2017-2018 Undergraduate Courses of Instruction

This list includes for each course the subject abbreviation, catalog number, title, credit hours, class or laboratory hours per week, description, requirements and prerequisites.

4000/6000-Level Courses

If a 4000-level course has a 6000-level counterpart, this is noted in the course description of the 4000-level course.

Cross-Referenced Courses

A cross-referenced course is one that can be taken for credit under different departmental subjects. For example, students can take Herpetology as either BIOL 4680 or WFB 4680. The student should select the desired departmental subject abbreviation in conference with an advisor. The departmental subject abbreviation may be changed only during the period allowed by the University calendar for adding a course.

Accounting

ACCT 2010 – Financial Accounting Concepts
3 Credits (3 Contact Hours)
Introduction to accounting principles with emphasis on the use of financial data and analysis of financial statements. Includes Honors sections.

ACCT 2020 - Managerial Accounting Concepts
3 Credits (3 Contact Hours)
Introduction to managerial accounting with emphasis on using accounting information to make decisions. Includes Honors sections.

ACCT 2900 - Special Topics
1-3 Credits (1-3 Contact Hours)
Examination of timely topics important to student success in the accounting and/or business fields. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Sophomore standing and consent of instructor.

ACCT 3030 - Cost Accounting
3 Credits (3 Contact Hours)
Application of cost analysis to manufacturing and distributing problems; analysis of behavior characteristics of business costs and a study of principles involved in standard cost systems; lectures and problems. Includes Honors sections. Preq: ACCT 2010 with a C or better.

ACCT 3110 - Intermediate Financial Accounting I
3 Credits (3 Contact Hours)
In-depth treatment of traditional financial accounting topics of standards setting, financial statement form and content, and accounting and reporting of current assets. Emphasizes basic theory, valuation, and measurement, as well as presentation and analysis of accounting information. Includes Honors sections. Preq: ACCT 2010 with a C or better.

ACCT 3120 - Intermediate Financial Accounting II
3 Credits (3 Contact Hours)
Continuation of ACCT 3110. In-depth treatment of accounting and reporting for noncurrent assets, current and noncurrent liabilities, and equity. Emphasizes basic theory, valuation, and measurement issues, as well as presentation and analysis of accounting information. Includes Honors sections. Preq: ACCT 3110 with a C or better.

ACCT 3130 - Intermediate Financial Accounting III
3 Credits (3 Contact Hours)
Continuation of ACCT 3120. In-depth treatment of selected accounting topics, such as investments, cash flows, tax allocation, post-retirement benefits, leases, and error corrections. Emphasizes basic theory, valuation, and measurement, as well as presentation and analysis of accounting information. Includes Honors sections. Preq: ACCT 3120 with a C or better.
ACCT 3220 - Accounting Information Systems
3 Credits (3 Contact Hours)
Study of computer-based accounting systems with attention to systems design, application, internal control, auditing the system, and system security. Preq: MGT 2180.

ACCT 3980 - Creative Inquiry in Accounting
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. To be taken Pass/No Pass only.

ACCT 3990 - Internship in Accounting
1-3 Credits (1-3 Contact Hours)
Faculty-supervised accounting internship designed to give students learning opportunities that support their classroom experiences. Requires a minimum of six full-time weeks. Course enrollment and internship must occur in the same semester. Simultaneous credit cannot be received for another internship offering. May be repeated for a maximum of three credits. To be taken Pass/No Pass only. Preq: Junior standing and consent of instructor.

ACCT 4040 - Individual Taxation
3 Credits (3 Contact Hours)
Interpretation of Federal income tax laws, regulations, and court decisions with practice in application of these laws to the returns of individuals, partnerships, and corporations. Includes Honors sections. Preq: ACCT 3110 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ACCT 4060 - Business Taxation
3 Credits (3 Contact Hours)
Introduction to the importance of taxation in business decision making. Emphasizes the interrelationship of taxes, the choice of business form, and various business transactions; exposes students to the breadth of business decisions which are affected by the Federal Income Tax. Preq: ACCT 3110 with a C or better.

ACCT 4080 - Retirement and Estate Planning
3 Credits (3 Contact Hours)
Provides students with an understanding of the tax consequences of personal financial, retirement, and estate planning. Subjects include the basic concepts of retirement, gift, income shifting, and estate planning. Preq: ACCT 4040 with a C or better.

ACCT 4100 - Contemporary Reporting and Management Control Systems
3 Credits (3 Contact Hours)
Application of analyses and management control systems for contemporary business needs, including sustainability reporting, lean systems, capacity management, performance measures and incentive measures and incentive systems, and target costing. Preq: ACCT 3030 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ACCT 4150 - Auditing
3 Credits (3 Contact Hours)
Study of professional and practical auditing theory. Includes a review of internal controls, audit procedures, and development of audit programs for various types of businesses. Considers auditors' professional and ethical standards. Preq: ACCT 3110 and ACCT 3220, each with a C or better.

Advanced Manufacturing

AMFG 3800 - Introduction to Manufacturing Systems and Processes
3 Credits (3 Contact Hours)
Students are introduced to how products are manufactured through team reverse engineering projects. Class discussions are driven by the students' external research on manufacturing topics and students develop a system model to capture the complexity of the process.

AMFG 4800 - Practicum Experience in Advanced Manufacturing
3 Credits (1 Contact Hours)
Students solve open-ended, real world manufacturing process and system design problems typically provided by industrial partners.
Students experience various aspects of a team project design process, including development of a mission statement, selection of appropriate design, methodologies, project management, economic decision making, recommendation justification, reporting and presentation. Prreq: AMFG 3800. Coreq: 4801.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AMFG 4801 - Practicum Laboratory in Advanced Manufacturing
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany AMFG 4800. Coreq: AMFG 4800.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**Aerospace Studies**

**AS 1090 - Air Force Today I**
2 Credits (1 Contact Hours)
Deals with Air Force in the contemporary world through a study of the total force structure: strategic offensive and defensive, general purpose, and aerospace support. Leadership laboratory activities include drill fundamentals, customs, and courtesies of the service. Coreq: AS 1091.

**AS 1091 - Air Force Today I Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AS 1090. Coreq: AS 1090.

**AS 1100 - Air Force Today II**
2 Credits (1 Contact Hours)
Continuation of AS 1090. Leadership laboratory includes drill, ceremonies, and an introduction to Air Force career opportunities. Coreq: AS 1101.

**AS 1101 - Air Force Today II Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AS 1100. Coreq: AS 1100.

**AS 2090 - Development of Air Power I**
2 Credits (1 Contact Hours)
Study of the development of air power from balloons and dirigibles through the peaceful employment of U.S. air power in relief missions and civic action programs in the late 1960s and also the air war in Southeast Asia. Leadership laboratory provides experience in guiding, directing, and controlling an Air Force unit. Coreq: AS 2091.

**AS 2091 - Development of Air Power I Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AS 2090. Coreq: AS 2090.

**AS 2100 - Development of Air Power II**
2 Credits (1 Contact Hours)
Continuation of AS 2090. Coreq: AS 2101.

**AS 2101 - Development of Air Power II Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AS 2100. Coreq: AS 2100.

**AS 3090 - Air Force Leadership and Management I**
4 Credits (3 Contact Hours)
Emphasizes the individual as a manager. Individual motivational and behavioral processes, leadership, communication, and group dynamics are covered to provide a foundation for the development of the Air Force officer's professional skills. Students prepare individual and group presentations, write reports, participate in group discussions, seminars, and conferences. Coreq: AS 3091.

**AS 3091 - Air Force Leadership and Management I Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AS 3090. Coreq: AS 3090.
AS 3100 - Air Force Leadership and Management II
4 Credits (3 Contact Hours)
Continuation of AS 3090. Uses the basic managerial processes involving decision making, utilization of analytical aids in planning, organizing, and controlling environment. Actual case studies are used to enhance learning and communication processes. Coreq: AS 3101.

AS 3101 - Air Force Leadership and Management II Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AS 3100. Coreq: AS 3100.

AS 4090 - National Security Policy I
4 Credits (3 Contact Hours)
Analysis of the role and function of the military officer in a democratic society and the relationships involved in civil-military interactions. Students prepare individual and group presentations, write reports, and participate in group discussions. Coreq: AS 4091.

AS 4091 - National Security Policy I Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AS 4090. Coreq: AS 4090.

AS 4100 - National Security Policy II
4 Credits (3 Contact Hours)
Continuation of AS 4090. Examines the environmental context in which U.S. defense policy is formulated and implemented. Emphasizes initial commissioned service and military justice. Students prepare individual and group presentations for the class, write reports, and participate in group discussions, seminars, and conferences. Coreq: AS 4101.

AS 4101 - National Security Policy II Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AS 4100. Coreq: AS 4100.

Agribusiness

AGRB 2020 - Agricultural Economics
3 Credits (3 Contact Hours)
Analytical survey of the various subdivisions of agricultural economics, including farm organization, enterprise, land economics, marketing, farm prices, governmental farm policies, and the relation of agriculture to the national and international economy.

AGRB 2050 - Agriculture and Society
3 Credits (3 Contact Hours)
Introduction to the development of world society focusing on food production, from early hunting and gathering to modern biotechnology. Covers factors driving societal growth with a global perspective. Explores systematic impacts of growth in technical capacity to produce agricultural products on farm and community organization, industrialization, and the global economy.

AGRB 3020 - Economics of Farm Management
3 Credits (3 Contact Hours)
Economic principles underlying the organization and operation of agricultural firms and related business enterprises. Particular emphasis is placed on management aspects of the farm as a production unit. Preq: AGRB 2020 or ECON 2110.

AGRB 3080 - Quantitative Agribusiness Analysis I
3 Credits (3 Contact Hours)
Focuses on the integration and use of introductory statistics, mathematics and microeconomic theory as an agribusiness decision tool. Profit maximization and cost minimization problems are solved in risky and riskless situations. Regression procedures are used to estimate economic parameters. Expected profit and risk tradeoffs are examined. Preq: AGRB 2020 or ECON 2110; and MATH 1020 and STAT 2300.

AGRB 3090 - Economics of Agricultural Marketing
3 Credits (3 Contact Hours)
General course in marketing agricultural commodities with particular emphasis upon food products. Analyzes efficiency criteria, consumer behavior, market organizations and institutions, and marketing functions. Includes Honors sections. Preq: AGRB 2020 or ECON 2000 or ECON 2110.

AGRB 3130 - Principles of Real Estate Appraisal
Introduction to basic principles and procedures of real estate appraisal. Topics include the real estate market, principles of valuation, legal concepts, and the application of the comparable sales, cost, and income approaches to real estate valuation. Preq: FIN 3070.

**AGRB 3190 - Agribusiness Management**  
3 Credits (3 Contact Hours)  
Study of the principles used in making management decisions and the application of these principles in agribusiness. Emphasizes the application of economics to the solution of problems facing managers of agricultural supply and marketing firms. Preq: AGRB 3020.

**AGRB 3510 - Principles of Agricultural Sales and Advertising**  
3 Credits (3 Contact Hours)  
Introduction to sales techniques and advertising strategies used by agribusiness firms. Students learn how to make professional sales calls and how effective advertising enhances sales, from the base research, to campaign strategy, to final consumer purchase. The social, economic, and ethical considerations of an advertising strategy are also examined. Preq: Junior standing and one of AGRB 2020 or ECON 2110.

**AGRB 3520 - Public Finance**  
3 Credits (3 Contact Hours)  
Principles of financing government, sources of public revenue, objects of public expenditures, problems of fiscal administration, and the application of fiscal policies in stabilizing the national economy. Preq: Junior standing.

**AGRB 3570 - Natural Resources Economics**  
3 Credits (3 Contact Hours)  
Principles and problems involved in the use of soil, water, forest, and mineral resources, with special emphasis on economic aspects of alternative methods of resource utilization. Preq: AGRB 2020 or ECON 2000 or ECON 2110.

**AGRB (HLTH) 3610 - Introduction to Health Care Economics**  
3 Credits (3 Contact Hours)  
Introductory course in which students learn the basic economics of the institutions comprising the health-care industry. Topics include the underlying supply, demand, and institutional factors impacting health-care availability and cost of health care. May also be offered as HLTH 3610.

**AGRB 4020 - Production Economics**  
3 Credits (3 Contact Hours)  
Economic analysis of agricultural production involving the concept of the farm as a firm; principles for decision making; the quantitative nature and use of production and cost functions and the interrelations and applications of these principles to resource allocation in farms and among areas. Preq: AGRB 3080; and ECON 3060 or ECON 3140.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGRB 4080 - Quantitative Agribusiness Analysis II**  
3 Credits (3 Contact Hours)  
Regression analysis, linear programming, and risk efficiency analysis techniques are presented and applied to agribusiness firms to improve firm economic efficiency. Microcomputer optimization and statistical software packages are utilized to develop firm level strategic plan to achieve efficient agribusiness outcomes in uncertain economic environments. Preq: AGRB 3080.

**AGRB 4090 - Commodity Futures Markets**  
3 Credits (3 Contact Hours)  
Introduction to the economic theory, organization, and operating principles of agricultural commodity futures markets in the United States. Emphasizes speculating, hedging, and investing in agricultural commodity futures contracts from the standpoint of the agribusiness entrepreneur. Preq: AGRB 3090.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGRB 4110 - Regional Impact Analysis**  
3 Credits (3 Contact Hours)  
Techniques for analysis of the growth and decline of regions, including economic-base theory, shift share, regional input-output, regional econometric models, and fixed impact models. Preq: AGRB 2020; or both ECON 2110 and ECON 2120.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGRB 4120 - Regional Economic Development Theory and Policy**
3 Credits (3 Contact Hours)
Development of rural economic activity in the context of historical, theoretical, and policy aspects of friction associated with spatial separation. Considers location factors, transfer costs, location patterns, and regional-growth policy. Preq: AGRB 2020 or ECON 2110. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGRB 4130 - Advanced Real Estate Appraisal**
3 Credits (3 Contact Hours)
Topics include highest and best use analysis, data collection, and analyses. Stresses advanced appraisal procedures for income, cost, and comparable sales approach to real estate valuation. Covers eminent domain, the appraisal of property in transition, and specialized property. Preq: AGRB 3130 or FIN 3070. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGRB 4210 - Globalization**
3 Credits (3 Contact Hours)
Utilizes basic principles of international economics (comparative advantage, free trade versus protectionism, exchange rate determination, etc.) to analyze the contemporary problems and issues of the world economy. Emphasizes application of economic principles to current globalization trends. Preq: AGRB 2020 or ECON 2000 or ECON 2110. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGRB (PES) 4260 - Cropping Systems Analysis**
3 Credits (2 Contact Hours)
Application of agronomic and economic principles in solving problems related to the production and marketing of agronomic crops. Major part of the course is a case study in which detailed analysis of a farm, agribusiness, or environmental situation is made with students making formal written and oral presentations of results. May also be offered as PES 4260. Preq: PES 1040; and Junior standing; and AGRB 2020 or ECON 2000 or ECON 2110. Coreq: AGRB 4261. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGRB (PES) 4261 - Cropping Systems Analysis Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany AGRB 4260. May also be offered as PES 4261. Coreq: AGRB 4260. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGRB 4520 - Agricultural Policy**
3 Credits (3 Contact Hours)
Review of public agricultural policy programs in the United States and a critical examination of current and proposed government policies and programs affecting the agricultural sector of the economy. Includes economic considerations as related to past and current farm price and income problems. Includes Honors sections. Preq: AGRB 2020 or ECON 2000 or ECON 2110. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGRB 4560 - Prices**
3 Credits (3 Contact Hours)
Review of the basic theory of price under competitive conditions and various modifications; nature, measurement, and causes of daily, seasonal, and cyclical price fluctuations; geographical price relationships; nature, function, and behavior of futures markets; government price programs. Includes Honors sections. Preq: AGRB 3080 or ECON 4050; and ECON 3060 or ECON 3140. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGRB (ECON) 4570 - Natural Resource Use, Technology and Policy**
3 Credits (3 Contact Hours)
Focuses on economic analyses of actual, efficient, and sustainable uses of natural resources, impacts of technologies that affect these uses, and policies that affect development and use of such technologies. Resource-technology-policy combinations may vary, but an example is crude oil, hybrid automotive engines, and fuel economy standards. May also be offered as ECON 4570. Preq: MATH 1020 or MATH 1060; and AGRB 3570 or ECON 3140. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGRB 4600 - Agricultural Finance**
3 Credits (3 Contact Hours)
Study of the principles and technique of financing in the agricultural sector. Topics include the capital situation in agriculture, concepts of farm financial management, use of credit, capital markets, lending agencies, and estate planning. Preq: ACCT 2010; and AGRB 2020 or ECON 2000 or ECON 2110.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGRB (WFB) 4750 - Economics of Wildlife Management and Policy
3 Credits (3 Contact Hours)
Integrated approach to the study of the economics of wildlife. Topics include determination of market and nonmarket value, single and multiple species management, enterprise cost and returns, marketing wildlife, leasing methods, complementarity and competitiveness with agricultural and forestry enterprises, and timber and crop damage cost estimates and control. May also be offered as WFB 4750. Preq: AGRB 2020 or ECON 2000 or ECON 2110 or FOR 3040 or WFB 3060.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGRB 4900 - Selected Topics
1-15 Credits (1-15 Contact Hours)
Study of topics in applied economics. Topics may include classroom and/or field experience not normally covered in other classes. May be repeated for credit, but only if different topics are covered. Preq: Junior standing.

AGRB 4910 - Internship, Agribusiness, and Community and Rural Development
1-6 Credits (1-6 Contact Hours)
Internship under faculty supervision in an approved agency or firm. Internships provide students with work experience in agribusiness or community and rural development. Students submit a comprehensive report within one week of the end of the internship. A maximum of six internship credits may be earned. Preq: Junior standing and consent of instructor.

AGRB 4940 - Creative Inquiry: Community and Rural Development
1-3 Credits (1-3 Contact Hours)
Multi-semester commitment to participate in agricultural and applied economics and community and economic development related research experience for students working in teams, mentored and directed by a faculty member. Students learn to collect, analyze, evaluate, and present information. Suitable for inclusion in the student's e-portfolio. May be repeated for a maximum of 12 credits. Preq: Consent of instructor.

Agricultural Education

AGED 1000 - Orientation and Field Experience
1 Credits (2 Contact Hours)
Supervised observations and explanations of vocational agriculture teaching while serving as teacher aides. One full week of field experience in representative high schools is required.

AGED 1020 - Agricultural Education Freshman Seminar
1 Credits (2 Contact Hours)
Introduces students to the South Carolina agriculture education structure and provides opportunities to prepare oral presentations on selected agricultural education organizations. Assists students in understanding the value of professional organizations to agriculture education in the state and nation. Preq: Agricultural Education major.

AGED 2000 - Agricultural Applications of Educational Technology
3 Credits (2 Contact Hours)
Overview of microcomputer hardware and software encompassing word processing, spreadsheet, utility, Web development, and graphic communications in an agricultural context. Coreq: AGED 2001.

AGED 2001 - Agricultural Applications of Educational Technology Laboratory
0 Credits (2 Contact Hours)

AGED 2010 - Introduction to Agricultural Education
3 Credits (2 Contact Hours)
Principles of education, development of agricultural education, and an introduction to the formulation of instructional programs for the teaching of agricultural courses. Coreq: AGED 2011.
AGED 2011 - Introduction to Agricultural Education Laboratory
0 Credits (3 Contact Hours)

AGED 2020 - Agricultural Education Sophomore Seminar
1 Credits (2 Contact Hours)
Instruction on how to establish a comprehensive student record-keeping system. Includes integration of that data into the FFA Awards program. Allows students hands-on experience with the total FFA Awards program on the state and national level. Preq: AGED 1020.

AGED 2030 - Teaching Agriscience
3 Credits (2 Contact Hours)
Integrates biological and technological concepts appropriate for teaching introductory middle or secondary school-level courses in agricultural science. Topics emphasize disciplines, theories, and applications in modern agricultural production. Experiences include teaching techniques, materials, resources, and the design and implementation of new activities to facilitate teaching agriscience. Preq: BIOL 1040 and BIOL 1060. Coreq: AGED 2031.

AGED 2031 - Teaching Agriscience Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGED 2030. Coreq: AGED 2030.

AGED 2040 - Applied Agriculture Calculations
3 Credits (3 Contact Hours)
Demonstrates basic mathematical applications in crop and livestock production and agribusiness and financial management. These applications aid students in understanding the mathematical applications needed in the agriculture field.

AGED 3020 - Agricultural Education Junior Seminar
1 Credits (2 Contact Hours)
Allows students the opportunity to prepare and deliver information on Career Development Events (CDE) and to understand fully the CDE concepts. Students receive much needed hands-on experience at the state and national levels. Preq: AGED 2020.

AGED 3030 - Mechanical Technology for Agriculture Education
3 Credits (2 Contact Hours)
Study of technical content and new technology utilized in agriculture mechanics. Integrates agriculture mechanics topics such as electrical wiring and controls, green industry maintenance, irrigation systems, and agriculture construction. Offers a delivery of mechanics instruction in the classroom and laboratory setting. Coreq: AGED 3031.

AGED 3031 - Mechanical Technology for Agriculture Education Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGED 3030. Coreq: AGED 3030.

AGED 3550 - Team and Organizational Leadership in the Food and Fiber System
3 Credits (3 Contact Hours)
Principles and practices in planning, developing, conducting, and evaluating leadership programs for agricultural groups. Focuses on helping students better understand themselves and others; improving group communications; becoming effective leaders and members of groups; improving leadership and personal development skills; assessing leadership situations, determining and administering appropriate leadership strategies.

AGED 3650 - Multiculturalism in Agricultural Education
3 Credits (3 Contact Hours)
Investigation of the cultures (both domestic and foreign) commonly encountered by agriculture education professionals. Customs, traditions, beliefs, stereotypes, and myths are explored. Strategies for relationship building, impact, and successful interaction are developed for formal and informal agricultural learning environments. Preq: Junior standing.

AGED 4000 - Supervised Field Experience II
1 Credits (3 Contact Hours)
Special emphasis is placed on enhancing existing knowledge and experiences of the students. Primary focus is on becoming acquainted with the student teaching center well in advance of the customary twelve-week directed teaching experience.

AGED 4010 - Instructional Methods in Agricultural Education
3 Credits (2 Contact Hours)
Appropriate methods of teaching vocational agriculture in high schools. Includes procedures for organizing teaching programs, teaching high school students, and directing FFA activities. Coreq: AGED 4011.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4011 - Instructional Methods in Agricultural Education Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGED 4010. Coreq: AGED 4010. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4020 - Agricultural Education Senior Seminar
1 Credits (2 Contact Hours)
Provides an opportunity to prepare and deliver information on continuing adult education. Assists students in fully understanding the adult education component of the total Secondary Agriculture Education Program. Preq: AGED 3020.

AGED 4030 - Principles of Adult/Extension Education
3 Credits (3 Contact Hours)
Overview of adult/extension education and adult learning. Selection of adult education providers is reviewed with emphasis on extension. Preq: Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4060 - Directed Teaching
12 Credits (36 Contact Hours)
Guided participation in the professional responsibilities of a teacher of vocational agriculture, including intensive study of the problems encountered and competencies developed. Twelve weeks of directed teaching in selected schools are required. Preq: AGED 4000 and AGED 4010.

AGED 4070 - Internship in Extension and Leadership Education
6-12 Credits (6-12 Contact Hours)
Internship placements may include county extension offices and other appropriate extension units. Six weeks of supervised experience must be completed for six hours of credit. Twelve weeks of supervised experience must be completed for 12 hours of credit. May be repeated for a maximum of 12 credits. Preq: AGED 4000 and AGED 4010 and Senior standing.

AGED 4120 - Senior Agriculture Leadership Seminar
1 Credits (2 Contact Hours)
Emphasizes leadership techniques and policies that affect agriculture. Students conduct research and make presentations on issues which influence agriculture policy. Preq: AGRB 3020; and one of AGRB 2020 or ECON 2000 or ECON 2110.

