inflammation, neoplasia, hemodynamic disorders, and other diseases.

VME 6421: Biology and Molecular Biology of Avian Viruses
Credits: 2 **Max: 4** **Grading Scheme:** Letter
Prerequisite: general virology and immunology.
Current scientific papers on biology of avian viruses of economic importance and on molecular approaches to understanding gene expression and function for diagnosis and immunization.

VME 6430C: Contemporary Issues in Small Animal Surgery
Credits: 3 **Max: 6** **Grading Scheme:** S/U
Prerequisite: DVM (or equivalent degree); master's students or Small Animal Surgical Residents pursuing a master's degree.
Current or significant scientific papers from the veterinary and human literature, formal presentations will be given on topics relevant to contemporary small animal surgery, including comparative/translational aspects. Emphasizes morbidity and mortality discussions on recent clinical soft-tissue and orthopedic case material.

VME 6464: Molecular Pathogenesis
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: biochemistry, immunology, or consent of instructor.
Papers on mechanisms of pathogenesis and molecular approaches toward diagnosis and control of either parasitic or viral and bacterial diseases. Focus varies each semester.

VME 6505: Autoimmunity
Credits: 1 **Max: 3** **Grading Scheme:** Letter
Prerequisite: GMS 6006 or consent of instructor.
Biological and biochemical aspects of immunology, focusing on molecular and cellular events involved in genetic susceptibility, pathogenesis, and treatment of human autoimmune diseases.

VME 6575: Veterinary Forensic Pathology
Credits: 3 **Grading Scheme:** Letter

Prerequisite: None.
Introducing students to the application of veterinary medicine to the forensic sciences. Course topics will focus on the interpretations of injury patterns, cause, manner and mechanism of death. Upon completion of this course, the student will have a basic knowledge of the pathological documentation required for scenes involving animals, including recognition of abuse, crime scene investigation, and interacting with the legal community.

VME 6602: General Toxicology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: background in biochemistry, physiology, and pharmacology.
General principles of toxicology. Mechanisms for occurrence of toxic effects in target organs and tissues.

VME 6603: Advanced Toxicology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: VME 6602.
Survey of the health effects of each major class of toxicants.

VME 6604: Literature Survey in Toxicology
Credits: 1-2 Max: 2 **Grading Scheme:** Letter
Critical presentation and evaluation of current literature in selected topics in toxicology.

VME 6605: Toxic Substances
Credits: 3 **Grading Scheme:** Letter
Prerequisite: general toxicology.
In-depth information on signs, symptoms, underlying mechanisms, diagnosis, and management of poisoning by drugs and chemicals.

VME 6606: Ecological Risk Assessment
Credits: 3 **Grading Scheme:** Letter
Prerequisite: VME 6602.
In-depth information on signs, symptoms, underlying mechanisms, diagnosis, and management of poisoning by drugs and chemicals.

VME 6607: Human Health Risk Assessment
Credits: 4 **Grading Scheme:** Letter
Conceptual approaches and computational techniques for quantitative health risk assessment.

VME 6613: Forensic Toxicology I
Credits: 3 **Grading Scheme:** Letter
Prerequisite: organic chemistry recommended.
Analytical techniques used to examine forensic drug and forensic toxicology specimens.

VME 6614: Forensic Toxicology II
Credits: 3 **Grading Scheme:** Letter
Prerequisite: VME 6613.
Toxicology of compounds commonly encountered in forensic specimens.

VME 6650: Principles of Mammalian Pharmacology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: graduate-level physiology course.
Principles of drug action. Emphasizes mechanisms of action and side effects for major drug classes used in humans and other mammals.

VME 6766: Laboratory Quality Assurance/Quality Control
Credits: 3 **Grading Scheme:** Letter
Procedures for ensuring quality practices in the analytical laboratory.

VME 6767: Issues in the Responsible Conduct of Research
Credits: 1 **Grading Scheme:** S/U
Presentation and discussion of issues; guiding principles and potential pitfalls.

VME 6771: Veterinary Epidemiologic Research
Credits: 3 **Grading Scheme:** Letter
Design, analysis, and interpretation of epidemiologic studies.