AGED 4150 - Leadership of Volunteers
3 Credits (3 Contact Hours)
Provides an overview of volunteer management. Examines the knowledge, skills, and abilities required of professional managers to involve volunteers effectively in the work of organizations. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4160 - Ethics and Issues in Agriculture and the Food and Fiber System
3 Credits (3 Contact Hours)
Explores ethical theories, concepts of critical thinking, and major ethical issues in American agriculture. The major social, political, economic, and ethical issues that arise in connection to the "food and fiber" system are examined and potential solutions considered. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4230 - Curriculum
3 Credits (3 Contact Hours)
Curriculum goals and related planning for career and continuing education programs. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4250 - Teaching Agricultural Mechanics
2 Credits (1 Contact Hours)
Instruction in organizing course content, conducting and managing an agricultural mechanics laboratory, shop safety, microteaching demonstrations of psychomotor skills, and methods of teaching manipulative abilities. Coreq: AGED 4251.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4251 - Teaching Agricultural Mechanics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGED 4250. Coreq: AGED 4250.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4280 - Special Studies in Agricultural Education
1-3 Credits (1-3 Contact Hours)
Students study, individually or collectively, selected topics and/or problems in agricultural education to meet the particular needs of the clientele enrolled. May be repeated for a maximum of six credits.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4400 - Program Development in Adult/Extension Education
3 Credits (3 Contact Hours)
Principles, theory, and practice in planning and conducting educational programs in adult/extension settings. Preq: Junior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4500 - Modern Topics and Issues
3 Credits (3 Contact Hours)
Students select a major area of concern to teachers of agriculture and county agents for intensive study at least one semester prior to offering the course. When feasible, team teaching with faculty from other departments in the College of Agriculture, Forestry and Life Sciences is utilized. Preq: Senior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED (EDF) 4800 - Foundations of Digital Media and Learning
3 Credits (2 Contact Hours)
Critical use of digital media for leadership and learning within societal and educational contexts. Course focuses on learner impact while exploring and evaluating technology-enhanced applications. Competencies with new media literacies are developed and cultural, ethical and participatory implications are addressed. Designed to meet Read to Succeed requirements. Registration preference may be given to students enrolled in a teacher education program. May also be offered as EDF 4800. Coreq: EDF 4801.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED (EDF) 4801 - Foundations of Digital Media and Learning Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AGED 4800. May also be offered as EDF 4801. Coreq: AGED 4800.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4810 - Web Design for the Life Sciences and Agriculture
3 Credits (2 Contact Hours)
Addresses basic principles and theories of Web design and site construction, including usability and accessibility considerations. Web and graphics design software are used to develop sites suitable for life science and agricultural organizations. Service-learning is used with student projects. Preq: AGED 2000 and CPSC 1200. Coreq: AGED 4811.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED 4811 - Web Design for the Life Sciences and Agriculture Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AGED 4810. Coreq: AGED 4810.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGED (EDF) 4820 - Advanced Educational Applications of Microcomputers
3 Credits (2 Contact Hours)
Provides students with the knowledge and skills needed to apply microcomputer technology to the utilization and generation of educational software in accordance with sound educational principles. May also be offered as EDF 4820. Preq: AGED 4800 or EDF 4800. Coreq: AGED 4821.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGED (EDF) 4821 - Advanced Educational Applications of Microcomputers Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AGED 4820. May also be offered as EDF 4821. Coreq: AGED 4820.

Agricultural Mechanization

**AGM 1010 - Introduction to Agricultural Mechanization and Business**
1 Credits (3 Contact Hours)
Introduces the Agricultural Mechanization and Business program. Provides an overview of the curriculum, exposes students to relevant extracurricular activities, and familiarizes students with potential employment opportunities through alumni and intern opportunities, and helps students to prepare for careers relevant to the major.

**AGM 2050 - Principles of Fabrication**
3 Credits (2 Contact Hours)
Principles, techniques, and methods in the selection, proper use, and maintenance of hand and power tools. Principal topics include welding, tool fitting, metalworking, woodworking, finishing and preserving, and heat treatment. Coreq: AGM 2051.

**AGM 2051 - Principles of Fabrication Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGM 2050. Coreq: AGM 2050.

**AGM 2060 - Machinery Management**
3 Credits (2 Contact Hours)
Teaches agriculture students to apply physical principles and sound reasoning to the mechanization of modern agricultural production and processing enterprises. Stresses the planning of efficient operational systems and wise selection of equipment, based on function and economic suitability. Preq or concurrent enrollment: MATH 1020 or MATH 1060; and PHYS 2000 or PHYS 2070. Coreq: AGM 2061.

**AGM 2061 - Machinery Management Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGM 2060. Coreq: AGM 2060.

**AGM 2190 - Agribusiness and Food Systems**
3 Credits (3 Contact Hours)
Provides a general introduction to the major activities associated with the movement of agricultural and food products from producers to processors to consumers and the essential supply chain functions of buying, selling, transportation, storage, financing, standardization, pricing and risk bearing. Preq: MATH 1020 or MATH 1060.

**AGM 2200 - Calculations for Mechanized Agriculture**
3 Credits (2 Contact Hours)
Enhances students' ability to analyze and solve a wide range of problems requiring engineering technology. Laboratory periods introduce students to microcomputer hardware. Basic programming and typical applications to agricultural mechanization problems are included. Preq or concurrent enrollment: PHYS 1220 or PHYS 2000 or PHYS 2070. Coreq: AGM 2201.

**AGM 2201 - Calculations for Mechanized Agriculture Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AGM 2200. Coreq: AGM 2200.

**AGM 2210 - Surveying: Earthwork and Area Measurements**
3 Credits (2 Contact Hours)
Fundamentals of surveying relative to earthwork and land area measurements, including linear measurements, leveling, angular measurements, and computations. Levels and total stations are used with an introduction to GPS. Preq or concurrent enrollment: MATH 1020 or MATH 1060. Coreq: AGM 2211.

**AGM 2211 - Surveying: Earthwork and Area Measurements Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGM 2210. Coreq: AGM 2210.
AGM 3010 - Soil and Water Conservation
3 Credits (3 Contact Hours)
Soil and water management is studied by applying principles of mathematics, fluid flow, hydrology, and soil characteristics as related to soil-water-vegetation complexes in runoff, erosion control, channel design, water conservation, drainage, stormwater best management practices and stream restoration. Preq or concurrent enrollment: MATH 1020 or MATH 1060.

AGM 3031 - Calculations for Mechanized Agriculture Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AGM 3030.

AGM 3190 - Agribusiness Decision Analysis
3 Credits (3 Contact Hours)
Improvement of the decision-making process in agricultural businesses through the use of decision-analysis software. Students build their own decision-making models using spreadsheets. Preq: AGM 2190 or AGRB 3020 or AGRB 3190 or MGT 2010.

AGM 3710 - Agricultural Mechanization Practicum
1-3 Credits (1-3 Contact Hours)
Pre-planned internship with an approved employer involved in agricultural technical or business endeavors. 130 hours of supervised responsibility are required per credit hour. A work journal, written/oral reports, company consent and evaluation must be on file. May be repeated for a maximum of twelve credits. To be taken Pass/No Pass only.

AGM 4000 - Senior Seminar in Agricultural Mechanization and Business
1 Credits (1 Contact Hours)
Seminar and project-based course providing information on a variety of topics of value for the development of professionals in agricultural mechanization and business and in agricultural education. Topics include development of a professional resume, professional ethics, and current topics related to agricultural technology and systems management. Preq: Junior or senior standing in Agricultural Mechanization and Business or in Agricultural Education.

AGM 4020 - Irrigation System Design
3 Credits (2 Contact Hours)
Uses basic soil-water-plant relationships to determine the need for and methods of irrigation and drainage. Topics include irrigation methods, irrigation requirements, system components including pipe pump sizing, and system design. Preq: Junior standing. Coreq: AGM 4021.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGM 4021 - Irrigation System Design Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AGM 4020. Coreq: AGM 4020.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGM 4050 - Environmental Control in Animal Structures
3 Credits (2 Contact Hours)
Design of environmental control systems for animal production facilities. Topics include effects of the thermal and chemical environment on animals, ventilation system design, thermal design of structural envelopes, design of heating, cooling, and lighting systems. Emphasis is on practical, energy-efficient applications to modern animal production facilities. Preq: AGM 2190 and AGM 2200. Coreq: AGM 4051.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGM 4051 - Environmental Control in Animal Structures Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGM 4050. Coreq: AGM 4050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AGM 4060 - Mechanical and Hydraulic Systems
3 Credits (2 Contact Hours)
Study of power transmission systems for agricultural production emphasizing mobile equipment. Characteristics, requirements, and design of both V-belt drive and roller-chain drives are presented. Emphasizes hydraulic power transmission systems, including pumps, actuators, control devices, and hydraulic circuitry. Preq: AGM 2060; and PHYS 1220 or PHYS 2000 or PHYS 2070. Coreq: 4061.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGM 4061 - Mechanical and Hydraulic Systems Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGM 4060. Coreq: AGM 4060.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGM 4100 - Precision Agriculture Technology**
3 Credits (2 Contact Hours)
Includes principles and hands-on application of technologies supporting precision agriculture. Topics include global positioning system (GPS), geographic information system software, variable rate technologies, collection of spatial data, automated guidance of equipment, spatial data mapping and analysis, remote sensing, and economic considerations. Preq: Junior standing. Coreq: AGM 4101.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGM 4101 - Precision Agriculture Technology Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGM 4100. Coreq: AGM 4100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGM (ELE) 4190 - Agribusiness Innovation and Entrepreneurship**
3 Credits (3 Contact Hours)
Emphasis on assessing students' abilities as agribusiness entrepreneurs, evaluating the feasibility of a business idea, creating strategies for organizing and marketing the agricultural business, exploring pricing for products or services, developing capital needs and sound financial statements, and researching, developing, and writing a comprehensive plan for the business. Preq: AGM 2190 or AGM 3190 or AGRB 3020 or AGRB 3190 or MGT 2010. May also be offered as ELE 4190.

**AGM 4520 - Mobile Power**
3 Credits (2 Contact Hours)
Study of tractors, emphasizing internal combustion engines and support systems necessary for their proper functioning. Also considers application of power, maintenance, adjustment, and general repair. Preq: PHYS 1220 or PHYS 2000 or PHYS 2070. Coreq: AGM 4521.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGM 4521 - Mobile Power Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGM 4520. Coreq: AGM 4520.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGM 4600 - Electrical Systems**
3 Credits (2 Contact Hours)
Students in agriculture and related curricula study electric and other utilities on the farm and in the home. Emphasizes selection, installation, and maintenance of wiring systems, lighting systems, motors, controls, water systems, and waste disposal systems. Preq: AGM 2200 and junior standing. Coreq: AGM 4601.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGM 4601 - Electrical Systems Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AGM 4600. Coreq: AGM 4600.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AGM 4720 - Capstone**
3 Credits (2 Contact Hours)
Covers professional conduct, ethics, oral and written communication, and financial matters. Each student completes a comprehensive project on a technical subject. The results are given in a written report and oral presentation. Students use digital portfolio technology to assess their education. Preq: AGM 3010 and AGM 4000 and AGM 4020 and AGM 4050 and AGM 4060 and AGM 4520 and AGM 4600. Coreq: AGM 4721.
AGM 4721 - Capstone Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AGM 4720. Coreq: AGM 4720.

AGM 4730 - Special Topics in Agricultural Mechanization
1-3 Credits (1-3 Contact Hours)
Comprehensive study and application of new technologies and methods not covered in existing courses. Emphasizes independent study using innovative approaches to problem solving. May be repeated for a maximum of six credits.

American Sign Language

ASL 1010 - American Sign Language I
4 Credits (3 Contact Hours)
Introduction to the basics of American Sign Language, its history, and culture. Visual-gestural communication techniques are used. Coreq: ASL 1011.

ASL 1011 - American Sign Language I Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany ASL 1010. Coreq: ASL 1010.

ASL 1020 - American Sign Language I
4 Credits (3 Contact Hours)
Continuation of ASL 1010 and culture to develop further communicative competencies. Proficiency oriented with the use of visual-gestural communication skills. Preq: ASL 1010. Coreq: ASL 1021.

ASL 1021 - American Sign Language I Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany ASL 1020. Coreq: ASL 1020.

ASL 2010 - American Sign Language II
3 Credits (3 Contact Hours)
Continuation of ASL 1020. Covers additional vocabulary, sentences, and grammar structures. Main focus is on conversational and receptive skills as well as a better understanding of Deaf culture. Preq: ASL 1020.

ASL 2020 - American Sign Language II
3 Credits (3 Contact Hours)
Continuation of ASL 2010, concentrating on intermediate conversational and discourse skills using American Sign Language, more complex American Sign Language grammar, reading comprehension, and composition of short stories, narratives, and dialogues with an emphasis on topics related to the Deaf community. Class is conducted totally in American Sign Language using visual-gestural communicative techniques. Preq: ASL 2010.

ASL 2970 - Creative Inquiry: American Sign Language
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Preq: Consent of faculty member because arrangements with faculty member must be established prior to registration.

ASL 3000 - Fingerspelling and Numbers in American Sign Language
1 Credit (1 Contact Hours)
Advanced study of the manual alphabet (fingerspelling) and the numerical system in American Sign Language, with extensive practice in both expressive and receptive skills. Preq: ASL 2010.

ASL 3010 - Advanced American Sign Language I
3 Credits (3 Contact Hours)

ASL 3020 - Advanced American Sign Language II
3 Credits (3 Contact Hours)
Continuation of ASL 3010. Focuses on American Sign Language fluency, vocabulary development, grammatical structures of American
Sign Language, use of classifiers, conversational skills, translating written texts into American Sign Language, and vice versa. Emphasis is on making formal presentations in American Sign Language. Preq: ASL 3010.

**ASL 3040 - Internship in American Sign Language**  
3 Credits (4 Contact Hours)  
Minimum 60 contact hours in an environment exclusively using American Sign Language. Frequent opportunities to converse with native signers in classroom settings, dormitory settings, meals, excursions, sporting events, cultural events, and meetings. Preq: ASL 2020.

**ASL 3050 - Deaf Studies in the United States**  
3 Credits (3 Contact Hours)  
In-depth look into language, culture, and daily lives of approximately one million people who use American Sign Language as their primary language. Traces the roots of American Sign Language from pre-revolutionary times to current science and knowledge and how it applies to professional fields.

**ASL 3150 - Survey of Interpreting in Public Schools**  
3 Credits (3 Contact Hours)  
Overview of the ASL/English interpreting profession in public schools. Includes discussions about the role, function, and aptitudes of educational interpreters, the bilingual and bicultural context, history of interpreting, principles of professional practice, laws that affect educational interpreting, and analysis of the impact of classroom variables on accessibility and interpretability. Preq: ASL 2010.

**ASL 3200 - American Sign Language English Interpreting in Elementary Schools I**  
3 Credits (3 Contact Hours)  
American Sign Language-English interpreting in the elementary classroom. Includes analysis of the discursive features of elementary classrooms; translation of materials encountered in elementary classrooms; rendering of interpretations of elementary classroom discourse, both consecutively and simultaneously; and assessment of the effectiveness of interpreted products. Preq: ASL 3010 and ASL 3150.

**ASL 3250 - American Sign Language English Interpreting in Secondary Schools I**  
3 Credits (3 Contact Hours)  
American Sign Language-English interpreting in the high school classroom. Includes analysis of the discursive features of several high school courses; translation of materials encountered in high school classrooms; rendering interpretations, both consecutively and simultaneously; and assessment of the effectiveness of interpreted products. Preq: ASL 3010 and ASL 3150.

**ASL 3450 - American Sign Language for Health Care Practitioners I**  
3 Credits (3 Contact Hours)  
Intermediate instruction of specific health care and medical terminology in American Sign Language. Topics relate to specific body systems, medical terminology, and cultural aspects that have a direct bearing on medical treatment and understanding the deaf patient. Preq: ASL 3020.

**ASL 3490 - Advanced Applications in American Sign Language**  
3 Credits (3 Contact Hours)  

**ASL 3950 - ASL-English Interpreting Field Observation**  
2 Credits (2 Contact Hours)  
Beginning interpreting students are exposed to various interpreting models and experiences to prepare them for functioning as professional interpreters. Students are expected to observe working interpreters in field settings for a minimum of 90 hours; and to contrast observation experiences and identify challenges in each setting. Preq: ASL 3150.

**ASL 3970 - Creative Inquiry in American Sign Language**  
1-4 Credits (1-4 Contact Hours)  
Students focus on a special research area under the guidance of a faculty member. After acquiring the requisite background, students formulate hypotheses for a group project, develop a critical framework, and initiate research on a specific topic.

**ASL 4010 - Discourse in American Sign Language I**  
3 Credits (3 Contact Hours)  
Designed for advanced-level students in American Sign Language. Primary goal is to further develop students' understanding and knowledge of American Sign Language by incorporating in-depth analysis of American Sign Language's historical development, linguistic structures, syntax, grammar, and pragmatics. Preq: ASL 3020.

**ASL 4020 - Discourse in American Sign Language II**  
3 Credits (3 Contact Hours)  
Continuation of American Sign Language 4010. Primary goal is to further develop students' understanding and knowledge of American
Sign Language by incorporating analysis of time concepts, variations due to region and ethnicity, pluralization, classifiers, locatives, temporal aspects, and pronoun usage in American Sign Language. Preq: ASL 4010.

**ASL 4050 - Advanced Deaf Culture and History**  
3 Credits (3 Contact Hours)  
Advanced study of deaf culture and history in the United States, including history, folklore, anthropology and sociology. All activities are conducted in American Sign Language (ASL). Preq: ASL 3010.

**ASL 4200 - American Sign Language English Interpreting in Elementary Schools II**  
3 Credits (3 Contact Hours)  
Continuation of ASL 3200. Further analyses of elementary school curricular discourse; rendering interpretations of elementary school classroom discourse simultaneously; preparation and interpretation or presentations from second language into first language; and assessment of the effectiveness or interpreted products. Preq: ASL 3200.

**ASL 4250 - American Sign Language English Interpreting in Secondary Schools II**  
3 Credits (3 Contact Hours)  
Continuation of ASL 3250. Further analyses of high school curricular discourse; rendering interpretations of high school classroom discourse simultaneously; preparing and interpreting presentations from second language to first language; and assessment of the effectiveness of interpreted products. Preq: ASL 3250.

**ASL 4450 - American Sign Language for Health Care Practitioners II**  
3 Credits (3 Contact Hours)  
Continuation of ASL 3450. Expands health care and medical terminology in American Sign Language. Topics relate to specific body systems, ASL medical terminology, insurance, and medications. Preq: ASL 3450.

**ASL 4600 - Deaf Literature and Folklore**  
3 Credits (3 Contact Hours)  
Designed for advanced-level students in American Sign Language. Primary goal is to further develop students' knowledge and understanding of Deaf literature, folklore, and the community at large. Includes introductions to deaf authors, literary works, plays, poetry, painting, and sculpture. Preq: ASL 3020.

**ASL 4970 - Creative Inquiry in American Sign Language**  
1-4 Credits (1-4 Contact Hours)  
Continuation of research initiated in ASL 3970. Students complete their projects and disseminate their research results. Preq: ASL 3970.

**ASL 4980 - Independent Study**  
1-3 Credits (1-3 Contact Hours)  
Supervised research and study on topics related to the origins and growth of American Sign Language and the Deaf Community in the United States (1800-present). May be repeated for a maximum of six credits. Preq: ASL 2020.

**Animal and Veterinary Sciences**

**AVS 1000 - Orientation to Animal and Veterinary Sciences**  
1 Credits (2 Contact Hours)  
Study of the role of animal agriculture in the world today emphasizing supply and demand of end products and careers available in the animal industry.

**AVS 1500 - Introduction to Animal Science**  
3 Credits (3 Contact Hours)  
Survey of animal industries and their role in society. Examines the relationship between man and animals in both a current and historical context. Coreq: AVS 1510.

**AVS 1510 - Introduction to Animal Science Laboratory**  
1 Credits (2 Contact Hours)  
Examines the basic principles in the handling of livestock and techniques of farm animal production as well as orientation to animal production units. Coreq: AVS 1500.

**AVS 2000 - Beef Cattle Techniques**
2 Credits (1 Contact Hours)
Examines basic principles in the techniques and management associated with production of both beef cattle and sheep. Students may take only one techniques course per semester. Preq or concurrent enrollment: AVS 1500 and AVS 1510. Coreq: AVS 2001.

**AVS 2001 - Beef Cattle Techniques Laboratory**
0 Credits (2 Contact Hours)

**AVS 2010 - Poultry Techniques**
2 Credits (1 Contact Hours)
Basic principles of the production of poultry are discussed and demonstrated. Students receive hands-on experience in the production and processing of poultry. Students may take only one techniques course per semester. Preq: AVS 1510. Coreq: AVS 2011.

**AVS 2011 - Poultry Techniques Laboratory**
0 Credits (2 Contact Hours)

**AVS 2020 - CAFLS Plus**
3 Credits (2 Contact Hours)
A professional development course intended for Collage of Agriculture, Forestry and Life Sciences sophomores and juniors who plan to complete an internship, co-op or other external learning experience. Emphasis is placed on understanding personality assessments, leadership styles, negotiation techniques, team dynamics and etiquette. The course is a seminar style course with accompanying laboratory exercises. Coreq: AVS 2021.

**AVS 2021 - CAFLS Plus Laboratory**
0 Credits (2 Contact Hours)

**AVS 2030 - Dairy Science Techniques**
2 Credits (1 Contact Hours)
Introduction to dairy production and processing. Laboratories include hands-on opportunities for management of dairy cattle, quality control of milk, and processing of milk and dairy products. Students may take only one techniques course per semester. Preq: AVS 1510. Coreq: AVS 2031.

**AVS 2031 - Dairy Science Techniques Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 2030. Coreq: AVS 2030.

**AVS 2040 - Horse Care Techniques**
2 Credits (1 Contact Hours)
Basic principles of equine behavior, handling, and management are discussed and demonstrated. Students receive hands-on experience with various management techniques, including handling and all aspects of health care. Students may take only one techniques course per semester. Preq: AVS 1510. Coreq: AVS 2041.

**AVS 2041 - Horse Care Techniques Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 2040. Coreq: AVS 2040.

**AVS 2050 - Horsemanship Techniques**
2 Credits (4 Contact Hours)
Develops basic to advanced skills based on rider aptitude. Students learn the mechanics of safety, lungeing, basic position, cues, and rider's aids, as well as individual work and building subtlety and finesse with aids.

**AVS 2060 - Swine Techniques**
2 Credits (1 Contact Hours)
Examines the basic principles in the techniques and management associated with production of swine. Students may take only one techniques course per semester. Preq: AVS 1500 and AVS 1510. Coreq: AVS 2061.

**AVS 2061 - Swine Techniques Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 2060. Coreq: AVS 2060.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Contact Hours</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVS 2080</td>
<td>Techniques of Teaching Horsemanship</td>
<td>3</td>
<td>2</td>
<td>Discusses teaching techniques and theory and handling of large mounted groups. Trains beginner through advanced levels. Preq: AVS 2040. Coreq: AVS 2081.</td>
</tr>
<tr>
<td>AVS 2081</td>
<td>Techniques of Teaching Horsemanship Laboratory</td>
<td>0</td>
<td>2</td>
<td>Non-credit laboratory to accompany AVS 2080. Coreq: AVS 2080.</td>
</tr>
<tr>
<td>AVS 2090</td>
<td>Livestock Exhibition Techniques</td>
<td>2</td>
<td>1</td>
<td>Students learn techniques associated with exhibition and evaluation of beef, dairy, equine, poultry, and swine. Preq: AVS 1510. Coreq: AVS 2091.</td>
</tr>
<tr>
<td>AVS 2091</td>
<td>Livestock Exhibition Techniques Laboratory</td>
<td>0</td>
<td>2</td>
<td>Non-credit laboratory to accompany AVS 2090. Coreq: AVS 2090.</td>
</tr>
<tr>
<td>AVS 2110</td>
<td>Meat Processing Techniques</td>
<td>2</td>
<td>1</td>
<td>Examines the basic principles of food animal processing. Laboratories include hands-on opportunities harvesting a variety of livestock, carcass evaluation, carcass fabrication and value-added meat products. Students also gain understanding in Hazard Analysis and Critical Control (HACCP) certification and meat inspection. Preq: AVS 1500. Coreq: AVS 2111.</td>
</tr>
<tr>
<td>AVS 2111</td>
<td>Meat Processing Techniques Laboratory</td>
<td>0</td>
<td>2</td>
<td>Non-credit laboratory to accompany AVS 2110. Coreq: AVS 2110.</td>
</tr>
<tr>
<td>AVS 2120</td>
<td>Small Ruminant Techniques</td>
<td>2</td>
<td>1</td>
<td>Basic principles of the production of small ruminant animals are discussed and demonstrated. Students receive hands on experience in the management, production and processing of sheep and goats. Activities include handling, health care, lambing or kidding, and fiber, milk and meat production. Students may only take one techniques course per semester. Preq: AVS 1510. Coreq: AVS 2121.</td>
</tr>
<tr>
<td>AVS 2121</td>
<td>Small Ruminant Techniques Laboratory</td>
<td>0</td>
<td>2</td>
<td>Non-credit laboratory to accompany AVS 2120. Coreq: AVS 2120.</td>
</tr>
<tr>
<td>AVS 3010</td>
<td>Anatomy and Physiology of Domestic Animals</td>
<td>4</td>
<td>3</td>
<td>Study of physiology and associated anatomy of the body systems, including nervous, skeletal, muscular, respiratory, digestive, circulatory, urinary, reproductive, and endocrine systems. Designed primarily for students in Animal and Veterinary Sciences. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: AVS 3011.</td>
</tr>
<tr>
<td>AVS 3011</td>
<td>Anatomy and Physiology of Domestic Animals Laboratory</td>
<td>0</td>
<td>3</td>
<td>Non-credit laboratory to accompany AVS 3010. Coreq: AVS 3010.</td>
</tr>
<tr>
<td>AVS 3020</td>
<td>Livestock Selection and Evaluation I</td>
<td>2</td>
<td>1</td>
<td>Selection and evaluation of the meat species of livestock with application of theory applied in multiple field exercises. Coreq: AVS 3021.</td>
</tr>
<tr>
<td>AVS 3021</td>
<td>Livestock Selection and Evaluation I Laboratory</td>
<td>0</td>
<td>2</td>
<td>Non-credit laboratory to accompany AVS 3020. Coreq: AVS 3020.</td>
</tr>
<tr>
<td>AVS 3090</td>
<td>Principles of Equine Evaluation</td>
<td>2</td>
<td>4</td>
<td>Discusses the selection and evaluation of equines for various disciplines. Emphasizes current industry standards with regard to &quot;form to function. Students place classes of four horses and develop oral reasons to defend their placing. Opportunities for competitive horse judging teams are available.</td>
</tr>
</tbody>
</table>
AVS 3100 - Animal Health
3 Credits (3 Contact Hours)
Discusses basic principles of animal health. Emphasizes disease prevention in beef cattle, dairy cattle, goats, horses, poultry, and swine. The most common and important diseases and zoonosis of farm animals are explained. Preq: AVS 1500.

AVS 3110 - Dairy Cattle Selection
2 Credits (1 Contact Hours)
Dairy selection and evaluation methods are studied, including evaluation according to the Purebred Dairy Cattle Association scorecard, linear evaluation, pedigrees, and Dairy Herd Improvement Association records. Emphasizes presentation of oral reasons. Coreq: AVS 3111.

AVS 3111 - Dairy Cattle Selection Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 3110. Coreq: AVS 3110.

AVS 3150 - Animal Welfare
3 Credits (3 Contact Hours)
Discussion of past, present, and future human/animal interaction. Topics include wild animals, domestication, animal welfare organizations, animal rights organizations, welfare assessment, animal agriculture, animal research, and other current topics. Preq: Junior standing.

AVS 3230 - Poultry and Poultry Products Evaluation
2 Credits (4 Contact Hours)
Selection of layers, broilers, and turkeys. Grading of poultry products according to USDA grade standards is also studied. Students are eligible to compete in intercollegiate poultry judging contests. May be repeated for a maximum of four credits.

AVS 3600 - Internship
1-12 Credits (1-12 Contact Hours)
Off-campus, preplanned, reviewed, approved, and supervised educational experience in an area related to animal and veterinary sciences. Based on a multifaceted work experience in a highly structured professional environment. Students submit periodic written reports and a final written and oral report. To be taken Pass/No Pass only. Preq: Consent of instructor.

AVS 3700 - Principles of Animal Nutrition
3 Credits (3 Contact Hours)
Familiarizes students with nutrients and feeds used in livestock and specialty animal production. Methods of evaluating common feed-stuffs are covered along with a survey of the functioning of the various digestive systems. Practical aspect to feeding each species is covered. Includes Honors sections. Preq: AVS 1500 and CH 1020.

AVS 3750 - Applied Animal Nutrition
3 Credits (2 Contact Hours)
Students learn procedures for formulating diets that meet nutrient requirements of livestock and poultry, utilizing traditional mathematical approaches and computerized formulation. Computerized least-cost formulation of diets is covered along with familiarization with feeding systems and approaches. Includes Honors sections. Preq: AVS 3700. Coreq: AVS 3751.

AVS 3751 - Applied Animal Nutrition Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 3750. Coreq: AVS 3750.

AVS 3850 - Equine Behavior and Training
3 Credits (1 Contact Hours)
Introduces students to the concepts and theories of equine behavior and behavior modifications in preparation for gentling and riding young horses. Students explore welfare and behavior concepts related to horse training and the human-horse interactions associated with horse training techniques. Preq: Junior standing; and AVS 2040 or AVS 2080 or AVS 3090. Coreq: AVS 3851.

AVS 3851 - Equine Behavior and Training Laboratory
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany AVS 3850. Coreq: AVS 3850.

AVS 3860 - Advanced Equine Behavior and Training
2 Credits (6 Contact Hours)
Students train young horses advanced skills in western or English disciplines. Students actively prepare horses for show or sale and
participate in a show or marketing/sale of their assigned horse. Develops students' negotiation and communication skills, industry insight, and industry-specific jargon.

**AVS 3900 - Practicum**
1-3 Credits (1-3 Contact Hours)
On-campus, pre-planned, supervised learning experience in an area related to animal and veterinary sciences. Gives experience not covered in other classwork. May be repeated for a maximum of four credits. To be taken Pass/No Pass only. Preq: Consent of instructor supervising practicum.

**AVS 4000 - Animal and Veterinary Sciences Professional Development**
1 Credit (1 Contact Hours)
Career development in the animal and veterinary sciences field by resume and interview preparation, learning about career opportunities, and interaction with industry professionals.

**AVS 4010 - Beef Production**
4 Credits (3 Contact Hours)
Discusses breeding, feeding, reproduction, and management of beef cattle. Emphasizes production systems integrating disciplines of animal agriculture into management plans and alternatives. Practical applications of beef production and management practices are also presented. Includes Honors sections. Preq: AVS 3700. Coreq: AVS 4011.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4011 - Beef Production Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 4010. Coreq: AVS 4010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4050 - Advanced Selection and Evaluation**
2 Credits (4 Contact Hours)
Special and advanced training in selection and evaluation of breeding, performance, and market animals or their products. Species used are beef and dairy cattle, sheep, swine, and horses. Preq: AVS 3020 or AVS 3090 or AVS 3110 or FDSC 3040; and consent of instructor.

**AVS 4060 - Seminars and Related Topics**
2 Credits (2 Contact Hours)
Students conduct in-depth library research on current topics related to animal science and give formal presentations using multimedia technology. Preq: Senior standing.

**AVS 4090 - Selected Topics**
1-3 Credits (1-3 Contact Hours)
Topics of interest to students at the undergraduate, graduate, and professional levels. Provides experience with problems not covered in other courses or on thesis research. May be repeated for a maximum of six credits, but only if different topics are covered.

**AVS 4100 - Domestic Animal Behavior**
3 Credits (3 Contact Hours)
Provides knowledge and understanding of behavior related to perception, learning, sociality, reproduction, feeding, and health for application in production, training, and design of environments for optimum health and welfare of domestic animals. Preq: AVS 1500 and AVS 1510; and Junior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4110 - Animal Growth and Development**
3 Credits (3 Contact Hours)
Integration of the nutritional, physiological, and genetic basis for animal growth and development with application to livestock and poultry production. Includes the cellular and molecular mechanisms controlling these processes and emphasizes the genes that regulate animal products (meat, eggs, wool, and milk). Preq: AVS 3010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4120 - Advanced Equine Management**
4 Credits (3 Contact Hours)
Further discussion of special considerations of the equine regarding housing, manure management, nutrition, reproduction, transportation, and behavior. Students gain insight into how horses differ from other livestock species and their unique requirements for the above
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4121 - Advanced Equine Management Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 4120. Coreq: AVS 4120.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4130 - Animal Products**
3 Credits (2 Contact Hours)
Introduction to the safe and humane production of red meat, poultry, and dairy products. Includes HACCP principles and production of value-added animal products. Coreq: AVS 4131.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4131 - Animal Products Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AVS 4130. Coreq: AVS 4130.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS (BIOL, MICR) 4140 - Basic Immunology**
3 Credits (3 Contact Hours)
Introduction to the immune system of vertebrate animals, with an emphasis on structure, function, regulation, and cellular and molecular mechanisms of immune responses. May also be offered as BIOL 4140 or MICR 4140. Preq: BIOL 4610 and MICRO 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4150 - Contemporary Issues in Animal Science**
3 Credits (3 Contact Hours)
Provides knowledge, understanding, and critical analytical skills on current issues in animal agriculture in diverse regional, national, and global social-cultural and political environments as they impact animals and man. Preq: Junior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4160 - Equine Exercise Physiology**
4 Credits (3 Contact Hours)
Integration of muscle, bone, cartilage, cardiovascular, and respiratory systems as related to the equine athlete. Encompasses biomechanics, kinetics, and kinesiology related concepts specific to the horse. Further discussion of diseases related to specific systems is covered. Preq: AVS 3010. Coreq: AVS 4161.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4161 - Equine Exercise Physiology Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 4160. Coreq: AVS 4160.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4170 - Animal Agribusiness Development**
2 Credits (1 Contact Hours)
Team-based development of a business relating to the animal industries. Students develop the business from the initial idea through operations. Focuses on the development of the business plan, including financials, personnel management, and resources needed. Preq: ACCT 2010; and ECON 2110 or ECON 2120. Coreq: AVS 4171.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4171 - Animal Agribusiness Development Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 4170. Coreq: AVS 4170.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
AVS 4200 - Poultry Science On-line
3 Credits (3 Contact Hours)
On-line course covering the physiology, nutrition, health, reproduction, genetics, breeding, housing, and management of commercial poultry species, including the processing of meat and egg products.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AVS 4220 - Special Problems
1-3 Credits (1-3 Contact Hours)
Laboratory, library, or field study of problems related to animal and veterinary sciences, emphasizing development and testing of hypothesis and reporting of results. May be repeated for a maximum of four credits. Preq: Junior standing and consent of instructor supervising study.

AVS (BIOL, MICR) 4240 - Immunology Laboratory
1 Credits (3 Contact Hours)
This course is designed to apply the knowledge gained in MICR 4140, Immunology lecture, in an applied setting. The experiments in this beginning immunology laboratory are designed to study both the innate and acquired immune systems. Experimentation into the formation, function and detection of antibodies provides students with skills in basic immunologic techniques. May also be offered as BIOL 4240 or MICR 4240. Preq or concurrent enrollment: MICR 4140.

AVS 4410 - Animal and Veterinary Sciences Teaching Experience
1-3 Credits (1-3 Contact Hours)
Formal teaching experience related to animal and veterinary sciences supervised by a faculty member. May involve classroom instruction, educational material development, and/or student evaluation and assessment. Students submit periodic written reports and a final written and oral report. May be repeated for a maximum of four credits. To be taken Pass/No Pass only. Preq: Consent of instructor.

AVS 4420 - Animal and Veterinary Sciences Extension Experience
1-3 Credits (1-3 Contact Hours)
Formal experience in extension education. Students are involved in development, implementation, or assessment of adult or youth educational programs related to animal and veterinary sciences, under supervision of extension professionals. Students submit periodic written reports and a final written and oral report. May be repeated for a maximum of four credits. To be taken Pass/No Pass only. Preq: Consent of instructor.

AVS 4430 - AVS International Experience
1-3 Credits (1-3 Contact Hours)
Preplanned and approved international education/cultural experience supervised by an Animal and Veterinary Sciences faculty member. Periodic reports or record keeping are required. Final report and oral presentation are required at the end of the experience. May be repeated for a maximum of four credits. To be taken Pass/No Pass only. Preq: Consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AVS 4440 - AVS Animal Agribusiness Travel Experience
2 Credits (1 Contact Hours)
Classroom and travel course to expose students to animal production operations, agribusiness, and industry leaders across various geographical areas. Travel is conducted during spring break and includes visits to farms, universities, and agribusinesses. Additional fee is required. To be taken Pass/Fail only. Preq: Junior standing in Animal and Veterinary Sciences and consent of instructor. Coreq: AVS 4441.

AVS 4441 - AVS Animal Agribusiness Travel Experience Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 4440. Coreq: AVS 4440.

AVS 4500 - Sustainable Livestock Production Systems
4 Credits (3 Contact Hours)

AVS 4501 - Sustainable Livestock Production Systems Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 4500. Coreq: AVS 4500.

AVS 4530 - Animal Reproduction
3 Credits (2 Contact Hours)
Reproductive physiology and endocrinology of animals with emphasis on farm animals. Reference is also made to reproduction in companion animals, wildlife, laboratory animals and humans. Includes Honors sections. Preq: AVS 1500 and AVS 3010. Coreq: AVS 4531.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4531 - Animal Reproduction Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AVS 4530. Coreq: AVS 4530.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4550 - Animal Reproductive Management**
2 Credits (1 Contact Hours)
Physiology and endocrinology of pregnant and nonpregnant farm animals are discussed. Techniques such as advanced reproductive technologies, breeding and pregnancy detection and record keeping to improve reproductive efficiency may be included. Different sections may emphasize individual species of agricultural importance. Preq: AVS 1500 and AVS 3010. Preq or concurrent enrollment: AVS 4530. Coreq: AVS 4551.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4551 - Animal Reproductive Management Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AVS 4550. Coreq: AVS 4550.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4650 - Animal Physiology I**
3 Credits (3 Contact Hours)
Advanced study of the physiological systems of domestic animals as these systems relate to the integrated functions of the body. Exposes students to advanced physiological concepts and current literature perspectives on a variety of body systems and processes. Students are expected to have completed introductory coursework in physiology and biochemistry.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4670 - Animal Physiology II**
3 Credits (3 Contact Hours)
Advanced course extending coverage of major and current topics in animal physiology across species not previously covered in AVS 4650. Major topics include digestive physiology in nonruminant and ruminant species, reproductive physiology, muscle physiology, and general aspects of avian physiology. Students are expected to have completed introductory coursework in physiology and biochemistry.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4700 - Animal Genetics**
3 Credits (3 Contact Hours)
Fundamental principles relating to the breeding and improvement of livestock, including variation, heredity, selection, linebreeding, inbreeding, crossbreeding, and other related subjects. Includes Honors sections.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS (BIOL) 4800 - Vertebrate Endocrinology**
3 Credits (3 Contact Hours)
Introduction to the basic principles of neuro-endocrine integration and homeostatic maintenance in vertebrates. Comparative morphology and physiology of various endocrine tissues and hormone chemistry and modes of action are considered. May also be offered as BIOL 4800. Preq: BIOL 3030. Students who have not completed BIOL 3030, but who have completed coursework in organic chemistry, may request an override from the instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AVS 4910 - Animal and Veterinary Sciences Undergraduate Research Experience**
1-3 Credits (1-3 Contact Hours)
Formal laboratory, library, or field study of problems related to animal and veterinary sciences, emphasizing hypothesis development, testing, and reporting results. Projects are preplanned, reviewed, and approved. Students submit periodic written reports and final written
and oral reports. May be repeated for a maximum of four credits. Preq: Consent of instructor.

**Anthropology**

**ANTH 2010 - Introduction to Anthropology**
3 Credits (3 Contact Hours)
Offers a four-field overview: primates and human biological origins; the development of agriculture and complex societies in the archaeological record; contemporary human societies cross-culturally; and the relationship between languages and cultures. An anthropological perspective on contemporary human problems is also presented. Includes Honors sections.

**ANTH 2050 - Professional Development**
2 Credits (2 Contact Hours)
Explores anthropology as a profession and examines the opportunities associated with an Anthropology major at Clemson University. Focus is on preparation for a range of careers related to anthropology and the resources and skills that contribute to professional success. Preq: ANTH 2010 and Anthropology major.

**ANTH 3010 - Cultural Anthropology**
3 Credits (3 Contact Hours)

**ANTH 3200 - North American Indian Cultures**
3 Credits (3 Contact Hours)
Discusses the prehistory of Native peoples, their cultural diversity at European contact, and the history and impact of that contact. Also examines contemporary issues facing Native Americans. Preq: ANTH 2010.

**ANTH 3310 - Archaeology**
4 Credits (3 Contact Hours)
Overview of anthropological archaeology emphasizing the scientific analyses, methodologies and theoretical approaches used by anthropological archaeologists to study the human past. Students learn about the origins and development of complex society and explore individual case studies. Coreq: ANTH 3311.

**ANTH 3311 - Archaeology Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ANTH 3310. Coreq: ANTH 3310.

**ANTH 3320 - World Archaeology**
3 Credits (3 Contact Hours)
Global survey of the earliest complex societies focusing on the origins of "pristine states" from the perspective of anthropological archaeology. Following a brief overview of archaeological methods and approaches, students learn about the origins of complex societies of Mesopotamia, the Indus Valley, Egypt, China, Mesoamerica, and the Andes.

**ANTH (BIOL) 3510 - Biological Anthropology**
3 Credits (3 Contact Hours)
Study of humans as biological organisms. Examines human evolution, primate social behavior, human physiological variations and disease resistance, and human skeletal anatomy and forensics. May also be offered as BIOL 3510. Preq: ANTH 2010; or BIOL 1030 and BIOL 1050; or BIOL 1040 and BIOL 1060; or BIOL 1100.

**ANTH (BIOL) 3530 - Forensic Anthropology**
3 Credits (3 Contact Hours)
Introduction to forensic anthropology, the science that utilizes methods from skeletal biology and archaeology as tools in human identification in a medico-legal context. May also be offered as BIOL 3530. Preq: Junior standing.

**ANTH (LANG) 3710 - Language and Culture**
3 Credits (3 Contact Hours)
Surveys key topics, theories, and methodological approaches in linguistic anthropology. Examines the complex relationships among language, culture, and communicative behavior and provides students with conceptual tools that inform the study of language in its cultural contexts. May also be offered as LANG 3710.

**ANTH 3910 - Medical Anthropology**
3 Credits (3 Contact Hours)
Offers an introduction to medical anthropology, emphasizing the interdisciplinary and cross-cultural perspective in studying health, illness and medicine; provides a survey of major theoretical frames, concepts and methods in the field; and attends to application of anthropology in medicine, nursing and public health in the emerging global context. May also be offered as LANG 3910. Preq: Junior standing.

ANTH 4030 - Qualitative Methods
3 Credits (3 Contact Hours)
Methods and techniques of qualitative field research, including participant observation, ethnographic interviewing, data analysis, and report writing. Preq: ANTH 2010. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ANTH 4040 - Anthropological Theories
3 Credits (3 Contact Hours)
Examines various anthropological theories and their utility in explaining contemporary global issues. Students read, discuss and compare original theoretical works, and synthesize ideas through class writings and debates. Preq: ANTH 3010.

ANTH (JAPN) 4170 - Japanese Culture and Society
3 Credits (3 Contact Hours)
Focuses on basic themes in Japanese culture found in social interaction and ritual behavior. Japanese social organization, including marriage and family patterns, neighborhood and community organization, and gender roles receive extensive attention. All readings and discussions are in English. May not be used to satisfy general modern language requirements. May also be offered as JAPN 4170.

ANTH (CHIN) 4180 - Chinese Culture and Society
3 Credits (3 Contact Hours)
Examines basic cultural values and the patterns of Chinese social life. Focuses on Chinese social organization and interpersonal dynamics, including the family system, gender identities, social exchanges and networks. All readings and discussions are in English. May not be used to satisfy general modern language requirements. May also be offered as CHIN 4180.

ANTH (WS) 4230 - Women in the Developing World
3 Credits (3 Contact Hours)
Comparative anthropological study of women and their status in developing countries around the world. A survey of women's daily lives in a global context, emphasizing education, economics, and the environment. Case studies include microfinance, literacy, reproductive rights and practices, and the impact of religious fundamentalism on women. May also be offered as WS 4230. Preq: Sophomore standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ANTH 4250 - Field Studies in Cultural Anthropology
1-6 Credits (1-6 Contact Hours)
Group field project in settings selected by the instructor to provide students with a variety of exposures to various cultural contexts. Project progress and student interpretations of findings are monitored by periodic group meetings and shared experiences. May be repeated for a maximum of six credits. Preq: Consent of instructor.

ANTH 4280 - Law, Culture and Society
3 Credits (3 Contact Hours)
Introduces anthropological approaches to the study of law. The power of language, the identity of legal subjects, intellectual property, postsocialist property relations, international disputes, human rights, and legal pluralism are examined. Students are encouraged to think critically about the place of law in human society. Preq: ANTH 2010 or JUST 2880 or SOC 2010.

ANTH 4350 - Field Studies in Archaeology
1-6 Credits (1-6 Contact Hours)
Students conduct fieldwork and research at an archaeological site, and gain experience in survey, mapping, excavation, cataloging and preliminary analysis of artifacts.

ANTH (BIOL) 4510 - Biological Variation in Human Populations
3 Credits (3 Contact Hours)
Provides an in-depth discussion of the most influential topics in human skeletal biology. Course explores the history and ethical dilemmas of the field, and examines how biological anthropologists use skeletons to reconstruct patterns of diet, disease, demography and physical activity in human populations. May be offered as BIOL 4510. Preq: ANTH 2010.

ANTH 4530 - Human Remains Recovery
3 Credits (3 Contact Hours)
Provides an introduction to forensic anthropology field methods. Students locate, excavate, and recover simulated human remains,
associated personal effects, and other materials from both surface scatters and simulated clandestine graves. Students also learn the basics of human identification using simulated skeletal remains. Preq: Consent of instructor.

**ANTH 4550 - Field Studies in Biological Anthropology**
1-6 Credits (1-6 Contact Hours)
Students participate in field study experiences related to biological anthropology. The focus of the field studies is on practical aspects of human skeletal biology, paleoanthropology, primate behavior, or other related field study. Students are trained in data collection methods and analysis utilized within biological anthropology. May also be offered as BIOL 4550. Preq: Consent of instructor.

**ANTH (BIOL) 4660 - Evolution of Human Behavior**
3 Credits (3 Contact Hours)
Familiarizes students with the evolutionary basis of human behavior. Examines topics such as altruism, cooperation, mating systems, parental investment, and social systems using diverse examples, from hunter-gatherer to technological societies. May also be offered as BIOL 4660. Preq: ANTH 3510 or BIOL 3350 or BIOL 4700. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ANTH (BIOL) 4740 - Primatology**
4 Credits (3 Contact Hours)
Biology of nonhuman primates, including their evolution, taxonomy, physiology, life history, behavioral ecology and conservation. Three field trips are required, during which students conduct behavioral observations and later analyze their data and present it in report format. May also be offered as BIOL 4740. Preq: ANTH 3510 or BIOL 3510; and either BIOL 1110 or both BIOL 1040 and BIOL 1060. Coreq: ANTH 4741. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ANTH (BIOL) 4741 - Primatology Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ANTH 4740. May also be offered as BIOL 4741. Coreq: ANTH 4740. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ANTH 4950 - Field Studies**
1-6 Credits (1-6 Contact Hours)
Group field project in settings selected by the instructor to provide students with a variety of exposures to various cultural contexts. Archaeological digs are included. Project progress and student interpretations of findings are monitored by periodic group meetings and shared experiences.

**ANTH 4960 - Creative Inquiry**
1-3 Credits (1-3 Contact Hours)
Investigates topics in anthropology selected by faculty and students. Goals, research, and outcomes vary from semester to semester and project to project. May be repeated for a maximum of 12 credits. Preq: ANTH 2010 and consent of instructor.

**ANTH 4980 - Independent Study**
1-3 Credits (1-3 Contact Hours)
Individual readings or projects in anthropological areas not covered in other courses. May be repeated for a maximum of six credits with advisor's approval. Preq: ANTH 2010 and consent of instructor.

**ANTH 4990 - Special Topics**
1-3 Credits (1-6 Contact Hours)
Anthropological topics of special interest are explored. May be repeated for a maximum of six credits if different topics are covered.

**Arabic**

**ARAB 1000 - Introduction to Arabic Conversation and Comprehension**
3 Credits (3 Contact Hours)
Introduction to the Arabic language and its different dialects and cultures. Also prepares students who wish to travel to Arabic speaking countries.

**ARAB 1010 - Elementary Arabic I**
4 Credits (3 Contact Hours)
Introductory course for beginners emphasizing acquisition of the Arabic alphabet and writing, basic grammar, vocabulary, speaking and listening skills, and developing strategies for the successful long-term acquisition of Arabic. Coreq: ARAB 1011.

**ARAB 1011 - Elementary Arabic I Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany ARAB 1010. Coreq: ARAB 1010.

**ARAB 1020 - Elementary Arabic II**
4 Credits (3 Contact Hours)
Continuation of ARAB 1010 consisting of three hours a week of classroom instruction and one hour a week in the language laboratory.

**ARAB 1021 - Elementary Arabic II Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany ARAB 1020. Coreq: ARAB 1020.

**ARAB 2010 - Intermediate Arabic I**
3 Credits (3 Contact Hours)

**ARAB 2011 - Intermediate Arabic I Laboratory**
0 Credits (1 Contact Hours)

**ARAB 2020 - Intermediate Arabic II**
3 Credits (3 Contact Hours)

**ARAB 2021 - Intermediate Arabic II Laboratory**
0 Credits (1 Contact Hours)

**ARAB 3050 - Intermediate Arabic Conversation and Composition**
3 Credits (3 Contact Hours)
Practice in modern standard Arabic with emphasis on vocabulary, pronunciation, intonation and comprehension. Includes written work to increase accuracy and assignments in the language laboratory. Preq: ARAB 2020.

**Architecture**

**ARCH 1010 - Introduction to Architecture**
3 Credits (6 Contact Hours)
This course serves as an introduction to the discipline and profession of architecture. Lectures cover a broad range of architectural issues, while the exercises and assignments give students the opportunity to build a strong foundation in visual studies.

**ARCH 1510 - Architecture Communication**
5 Credits (2 Contact Hours)
Introduction to principles and elementary vocabulary of architectural design. Collaborative studio which offers instruction in the specific skills of formal design composition, visual communication, oral presentation, and computer literacy. Preq: ARCH 1010. Coreq: ARCH 1511.

**ARCH 1511 - Architecture Communication Laboratory**
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany ARCH 1510. Coreq: ARCH 1510.

**ARCH 1520 - Collaborative Studio II**
3 Credits (1 Contact Hours)
Continuation of ARCH 1510. Introduction to an elemental vocabulary of architecture within basic spatial design problems, emphasizing
visual communications skills, oral presentations of work, and analysis and discussion of design issues through critical readings of canonical texts and buildings. Preq: ARCH 1510. Coreq: ARCH 1521.