VME 6810: Integrating Veterinary Medicine with Shelter Systems
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Students should be currently enrolled in a professional veterinary medicine program leading to a DVM degree or should already hold a DVM or VMD degree.
Understanding and appreciation of the critical role played by veterinarians in protecting the health and welfare of sheltered dogs and cats.

VME 6811: Shelter Animal Physical Health
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Students should be currently enrolled in a professional veterinary medicine program leading to a DVM or VMD degree; or should already hold a DVM or VMD degree. Equivalent degree programs from international veterinary medical schools are acceptable.
Construction, critique, and implementation of policies and protocols to protect and enhance the physical health and well-being of sheltered dogs and cat, including recognizing and responding to threats to physical health.

VME 6812: Shelter Animal Behavior and Welfare
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Students should be currently enrolled in a professional veterinary medicine program leading to a DVM or VMD degree; or should already hold a DVM or VMD degree. Equivalent degree programs from international veterinary medical schools are acceptable.
Concepts related to shelter behavior programs; evaluation of quality of shelter behavior programs; and implementation of changes to promote shelter animal behavior and welfare.

VME 6905: Problems in Veterinary Medical Sciences
Credits: 1-4 **Max: 12** **Grading Scheme:** Letter, H

VME 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

VME 6931: Seminar in Veterinary Medical Sciences
Credits: 1 **Max: 8** **Grading Scheme:** S/U

VME 6932: Seminar in Physiological Sciences
Credits: 1 **Max: 8** **Grading Scheme:** S/U
Weekly seminar series on topics in comparative physiological sciences, including nervous, cardiovascular, gastrointestinal, urogenital, and musculoskeletal systems.

VME 6933: Seminar in Infectious Diseases and Experimental Pathology
Credits: 1 **Max: 8** **Grading Scheme:** S/U
Weekly seminar series on topics in infectious diseases of animals presented by students, faculty, and visiting speakers.

VME 6934: Topics in Veterinary Medical Sciences
Credits: 1-4 **Max: 10** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Studies in topics involving new developments and/or research techniques in veterinary medical sciences.

VME 6936: Seminar in Pathophysiology
Credits: 1 **Max: 8** **Grading Scheme:** S/U
Prerequisite: physiology, biochemistry.
Weekly seminar series in mammalian pathophysiology.

VME 6938: Topics in Aquatic Animal Health
Credits: 1 **Max: 4** **Grading Scheme:** Letter
Presentation/discussion by students of selected articles relating to aquatic animal health, including both vertebrates and invertebrates.

VME 6940: Supervised Teaching
Credits: 1-5 Max: 5 Grading Scheme: S/U

VME 6971: Research for Master's Thesis
Credits: 1-15 Grading Scheme: S/U

VME 7979: Advanced Research
Credits: 1-12 Grading Scheme: S/U
Research for doctoral students in veterinary medical sciences before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

VME 7980: Research for Doctoral Dissertation
Credits: 1-15 Grading Scheme: S/U

WIS 5323C: Impact of Diseases on Wildlife Population
Credits: 3 Grading Scheme: Letter
Prerequisite: WIS 3401 or equivalent.
Diseases of wildlife, with emphasis on their impact on avian and mammalian populations of North America.

WIS 5496: Research Design in Wildlife Ecology
Credits: 3 Grading Scheme: Letter
Prerequisite: STA 3023 or equivalent; upper-division course in ecology.
Scientific philosophy and logic of modern ecological approaches, and practical research design as applied to wildlife field ecology. Offered fall term.

WIS 5521: Plant-Animal Interactions
Credits: 3 Grading Scheme: Letter
Prerequisite: PCB 4674 and one of the following courses: PCB 4044C or WIS 3401 or PCB 3601C.
Major types of plant-animal interactions and the conceptual and empirical approaches used to study them. Offered even-numbered years.

WIS 5555C: Conservation Biology
Credits: 3 Grading Scheme: Letter
Prerequisite: basic courses in ecology, genetics.
Application of biological and resource management theory to the problem of the conservation of natural communities. Offered fall term.

WIS 6444: Advanced Wetlands Ecology
Credits: 4 Grading Scheme: Letter
Prerequisite: WIS 4443, SOS 4242, EES 6308C, or consent of instructor.
Examination of geology, hydrology, chemistry, flora, fauna, and ecology of major wetland systems in North America.