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Contact Hours</th>
<th>Description</th>
<th>Preq/ Coreq</th>
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<tbody>
<tr>
<td>ARCH 1521</td>
<td>Collaborative Studio II Laboratory</td>
<td>0</td>
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<td>Non-credit laboratory to accompany ARCH 1520. Coreq: 1520.</td>
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<td>ARCH 2040</td>
<td>History of Modern Architecture</td>
<td>3</td>
<td>3</td>
<td>Survey of the modern period featuring special topics in the history of architecture. Emphasis is on typologies, historical antecedents and European precedents which give shape to buildings in the period of study. Key aspects of architectural theory and practice will be highlighted. Preq: AAH 1020.</td>
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<td>ARCH 2510</td>
<td>Architecture Foundations I</td>
<td>6</td>
<td>2</td>
<td>Architectural analysis and design problems with a focus on understanding the context of architecture. Specific investigation of buildings as part of the cityscape and the landscape. Instruction on visual communications skills, computer modeling, and oral presentation techniques support the design discussions. Preq: ARCH 1510. Coreq: ARCH 2511.</td>
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<td>Architecture Foundations I Laboratory</td>
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<td>ARCH 2520</td>
<td>Architecture Foundations II</td>
<td>6</td>
<td>2</td>
<td>Continuation of ARCH 2510. Architectural design problems with a focus on structural and construction principles and their relationship to contextual situations. Instruction in oral communication skills and computer graphics support the design discussions. Preq: ARCH 2510. Coreq: ARCH 2521.</td>
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<td>Non-credit laboratory to accompany ARCH 2520. Coreq: ARCH 2520.</td>
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<td>ARCH 2700</td>
<td>Structures I</td>
<td>3</td>
<td>3</td>
<td>The study of statically determinate structural elements and systems including load tracing through physical modeling and theoretical and analytical analysis, the interrelationship between stress and strain, stability and the implication of tension, compression, shear torsion and bending. Preq: PHYS 2070 and PHYS 2090.</td>
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<tr>
<td>ARCH 2710</td>
<td>Structures II</td>
<td>3</td>
<td>3</td>
<td>The study of force distributions and behavior in building structures constructed of reinforced concrete, steel and wood. Exploration of typical building components including beams, slabs, columns and foundations and how they are used in high-rise and long span structural design. Preq: ARCH 2700 or CSM 2010.</td>
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<tr>
<td>ARCH 3500</td>
<td>Introduction to Urban Contexts</td>
<td>6</td>
<td>12</td>
<td>Addresses architectural problems related to urban contexts, and studies architectural resolutions that explore the interface between buildings and the public realm for particular sites. Introduces urban design fundamentals, building egress codes, and zoning, and promotes continued development of architectural, graphic and oral communication skills. Design problems vary every semester according to current issues.</td>
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<tr>
<td>ARCH 3510</td>
<td>Studio Clemson</td>
<td>6</td>
<td>1</td>
<td>Addresses architectural problems with varied scales, programs, and locations. Emphasizes the relationship between architecture and context. Projects include analysis, conceptual development, and architectonic resolutions. Continued development of graphic and oral communication skills. Design problems vary every semester according to current issues. May be repeated for a maximum of 18 credits. Preq: ARCH 2520. Coreq: ARCH 3511.</td>
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<tr>
<td>ARCH 3511</td>
<td>Studio Clemson Laboratory</td>
<td>0</td>
<td>11</td>
<td>Non-credit laboratory to accompany ARCH 3510. Coreq: ARCH 3510.</td>
<td></td>
</tr>
</tbody>
</table>
ARCH 3520 - Studio Charleston
6 Credits (1 Contact Hours)
Addresses architectural problems with varied scales and programs in the context of Charleston, South Carolina. Emphasizes the relationship between architecture and context. Projects include analysis, conceptual development, and architectonic resolutions. Continued development of graphic and oral communication skills. Design problems vary every semester according to current issues. May be repeated for a maximum of 12 credits. Preq: ARCH 2520. Coreq: ARCH 3521.

ARCH 3521 - Studio Charleston Laboratory
0 Credits (11 Contact Hours)
Non-credit laboratory to accompany ARCH 3520. Coreq: ARCH 3520.

ARCH 3530 - Studio Genoa
6 Credits (1 Contact Hours)
Addresses architectural problems with varied scales and programs in the context of Genoa, Italy, and historic Europe. Emphasizes the relationship between architecture and context. Projects include analysis, conceptual development, and architectonic resolutions. Design problems vary every semester according to current issues. Continued development of graphic and oral communication skills. May be repeated for a maximum of 12 credits. Preq: ARCH 2520. Coreq: ARCH 3531.

ARCH 3531 - Studio Genoa Laboratory
0 Credits (11 Contact Hours)
Non-credit laboratory to accompany ARCH 3530. Coreq: ARCH 3530.

ARCH 3540 - Studio Barcelona
6 Credits (1 Contact Hours)
Addresses architectural problems with varied scales and programs in the context of Barcelona, Spain. Emphasizes the relationship between architecture and context. Projects include analysis, conceptual development, and architectonic resolutions. Continued development of graphic and oral communication skills. Design problems vary every semester according to current issues. May be repeated for a maximum of 12 credits. Preq: ARCH 2520. Coreq: ARCH 3541.

ARCH 3541 - Studio Barcelona Laboratory
0 Credits (11 Contact Hours)
Non-credit laboratory to accompany ARCH 3540. Coreq: ARCH 3540.

ARCH 3550 - Studio South
6 Credits (1 Contact Hours)
Addresses architectural problems with varied scales and programs in the context of the South. Emphasizes the relationship between architecture, community, and context. Projects include analysis, conceptual development, and architectonic resolutions. Continued development of graphic and oral communication skills. Design problems vary every semester according to current issues. May be repeated for a maximum of twelve credits. Preq: ARCH 2520. Coreq: ARCH 3551.

ARCH 3551 - Studio South Laboratory
0 Credits (11 Contact Hours)
Non-credit laboratory to accompany ARCH 3550. Coreq: ARCH 3550.

ARCH 4010 - Architectural Portfolio
3 Credits (3 Contact Hours)
Continues portfolio development for Architecture students, including professional portfolio, academic portfolio, and digital portfolio. Preq: ARCH 2520.

ARCH 4030 - The Modern Architectural Movement
3 Credits (3 Contact Hours)
Seminar in the analysis and criticism of architectural and town building works. Course sequence includes historic and contemporary examples, literary searches, field trips, essays, and oral reports. Preq: Senior standing.

ARCH 4040 - Current Directions in Architecture
3 Credits (3 Contact Hours)
Critical analysis of the development and current directions of modern movements in architecture. Preq: Senior standing.

ARCH 4050 - American Architectural Styles 1650 to 1950
3 Credits (3 Contact Hours)
Survey of American architectural styles and of the architects responsible for them, from the Colonial period to our recent past. Considerable emphasis is placed on identifying those architectural elements which serve as clues in determining a building's architectural
style. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ARCH 4120 - Architectural History Research**  
3 Credits (3 Contact Hours)  
Directed investigations related to the art and architectural history of Europe. May be repeated for a maximum of six credits. Preq: Junior standing.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ARCH 4140 - Design Seminar**  
3 Credits (3 Contact Hours)  
Exploration of topical issues in architecture, art, construction, and planning. May be repeated for a maximum of six credits. Preq: Junior standing.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ARCH 4160 - Field Studies in Architecture and Related Arts**  
3 Credits (3 Contact Hours)  
Documentation and analysis of architectural structures observed during off-campus travels in graphic and written form. May be repeated for a maximum of six credits. Preq: Junior standing.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ARCH 4210 - Architectural Seminar**  
3 Credits (3 Contact Hours)  
Lectures and seminars dealing with pertinent topics related to environmental and technological considerations in architecture and the building industry. Preq: Senior standing.

**ARCH 4240 - Product Design**  
3 Credits (9 Contact Hours)  
Furniture and product system design with emphasis on ergonomics and the relationship of form and materials. Preq: Senior standing.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ARCH 4250 - Energy in Architecture**  
3 Credits (3 Contact Hours)  
Climate design methodology and its influence on building energy patterns and architectural form. Preq: Senior standing and consent of instructor.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ARCH 4260 - Architectural Color Graphics**  
3 Credits (3 Contact Hours)  
Architectural color graphics by computer. Theories of color classification and interaction; application of color theories to art and architecture. Preq: Consent of instructor.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ARCH 4270 - Advanced Color Graphics**  
3 Credits (3 Contact Hours)  
Theories of color classification and interaction; three-dimensional color modeling by computer; advanced application of color theories to art and architecture. Preq: ARCH 4260.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ARCH 4280 - Computer-Aided Design**  
3 Credits (2 Contact Hours)  
Introduction to the concepts, skills, and applications of computer-aided design as they relate to the practice of architecture. Preq: Senior standing. Coreq: ARCH 4281.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
ARCH 4281 - Computer-Aided Design Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ARCH 4280. Coreq: ARCH 4280.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ARCH 4290 - Architectural Graphics
3 Credits (3 Contact Hours)
Provides students with an understanding of the concepts, skills, techniques, and strategies of visual presentation and graphics as they relate to the design professions: architects/landscape architects. Preq: Junior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ARCH 4300 - Theories and Philosophies of Technology and Architecture
3 Credits (3 Contact Hours)
Theoretical and practical examination of technology and architecture from pre-modern and modern viewpoints to study its nonneutral role in shaping and reflecting knowledge, beliefs, and actions within a cultural context.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ARCH 4400 - New York Field Study
3 Credits (3 Contact Hours)
Study of architecture, art, planning, and urban design of New York. Two weeks of residence are required with scheduled field trips to relevant sites in all five boroughs, with counseling to determine research interests. Guidance is provided to resources in the city. A final report is required. Offered in the summer only.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ARCH 4510 - Architecture Studio III
6 Credits (11 Contact Hours)

ARCH 4520 - Synthesis Studio
6 Credits (1 Contact Hours)
Integrates acquired skills, abilities, and interests from previous architecture studios. Projects emphasize the accumulation of architectural experiences and knowledge. Preq: Senior standing. Coreq: ARCH 4521.

ARCH 4770 - Introduction of Craft
1-3 Credits (1-3 Contact Hours)
Architectural craft lab offered under different material specializations, all of which introduce students to design as informed by craft through a hands-on lab. Basic craft operations and material properties are introduced for the subject material (wood, steel, etc.) May be repeated for a maximum of six credits.
ARCH 4850 - History and Theory of Architecture + Health
3 Credits (3 Contact Hours)
Introduces relationships between health and architectural settings for health. Examines connections between cultural context, medical thought, health-care delivery, and health facility design within different time periods. Introduces contemporary theories on the relationships between human beings, their health and well-being, and the design of the physical environment. Preq: Consent of instructor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ARCH 4880 - Architectural Programming and Predesign
3 Credits (3 Contact Hours)
Introduces the theory, mechanics, and practice of architectural programming and post-occupancy evaluation. Presents programming as a means to create architectural settings sensitive to the needs of their inhabitants. Emphasizes collaborative methodologies that involve identifying relevant goals, facts, issues, needs, and concepts. Students develop an architectural program. Preq: Consent of instructor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ARCH 4890 - Internship
1-6 Credits (1-6 Contact Hours)
Practicum in professional practice. Paid work/study in a variety of related disciplines provides students with hands-on experience in design and fabrication fields relevant to the environmental design professions. Consists of two parts: a professional component, managed by an approved sponsor, and an academic component, taught by the instructor. May be repeated for a maximum of 18 credits. Preq: Consent of instructor and acceptance by sponsor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ARCH 4900 - Directed Studies
1-5 Credits (1-5 Contact Hours)
Comprehensive studies and research of special topics not covered in other courses. Emphasis is on field studies, research activities, and current developments in architecture. May be repeated for a maximum of ten credits. Includes Honors sections. Preq: Consent of department chair. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ARCH 4990 - Selected Topics in Architecture
1-3 Credits (1-3 Contact Hours)
Study of selected topics in architecture. May be repeated for a maximum of nine credits, but only if different topics are covered. Includes Honors sections. Preq: Junior standing.

Art

ART 1030 - Visual Arts Studio
3 Credits (6 Contact Hours)
Studio projects in basic visual elements and principles. The development of creative design process, visual organization, and design skills are introduced as a foundation for further study in visual arts.

ART 1050 - Foundation Drawing I
3 Credits (3 Contact Hours)
Introduction to drawing. Presents exploration of observational drawing practices with an emphasis on structural investigations of form and application of spatial systems. Basic materials and approaches associated with drawing are studied and applied. Preq: Visual Arts major.

ART 1060 - Foundation Drawing II
3 Credits (3 Contact Hours)
Further exploration of introductory drawing. Emphasizes use of tone and color. Students work primarily with representational categories, developing comprehension of complex forms and spaces in relation to the 2-D planes. Includes use of rigorous observational drawing practices in conjunction with thematic efforts. Preq: ART 1050 or ART 1510.

ART 1510 - Foundations in Visual Art I
3 Credits (6 Contact Hours)
Intensive introduction to the fundamentals of visual art. Studio projects, lectures, and discussions introduce topics and projects relative to foundation-level art students. Explores historical and contemporary applications of the elements and principles of design. Preq: Visual Arts major.
ART 1520 - Foundations in Visual Art II
3 Credits (6 Contact Hours)
Intensive introduction to the fundamentals of visual art. Studio projects, lectures, and discussions introduce topics and projects relative to foundation-level art students. Explores historical and contemporary applications of the elements and principles of design. Preq: Visual Arts major.

ART 1530 - Orientation to Visual Arts I
1 Credit (1 Contact Hours)
Introduction to the visual arts profession focusing on issues related to various career opportunities, creativity, problem-solving methodologies, and current thinking in contemporary art. Preq: Visual Arts major.

ART 2050 - Beginning Life Drawing
3 Credits (6 Contact Hours)
Primary emphasis is on drawing from the live model. Students' drawing skills and fundamental understanding of the structure and form of the human figure are reviewed through studio practice, augmented by lectures, discussions, demonstrations, and critiques. Addresses historical and contemporary use of the human figure in visual arts. Preq: ART 1060 or ART 1510 or ART 1520.

ART 2070 - Beginning Painting
3 Credits (6 Contact Hours)
Introduction to basic materials, methods, and techniques of painting. Primary medium used is acrylic, and other painting media may also be introduced. Emphasizes basic skills in painting plus individual creative development. Preq: ART 1510 and ART 1530 and ART 2050 (Visual Arts majors); ART 1030 (non-Art Majors); ARCH 1520 (Architecture majors); LARC 1520 (Landscape Architecture majors).

ART 2090 - Beginning Sculpture
3 Credits (6 Contact Hours)
Studio course investigating the meaning of sculpture through traditional and nontraditional approaches. Establishes a working knowledge of material and process in several media. Personal expression is encouraged and enhanced by employment of problem-solving techniques. Static, temporal, installation, and site specific sculpture is explored. Preq: ART 1510 and ART 1520 and ART 1530 and ART 1540 and ART 2050 (Visual Arts majors); ART 1030 (non-Art majors); ARCH 1520 (Architecture majors); LARC 1520 (Landscape Architecture majors).

ART 2100 - Art Appreciation
3 Credits (3 Contact Hours)
One-semester lecture survey that introduces the nonmajor to an overview of art and architecture from different time periods and cultures. Students are encouraged to appreciate the contribution to art made by the great masters and to discern different styles, art techniques, and creative traditions. Includes Honors sections.

ART 2110 - Beginning Printmaking
3 Credits (6 Contact Hours)
Studio course introducing basic techniques of relief printing, intaglio, lithography, silkscreen, and papermaking. Each semester concentrates on two or three of these techniques. Coursework integrates print-making processes and creativity. Preq: ART 1510 and ART 1520 and ART 1530 and ART 1540 and ART 2050 (Visual Arts majors); ART 1030 (non-Art majors); ARCH 1520 (Architecture majors); LARC 1520 (Landscape Architecture majors).

ART 2130 - Beginning Photography
3 Credits (6 Contact Hours)
Introduction to the use of photography as an art medium. Lectures and studio work cover the utilization of the camera, processing, and printing in black and white, with emphasis on perception and creative expression. Preq: ART 1510 and ART 1520 and ART 1530 and ART 1540 and ART 2050 (Visual Arts majors); ART 1030 (non-Art majors); ARCH 1520 (Architecture majors); LARC 1520 (Landscape Architecture majors).

ART 2150 - Beginning Graphic Design
3 Credits (6 Contact Hours)
Introduction to fundamental techniques, concepts, and principles of visual communication. Through a series of projects and studio work, students explore techniques of communication through the use of type design, typography, photography, illustration, symbolism, and product design. Individual creative development is stressed. Preq: ART 1510 and ART 1520 and ART 1530 and ART 1540 and ART 2050 (Visual Arts majors); ART 1030 (non-Art majors); ARCH 1520 (Architecture majors); LARC 1520 (Landscape Architecture majors).

ART 2170 - Beginning Ceramics
3 Credits (6 Contact Hours)
Basic studio course introducing ceramic arts through its various processes and techniques. Hand building methods as well as throwing on the potter's wheel are developed. Weekly projects emphasize imagination, self-expression, and skill development. Ceramic history is
introduced through slide lectures. Preq: ART 1510 and ART 1520 and ART 1530 and ART 1540 and ART 2050 (Visual Arts majors); ART 1030 (non-Art majors); ARCH 1520 (Architecture majors); LARC 1520 (Landscape Architecture majors).

**ART 2210 - Beginning New Media**
3 Credits (6 Contact Hours)
Explores new media art practices and ideas. Digital tools and processes are explored relative to drawing, painting, printing, bookmaking, and photography. Introduces new media as a context of new collective, interactive, and social modes of art production. Preq: ART 1060 and ART 1510 and ART 1520.

**ART 2230 - Woodworking Studio**
3 Credits (6 Contact Hours)
Introduces woodworking explorations in sculpture and furniture design emphasizing technical understanding and creative application of woodworking processes and methodologies. Students experiment with wood as a vehicle for personal expression and thematic development and conduct research on the historical impact of woodworking in the visual arts. Preq: ART 1510; and one of ART 1520 or ARCH 1520 or LARC 1520.

**ART 3050 - Intermediate Drawing**
3 Credits (6 Contact Hours)
Presents drawing problems and processes directed toward the production of thematically driven projects. Exploration of diverse drawing media. Emphasizes further development of drawing skills, relationships of materials/techniques to subject matter, and the study of contemporary issues in drawing. Preq: ART 2050.

**ART 3070 - Painting**
3 Credits (6 Contact Hours)
Continuation of ART 2070 with increased emphasis on personal expression and growth in technical competence. Some study of painting history is included in studio activity. Preq: ART 2070.

**ART 3090 - Sculpture**
3 Credits (6 Contact Hours)
Continuation of ART 2090 with increased emphasis on personal expression and content of work. Further exploration of materials and processes, including an introduction to foundry casting and advanced welding techniques. Individual investigation into current and historical aspects of sculpture is required. Preq: ART 2090.

**ART 3110 - Printmaking**
3 Credits (6 Contact Hours)
Continuation of processes in beginning printmaking emphasizing expanding the range and depth of technique. The relationship of technique and process to creative idea development is emphasized. Preq: ART 2110.

**ART 3120 - Printmaking Research I**
1-3 Credits (1-3 Contact Hours)
Continuation of ART 3110. Technical and conceptual research in printmaking to develop self-expression. Special projects are constructed in consultation with instructor. May be repeated for a maximum of five credits. Preq: ART 3110.

**ART 3130 - Photography**
3 Credits (6 Contact Hours)
Continuation of ART 2130. Advanced techniques and more diverse types of film and paper are used in making images of personal and expressive nature. The design and construction of a view camera, printing in color, and multiple imagery may also be included. Preq: ART 2130.

**ART 3150 - Graphic Design**
3 Credits (6 Contact Hours)
Continuation of concepts and techniques introduced in ART 2150 with emphasis on more applied projects. Individual creative solutions are emphasized. Preq: ART 2150.

**ART 3170 - Ceramic Arts**
3 Credits (6 Contact Hours)
Continuation of skill development leading to more challenging projects and independent efforts. Further exposure to ceramic history and ceramic technology is presented. Preq: ART 2170.

**ART 3180 - Ceramics Research I**
1-3 Credits (1-3 Contact Hours)
Continuation of ART 3170. Technical and conceptual research in ceramics for the purpose of self-expression. Projects are constructed in consultation with instructor. May be repeated for a maximum of five credits. Preq: ART 3170.
ART 3210 - New Media Art II
3 Credits (6 Contact Hours)
Intermediate-level course that introduces students to time-based art practices such as video art, installation, and performance art forms. Through regularly scheduled studio projects, readings, and screenings, students develop video, installation, and motion graphic techniques, and receive a historical overview of time-based art practices. Preq: ART 2210.

ART 3230 - Digital Sculpture
3 Credits (6 Contact Hours)
Studio course covering digital processes applied to making sculpture. Explores digital media as a resource for creative development, creating digital renderings of sculptures, and the fabrication of models and sculptures using CNC technology. Preq: ART 2090 and ART 3210.

ART 3550 - Atelier InSite Creative Inquiry I
1-3 Credits (2-6 Contact Hours)
An in-depth examination and research of Site Specific Public Art as it currently exists. Course provides critically considered and appropriate artwork for new building projects on the Clemson University campus. Open to students from a wide variety of programs who are interested in this interdisciplinary collaborative endeavor.

ART 3570 - Community Supported Art - Creative Inquiry
1-3 Credits (2-6 Contact Hours)
Examination and research of arts non-profit fundraising models in various iterations. This course provides a sampling of professional marketing, social networking and other professional development practices for artists and arts organizations through real-world problem solving and application on the Clemson University campus or in the surrounding community. May be repeated for a maximum of nine credits.

ART 3750 - Writing for the Arts in Charleston
3-6 Credits (3-6 Contact Hours)
Using Charleston's international Spoleto Festival USA as a laboratory, students engage in interdisciplinary, critical readings and observations of multiple elements of performing and visual arts programs, and write extensively about their place in a global, contemporary society. Students develop professional and technological literacies using print and digital media. Offered summer only. May be repeated for a maximum of six credits. Preq: ENGL 1030.

ART 4050 - Advanced Drawing
3 Credits (6 Contact Hours)
Advanced level studies of drawing which explore the synthesis of refined drawing skills and philosophies of art. Students' understanding of drawing as a form of art is developed through studio practice augmented by critiques, demonstrations, lectures, field trips, and independent research. Preq: ART 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ART 4070 - Advanced Painting
3 Credits (6 Contact Hours)
Advanced studio course in painting. Students select painting media and develop a strong direction based on prior painting experience. Includes study of contemporary painters and directions. Preq: ART 3070.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ART 4090 - Advanced Sculpture
3 Credits (6 Contact Hours)
Intensive independent studio concentration to further develop personal direction and content. Emphasizes continued investigation of sculptural context, materials and processes, and relative historical research. Preq: ART 3090.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ART 4110 - Advanced Printmaking
3 Credits (6 Contact Hours)
Culmination of process, techniques, and individual development. Students are expected to have mastered process and technique for the benefit of the image produced. Creativity and self-expression are highly emphasized as students select a process for concentrated study. Preq: ART 3110.

ART 4130 - Advanced Photography
3 Credits (6 Contact Hours)
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ART 4150 - Advanced Graphic Design**
3 Credits (6 Contact Hours)
Continuation of ART 3150. Personal expression through communication techniques is further explored. Individual projects are emphasized. Preq: ART 3150.

**ART 4160 - Advanced Media Art: Interactive Objects and Environments**
3 Credits (6 Contact Hours)
Students apply advanced media art production skills to create objects and environments that respond to user input or interaction. Tools used may include, but are not limited to, microcontrollers, sensors, RFID systems and electronic circuits, as well as traditional input devices. Preq: ART 3210.

**ART 4170 - Advanced Ceramic Arts**
3 Credits (6 Contact Hours)
Students are directed toward further development of ideas and skills. Glaze calculation and firing processes are incorporated to allow for a dynamic integration of form and ideas. Preq: ART 3170.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ART 4200 - Selected Topics in Art**
1-3 Credits (1-3 Contact Hours)
Intense course in studio art. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Senior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ART 4210 - Two-Dimensional Digital Animation**
3 Credits (6 Contact Hours)
Exposes students to the principles of animation with traditional techniques, while incorporating the latest 2-D digital tools. Students also develop interactive animations and showcase their work via the Internet. Preq: ART 3210.

**ART 4550 - Atelier InSite Creative Inquiry II**
1-3 Credits (2-6 Contact Hours)
An in-depth examination and research of Site Specific Public Art as it currently exists. Course provides critically considered and appropriate artwork for new building projects on the Clemson University campus. Continuation of ART 3550. Open to students from a wide variety of programs who are interested in this interdisciplinary collaborative endeavor. Preq: ART 3550.

**ART 4710 - Bachelor of Fine Arts Senior Studio I**
3 Credits (6 Contact Hours)
Individual studio project directed by an instructor and determined by the student in consultation with the instructor. Focuses on a particular studio area, concept, or theme. May be repeated for a maximum of six credits. Preq: Senior standing and completion of 3000/4000 sequence in the chosen studio area, minimum grade-point average of 3.0 in focus studio area, participation in senior studio interview. Coreq: ART 4730.

**ART 4720 - Bachelor of Fine Arts Senior Studio II**
4 Credits (12 Contact Hours)
Individual studio project directed by an instructor and determined by the student in consultation with the instructor. Usually focuses upon a particular studio area, concept, or theme. Preq: ART 4710 with a B or better.

**ART 4730 - Senior Seminar in Professional Career Preparation**
3 Credits (3 Contact Hours)
Seminar and practical guide to prepare students for entry into the professional art world. Focuses on issues concerning visual artists in the early years of their professional activities. Presents career options and practical information for the graduating senior, including portfolio development. Coreq: ART 4710.

**ART 4740 - Travel Seminar**
1 Credits (1 Contact Hours)
Students travel with faculty to museums, galleries and festivals that directly affect studio practice, art history knowledge and engagement in historical and contemporary art practice. Students plan trips, conduct research, keep a journal and make presentations on works and sites
visited and matters pertaining to professional practice. To be taken Pass/Fail only. May be repeated for a maximum of three credits. Preq: Junior standing.

**ART 4750 - Senior Exhibition Internship**
1 Credits (3 Contact Hours)
Students complete various projects related to their BFA Senior Exhibition during this weekly internship through Clemson University's Lee Gallery. The internship compliments the BFA studio curriculum by providing students access to professional practices in exhibition design and execution. Preq: ART 4710.

**ART 4890 - Art and Art History Internship**
1-3 Credits (1-3 Contact Hours)
Internship with an approved sponsoring art institution in support of professional development and best art practices. May be repeated for a maximum of six credits. Preq: Junior standing in Visual Arts and consent of instructor and acceptance by sponsor.

**ART 4900 - Directed Studies**
1-5 Credits (1-5 Contact Hours)
Study of areas in the visual arts not included in other courses or additional advanced work. Must be arranged with a specific instructor prior to registration. May be repeated for a maximum of 18 credits. Includes Honors sections. Preq: Consent of instructor.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**Art and Architectural History**

**AAH 1010 - Survey of Art and Architectural History I**
3 Credits (3 Contact Hours)
Comprehensive survey of art and architectural history of Western heritage as well as significant coverage of Asian, African, Native American, and South American art. The arts are studied within the contexts of history, geography, politics, religion, and culture. Survey includes Ancient through Gothic. Includes Honors sections.

**AAH 1020 - Survey of Art and Architectural History II**
3 Credits (3 Contact Hours)

**AAH 2030 - History and Theory of Architecture I**
3 Credits (3 Contact Hours)
First in a two-semester sequence of special topics and issues in the history of architecture. Emphasizes architectural theory and practice in the past and present. Includes analysis of differing approaches to history: chronological, typological, thematic, phenomenological. Includes Honors sections. Preq: AAH 1020.

**AAH 2040 - History and Theory of Architecture II**
3 Credits (3 Contact Hours)

**AAH 2050 - History and Theory of Art I**
3 Credits (3 Contact Hours)
First of a two-semester sequence on special topics and issues in the history of art. Emphasizes stylistic developments and specific art movements. Analyzes art within the larger context of social, political, and religious history. Examines art techniques and theory as they have developed. Includes Honors sections. Preq: AAH 1020.

**AAH 2060 - History and Theory of Art II**
3 Credits (3 Contact Hours)
Second of a two-semester sequence on special topics and issues in the history of art. Continued emphasis on stylistic developments and art movements, with specific attention directed toward post-Renaissance art. Analyzes the influence of past history on modern. Includes Honors sections. Preq: AAH 2050.

**AAH 3050 - Contemporary Art History**
Study of contemporary art from World War II to the present, exploring forces that have shaped various movements and directions. Preq: AAH 2060.

**AAH 3300 - Honors Colloquium**
3 Credits (0 Contact Hours)
Undergraduate honors colloquium emphasizing interdisciplinary interpretations. Focuses on an integration of art, architecture, landscape, and city planning. Preq: AAH 2040 or AAH 2060.

**AAH 3950 - Special Topics in Visual Studies Abroad I**
3 Credits (3 Contact Hours)
On-site exposure to art and architecture in foreign countries, coupled with lectures and study problems. Different countries may be selected for study at faculty discretion. May be taught as a compact course during the academic year with a short stay in a foreign country or during summer with extended foreign experience. May not be taken Pass/No Pass. Preq: AAH 2040 or AAH 2060.

**AAH 4110 - Directed Research in Art History I**
3 Credits (3 Contact Hours)
Comprehensive studies and research of special topics not covered in other courses. Emphasis is on field studies, research activities, and current developments in art history. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AAH 4120 - Directed Research in Art History II**
3 Credits (3 Contact Hours)
Continuation of AAH 4110. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AAH 4230 - Studies in the Art and Architecture of the Renaissance I**
3 Credits (3 Contact Hours)
Consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th century through the 18th century), with a study in depth of selected examples from the period. Preq: AAH 2040 or AAH 2060. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AAH 4240 - Studies in the Art and Architecture of the Renaissance II**
3 Credits (3 Contact Hours)
Consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th century through the 18th century), with a study in depth of selected examples from the period. Preq: AAH 4230. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AAH 4300 - Twentieth Century Art I**
3 Credits (3 Contact Hours)
Acquaints students with the major artists' monuments and issues of the Modern period in art. Through lectures and discussions and the reading of primary sources, course places the major modern movements in the context of the period (1860s through 1945). Preq: Consent of instructor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**AAH 4320 - Twentieth Century Art II**
3 Credits (3 Contact Hours)
Overview of trends in art and architecture since World War II. Specific artists, artworks, and movements are presented in a socio/historic context with specific emphasis on the transition from a late-modernist to a post-modern perspective. Preq: Consent of instructor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**Astronomy**

**ASTR 1010 - Solar System Astronomy**
3 Credits (3 Contact Hours)
Descriptive survey of the universe, with emphasis on basic physical concepts and the objects in our solar system. Related topics of current interest are included. For nonscience majors.

**ASTR 1020 - Stellar Astronomy**
3 Credits (3 Contact Hours)
Descriptive survey of the universe, with emphasis on basic physical concepts and galactic and extragalactic objects. Related topics of current interest are included. For nonscience majors. May not be taken by students who have completed ASTR 3020.

**ASTR 1030 - Solar System Astronomy Laboratory**
1 Credits (2 Contact Hours)
Optional laboratory to accompany ASTR 1010. Demonstrations, laboratory exercises, and planetarium visits supplement the lecture course. Preq or concurrent enrollment: ASTR 1010.

**ASTR 1040 - Stellar Astronomy Laboratory**
1 Credits (2 Contact Hours)
Optional laboratory to accompany ASTR 1020. Demonstrations, laboratory exercises, and planetarium visits supplement the lecture course. Preq or concurrent enrollment: ASTR 1020.

**ASTR 1050 - Physics of the Universe**
3 Credits (3 Contact Hours)
Basic physics principles of Newtonian mechanics, special and general relativity, quantum mechanics, atomic structure, thermal physics, optics, and radiation physics are qualitatively and quantitatively presented. These principles are then applied to demonstrate their usefulness in understanding fundamental astrophysical objects and processes in the cosmos. Preq: MATH 1050.

**ASTR (GEOL) 2200 - Planetary Science**
3 Credits (3 Contact Hours)
Survey of the formation and evolution of planetary bodies. Emphasizes the origin of planetary material and comparative study of the primary processes operative on planetary surfaces. Describes major features of the planets and moons in our solar system, as revealed by recent space missions. May also be offered as GEOL 2200.

**ASTR 3020 - Stellar Astrophysics**
3 Credits (3 Contact Hours)
Study of the basic physical concepts necessary for understanding the sun, other stars, and their evolution. Topics include star formation, stellar structure and evolution, binary stars, and observational techniques. Preq: PHYS 2210.

**ASTR 3030 - Galactic Astrophysics**
3 Credits (3 Contact Hours)
Study of basic physical concepts necessary for understanding the structure of the galaxy, the motions of the stars within it, the nature of the interstellar matter, other galaxies, the large-scale structure of the universe, and the origin of the solar system. Preq: PHYS 2210.

**ASTR 4750 - Selected Topics in Astrophysics**
1-3 Credits (1-3 Contact Hours)
Comprehensive study of an area of astrophysics. Topics may include nucleosynthesis and stellar evolution, extragalactic distance scale, structure and evolution of galaxies, and large-scale structure of the universe. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: ASTR 3020.

**Athletic Leadership**

**AL 3440 - Athletics and Woman: Current and Historical Issues**
3 Credits (3 Contact Hours)
Addresses the various roles of women in the athletic environment, from high school to intercollegiate athletics to professional levels, and considers the psychology of female athletes, the differences between coaching men and coaching women, and leadership strategies for women.

**AL 3490 - Principles of Coaching**
3 Credits (3 Contact Hours)
Investigation into the scientific basis of the coaching profession, middle and high school levels. Topics include developing a coaching philosophy, sport psychology, sport pedagogy, sport physiology, athletic administration, and risk management. Current issues regarding sportsmanship, gender equity compliance, and cultural diversity are researched and synthesized.
AL 3500 - Scientific Basis of Coaching I: Exercise Physiology
3 Credits (3 Contact Hours)
Increases understanding of basic scientific information concerning athletic performance by using the conceptual approach. Focuses primarily on an in-depth investigation into the physiological principles that can enhance athletic performance. Includes phases of physical training as well as comprehensive evaluative techniques. Preq or concurrent enrollment: AL 3490 or AL 3520 or BIOL 2200 or BIOL 2230.

AL 3510 - National Coach Certification Preparation for Athletic Leadership
1-3 Credits (2-6 Contact Hours)
In this course, those with a duty to act learn the skills needed to respond appropriately to cardiac and breathing emergencies. Each participant learns to become a more responsible coach and when and how to safely return an athlete to play. Students also learn to use an Automated External Defibrillator (AED) to care for victims of cardiac arrest, and receive American Red Cross CPR certification in the context of sport safety training as outlined in the National Standards for Sport Coaches.

AL 3520 - Scientific Basis of Coaching II: Kinesiology
3 Credits (3 Contact Hours)
Increases understanding of basic scientific information concerning athletic movement by utilizing the conceptual approach. Deals with the basic laws of human motion necessary in evaluation of athletic movement, utilizing joint structure and anatomic landmarks as a basis for motion. Preq or concurrent enrollment: AL 3530 or AL 3500 or BIOL 2200 or BIOL 2230.

AL 3530 - Theory of Prevention and Treatment of Athletic Injuries
3 Credits (2 Contact Hours)
Increases understanding of principles involved in the prevention and treatment of athletic injuries. Deals with basic anatomy, first aid, and diagnostic techniques necessary for the understanding of basic athletic training procedures. Preq or concurrent enrollment: AL 3490 or BIOL 2200 or BIOL 2230 or ED 3220 or LS 2750 or LS 2760 or LS 2770 or PRTM 3510. Coreq: AL 3531.

AL 3531 - Theory of Prevention and Treatment of Athletic Injuries Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AL 3530. Coreq: AL 3530.

AL 3600 - High School Athletics Ethical and Legal Issues
3 Credits (3 Contact Hours)
Investigates ethical and legal issues specific to high school athletic program administration as identified by the National Interscholastic Athletic Administrators Association (NIAAA) Leadership Program and addressed by the National Association for Sport and P.E. (NASPE) National Standards for Sport Coaches. Preq: Completion of or concurrent enrollment in AL 3490; or junior standing with a minimum GPA of 2.3.

AL 3610 - Administration and Organization of Athletic Programs
3 Credits (3 Contact Hours)
Study of modern techniques and practices used in administering athletic programs. Emphasizes areas such as practice and game organization, purchase and care of equipment, budget and finances, public relations, and legal liability in athletic programs. Preq or concurrent enrollment: AL 3490 or PRTM 2230 or PRTM 2240.

AL 3620 - Psychology of Coaching
3 Credits (3 Contact Hours)
Study of psychological techniques utilized to promote maximum athletic performance. Emphasizes motivation, coaching philosophy, athletic personality, mental preparation, and goal-oriented behavior. Preq or concurrent enrollment: AL 3490 or PSYC 2010.

AL 3710 - Coaching Baseball
1 Credit (3 Contact Hours)
Increases understanding of basic technical and practical information concerning the coaching of baseball by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. Preq: Completion of or concurrent enrollment in AL 3490; or junior standing with a minimum GPA of 2.3.

AL 3720 - Coaching Basketball
1 Credit (3 Contact Hours)
Increases understanding of basic technical and practical information concerning the coaching of basketball by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. Preq: Completion of or concurrent enrollment in AL 3490; or junior standing with a minimum GPA of 2.3.
AL 3730 - Coaching Cross Country  
1 Credits (3 Contact Hours)  
Increases understanding of technical and practical information concerning the coaching of cross country by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. Preq: Completion of or concurrent enrollment in AL 3490; or junior standing with a minimum GPA of 2.3.

AL 3740 - Coaching Football  
1 Credits (3 Contact Hours)  
Increases understanding of basic technical and practical information concerning the coaching of football by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. Preq: Completion of or concurrent enrollment in AL 3490; or junior standing with a minimum GPA of 2.3.

AL 3750 - Coaching Soccer  
1 Credits (3 Contact Hours)  
Increases understanding of basic technical and practical information concerning the coaching of soccer by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. Preq: Completion of or concurrent enrollment in AL 3490; or junior standing with a minimum GPA of 2.3.

AL 3760 - Coaching Strength and Conditioning  
1 Credits (3 Contact Hours)  
Increases understanding of basic technical and practical information concerning the coaching of strength and conditioning by utilizing the conceptual approach. Students study basic principles of coaching, training programs, and equipment appraisal as a means to improve athletic performance. Also covers total program development as it pertains to specific levels of competition. Preq: Completion of or concurrent enrollment in AL 3490; or junior standing with a minimum GPA of 2.3.

AL 3770 - Coaching Track and Field  
1 Credits (3 Contact Hours)  
Increases understanding of basic technical and practical information concerning the coaching of track and field by utilizing the conceptual approach. Students study basic principles of coaching, competitive organization, and proper technical skills needed to improve athletic performances. Also covers total program development as it pertains to specific levels of competition. Preq: Completion of or concurrent enrollment in AL 3490; or junior standing with a minimum GPA of 2.3.

AL 4000 - Athletic Leadership Internship  
0 Credits (3 Contact Hours)  
Athletic coaching and administration internship for a minimum of 60 hours. To be taken concurrently with any other Clemson University course. To be taken Pass/No Pass only. Students must have current CPR certification. Preq: Consent of Athletic Leadership coordinator.

AL 4380 - Selected Topics in Athletic Leadership  
1-3 Credits (1-3 Contact Hours)  
Specific athletic leadership topics not found in other courses are selected for in-depth study. May be repeated for a maximum of nine credits, but only if different topics are covered.

AL 4390 - Independent Study in Athletic Leadership  
1-3 Credits (1-3 Contact Hours)  
Independent study in athletic leadership under the direction of an athletic leadership faculty member. Student and faculty member develop a course of study different from any existing courses and designed for the individual student to enhance leadership skills in athletics. May be repeated for a maximum of nine credits with different course topics.

AL 4530 - Athletic Injuries: Prevention, Assessment and Rehabilitation  
3 Credits (3 Contact Hours)  
Gives students an understanding of prevention, treatment, and rehabilitation procedures of injured athletes. Preq: Completion of or concurrent enrollment in AL 3490; or junior standing with a minimum GPA of 2.3.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

Audio Technology
AUD 1850 - Introduction to Audio Technology
3 Credits (2 Contact Hours)

AUD 1851 - Introduction to Audio Technology Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AUD 1850. Coreq: AUD 1850.

AUD 1950 - Creative Inquiry I
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

AUD 2790 - Audio Practicum
3 Credits (1 Contact Hours)
Practical work in audio providing technical services to the broader university and surrounding community. Projects include recording live performances, sound support for public events, and audio support for film and animation projects. May be repeated for a maximum of six credits. Preq: AUD 3800 with a C or better. Coreq: AUD 2791.

AUD 2791 - Audio Practicum Laboratory
0 Credits (5 Contact Hours)
Non-credit laboratory to accompany AUD 2790. Coreq: AUD 2790.

AUD 2800 - Sound Reinforcement
3 Credits (2 Contact Hours)

AUD 2801 - Sound Reinforcement Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AUD 2800. Coreq: AUD 2800.

AUD 2850 - Acoustics of Music
3 Credits (3 Contact Hours)
Study of the relationship between the laws of physics and the production of music from an audio engineering perspective. Topics include mechanical and acoustical laws, harmonic analysis, musical scales, sound production in instruments, and the physiology of hearing. Preq: Production Studies in Performing Arts major.

AUD 2950 - Creative Inquiry II
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

AUD 3800 - Audio Engineering I
3 Credits (2 Contact Hours)
Intermediate-level course in music technology focusing on digital hard-disk recording and acoustical considerations in audio engineering. Preq: PHYS 1220 with a C or better or PHYS 2070 with a C or better; and MUSC 1800 with a C or better or AUD 1850 with a C or better. Coreq: 3801.

AUD 3801 - Audio Engineering I Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AUD 3800. Coreq: AUD 3800.

AUD 3850 - Advanced Live Sound Reinforcement
3 Credits (2 Contact Hours)
Advanced course in live sound reinforcement focused on digital consoles and sound system design. Preq: AUD 2800 with a C or better. Coreq: AUD 3851.

AUD 3851 - Advanced Live Sound Reinforcement Laboratory
AUD 3860 - Electronic Composition and Sound Design
3 Credits (2 Contact Hours)
Intermediate- to advanced-level course covering techniques, methods and issues associated with electronic music composition and production. Topics include advanced MIDI/sequencing techniques, electronic orchestral arrangements, scoring/sound design, and picture and audio processing. Preq: AUD 1850 or MUSC 1800. Coreq: AUD 3861.

AUD 3861 - Electronic Composition and Sound Design Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AUD 3860. Coreq: AUD 3860.

AUD 3890 - Creative Inquiry III
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

AUD 4800 - Audio Engineering II
3 Credits (2 Contact Hours)
Advanced course in music technology focused on music production integrating digital audio and virtual instruments. Preq: AUD 2850; and AUD 3800; and PHYS 2080 or PHYS 2210; each with a C or better. Coreq: AUD 4801.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AUD 4801 - Audio Engineering II Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AUD 4800. Coreq: AUD 4800.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

AUD 4850 - Production Workshop
3 Credits (2 Contact Hours)
Project-based course focused on music production. Students produce an audio CD that includes recorded audio tracks and/or newly-created sequenced material with creative and appropriate packaging. Preq: AUD 4800 with a C or better. Coreq: AUD 4851.

AUD 4851 - Production Workshop Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany AUD 4850. Coreq: AUD 4850.

AUD 4950 - Creative Inquiry IV
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

AUD 4990 - Independent Study in Audio Technology
1-3 Credits (1-3 Contact Hours)
Tutorial work for students with special interests in audio study outside the scope of existing courses. May be repeated for a maximum of six credits. Preq: Consent of department chair.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

Automotive Engineering

AUE 4010 - Vehicle Dynamics
4 Credits (3 Contact Hours)
Fundamental concepts in the dynamic behavior of ground vehicles, mainly two- and four-wheeled vehicles, are discussed. The application of dynamic systems modeling and analysis are stressed to bring understanding to ride performance, handling and straight-line running. Practical considerations in vehicle design and its influence on vehicle performance are discussed. Preq: ME 3050. Coreq: AUE 4011.
AUE 4011 - Vehicle Dynamics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany AUE 4010. Coreq: AUE 4010.

AUE 4020 - Automobile Powertrain Systems
4 Credits (3 Contact Hours)
Addresses key aspects of automobile powertrain engineering, from government regulation to sub-system design. Powertrain operational requirements are discussed in the context of vehicle-level performance, fuel economy and emissions. The function, design, performance and engineering requirements of engines, transmissions, electric motors and high voltage batteries are described in detail. Preq: ENGR 1410 and ME 3030. Coreq: AUE 4021.

AUE 4030 - Automotive Engineering Project Tools
2 Credits (2 Contact Hours)
This team-based project course covers state-of-the-art analysis tools and methods for executing automotive system/subsystem design and integration. Topics include automotive development processes, hands-on training on select design software covering different disciplines, and team projects utilizing the same. Preq: ENGR 1410 and ENGR 2080.

AUE 4040 - Automotive Engineering Project Prototyping and Validation
2 Credits (2 Contact Hours)
In this project-based course, student teams develop and validate prototype automotive systems, sub-systems or components. Lectures cover select topics related to product prototyping and validation, such as design for manufacturing, machining, 3D printing, welding, wiring, instrumentation, data acquisition, assembly, experimental design, data analysis and interpretation. Preq: AUE 4030.

Biochemistry

BCHM 1030 - Careers in Biochemistry and Genetics
1 Credit (1 Contact Hours)
Introduces students to biochemistry and genetics career paths, professional organizations, ethical issues, and requirements for advanced study. Also gives students training in design of a professional portfolio. Credit toward a degree will be given for only one of BCHM 1030, GEN 1030. Preq: Biochemistry or Genetics major.

BCHM 3010 - Molecular Biochemistry
3 Credits (3 Contact Hours)
Introduces the nature, production, and replication of biological structure at the molecular level and its relation to function. Includes Honors sections. Preq: BIOL 1100 with a C or better. Preq or concurrent enrollment: CH 2230 with C or better.

BCHM (GEN) 3040 - Molecular Biology Laboratory
2 Credits (4 Contact Hours)
Introduces fundamental molecular biology laboratory techniques commonly used in biochemistry, genetics, and molecular biology research. Principles and applications of these techniques are also discussed. May also be offered as GEN 3040. Preq: BIOL 1100. Preq or concurrent enrollment: BCHM 3010 or GEN 3020.

BCHM 3050 - Essential Elements of Biochemistry
3 Credits (3 Contact Hours)
Introduction to structure, synthesis, metabolism and function of biomolecules in living organisms. Preq: BIOE 1010 or BIOL 1030 or BIOL 1100. Preq or concurrent enrollment: CH 2010 or CH 2230.

BCHM 4060 - Physiological Chemistry
3 Credits (3 Contact Hours)
Studies chemical basis of the mammalian physiological processes of muscle contraction, nerve function, respiration, kidney function, and blood homeostasis. Discusses composition of specialized tissue such as muscle, nerve, blood, and bone and regulation of water, electrolytes, and acid-base balance. Preq: BCHM 3050 or CH 2230 or CH 2100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BCHM 4230 - Principles of Biochemistry
3 Credits (3 Contact Hours)
Study of the chemistry of amino acids, monosaccharides, fatty acids, purines, pyrimidines, and associated compounds leads to an understanding of their properties and the relationship between structure and function that makes them important in biological processes. The use of modern techniques is stressed. Preq: CH 2240.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BCHM 4310 - Physical Approach to Biochemistry**
3 Credits (3 Contact Hours)
Study of chemical and physical properties of amino acids, lipids, nucleic acids, sugars, and their biopolymers. Physical and mathematical analyses are correlated with biological structure and function. Includes Honors sections. Preq: BCHM 3010 with a C or better. Preq or concurrent enrollment: CH 3300 or CH 3310.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BCHM 4320 - Biochemistry of Metabolism**
3 Credits (3 Contact Hours)
Study of the central pathway of carbohydrate, lipid, and nucleotide metabolism. Emphasizes bioenergetics, limiting reactions, and the regulation and integration of the metabolic pathways. Includes Honors sections. Preq: BCHM 3010 and BCHM 4310, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BCHM 4330 - Physical Approach to Biochemistry Laboratory**
2 Credits (4 Contact Hours)
Experiments to illustrate current methods used in biochemical research. Preq or concurrent enrollment: BCHM 4310.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BCHM 4340 - Biochemistry of Metabolism Laboratory**
2 Credits (4 Contact Hours)
Experiments are conducted to illustrate current methods used in metabolic biochemical research. Preq: Concurrent enrollment in BCHM 4320.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BCHM 4360 - Molecular Biology: Genes to Proteins**
3 Credits (3 Contact Hours)
Examines how nucleic acids and proteins are synthesized in prokaryotic and eukaryotic cells. Designed for students interested in biochemistry, cell biology, molecular biology, and cell physiology. Includes Honors sections. Preq: BCHM 3010 and GEN 3020, each with C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BCHM (GEN) 4400 - Bioinformatics**
3 Credits (3 Contact Hours)
Theory and application of computational technology to analysis of the genome, transcriptome, and proteome. Includes Honors sections. May also be offered as GEN 4400. Preq: BCHM 3010 or BCHM 3050 or GEN 3000 or GEN 3020, with C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BCHM 4430 - Molecular Basis of Disease**
3 Credits (3 Contact Hours)
Topics in heritable human metabolic disorders, including clinical features and newborn screening, genetic testing, the biochemical basis, and treatment. Preq: BCHM 3010 or BCHM 3050 with a C or better; and GEN 3000 or GEN 3020 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BCHM 4900 - Selected Topics in Biochemistry**
1-4 Credits (1-4 Contact Hours)
Comprehensive study of selected topics not covered in other courses. May be repeated for a maximum of eight credits, but only if different topics are covered. Preq: Consent of instructor.