WIS 6455: Wildlife Population Ecology
Credits: 3 Grading Scheme: Letter
Rigorous background in population analysis covering population growth and regulation, species interactions, life-history theory, and population viability analysis.

WIS 6466: Wildlife Population Modeling
Credits: 3 Grading Scheme: Letter
Prerequisite: one course in calculus or liner algebra; one course in basic or popular ecology.
Theory and applications of life tables, age, and stage-structured matrix population models. Sensitivity analysis and analysis of life table response experiments. Unstructured population models.

WIS 6468C: Pattern and Process in Landscape Ecology
Credits: 3 Grading Scheme: Letter
Exploration of applied and quantitative methods to explore links between landscape patterns and processes.

WIS 6525: Environmental Interpretation
Credits: 3 Grading Scheme: Letter

Theory and practice of environmental interpretation for natural resource management. Design, implementation, and evaluation of programming about environment for variety of audiences and settings.

WIS 6543: Wildlife and Agriculture
Credits: 3 **Grading Scheme:** Letter
Prerequisite: WIS 3401 Wildlife Ecology and Management or equivalent.
Wildlife ecology and management in agricultural lands. Effects of agriculture on wildlife. Policies affecting wildlife in agricultural systems. Methods of integrating wildlife and agriculture. Offered spring term in odd-numbered years.

WIS 6544: Administration in Natural Resources
Credits: 3 **Grading Scheme:** Letter
Natural resource agency administration primer in budgets, personnel management, program development, leadership, and strategic planning.

WIS 6575: Mammalian Carnivores: Conservation and Management Issues
Credits: 2 **Grading Scheme:** Letter
Prerequisite: PCB 3034C or 4044C.
Strategies and paradigms for management and conservation of mammalian carnivore populations. Social systems, life history variables, conflicts with human, reintroduction and translocation. Offered spring term of odd-numbered years.

WIS 6578: Human Dimensions of Biological Conservation
Credits: 3 **Grading Scheme:** Letter
Interdisciplinary overview of theory and practice of conservation education, communication, and integrated resource management using local and international models.

WIS 6905: Research Problems in Wildlife and Range Sciences
Credits: 1-6 **Max: 10** **Grading Scheme:** Letter
Prerequisite: consent of instructor.

WIS 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U
Prerequisite: consent of instructor.

WIS 6933: Seminar
Credits: 1 **Grading Scheme:** S/U

WIS 6934: Topics in Wildlife and Range Sciences
Credits: 1-4 **Max: 10** **Grading Scheme:** Letter
Prerequisite: WIS 6452 , WIS 5555C, or consent of instructor.
Advanced concepts and practices in wildlife management and conservation. Topics vary.

WIS 6940: Supervised Teaching
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U
Prerequisite: consent of instructor.

WIS 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

WIS 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

WIS 7980: Research for Doctoral Dissertation
Credits: 1-15 **Grading Scheme:** S/U

WST 5933: Proseminar in Women's Studies
Credits: 3 **Max: 6** **Grading Scheme:** Letter

Proseminar (seminar that prepares you for more advanced work) introducing graduate students to Women's Studies scholarship. Overview of feminist thought, interdisciplinary research, and feminist practice. Students are introduced to scholars in the field, and learn how to design and implement an independent research project appropriate to Women's Studies.

WST 6348: Ecofeminism
Credits: 3 **Grading Scheme:** Letter
Holistic framework for understanding connections among environmental, feminist, and social justice issues. Critical analysis of positions within ecofeminist theory.

WST 6508: Advanced Feminist Theory
Credits: 3 **Grading Scheme:** Letter
Prerequisite: Graduate-level course in feminist theory or equivalent.
Introduction to contemporary theoretical ideas in feminist thought. Often taught with a common theme, in and across disciplines.

WST 6905: Independent Study
Credits: 1-3 **Max: 6** **Grading Scheme:** Letter
Prerequisite: consent of instructor and department chair; and 1 women's studies course, or course that counts for women's studies.
Independent reading or research under guidance.