**BCHM 4910 - Directed Research in Biochemistry**
1-8 Credits (3-24 Contact Hours)
Orientation in biochemical research (i.e., experimental planning, execution and reporting). May be repeated for a maximum of 20 credits. Includes Honors sections. Preq: Consent of instructor.
**BCHM 4920 - Honors Thesis in Biochemistry**  
1 Credits (1 Contact Hours)  
Students complete a senior thesis and oral presentation detailing their honors research in biochemistry. Preq or concurrent enrollment: Students are expected to have completed or be concurrently enrolled in their second semester of an Honors section of BCHM 4910 for a minimum of four credits when registering for this course.

**BCHM 4930 - Senior Seminar**  
2 Credits (2 Contact Hours)  
Analysis and discussion of papers from the primary literature in the life sciences particularly in biochemistry. Students find pertinent articles in the primary literature and present and analyze the selected reading. Includes Honors sections. Preq: BCHM 3010 and GEN 3020, each with a C or better; and one of BCHM 4310 or BCHM 4320 or BCHM 4360 with a C or better.

**Bioengineering**

**BIOE 1010 - Biology for Bioengineers**  
1 Credits (1 Contact Hours)  
Provides basic introduction to fundamental principles of molecular and cellular biology. Preq: CH 1010.

**BIOE 2000 - Bioengineering Professional Development**  
0 Credits (1 Contact Hours)  
Provides an introduction to the professional opportunities available for bioengineering students. Students learn best practices and prepare for a bioengineering career. To be taken Pass/No Pass only. Preq: Sophomore standing in bioengineering.

**BIOE 2010 - Introduction to Biomedical Engineering**  
3 Credits (3 Contact Hours)  
Provides engineering, biological, and physical science students with an overview of the replacement of human body parts and the problems related to artificial devices. Preq: CH 1020; and one of BIOE 1010 or BIOL 1030 or BIOL 1100.

**BIOE 3000 - Bioengineering Ethics and Entrepreneurship**  
0 Credits (1 Contact Hours)  
Introduction to the ethical considerations of performing human and animal research in support of medical technology development. Students are exposed to fundamental business concepts related to translating technology to the marketplace. To be taken Pass/No Pass only. Preq: BIOE 2000.

**BIOE 3020 - Biomaterials**  
3 Credits (2 Contact Hours)  
Study of metallic, ceramic, and polymer materials used for surgical and dental implants; materials selection, implant design, physical and mechanical testing; corrosion and wear in the body. In addition, physical and mechanical properties of tissue as related to microstructure are studied. Preq: BIOE 2010 and MSE 2100; and either both CH 2010 and CH 2020, or both CH 2230 and CH 2270. Coreq: BIOE 3021.

**BIOE 3021 - Biomaterials Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany BIOE 3020. Coreq: BIOE 3020.

**BIOE 3100 - Engineering Analysis of Physiological Processes**  
4 Credits (3 Contact Hours)  
Application of knowledge of mathematics, science, and engineering to cellular systems physiology, including function, dysfunction, and the mechanisms that underlie treatment. Associated laboratory modules give students opportunity to design, conduct, and analyze experiments, to use the techniques, skills, and tools necessary for engineering practice. Preq: BIOE 1010 or BIOL 1030 or BIOL 1100. Coreq: BIOE 3101.

**BIOE 3101 - Engineering Analysis of Physiological Processes Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany BIOE 3100. Coreq: BIOE 3100.

**BIOE 3200 - Biomechanics**  
3 Credits (3 Contact Hours)  
Study of relation between biological and mechanical functions of musculoskeletal tissues such as bone, ligaments, muscles, cartilage, etc.; mechanics of human joints; analysis of implants and implant failure. Preq: CE 2010 and MATH 2080.
BIOE 3210 - Biofluid Mechanics
3 Credits (3 Contact Hours)
Introduces mechanics of biological fluids (e.g., blood, synovial fluid and physiological solutions) with an emphasis on the formation of biological problems within the context of (1) kinematics, (2) the concept of stress, (3) linear momentum balance, (4) constitutive relations and (5) boundary conditions. Preq: CE 2010 and MATH 2080.

BIOE 3470 - Transport Processes in Bioengineering
3 Credits (3 Contact Hours)
Introduction of fundamental engineering principles to analyze energy, mass and momentum transport in biomedical systems. Emphasis is placed on the development and solution of mathematical equations to describe transport processes and their application to understand how various parameters influence biomedical system behavior. Preq: MATH 2080 and MSE 2100. Preq or concurrent enrollment: MSE 3260.

BIOE 3700 - Bioinstrumentation and Bioimaging
3 Credits (2 Contact Hours)
Introduction of fundamental topics in bioinstrumentation and bioimaging focused on the acquisition and monitoring of vital signals. Basic principles for the selection and appropriate use of instruments for solving bioengineering and medical problems such as microscopy, magnetic resonance imaging, and ultrasounds, among others, are addressed. Preq: MATH 2080; and ECE 2020 or ECE 2070. Coreq: BIOE 3701.

BIOE 3701 - Bioinstrumentation and Bioimaging Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOE 3700. Coreq: BIOE 3700.

BIOE 4000 - Bioengineering Leadership and MedTech Commercialization
1 Credit (1 Contact Hours)
Introduction to common leadership techniques and managerial approaches. Students are exposed to various product/technology valuation techniques that contribute to how business decisions are made in the MedTech sector. To be taken Pass/No Pass only. Preq: BIOE 3000.

BIOE 4010 - Bioengineering Design Theory
3 Credits (3 Contact Hours)
Introduces principles of engineering design and applies them to the design of medical devices. Covers materials selection, fabrication processes, performance standards, cost analysis, and design optimization. Students defend a design project proposal in written and oral form before a faculty jury. Preq: BIOE 3020 or BIOE 3200 or BIOE 3700.

BIOE 4020 - Biocompatibility
3 Credits (2 Contact Hours)
Guides students through the theory and practice of determining compatibility of biomaterials and medical devices as required by the FDA. Hands-on experiments emphasize host-implant interactions such as toxicity towards tissues using specific techniques, including cell culture, implantation of biomaterials in experimental animals and histopathology. Preq: BIOE 3020 and BIOL 4610. Coreq: BIOE 4021.

BIOE 4021 - Biocompatibility Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOE 4020. Coreq: BIOE 4020.

BIOE 4030 - Applied Biomedical Design
3 Credits (1 Contact Hours)
Creative application of bioengineering and design principles to solving clinically relevant design problems. Team-based development, construction and evaluation of design prototypes in accordance with design theory. Students present results to faculty jury and external collaborators through written reports and oral presentations. Preq: BIOE 4010. Coreq: BIOE 4031.

BIOE 4031 - Applied Biomedical Design Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany BIOE 4030. Coreq: BIOE 4030.

BIOE 4120 - Orthopaedic Engineering and Pathology
3 Credits (3 Contact Hours)
Interdisciplinary study of clinical orthopaedic cases (bone growth, bone remodeling, osteoarthritis, implant fixation and joint replacements); biomechanical, biomaterials, tribology and clinical diagnosis of failed implants (total joint replacements, fracture fixation and spinal instrumentation); basic concepts of orthopaedic pathology for engineers. Preq: BIOE 3020 and BIOE 3200; Preq or concurrent enrollment: BIOL 3150. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
BIOE 4150 - Research Principles and Concepts
1 Credit (1 Contact Hours)
Introduces seniors and graduate students to principles and practices of scientific research. Topics include developing scientific concepts, developing projects, pursuing research, collaborating in multidisciplinary teams, patenting and publishing technical and scientific information, and reviewing professional and ethical standards of performance. Includes Honors sections. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOE 4200 - Sports Engineering
3 Credits (3 Contact Hours)
Study of engineering principles involved in sports: body systems in human motion, analysis of gait, basic performance patterns in athletic movements, performance improvements, design of sports equipment. Preq: BIOE 3020 and BIOE 3200. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOE 4230 - Cardiovascular Engineering and Pathology
3 Credits (3 Contact Hours)
Medical and bioengineering aspects of artificial cardiovascular and vascular devices; physiology and pathological aspects of patients with need for such devices; diagnostic techniques and surgical management of diseases and pathology; design aspects of current devices and selection; state of the art in experiments and human clinical trials. Preq: BIOE 3020 and BIOL 3150; and either BIOE 3200 or BIOE 3210. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOE 4310 - Medical Imaging
3 Credits (2 Contact Hours)
Introduction to the history, physics, and basis of medical imaging devices; including X-ray, Computed Tomography, Magnetic Resonance Imaging, and Ultrasound. Students will understand imaging from both an engineering and clinical prospective. Students will have the opportunity to work with real medical-images, to understand the trade-offs between modalities. Preq: MATH 2080; and one of ECE 2020 or ECE 2070. Preq or concurrent enrollment: BIOE 3700. Coreq: BIOE 4311. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOE 4311 - Medical Imaging Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany BIOE 4310. Coreq: BIOE 4310. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOE 4350 - Computer Modeling of Multiphysics Problems
3 Credits (3 Contact Hours)
This course will introduce students to a holistic way to deal with complicated engineering problems using a computer modeling approach. For example, a real-world problem governed by combined mechanical, electrical, thermal, electrochemical and mass-transport phenomena will be dealt with in an integrated and multidisciplinary way rather than the conventional piece-wise single-discipline way. Preq: MATH 2080. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOE 4400 - Biopharmaceutical Engineering
3 Credits (3 Contact Hours)
This course examines the design principles necessary to use bacteria, fungi, and mammalian cells in bioengineering applications, including molecular techniques, fermentation, process scale-up, purification processes, and FDA regulations. The production of biopharmaceuticals derived from recombinant systems, including uses in medical systems, in emphasized. Preq: BCHM 3050. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOE 4480 - Tissue Engineering
3 Credits (2 Contact Hours)
Explores the application of engineering principles toward the development of biologically based substitutes that restore, maintain, or improve tissue function. Topics include biodegradable scaffolds, wound healing and tissue repair, cell-matrix interactions, immunology and biocompatibility, stem cells. Preq: BIOE 3020 and BIOL 3150. Preq or concurrent enrollment: BIOL 4610. Coreq: BIOE 4481.

BIOE 4481 - Tissue Engineering Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOE 4480. Coreq: BIOE 4480.

**BIOE 4490 - Drug Delivery**
3 Credits (3 Contact Hours)
Fundamental principles of controlled drug delivery including drug release mechanisms, physiological barriers, and various types of delivery routes. Specific emphasis is placed on understanding drug delivery technologies and processes to scale up the fabrication of drug delivery systems. Preq: BIOE 3020.

**BIOE 4500 - Special Topics in Bioengineering**
1-4 Credits (1-4 Contact Hours)
Comprehensive study of a topic of current interest in the field of biomedical engineering under the direct supervision and guidance of a faculty member. May be repeated for a maximum of six credits, but only if different topics are covered. Includes Honors sections. Preq: Consent of instructor.

**BIOE 4510 - Creative Inquiry in Bioengineering**
1-3 Credits (1-3 Contact Hours)
Disciplinary and multidisciplinary team research projects with the goal of developing the students' skills in literature research, engineering design, and data analysis. May be repeated. Preq: Consent of instructor.

**BIOE 4600 - International Bioengineering Research Topics**
1-6 Credits (1-6 Contact Hours)
Comprehensive study and research exposure relating to bioengineering research topics at an international institution through the Bioengineering study abroad program. Students are exposed to laboratory and research methods while under the direct supervision and guidance of approved international mentors. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Consent of instructor.

**BIOE 4610 - International Study in Bioengineering**
3 Credits (3 Contact Hours)
Introduction to selected bioengineering topics through participation in international study abroad summer programs. Offers an international study experience to undergraduates through lectures, guest speakers, tours, and/or laboratory exposure on a selected bioengineering topic chosen annually by the department. Preq: Consent of instructor.

**BIOE 4690 - International Bioengineering Internship**
1-3 Credits (1-3 Contact Hours)
Observation and assignment in an international medical school, dental school, hospital, regulatory agency, or industrial department. Course is affiliated with the bioengineering study abroad program and students are under the direct supervision and guidance of approved international mentors. May be repeated for a maximum of six credits. Preq: Consent of instructor.

**BIOE 4710 - Biophotonics**
3 Credits (3 Contact Hours)
Biophotonics is an interdisciplinary subject of applying photonics to study biological samples from individual cells to the entire body. Introduces fundamental and frontier topics in optical imaging aspects of biophotonics for senior-level undergraduates and graduate students to gain the ability to solve bioimaging-related biomedical problems. Preq: MATH 2080; and PHYS 2210; and either ECE 2070 or ECE 3200. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOE 4760 - Biosurface Engineering**
3 Credits (2 Contact Hours)
Study of how surface design influences the interactions of biomolecules with biomaterials and how this in turn influences implant biocompatibility. Laboratory addresses both the theory and application of various analytical instruments commonly used in bioengineering to characterize biomaterials surfaces and investigate biomolecule-surface interactions. Preq: Senior standing in Bioengineering and BCHM 3050. Coreq: BIOE 4761.

**BIOE 4761 - Biosurface Engineering Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOE 4760. Coreq: BIOE 4760.

**BIOE 4820 - Biomaterial Implantology**
3 Credits (2 Contact Hours)
Provides training in the planning and conduct of experimental surgery, including laws and regulations; institutional requirements; selection of animal models; ethical considerations of animal research; preparation of animals for surgery; general and special surgical techniques;
aseptic surgical techniques; and basic and applied instrumentation. Preq: Junior standing in Bioengineering. Coreq: BIOE 4821. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOE 4821 - Biomaterial Implantology Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOE 4820. Coreq: BIOE 4820. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOE 4900 - Internship**
1 Credits (3 Contact Hours)
Observation and assignment in a medical school, dental school, hospital, regulatory agency, or industrial department. May be repeated for a maximum of two credits. To be taken Pass/No Pass only. Preq: Senior standing in Bioengineering and consent of department chair.

**BIOE 4910 - Mentored Research in Bioengineering**
1-6 Credits (1-6 Contact Hours)
Mentored research training for undergraduate students working with a faculty advisor, including literature review, experimental design, research documentation, and presentation of results. May be repeated. Honors students must take six credits under a single advisor and write an honors thesis. Includes Honors sections. Preq: Consent of instructor.

**Biology**

**BIOL 1010 - Frontiers in Biology I**
1 Credits (1 Contact Hours)
Introduces Biological Sciences majors to the Biological Sciences Advising Center, curricula, pre-professional health advisors, University career services, and the department's faculty.

**BIOL 1030 - General Biology I**
3 Credits (3 Contact Hours)
First in a two-semester sequence. Includes an evolutionary approach to cells, cellular activities, genetics, and animal diversity emphasizing the processes of science. Credit toward a degree will be given for BIOL 1030 or 1100 only. Includes Honors sections.

**BIOL 1040 - General Biology II**
3 Credits (3 Contact Hours)
Continuation of BIOL 1030. Includes an evolutionary approach to human anatomy and physiology, plant diversity, morphology, and physiology and principles of ecology. Credit toward a degree will be given for BIOL 1040 or 1110 only. Includes Honors sections. Preq: BIOL 1030 and BIOL 1050; or BIOL 1100.

**BIOL 1050 - General Biology Laboratory I**
1 Credits (3 Contact Hours)
Laboratory to accompany BIOL 1030. Emphasizes developing laboratory techniques, becoming familiar with biological instrumentation, and performing investigations and interpreting results in the areas of biochemistry, cell biology, and molecular biology. Preq or concurrent enrollment: BIOL 1030.

**BIOL 1060 - General Biology Laboratory II**
1 Credits (3 Contact Hours)
Laboratory to accompany BIOL 1040. Emphasizes developing laboratory techniques, becoming familiar with biological instrumentation, and performing investigations and interpreting results in the areas of organismal structure, physiology, and ecology. Preq or concurrent enrollment: BIOL 1040.

**BIOL 1090 - Introduction to Life Science**
4 Credits (3 Contact Hours)
Survey of topics in botany, zoology, microbiology, and ecology emphasizing comprehension and practical application of life-science concepts to experiments and activities for the elementary school classroom. Enrollment priority will be given to Early Childhood and Elementary Education majors. Coreq: BIOL 1091.

**BIOL 1091 - Introduction to Life Science Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 1090. Coreq: BIOL 1090.
BIOL 1100 - Principles of Biology I
5 Credits (4 Contact Hours)
Introductory course designed for students majoring in biological disciplines. Integrates lecture and laboratory and emphasizes a modern, quantitative, and experimental approach to explanations of structure, composition, dynamics, interactions, and evolution of cells and organisms. High school chemistry is recommended. Credit toward a degree will be given for BIOL 1100 or 1030 only. Includes Honors sections. Coreq: BIOL 1101.

BIOL 1101 - Principles of Biology I Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 1100. Coreq: BIOL 1100.

BIOL 1110 - Principles of Biology II
5 Credits (4 Contact Hours)
Continuation of BIOL 1100, emphasizing the study of plants and animals as functional organisms and the principles of ecology. Credit toward a degree will be given for BIOL 1110 or 1040 only. Includes Honors sections. Preq: BIOL 1100. Coreq: BIOL 1111.

BIOL 1111 - Principles of Biology II Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 1110. Coreq: BIOL 1110.

BIOL 1200 - Biological Inquiry Laboratory
1 Credits (3 Contact Hours)
Required laboratory experience to accompany BIOL 1220 or 1230. Focuses on the process and outcomes of scientific inquiry. Students employ scientific methodology in a laboratory environment as well as critical analysis of biological problems in a small group context. Preq or concurrent enrollment: BIOL 1220 or BIOL 1230.

BIOL 1220 - Keys to Biodiversity
3 Credits (3 Contact Hours)
Introduction to scientific inquiry through analysis of biodiversity. Biological foundations for life are studied, including evolution, ecology, genetics, cells, and molecules. Also includes discussion of ethical issues related to biodiversity. Credit toward a degree will be given for only one of BIOL 1220 or 1230.

BIOL 1230 - Keys to Human Biology
3 Credits (3 Contact Hours)
Introduction to scientific inquiry through human biology. Considers biological processes occurring within humans and human impact on global biological processes. Interrelationships ultimately affecting evolution and diversity are explored. Credit toward a degree will be given for only one of BIOL 1220 or BIOL 1230.

BIOL 1910 - Directed Research
1-3 Credits (3-9 Contact Hours)
Research projects, supervised by faculty in the College of Agriculture, Forestry and Life Sciences introducing research methods. Restricted to outstanding high school students, selected using Governor's School for Science and Mathematics ranking criteria. May be repeated for a maximum of six credits. Preq: Entering high school junior or senior status and consent of faculty research supervisor and department in which research is conducted.

BIOL 2000 - Biology in the News
3 Credits (3 Contact Hours)
For non-science majors. Students examine current topics of biology appearing in newspapers and other current media. Uses a problem-based learning approach, with students working as teams and individually on areas of interest identified by the class. Students are expected to have completed the General Education Natural Science Requirement prior to enrolling in this course. Preq: ENGL 1030.

BIOL 2010 - Biotechnology and Society
3 Credits (3 Contact Hours)
Introduction to the theories, fields, and applications of biotechnology, including the structure and function of genes and their manipulation to improve plant and animal productivity and human health. Individual case studies are examined, including social and ethical issues surrounding biotechnology-based research and development. Not open to Genetics majors. Preq: BIOL 1200; and one of BIOL 1210 or BIOL 1220 or BIOL 1230 or BIOL 1240; and General Education Natural Science requirement.

BIOL 2030 - Human Disease and Society
3 Credits (3 Contact Hours)
Focuses on the basic biology underlying human disease, how disease is understood, and current methods of prevention and treatment of
disease. The economics as well as the social and ethical issues surrounding human disease are a common thread throughout the course.
Preq: Both BIOL 1040 and BIOL 1060; or BIOL 1110; or BIOL 1220; or BIOL 1230.

**BIOL 2040 - Environment, Energy and Society**  
3 Credits (3 Contact Hours)  
Examines power and energy production, the resultant environmental effects, and the relationship between this technology and society. Introduces historical and contemporary sources of energy and power; the economic, social, and political forces important for types and patterns of development; and the resultant impacts to ecosystems and the environment.

**BIOL 2050 - Plant Form and Function**  
3 Credits (3 Contact Hours)  
Introductory course for students majoring in plant sciences. Integrates lecture and laboratory and emphasizes fundamental structures and functions of higher plants. Preq: BIOL 1030 and BIOL1050.

**BIOL 2060 - Plant Form and Function Laboratory**  
1 Credits (1 Contact Hours)  
Laboratory for BIOL 2050. Preq or concurrent enrollment: BIOL 2050.

**BIOL 2100 - Evolution and Creationism**  
3 Credits (3 Contact Hours)  
Critical review of the scientific and technological basis for evolutionary theory compared to creationist explanations for the origin and diversity of life. Includes a historical survey of the impact that the evolution/creation debate has had on law, politics, education, and other important aspects of society. Credit toward a degree will be given for only one of BIOL 2100 or PHIL 2100. Preq: BIOL 1040 or BIOL 1110; and one of BIOL 1220 or BIOL 1230; and General Education Natural Science requirement.

**BIOL 2110 - Introduction to Toxicology**  
3 Credits (3 Contact Hours)  
Acquaints students with the field of toxicology, integrates the science of toxicology with regulatory policy, and demonstrates its impact on our daily lives. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110.

**BIOL 2200 - Biology: Concepts, Issues, and Values**  
3 Credits (3 Contact Hours)  
Develops a thorough knowledge of basic biological concepts and issues and explores how these can be incorporated into a system of human values affecting technology, society, and life.

**BIOL 2220 - Human Anatomy and Physiology I**  
4 Credits (3 Contact Hours)  
Basic introductory course in integrated human anatomy and physiology covering cells and tissues; integumentary, skeletal, muscular, and nervous systems; sensory organs. Physiology is stressed. Structured primarily for Nursing and other health-related curricula. Preq: BIOL 1030 and BIOL 1050; or BIOL 1100; and CH 1010 or CH 1050. Coreq: BIOL 2221.

**BIOL 2221 - Human Anatomy and Physiology I Laboratory**  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany BIOL 2220. Coreq: BIOL 2220.

**BIOL 2230 - Human Anatomy and Physiology II**  
4 Credits (3 Contact Hours)  
Continuation of BIOL 2220 covering endocrine, reproductive, cardiovascular, lymphatic, respiratory, urinary, and digestive systems; fluid and electrolyte balance. Physiology is stressed. Preq: BIOL 2220. Coreq: BIOL 2231.

**BIOL 2231 - Human Anatomy and Physiology II Laboratory**  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany BIOL 2230. Coreq: BIOL 2230.

**BIOL 2300 - Emergency Medical Responder**  
3 Credits (3 Contact Hours)  
Students are prepared to provide emergency pre-hospital assessment and care for patients with a variety of medical conditions and traumatic injuries. Study areas include introduction to emergency medical services systems, EMR roles and responsibilities, anatomy and physiology, medical emergencies, trauma, and working in the pre-hospital setting. Preq: BIOL 1030 and BIOL 1040, and BIOL 1050 and BIOL 1060; or BIOL 1100 and BIOL 1110. Consent of instructor.

**BIOL (ENT) 3010 - Insect Biology and Diversity**
4 Credits (3 Contact Hours)
Introduction to the study of insects, with emphasis on their structure, function, ecology, and behavior. Identification of commonly encountered species is highlighted. Relationships between insect and human populations are discussed. Control technologies are introduced, with emphasis on environmentally responsible tactics. Offered fall semester only. May also be offered as ENT 3010. Coreq: BIOL 3011.

BIOL (ENT) 3011 - Insect Biology and Diversity Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 3010. May also be offered as ENT 3011. Coreq: BIOL 3010.

BIOL 3020 - Invertebrate Biology
3 Credits (3 Contact Hours)
In-depth survey and comparison of free-living invertebrate animals emphasizing functional anatomy, development, and evolutionary relationships. Includes Honors sections. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: BIOL 3060.

BIOL 3030 - Vertebrate Biology
3 Credits (3 Contact Hours)
Comprehensive survey of vertebrate animals, including their taxonomy, morphology, evolution, and selected aspects of the natural history and behavior. Includes Honors sections. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110.

BIOL 3040 - Biology of Plants
3 Credits (3 Contact Hours)
Survey of the major groups of plants, their biology, diversity, and evolution. Includes Honors sections. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: BIOL 3080.

BIOL 3060 - Invertebrate Biology Laboratory
1 Credits (3 Contact Hours)
Survey and comparison of the biology of living invertebrates, examples of which are drawn primarily from the southeastern coast of the United States. Preq: Introductory two-semester biology sequence with laboratory. Coreq: BIOL 3020.

BIOL 3070 - Vertebrate Biology Laboratory
1 Credits (3 Contact Hours)
Comparative and phylogenetic study of the gross morphology of vertebrates. Preq or concurrent enrollment: BIOL 3030.

BIOL 3080 - Biology of Plants Practicum
1 Credits (3 Contact Hours)
Laboratory exercises that explore the major groups of plants, their biology, diversity, and evolution. Coreq: BIOL 3040.

BIOL (WFB) 3130 - Conservation Biology
3 Credits (3 Contact Hours)
Study of the biological bases for the conservation of flora, fauna, and habitats. Biological factors that influence the decision-making process are also addressed. May also be offered as WFB 3130. Preq: BIOL 1030 and BIOL 1050 and BIOL 1040 and BIOL 1060; or BIOL 1100 and BIOL 1110.

BIOL 3150 - Functional Human Anatomy
4 Credits (3 Contact Hours)
Introduction to the anatomical structures associated with all organ systems found in the human body at both the gross and microscopic level. Basic physiology is integrated to assist with understanding the function of the anatomical systems. Preq: BIOE 1010; or BIOL 1030 and BIOL 1050; or BIOL 1100; and junior standing. Coreq: BIOL 3151.

BIOL 3151 - Functional Human Anatomy Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 3150. Coreq: BIOL 3150.

BIOL 3160 - Human Physiology
4 Credits (3 Contact Hours)
Study of the functional processes associated with the various organ systems in the human body. Students develop a basic understanding of the important and fundamental concepts in human physiology and how organ systems maintain homeostasis. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110; and CH 1020; and junior standing. Coreq: BIOL 3161.

BIOL 3161 - Human Physiology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 3160. Coreq: BIOL 3160.
BIOL 3200 - Field Botany
4 Credits (2 Contact Hours)
Introductory study of the taxonomy, ecology, and evolution of plants in their natural environment with an emphasis on identification and characteristics of representative species and plant communities in the Carolinas. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: BIOL 3201.

BIOL 3201 - Field Botany Laboratory
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany BIOL 3200. Coreq: BIOL 3200.

BIOL 3350 - Evolutionary Biology
3 Credits (3 Contact Hours)
Introduction to basic concepts and underlying principles of modern evolutionary biology. Topics include a historical overview of evolutionary theories, elementary population genetics, principles of adaptation, speciation, systematics and phylogenetic inference, fossil record, biogeography, molecular evolution, and human evolution. Includes Honors sections. Preq: GEN 3000 or GEN 3020.

BIOL (PES) 3400 - Medical Botany
3 Credits (3 Contact Hours)
Study of use of compounds of plant and fungal origin as poisons, hallucinogens, and pharmaceuticals. May also be offered as PES 3400. Preq: BIOL 1040 and BIOL1060; or BIOL 1110; and CH 1020.

BIOL (ANTH) 3510 - Biological Anthropology
3 Credits (3 Contact Hours)
Study of humans as biological organisms. Examines human evolution, primate social behavior, human physiological variations and disease resistance, and human skeletal anatomy and forensics. May also be offered as ANTH 3510. Preq: ANTH 2010; or BIOL 1030 and BIOL 1050; or BIOL 1040 and BIOL 1060; or BIOL 1100.

BIOL (ANTH) 3530 - Forensic Anthropology
3 Credits (3 Contact Hours)
Introduction to forensic anthropology, the science that utilizes methods from skeletal biology and archaeology as tools in human identification in a medico-legal context. May also be offered as ANTH 3530. Preq: Junior standing.

BIOL 3940 - Selected Topics in Creative Inquiry I
1-3 Credits (1-3 Contact Hours)
Disciplinary and multidisciplinary group research projects develop the student's ability to discover, analyze, and evaluate data. May be repeated for a maximum of six credits. Honors students must take at least six credits over a two-semester period with the same research advisor and write an honors thesis. These credits may include BIOL 3940, BIOL 4940 or both. Includes Honors sections. Preq: Consent of instructor.

BIOL 3941 - Selected Topics in Creative Inquiry I Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany BIOL 3940.

BIOL (ENT) 4000 - Insect Morphology
4 Credits (3 Contact Hours)
Study of insect structure in relation to function and of the variation of form in insects. Includes Honors sections. May also be offered as ENT 4000. Preq: ENT 3010. Coreq: BIOL 4001. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (ENT) 4001 - Insect Morphology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 4000. May also be offered as ENT 4001. Coreq: BIOL 4000. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4010 - Plant Physiology
3 Credits (3 Contact Hours)
Relations and processes pertaining to maintenance, growth, and reproduction of plants, including absorption of matter and energy, water relations of the plant, utilization of reserve products and liberation of energy. Includes Honors sections. Preq: BIOL 1040 and BIOL1060; or BIOL 1110; and CH 1020.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4020 - Plant Physiology Laboratory**
1 Credit (3 Contact Hours)
Laboratory exercises and experiments designed to indicate the relations and processes which pertain to maintenance, growth, and reproduction of plants, including absorption of matter and energy, water relations of the plant, utilization of reserve products, and liberation of energy. Preq or concurrent enrollment: BIOL 4010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4030 - Introduction to Applied Genomics**
3 Credits (3 Contact Hours)
Emphasizes the practical application of bioinformatic/genomic skills to solve biological problems. The course includes an introduction to the Linux operating system, the bash command line environment, principles of next-generation sequencing, genome assembly, gene prediction, annotation, databases, gene/genome clustering, recombination detection, phylogenomics, transcriptomics, and metagenomics. Preq: BIOL 1030 or BIOL 1100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL (GEN) 4050 - Molecular Genetics of Eukaryotes**
3 Credits (3 Contact Hours)
Molecular genetic analyses of eukaryotes in relation to mutations and repair, complex phenotypes, biochemical pathways, short- and long-term regulation of gene expression, and evolution. May also be offered as GEN 4050. Preq: one of the following combinations: BCHM 3010 or BCHM 3050; or GEN 3000 and GEN 3020.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4060 - Introductory Plant Taxonomy**
3 Credits (3 Contact Hours)
Introduction to the basic principles and concepts of plant systematics with emphasis on the plants of South Carolina. Includes Honors sections. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: BIOL 4070.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4070 - Plant Taxonomy Laboratory**
1 Credit (3 Contact Hours)
Introduction to basic techniques of plant taxonomy with laboratory and field emphasis on the flora of South Carolina. Coreq: BIOL 4060.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4080 - Comparative Vertebrate Morphology**
3 Credits (3 Contact Hours)
Phylogeny and diversity of vertebrates and study of their comparative morphology, leading to an understanding of the relationships and functioning of living organisms. Includes Honors sections. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: BIOL 4090.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4090 - Comparative Vertebrate Morphology Laboratory**
2 Credits (5 Contact Hours)
Comparative anatomy of representative vertebrates; methods used in preparing specimens for study and display. Includes Honors sections. Coreq: BIOL 4080.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4100 - Limnology**
3 Credits (3 Contact Hours)
Detailed introduction to the physical, chemical, and biological interrelationships that characterize inland water environments. A fundamental approach to the interactions of components of the environment is developed at a theoretical level. Preq: Junior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4110 - Limnological Analyses**
2 Credits (1 Contact Hours)
Examines a broad range of topics covered with both standing and running fresh waters. About one-third of the laboratory exercises address the major physical components of lakes and streams. The remainder provides rationale and methods for quantitative analyses of biota, as well as some integrated analyses of whole ecosystems. Includes Honors sections. Preq or concurrent enrollment: BIOL 4100 or BIOL 4430. Coreq: BIOL 4111.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4111 - Limnological Analyses Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany BIOL 4110. Coreq: BIOL 4110.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (ENR) 4130 - Restoration Ecology
3 Credits (3 Contact Hours)
Applies ecological principles to the restoration of disturbed terrestrial, wetland, and aquatic ecosystems. Includes the restoration of soils and waterways, of flora and fauna, and of natural ecological processes such as plant succession and nutrient cycling. May also be offered as ENR 4130. Preq: BIOL 3130 or BIOL 4410 or WFB 3130.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (AVS, MICR) 4140 - Basic Immunology
3 Credits (3 Contact Hours)
Introduction to the immune system of vertebrate animals, with an emphasis on structure, function, regulation, and cellular and molecular mechanisms of immune responses. Includes Honors sections. May also be offered as AVS 4140 or MICR 4140. Preq: BIOL 4610 and MICR 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (ENT) 4150 - Insect Taxonomy
3 Credits (1 Contact Hours)
Identification of the principal families of the major orders of adult insects. Laboratory work consists of intensive practice of such identification. Lecture material deals with theoretical discussion of taxonomic features observed in the laboratory. May also be offered as ENT 4150. Preq: BIOL 4000 or ENT 4000. Coreq: BIOL 4151.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (ENT) 4151 - Insect Taxonomy Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany BIOL 4150. May also be offered as ENT 4151. Coreq: BIOL 4150.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4170 - Marine Biology
3 Credits (3 Contact Hours)
Survey of the organisms that live in the sea and their adaptations to the marine environment. Emphasizes characteristics of marine habitats, organisms, and the ecosystems. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4200 - Neurobiology
3 Credits (3 Contact Hours)
Broad background in neurobiology. Topics include neuroanatomical structure-function; conduction in the neuron; neurite growth and development; neuromuscular junction; chemistry, physiology, and pharmacology of specific neurotransmitters and receptors; visual process; axoplasmic transport; hypothalamic-pituitary regulation; theories of behavior; theories of learning and memory. Includes Honors sections. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110; and BIOL 4610. Preq or concurrent enrollment: PHYS 2080.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (AVS, MICR) 4240 - Immunology Laboratory
1 Credits (3 Contact Hours)
This course is designed to apply the knowledge gained in MICR 4140, Immunology lecture, in an applied setting. The experiments in this beginning immunology laboratory are designed to study both the innate and acquired immune systems. Experimentation into the formation,
function and detection of antibodies provides students with skills in basic immunologic techniques. May also be offered as AVS 4240 or MICR 4240. Preq or concurrent enrollment: MICR 4140.

**BIOL (PLPA) 4250 - Introductory Mycology**
3 Credits (3 Contact Hours)
Introduction to the biology of all the groups of fungi and some related organisms, with considerations of the taxonomy, morphology, development, physiology, and ecology of representative forms. May also be offered as PLPA 4250. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL (PLPA) 4260 - Mycology Practicum**
2 Credits (1 Contact Hours)
Application of the principles of mycological techniques, microscopic study of fungi. Examples from all major groups of fungi are included. May also be offered as PLPA 4260. Preq or concurrent enrollment: BIOL 4250 or PLPA 4250. Coreq: BIOL 4261.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL (PLPA) 4261 - Mycology Practicum Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany BIOL 4260. May also be offered as PLPA 4261. Coreq: BIOL 4260.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4280 - Quantitative Biology**
4 Credits (3 Contact Hours)
Applies quantitative methods to a wide range of biological problems. Main focus is on building modeling skills using population, physiological, genetic, and evolutionary problems. Also includes a review of statistical principles and introduces basic bioinformatics techniques. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110; and MATH 1080 or MATH 1110. Coreq: BIOL 4281.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4281 - Quantitative Biology Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 4280. Coreq: BIOL 4280.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4320 - Animal Histology**
3 Credits (3 Contact Hours)
Structural and functional study of the basic tissues of animals and tissue makeup of organs. Emphasizes light microscopy level with selected tissue studied at the electron microscope level. Includes Honors sections. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: BIOL 4330.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4330 - Animal Histology Laboratory**
2 Credits (1 Contact Hours)
Microscopic examination of basic animal tissue types and the tissue makeup of organs which comprise systems. Includes Honors sections. Coreq: BIOL 4320 and BIOL 4331.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4331 - Animal Histology Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany BIOL 4330. Coreq: BIOL 4330.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4340 - Biological Chemistry Laboratory Techniques**
2 Credits (1 Contact Hours)
Theory and application of some of the routine tools and techniques used in biological chemistry. Lectures introduce laboratory theory and provide additional laboratory instructions; discuss results; and conduct student evaluations. Laboratory periods are used to conduct each activity. Preq or concurrent enrollment: BCHM 3010 or BCHM 3050. Coreq: BIOL 4341.


**BIOL 4341 - Biological Chemistry Laboratory Techniques Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 4340. Coreq: BIOL 4340.

**BIOL (ENT) 4360 - Insect Behavior**
3 Credits (2 Contact Hours)
Fundamentals of insect behavior in an evolutionary and ecological perspective. Laboratory emphasizes generation and testing of hypotheses and observation, description, and quantification of insect behavior. May also be offered as ENT 4360. Preq: ENT 3010. Coreq: BIOL 4361.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL (ENT) 4361 - Insect Behavior Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 4360. May also be offered as ENT 4361. Coreq: BIOL 4360.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4400 - Developmental Animal Biology**
3 Credits (3 Contact Hours)
Events and mechanisms responsible for the development of multicellular animals. Gametogenesis, fertilization, embryonic development, cellular differentiation, morphogenesis, larval forms and metamorphosis, asexual reproduction, regeneration, malignancy, and aging are analyzed in terms of fundamental concepts and control processes. Includes Honors sections. Preq: BCHM 3010 or 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4410 - Ecology**
3 Credits (3 Contact Hours)
Study of basic ecological principles underlying the relationships between organisms and their biotic and abiotic environments. Includes physiological, population, and community ecology, with applications of each to human ecological concerns. Includes Honors sections. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4420 - Biogeography**
3 Credits (3 Contact Hours)
Study of patterns of distribution of plants and animals in space and time. Includes Honors sections. Preq: BIOL 3020 or BIOL 3030 or BIOL 3040.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4430 - Freshwater Ecology**
3 Credits (3 Contact Hours)
Study of basic ecological principles and concepts as they apply to freshwater environments: rivers and streams, wetlands, lakes and ponds, and reservoirs. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4440 - Freshwater Ecology Laboratory (Lecture Portion)**
2 Credits (1 Contact Hours)
Laboratory-based course providing a synthesis of major components of freshwater ecosystems. Activities are hypothesis driven and relate to each other to form an overall synthesis of the field. Hands-on experience allows engagement in creative inquiry. Preq or concurrent enrollment: BIOL 4430. Coreq: BIOL 4441.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4441 - Freshwater Ecology Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany BIOL 4440. Coreq: BIOL 4440.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
BIOL 4450 - Ecology Laboratory (Lecture Portion)  
2 Credits (1 Contact Hours)  
Modern and classical approaches to the study of ecological problems discussed in BIOL 4410. Students are introduced to field, laboratory and computer-based analyses of plant and animal populations and communities. Includes Honors sections. Preq or concurrent enrollment: BIOL 4410. Coreq: BIOL 4451.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4451 - Ecology Laboratory  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany BIOL 4450. Coreq: BIOL 4450.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4460 - Plant Ecology  
3 Credits (3 Contact Hours)  
Ecology of plants in relation to their biotic and abiotic environments. Individual organisms, populations, and communities are considered with an emphasis on seed plants in terrestrial environments. Includes Honors sections. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4470 - Plant Ecology Laboratory (Lecture Portion)  
2 Credits (1 Contact Hours)  
Experimental and observational approach to addressing principles discussed in BIOL 4460. Students are introduced to field and laboratory methods involving individual organisms, populations, and communities. Includes Honors sections. Preq or concurrent enrollment: BIOL 4460. Coreq: BIOL 4471.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4471 - Plant Ecology Laboratory  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany BIOL 4470. Coreq: BIOL 4470.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4480 - Marine Ecology  
3 Credits (3 Contact Hours)  
Study of ecological principles underlying the relationships of marine organisms to their ocean environment. Includes physiological, behavioral, population, and community ecology with applications to conservation and sustainability of marine resources. Includes Honors sections. Preq: BIOL 3020 or BIOL 4170.

BIOL 4490 - Field Ecology  
4 Credits (3 Contact Hours)  
Introduces students to the practice of field ecology in terrestrial, aquatic, and/or marine habitats. Emphasis is placed on field techniques, organism adaptations, regional conservation issues, and effects of human disturbance. May be repeated for a maximum of eight credits, but only if different topics are covered. Preq: Consent of instructor. Coreq: BIOL 4491.

BIOL 4491 - Field Ecology Laboratory  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany BIOL 4490. Coreq: BIOL 4490.

BIOL 4500 - Developmental Biology Laboratory (Lecture Portion)  
2 Credits (1 Contact Hours)  
Examines a broad range of topics concerned with the development of multicellular animals such as gametogenesis, fertilization, embryonic development, cell differentiation, morphogenesis, larval metamorphosis, and regeneration. Laboratory exercises provide the rationale and methods for the descriptive and experimental analysis of development in representative invertebrates and vertebrates. Includes Honors sections. Preq or concurrent enrollment: BIOL 4400. Coreq: BIOL 4501.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4501 - Developmental Biology Laboratory
BIOL (ANTH) 4510 - Biological Variation in Human Populations
3 Credits (3 Contact Hours)
Provides an in-depth discussion of the most influential topics in human skeletal biology. Course explores the history and ethical dilemmas of the field, and examines how biological anthropologists use skeletons to reconstruct patterns of diet, disease, demography and physical activity in human populations. May be offered as ANTH 4510. Preq: ANTH 2010.

BIOL (PLPA) 4540 - Plant Virology
4 Credits (3 Contact Hours)
Study of plant viruses: their morphology, biochemistry, purification, and transmission; symptoms resulting from virus infection; virus vector relationships. Serological and nucleic acid hybridization procedures. Diagnosis of viral diseases and the identification of causal agents. Replication of plant viruses, the interaction between viral host and plant genome. Control of plant viral diseases. May also be offered as PLPA 4540. Preq: BCHM 3010 or BCHM 3050 or MICR 3050. Coreq: BIOL 4541.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (PLPA) 4541 - Plant Virology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 4540. Coreq: BIOL 4540. May also be offered as PLPA 4541.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4550 - Field Studies in Biological Anthropology
1-6 Credits (1-6 Contact Hours)
Students participate in field study experiences related to biological anthropology. The focus of the field studies is on practical aspects of human skeletal biology, paleoanthropology, primate behavior, or other related field study. Students are trained in data collection methods and analysis utilized within biological anthropology. May also be offered as ANTH 4550. Preq: Junior standing.

BIOL (MICR) 4560 - Medical and Veterinary Parasitology
3 Credits (3 Contact Hours)
Introduction to parasitism in the animal kingdom. Emphasizes basic and applied principles related to economically and medically important diseases. Classical and experimental approaches to the study of parasitism are examined in reference to protozoa, helminths, and arthropods. Includes Honors sections. May also be offered as MICR 4560. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: BIOL 4570.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (MICR) 4570 - Medical and Veterinary Parasitology Laboratory (Lecture Portion)
2 Credits (1 Contact Hours)
Laboratory to reinforce material presented in BIOL 4560. Introduces students to both live and preserved human/animal parasites. Also introduces techniques used in collection, preservation, and examination of animal parasites. Includes Honors sections. May also be offered as MICR 4570. Coreq: BIOL 4560 and BIOL 4571.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (MICR) 4571 - Medical and Veterinary Parasitology Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany BIOL 4570. May also be offered as MICR 4571. Coreq: BIOL 4570.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4580 - Cell Physiology
3 Credits (3 Contact Hours)
Study of the chemical and physical principles of cell function emphasizing bioenergetics and membrane phenomena. Includes Honors sections. Preq: BCHM 3010 or BCHM 3050.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4590 - Systems Physiology
3 Credits (3 Contact Hours)
Physiological systems of vertebrates and their homeostatic controls. Describes the function of the major physiological systems in terms of anatomical structure and chemical and physical principles. Includes Honors sections. Preq: [BIOL 1040 and BIOL 1060; or BIOL 1110];
and [CH 1020; or PHYS 2080 and PHYS 2100; or PHYS 2210 and PHYS 2230.]
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4600 - Systems Physiology Laboratory (Lecture Portion)**
2 Credits (1 Contact Hours)
Modern and classical experimental methods are used to demonstrate fundamental physiological principles discussed in BIOL 4590. Students are introduced to computer-aided data acquisition and computer simulations of physiological function. Preq or concurrent enrollment: BIOL 4590. Coreq: BIOL 4601.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4601 - Systems Physiology Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany BIOL 4600. Coreq: BIOL 4600.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4610 - Cell Biology**
3 Credits (3 Contact Hours)
In-depth analysis of how and where intracellular and extracellular molecules control general and specific cellular functions such as gene expression, secretion, motility, signaling, cell-cycle control and differentiation. Taught and graded at a level where students are expected to infer from and integrate cellular events. Includes Honors sections. Preq: BCHM 3010 or BCHM 3050 or BCHM 4060.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4620 - Cell Biology Laboratory (Lecture Portion)**
2 Credits (1 Contact Hours)
Laboratory to accompany BIOL 4610. Focuses on molecular and microscopic analysis of eukaryotic cells. Preq or concurrent enrollment: BIOL 4610. Coreq: BIOL 4621.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4621 - Cell Biology Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany BIOL 4620. Coreq: BIOL 4620.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4640 - Mammalogy**
4 Credits (3 Contact Hours)
Origin, evolution, distribution, structure, and function of mammals, with laboratory emphasis on the mammals of the Southeast. Preq: BIOL 3030. Coreq: BIOL 4641.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4641 - Mammalogy Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 4640. Coreq: BIOL 4640.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL (ANTH) 4660 - Evolution of Human Behavior**
3 Credits (3 Contact Hours)
Familiarizes students with the evolutionary basis of human behavior. Examines topics such as altruism, cooperation, mating systems, parental investment, and social systems using diverse examples, from hunter-gatherer to technological societies. May also be offered as ANTH 4660. Preq: ANTH 3510 or BIOL 3350 or BIOL 4700.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4670 - Principles of Hematology**
3 Credits (3 Contact Hours)
Basic hematological principles as they relate to normal blood cell production, as well as in abnormal conditions that result in diseases of the
hematological system. Clinical practice, ethics and controversies in hematology are discussed. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110.

BIOL (WFB) 4680 - Herpetology
4 Credits (3 Contact Hours)
Physiology, functional morphology, ecology, evolution, biomechanics and current literature of amphibians and reptiles. Laboratory study examines morphology and identification of world families and United States genera, as well as southeastern species. Field trips are required. May also be offered as WFB 4680. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: BIOL 4681. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (WFB) 4681 - Herpetology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 4680. May also be offered as WFB 4681. Coreq: BIOL 4680. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (ENT, WFB) 4690 - Aquatic Insects
3 Credits (1 Contact Hours)
Identification, life history, habitats, and interrelationships of aquatic insects; techniques of qualitative field collecting; important literature and research workers. Includes Honors sections. May also be offered as ENT 4690 or WFB 4690. Preq: BIOL 1100 and BIOL 1110 and sophomore standing. Coreq: BIOL 4691. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (ENT, WFB) 4691 - Aquatic Insects Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany BIOL 4690. May also be offered as ENT 4691 or WFB 4691. Coreq: BIOL 4690. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4700 - Behavioral Ecology
3 Credits (3 Contact Hours)
Historical and modern developments in animal behavior emphasizing the evolutionary and ecological determinants of behavior. A synthesis of ethology and comparative psychology. Includes Honors sections. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4710 - Behavioral Ecology Laboratory (Lecture Portion)
2 Credits (1 Contact Hours)
Laboratory exercises that explore the behavior of animals. Emphasizes behavioral observation and analysis and presentation of findings in a report format. Includes a semester-long independent research project. Preq or concurrent enrollment: BIOL 4700. Coreq: BIOL 4711. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4711 - Behavioral Ecology Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany BIOL 4710. Coreq: BIOL 4710. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4720 - Ornithology
4 Credits (3 Contact Hours)
Biology of birds: their origin and diversification, adaptations, phylogeny, classification, structure and function, behavior, ecology, and biogeography. Field identification is emphasized, and field trips are required. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4721 - Ornithology Laboratory
0 Credits (3 Contact Hours)
Noncredit laboratory to accompany BIOL 4720. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
**BIOL 4730 - History of Modern Biology**  
3 Credits (3 Contact Hours)  
Examines the intellectual and social factors defining the study of life from the scientific revolution of the 1600s to the modern biological sciences. Investigates the historical origins of biological disciplines and explores the differing cultures, methodologies, and philosophical commitments of these communities. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL (ANTH) 4740 - Primatology**  
4 Credits (3 Contact Hours)  
Biology of nonhuman primates, including their evolution, taxonomy, physiology, life history, behavioral ecology and conservation. Three field trips are required, during which students conduct behavioral observations and later analyze their data and present it in report format. May also be offered as ANTH 4740. Preq: ANTH 3510 or BIOL 3510; and either BIOL 1110 or both BIOL 1040 and BIOL 1060. Coreq: BIOL 4741.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL (ANTH) 4741 - Primatology Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany BIOL 4740. May also be offered as ANTH 4741. Coreq: BIOL 4740.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4750 - Comparative Physiology**  
3 Credits (3 Contact Hours)  
Physiological systems of invertebrates and vertebrates emphasizing environmental adaptation. Physiological principles as they relate to metabolism, thermoregulation, osmoregulation, respiration, and neural and integrative physiology. Includes Honors sections. Preq: CH 1020; and either BIOL 1110 or both BIOL 1040 and BIOL 1060.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4760 - Comparative Physiology Laboratory (Lecture Portion)**  
2 Credits (1 Contact Hours)  
Modern classical experimental methods are used to demonstrate fundamental physiological principles discussed in BIOL 4750. Introduces students to computer-aided data acquisition and manipulation as well as computer simulations of physiological function. Includes Honors sections. Preq or concurrent enrollment: BIOL 4750. Coreq: BIOL 4761.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4770 - Ichthyology**  
3 Credits (2 Contact Hours)  
Systematics, life history, distribution, ecology, and current literature of fish. Laboratory study of morphology and identification of U.S. genera, as well as all southeastern species. Field trips are required.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4771 - Ichthyology Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany BIOL 4770. Coreq: BIOL 4770.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BIOL 4780 - Exercise Physiology**  
3 Credits (3 Contact Hours)  
Introduction to the physiology of exercise. Focuses on the function and adaptations of body systems in response to exercise. Structured primarily for students interested in Prrehabilitation Sciences. Preq: BIOL 2220 and BIOL 2230; or BIOL 3150 and BIOL 3160.
BIOL 4790 - Kinesiology
3 Credits (3 Contact Hours)
Introduction to the study of human movement. Focuses on the application of biomechanical and motor control principles to human motion, including daily living, sport, and work activities. Structured primarily for students interested in Prerehabilitation Sciences. Preq: BIOL 2220 or BIOL 3150.