WST 6935: Special Topics in Women's Studies
Credits: 3 **Max: 9** **Grading Scheme:** Letter
Selected topics in gender and women's studies, emphasizing new knowledge production and contributions in feminist scholarship. Examines a specific topic, a major figure, or a current problem in more depth than is regularly possible in a more general course.

WST 6936: Feminist Challenges to Disciplinary Paradigms
Credits: 3 **Max: 6** **Grading Scheme:** Letter
Examines how feminist scholarship can transform traditional disciplines and bodies of knowledge. Acquaints students with the major feminist challenges to ways of thinking in one or more fields of study. Such ways of thinking can include theory, methodology, disciplinary assumptions, and/or applications.

WST 6946: Internship in Applied Women's Studies and Gender Research
Credits: 1-3 **Max: 6** **Grading Scheme:** S/U
Prerequisite: permission of program director.
Practical experience in community. Internship with local agency, group, or business in women's issues.

WST 6957: International Studies in Women's Studies and Gender Research
Credits: 1-6 **Max: 12** **Grading Scheme:** S/U
Prerequisite: admission to approved study abroad program and permission of department.

WST 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

ZOO 5115C: Vertebrate Paleontology
Credits: 3 **Grading Scheme:** Letter
Prerequisite: ZOO 3713C.
Evolutionary history of major vertebrate groups, emphasizing the principles of prehistoric investigations.

ZOO 5486C: Mammalogy
Credits: 4 **Grading Scheme:** Letter
Prerequisite: ZOO 2203C.
Study of the ecology, natural history, behavior, and evolutionary history of mammals.

ZOO 5939: Seminar in Morphology
Credits: 2 **Max: 9** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Advanced topics in the description, analysis, and evolution of animal form.

ZOO 6005: Integrative Principles of Zoology I
Credits: 4 **Grading Scheme:** Letter
Integrative approach to fundamental principles of ecology, evolution, and comparative biology.

ZOO 6308: Dynamic Optimization Modeling in Behavioral and Evolutionary Ecology
Credits: 3 **Grading Scheme:** Letter
Powerful and simple techniques for formalizing hypotheses. Appropriate to address questions of relative fitness of alternative choices or strategies. Instruction in computer programming and dynamic modeling.

ZOO 6406: Biology of Sea Turtles
Credits: 3 **Grading Scheme:** Letter
All aspects of biology of sea turtles and how their biology affects their conservation.

ZOO 6456C: Ichthyology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: ZOO 2203C.

ZOO 6515C: Ethology
Credits: 4 **Grading Scheme:** Letter
Prerequisite: graduate standing or consent of instructor.
The evolution, mechanisms, and classification of animal behavior, emphasizing how to design and conduct behavioral research.

ZOO 6542: Nutritional Ecology
Credits: 3 **Grading Scheme:** Letter
Interactions of nutrition and ecology, emphasizing how digestive processes regulate animal productivity and plant/animal interactions.

ZOO 6905: Individual Studies
Credits: 1-8 **Max: 12** **Grading Scheme:** Letter

ZOO 6910: Supervised Research
Credits: 1-5 **Max: 5** **Grading Scheme:** S/U

ZOO 6920: Zoology Colloquium
Credits: 1 **Max: 9** **Grading Scheme:** S/U
Readings and oral presentations on general topics in zoology. Discussions with eminent scientists in the discipline.

ZOO 6927: Special Topics in Zoology
Credits: 1-4 **Max: 15** **Grading Scheme:** Letter

ZOO 6931: Seminar in Marine Turtle Biology
Credits: 1-2 **Max: 5** **Grading Scheme:** Letter
Prerequisite: consent of instructor.
Advanced topics in biology and conservation of marine turtles.

ZOO 6939: Seminar in Animal Behavior
Credits: 1-3 **Max: 9** **Grading Scheme:** Letter
Prerequisite: graduate standing or consent of instructor.
Advanced topics in animal behavior.

ZOO 6971: Research for Master's Thesis
Credits: 1-15 **Grading Scheme:** S/U

ZOO 7979: Advanced Research
Credits: 1-12 **Grading Scheme:** S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been admitted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ZOO 7980: Research for Doctoral Dissertation

Credits: 1-15 **Grading Scheme:** S/U