BIOL (AVS) 4800 - Vertebrate Endocrinology
3 Credits (3 Contact Hours)
Introduction to the basic principles of neuro-endocrine integration and homeostatic maintenance in vertebrates. Comparative morphology and physiology of various endocrine tissues and hormone chemistry and modes of action are considered. May also be offered as AVS 4800. Preq: BCHM 3010 or BCHM 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (EDSC) 4820 - Laboratory Techniques for Teaching Science
3 Credits (1 Contact Hours)
Focuses on basic lab skills needed to plan, prepare, and conduct inquiry-based laboratories and to familiarize pre-service teachers with a variety of scientific equipment and their methodologies. Topics include ways to integrate technology into the classroom, lab safety, and the development of inquiry-based classroom activities. May also be offered as EDSC 4820. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: BIOL 4821.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL (EDSC) 4821 - Laboratory Techniques for Teaching Science
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany BIOL 4820. May also be offered as EDSC 4821. Coreq: BIOL 4820.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4830 - Stem Cell Biology
3 Credits (3 Contact Hours)
Stem cells are the focus of intense interest because of their utility for treating human diseases. This course provides a broad treatment of the biology of stem cells and assesses their current therapeutic capacity in clinical medicine. Preq: BIOL 4610.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4840 - Human and Comparative Vertebrate Embryology
3 Credits (3 Contact Hours)
Study of human and comparative embryology with an introduction to related clinical correlations. Students develop an understanding of normal and abnormal human and comparative vertebrate embryonic development. Includes Honors sections. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4850 - Molecular Phylogenetics and the Comparative Method
4 Credits (3 Contact Hours)
Theory and application using bioinformatic tools to develop phylogenetic trees; analysis of ecological data within a phylogenetic framework, with an emphasis on speciation and biogeography. Preq: BIOL 1100 and BIOL 1110 and BIOL 3350. Coreq: BIOL 4851.

BIOL 4851 - Molecular Phylogenetics and the Comparative Method Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BIOL 4850. Coreq: BIOL 4850.

BIOL 4860 - Natural History
3 Credits (3 Contact Hours)
Interdisciplinary examination, through readings and critical discussion, of concepts of nature and biodiversity in relation to human endeavors. Course seeks to achieve a balanced perspective from which to seek compromises between conflicting views of nature. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110.

BIOL 4870 - Electron and Optical Microscopy Theory
3 Credits (2 Contact Hours)
Offers a theoretical and practical introduction to light and electron microscopy. Topics include Koehler illumination, polarization,
interference, phase contrast, DIC epifluorescence, laser scanning light microscopy, SEM, TEM, EDS, ultramicrotomy, tomography, and digital imaging. Preq: Consent of instructor. Coreq: BIOL 4871.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4871 - Electron and Optical Microscopy Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany BIOL 4870. Coreq: BIOL 4870.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BIOL 4880 - Health Professions Practicum
3 Credits (3 Contact Hours)
A study abroad opportunity for students who have decided to pursue a career in medicine, dentistry, or rehabilitation sciences. This course provides students with direct, hands-on experience working with health professionals. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Consent of instructor.

BIOL 4890 - Clinical Applications and Medical Practice
3 Credits (2 Contact Hours)
Explores the various fields, specialties, and subspecialties in medicine. Provides students with the opportunity to shadow physicians in a hospital and/or office setting and to discuss current issues and advances in medicine with practicing physicians and other health care professionals. Preq: Consent of instructor. Coreq: BIOL 4891.

BIOL 4891 - Clinical Applications and Medical Practices Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany BIOL 4890. Coreq: BIOL 4890.

BIOL 4910 - Undergraduate Research in Biological Sciences
1-4 Credits (3-12 Contact Hours)
Mentored research problems introduce undergraduate students to the planning and execution of research and the presentation of research findings. May be repeated for a maximum of eight credits. Honors students must take at least six credits under a single research advisor over two semesters and must write an honors thesis. Includes Honors sections. Preq: Consent of instructor.

BIOL 4920 - Internship in Biological Sciences
0-4 Credits (3-12 Contact Hours)
Preplanned internship at an advisor-approved facility to give students learning opportunities beyond their classroom experiences. Students submit a Student Internship Contract and a two-page study plan before the internship and a comprehensive report within one week of the end of the internship. May be repeated for a maximum of six credits. To be taken Pass/Fail only. Preq: Consent of instructor.

BIOL 4930 - Senior Seminar
2 Credits (2 Contact Hours)
Capstone course engaging students in analysis and discussion of publications from the technical and non-technical literature in biological sciences and from current topics of biology appearing in other media. Emphasis is placed on ethical issues that arise as a result of biological research. Preq: Senior standing; COMM 1500 or COMM 2500 or ENGL 3140 or ENGL 3150.

BIOL (MICR) 4940 - Selected Topics in Creative Inquiry II
2-3 Credits (1 Contact Hours)
Disciplinary and multidisciplinary group research projects with the goal of developing the students' ability to discover, analyze, and evaluate data. May be repeated for a maximum of six credits. Honors students must take at least six credits over a two-semester period with the same research advisor and write an honors thesis. These credits may include BIOL 3940, BIOL 4940 or both. Includes Honors sections. May also be offered as MICR 4940. Preq: Consent of instructor. Coreq: BIOL 4941.

BIOL (MICR) 4941 - Selected Topics in Creative Inquiry II Laboratory
0 Credits (3-6 Contact Hours)
Non-credit laboratory to accompany BIOL 4940. May also be offered as MICR 4941. Coreq: BIOL 4940.

BIOL 4950 - Service Learning in Biology
2-4 Credits (1 Contact Hours)
Combines service and academic learning while helping pre-college or college students learn about the fundamental aspects of science. Provides lecture and laboratory experiences as students learn to prepare and participate in supervised laboratory teaching for pre-college or college students. May be repeated for a maximum of six credits. Preq: Consent of instructor. Coreq: BIOL 4951.

BIOL 4951 - Service Learning in Biology Laboratory
0 Credits (3-9 Contact Hours)
Non-credit laboratory to accompany BIOL 4950. Coreq: BIOL 4950.

**BIOL 4960 - Selected Topics**
1-4 Credits (1-4 Contact Hours)
Lecture coverage of selected topics in cellular and developmental biology, ecology, behavior, evolutionary biology, molecular biology, physiology, systematics, and other topics in the biological sciences. May be repeated for a maximum of nine credits, but only if different topics are covered. Preq: Consent of instructor.

**BIOL 4970 - Special Topics Laboratory**
1-3 Credits (2-9 Contact Hours)
Specialized laboratory experiences in cellular and developmental biology, ecology, behavior, evolutionary biology, molecular biology, physiology, systematics, and other topics of interest in the biological sciences. May be repeated for a maximum of nine credits, but only if different topics are covered. Preq: Consent of instructor.

**Biomolecular Engineering**

**BMOL 4030 - Biotransport Phenomena**
3 Credits (3 Contact Hours)
Analysis of single and multidimensional steady-state and transient problems in momentum, mass, and energy transfer in biological systems. Mathematical similarities and differences in these mechanisms are stressed, and mathematical descriptions of physiological and engineering systems are formulated. Preq: CHE 3300 and MATH 2080.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BMOL 4230 - Bioseparations**
3 Credits (3 Contact Hours)
Study of principal methods of separation and purification of bioproducts, such as proteins, amino acids, and pharmaceuticals. Topics include analytical bioseparations, membrane separations, sedimentation, cell disruption, extraction, adsorption, chromatography, precipitation, crystallization, and drying. Preq: CHE 3300; and BCHM 3010 or BCHM 3050 or BCHM 4230.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BMOL 4250 - Biomolecular Engineering**
3 Credits (3 Contact Hours)
Introduction to basic principles of biomolecular engineering: the purposeful manipulation of biological molecules and processes applied to problems and issues in the life sciences, biotechnology, and medicine. Topics include carbohydrates, proteins, nucleic acids, and lipids with emphasis on their structure-property-function relations; molecular recognition; biochemical pathway engineering; and cell growth. Preq: CH 2240; and one of CH 3300 or CH 3310 or CHE 2200.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BMOL 4260 - Biosensors and Bioelectronic Devices**
3 Credits (3 Contact Hours)
Development of methodologies used to design, fabricate, and apply biosensors and bioelectronic devices for the environmental, medical, and chemicals industries. Application of the fundamentals of measurement science to optical, electrochemical, mass, and thermal means of signal transduction. Use of the fundamentals of surface science to interpret bio-immobilization and biomolecule-surface interactions. Preq: CHE 3300; and BCHM 3010 or BCHM 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BMOL 4270 - Membranes for Biotechnology and Biomedicine**
3 Credits (3 Contact Hours)
Students learn principles of membrane science and technology and study membrane applications in the biotechnology and biomedical industries. Advanced topics include surface modification of membranes, synthesis of porous membranes for biomedical applications such as tissue engineering, environmentally responsive membranes, and membrane-based biomedical devices. Preq: CHE 3300.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BMOL 4290 - Bioprocess Engineering**
3 Credits (3 Contact Hours)
Chemical engineering principles are applied to bioprocess design. Emphasis is placed on designing bioreactors and bioseparation unit
operations used in industrial biotechnology and the chemical process industry. Application of bioreaction and bioseparation operations to other chemical processes are discussed. Preq: CHE 3300 and CHE 4500.

## Biosystems Engineering

**BE 1990 - Creative Inquiry in Biosystems Engineering I**  
1-3 Credits (1-3 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be taken twice for a maximum of six credits. To be taken Pass/No Pass only.

**BE 2100 - Introduction to Biosystems Engineering**  
2 Credits (1 Contact Hours)  
Overview of topics and engineering application areas that comprise the biosystems engineering profession. Significant emphasis is also given to development of oral and written communication skills needed by the engineering professional, introduction to design methodology, and application of engineering fundamentals to biological systems. Preq or concurrent enrollment: ENGR 1070. Coreq: BE 2101.

**BE 2101 - Introduction to Biosystems Engineering Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany BE 2100. Coreq: BE 2100.

**BE 2120 - Fundamentals of Biosystems Engineering**  
2 Credits (1 Contact Hours)  
Introduction to fundamental concepts in biosystems engineering, including mass, energy, and momentum balances; mass, heat, and momentum transfer; biological response to environmental variables, biological materials, biological kinetics, and techniques of measurement and analysis of engineering and biological data. Laboratory includes hand-on exercises, problem solving and computer sessions, and oral presentations. Preq or concurrent enrollment: MATH 1060 and ENGR 1070. Coreq: BE 2121.

**BE 2121 - Fundamentals of Biosystems Engineering Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany BE 2120. Coreq: BE 2120.

**BE 2990 - Creative Inquiry in Biosystems Engineering II**  
1-3 Credits (1-3 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be taken twice for a maximum of six credits. To be taken Pass/No Pass only.

**BE 3000 - Biosystems Engineering Honors Seminar**  
0 Credits (0 Contact Hours)  
Introduces undergraduate students to current faculty research. Project ideas are then developed to prepare students in choosing a research topic for the senior honors thesis. Students are required to attend senior honors thesis presentations. To be taken Pass/No Pass only. Preq: Junior standing in departmental honors program.

**BE 3010 - Biosystems Engineering Honors Thesis Research**  
3 Credits (6 Contact Hours)  
Honors thesis project proposal, initial research, report, and presentation of biosystems engineering project for completion of junior requirements of the Biosystems Engineering Honors program. Preq: BE 3000.

**BE 3100 - Biosystems Engineering Thermodynamics**  
3 Credits (3 Contact Hours)  
Introduction of basic thermodynamic principles pertaining to biosystems engineering with emphasis on biochemical, biomechanical, and ecological problems. Preq: CE 2010.

**BE 3140 - Biosystems Engineering Mechanical Design**  
3 Credits (3 Contact Hours)  
Study of basic mechanical design of biosystems. Includes an introduction to biomechanics and biomaterial properties. Studies applications of machine components and their selection related to specific types of biosystems. Team design project is required. Preq: CE 2060 or ME 3020.
BE 3200 - Principles and Practices of Geomatics
3 Credits (2 Contact Hours)
Basic surveying measurements and computations for engineering project control, mapping, and construction layout. Leveling, earthwork, area, and topographic measurements using levels, total stations and GPS. Application of Mapping via GIS. Preq: MATH 1060. Preq or concurrent enrollment: ENGR 2100. Coreq: BE 3201.

BE 3201 - Principles and Practices of Geomatics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BE 3200. Coreq: BE 3200.

BE 3220 - Small Watershed Hydrology and Sedimentology
3 Credits (3 Contact Hours)
Fundamental relationships governing rainfall disposition are used as bases for defining the hydrology of watersheds. Emphasizes application of modeling techniques appropriate for runoff and sediment control. Preq or concurrent enrollment: CE 3410.

BE 3700 - Practicum
1-3 Credits (1-3 Contact Hours)
Preplanned internship with an approved employer involved with biosystems engineering endeavors. A minimum 1300 hours of supervised responsibility is required per credit hour. Evaluation is based on activity journal, written/oral report, and an evaluation from the supervisor. May be repeated for a maximum of three credits. To be taken Pass/No Pass only. Preq: Junior standing and consent of department.

BE 3990 - Creative Inquiry in Biosystems Engineering III
1-3 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be taken twice for a maximum of six credits. To be taken Pass/No Pass only.

BE 4000 - Biosystems Engineering Honors Thesis
3 Credits (6 Contact Hours)
Individual research projects are conducted under the supervision and guidance of a faculty member. Senior honors thesis is required. Preq or concurrent enrollment: BE 3010.

BE (PES) 4080 - Land Treatment of Wastewater and Sludges
3 Credits (3 Contact Hours)
Principles for designing environmentally acceptable land application systems using municipal and industrial wastewater and sludges are presented. Topics include land-limiting constituent analysis; soil-plant interactions; system equipment and design; system operation and management; public acceptance, social, and regulatory issues. Case studies and field trips are planned. Preq: Senior standing. May also be offered as PES 4080. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4100 - Biological Kinetics and Reactor Modeling
3 Credits (2 Contact Hours)
Fundamentals of microbial and biochemical kinetics used in analysis and design of biological systems. Topics include mathematical and computer modeling of biological kinetics and systems, estimating model coefficients, and development of microbial kinetic models as basis for batch and continuous reactor design. Preq: BE 2120 and CE 2080; and MATH 2080 with a C or better. Coreq: BE 4101. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4101 - Biological Kinetics and Reactor Modeling Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BE 4100. Coreq: BE 4100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4120 - Heat and Mass Transport in Biosystems Engineering
3 Credits (3 Contact Hours)
Fundamentals of heat and mass transport used in engineering design and analysis of biological systems; principles of steady state and transient energy and mass balances, including chemical and biological generation terms. Preq: BE 4100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
BE 4140 - Biosystems Engineering Unit Operations
3 Credits (2 Contact Hours)
Applies the basic principles of statics, dynamics, and thermodynamics to design of mechanical and electrical systems supporting biological operations and processes. Preq: BE 3140 and ME 3100. Coreq: BE 4141.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4141 - Biosystems Engineering Unit Operations Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BE 4140. Coreq: BE 4140.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4150 - Instrumentation and Control for Biosystems Engineers
3 Credits (2 Contact Hours)
Overview of modern instrumentation techniques and digital electronic components and subsystems to integrate them into digital data acquisition and control systems for biosystems. Laboratory use of equipment is emphasized. Topics include characteristics of instruments, signal conditioning, transducer theory and applications, programmable logic controllers, and digital data acquisition and control. Preq: ECE 2070 and ECE 2080. Coreq: BE 4151.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4151 - Instrumentation and Control for Biosystems Engineers Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BE 4150. Coreq: BE 4150.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4170 - Applied Instrumentation and Control for Biosystems
2 Credits (1 Contact Hours)
Hardware and software implementation of digital data acquisition and control systems for application to agriculture, aquaculture, biotechnology, and other biosystems. Topics include digital electronic circuits and components, microcomputer architecture, interfacing, and programming. Preq: BE 4150. Coreq: BE 4171.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4171 - Applied Instrumentation and Control for Biosystems Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BE 4170. Coreq: BE 4170.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4210 - Engineering Systems for Soil Water Management
2 Credits (1 Contact Hours)
Presents fundamentals of design related to drainage of lands, irrigation, and modification of the microenvironment for optimum productivity. Preq: CE 3410 or CHE 2300 or ME 3080. Coreq: BE 4211.

BE 4211 - Engineering Systems for Soil Water Management Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BE 4210. Coreq: BE 4210.

BE 4220 - Hydrologic Modeling of Small Watersheds
3 Credits (3 Contact Hours)
Design of structures and development of best management practices for runoff, flood, and sediment control from rural and urban areas, including natural and disturbed watersheds. Topics include modeling of prismatic and non-prismatic channels, culverts, and detention/retention ponds. Preq: BE 3220.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4240 - Ecological Engineering
3 Credits (3 Contact Hours)
Focuses on engineering solutions to environmental and socioeconomic problems using ecological design principles. Explores ecosystem
processes as they pertain to sustainable development, natural resource protection, food and energy production, waste management, and environmental restoration. Engineering fundamentals and ecological modeling are integral components of this course. Preq: CE 3410 or CHE 2300 or ME 3080.

**BE 4270 - Ecohydrology**  
3 Credits (3 Contact Hours)  
Focuses on the understanding of the mechanisms that control the circulation of water among atmosphere, soil, and plants. The spatial and temporal linkages between soil moisture dynamics and climate, soil, and vegetation are explored. Plant strategies in water use and hydrologic controls of ecosystems are integral components of this course. May also be offered as EES 4270 or GEOL 4270. Preq: CE 3410 or CHE 2300 or ME 3080.  

**BE 4280 - Biochemical Engineering**  
3 Credits (3 Contact Hours)  
Use of microorganisms and enzymes for the production of chemical feedstocks, single-cell protein, antibiotics, and other fermentation products. Topics include kinetics and energetics of microbial metabolism, design and analysis of reactors for microbial growth and enzyme-catalyzed reactions, and considerations of scale-up, mass transfer, and sterilization during reactor design. Preq or concurrent enrollment: BE 4100 or CHE 3300. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BE 4350 - Applications in Biotechnology Engineering**  
3 Credits (2 Contact Hours)  
Bioengineering principles applied to the expanding fields of agricultural biotechnology, ecotechnology, and biomedical technology. Specific applications include waste treatment and ecological engineering, bioreactor propagation of plant and animal cells and tissues, applied genomics and synthetic seed production, biosensors and biomonitoring, biological implants and materials biocompatibility. Preq: BE 4280 or CHE 4280. Coreq: BE 4351. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BE 4351 - Applications in Biotechnology Engineering Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany BE 4350. Coreq: BE 4350. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BE 4380 - Bioprocess Engineering Design**  
3 Credits (2 Contact Hours)  
Design and analysis of systems for processing biological materials. Topics include biotechnology, thermodynamics, transport processes, and biological properties related to bioprocess design and computational simulation. Unit operations include basic bioreactor operation, bioseparations, and preservation techniques. Preq or concurrent enrollment: BE 4100 or CHE 3300 or EES 4020. Coreq: BE 4381. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BE 4381 - Bioprocess Engineering Design Laboratory**  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany BE 4380. Coreq: BE 4380. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BE (CE) 4400 - Sustainable Energy Engineering**  
3 Credits (2 Contact Hours)  
Investigation into merging renewable energy resources, including detailed study of solar, wind, and bioenergy alternatives. Also includes principles, technologies, and performance evaluation of components for these technologies and an introduction to tidal, hydro, geothermal, and other energy; energy conservation; cogeneration; financial, economical, and other issues related to alternative energy sources. May also be offered as CE 4400. Preq: Junior standing in an engineering major. Coreq: BE 4401. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**BE (CE) 4401 - Sustainable Energy Engineering Laboratory**  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany BE 4400. May also be offered as CE 4401. Coreq: BE 4400. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
BE (EES, FOR) 4510 - Newman Seminar and Lecture Series in Natural Resources Engineering
1 Credits (2 Contact Hours)
Topics dealing with development and protection of land, air, water, and related resources are covered by seminar with instructor and invited lecturers. Current environmental and/or resource conservation issues are addressed. Includes Honors sections. May also be offered as EES 4510 or FOR 4510. Preq: Senior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4640 - Non-Point Source Management in Engineered Ecosystems
3 Credits (2 Contact Hours)
Fundamentals of non-point source pollution, including quantification of environmental impact and ecosystem management related to contaminants and nutrients and to planning and design of ecological systems. Preq: MICR 3050 and Senior standing in engineering. Coreq: BE 4641.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4641 - Non-Point Source Management in Engineered Ecosystems Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BE 4640. Coreq: BE 4640.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4730 - Special Topics in Biosystems Engineering
1-3 Credits (1-3 Contact Hours)
Comprehensive study of special topics not covered in other courses. Emphasizes independent pursuit of detailed investigations. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Consent of instructor.

BE 4740 - Biosystems Engineering Design Project Management
2 Credits (1 Contact Hours)
Study of biological systems design using hydrology principles, fluid mechanics, bioprocessing, heat/mass transfer, instrumentation, mechanical unit operations, and structural principles for project design, scheduling, and cost estimation. Topics also include engineering ethics, professional development, written and oral communication, and job skills. Senior portfolios are also developed. Preq: Senior standing in Biosystems Engineering. Coreq: BE 4741.

BE 4741 - Biosystems Engineering Design/Project Management Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BE 4740. Coreq: BE 4740.

BE 4750 - Biosystems Engineering Capstone Design
2 Credits (6 Contact Hours)
Applications of hydrology, fluid mechanics, bioprocessing, heat/mass transfer, instrumentation, mechanical unit operations, and structural principles in design; project scheduling; cost estimation; ethics; environmental and social impacts; design drawings; and report documentation. Preq: Senior standing in Biosystems Engineering.

BE (EES) 4840 - Municipal Solid Waste Management
3 Credits (3 Contact Hours)
Introduction to the problems, regulations, collection, handling, recycling, and disposal of municipal solid wastes in the urban and rural sectors. Emphasizes an integrated waste-management system with resource recovery, composting, incineration, landfill disposals, and their costs. May also be offered as EES 4840. Preq: EES 2020 or EES 4010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

BE 4990 - Creative Inquiry in Biosystems Engineering IV
1-3 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be taken twice for a maximum of six credits. To be taken Pass/No Pass only.
BT 2200 - Biosystems Technology I
3 Credits (2 Contact Hours)
Introduces fundamental and applied concepts used in bioprocessing for biofuels and other high value compounds. Topics include operation of batch and continuous flow bioreactors, microbial growth in anaerobic and aerobic environments, fermentation for biofuel production, and use of renewable energy in bioprocessing. Laboratory includes hands-on exercises, problem-solving/computer sessions and oral presentations. Preq: BIOL 1030 and BIOL 1050 and CH 1010. Coreq: BT 2201.

BT 2201 - Biosystems Technology I Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BT 2200. Coreq: BT 2200.

BT 2400 - Biosystems Technology II
3 Credits (2 Contact Hours)
Introduces basic unit operations used in bioprocessing for biofuels and other bioproducts. Covers operation and selection of pumps, heat exchangers, separation systems and sensors used in bioprocessing. Laboratory includes hands-on exercises, problem-solving/computer sessions, and oral presentations. Preq: BT 2200. Coreq: BT 2401.

BT 2401 - Biosystems Technology II Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany BT 2400. Coreq: BT 2400.

Business

BUS 1010 - Business Foundations
1 Credits (1 Contact Hours)
Introduction to a variety of topics critical to student success, including an overview of Clemson business degrees, on-campus resources available to ensure success, academic advising, business ethics, internships, co-ops, study abroad programs, student organizations, ePortfolios, and Clemson history.

BUS 2910 - Honors Seminar in International Business
1 Credits (1 Contact Hours)
Introduction to the International Business Honors Program presented through a discussion of thesis expectations, study abroad experiences, and seminars given by returning senior International Business Honors students. To be taken Pass/No Pass only. Preq: Membership in Calhoun Honors College.

BUS 2990 - Creative Inquiry in Business
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of four credits.

BUS 3910 - International Business Honors Thesis Research
1 Credits (1 Contact Hours)
Students work with a Clemson advisor and an international advisor to develop a research topic for the senior thesis. Students work and conduct research while participating in an approved study abroad. To be taken Pass/No Pass only. Preq: BUS 2910.

BUS 3920 - International Business Honors Thesis Proposal
1 Credits (1 Contact Hours)
Students work with a Clemson advisor and an international advisor to complete a proposal for the senior thesis. Students work and conduct research while participating in an approved study abroad. To be taken Pass/No Pass only. Preq: BUS 3910.

BUS 3990 - Creative Inquiry in Business
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of four credits.

BUS 4910 - International Business Honors Thesis I
3 Credits (3 Contact Hours)
Students work with an advisor to conduct literature review and research on a senior thesis topic and prepare presentations and thesis drafts based on this work. Preq: BUS 3920.
BUS 4920 - International Business Honors Thesis II
3 Credits (3 Contact Hours)
Students work with an advisor to complete a senior thesis. They prepare and present a seminar on the topic for presentation to faculty and other International Business Honors students. Preq: BUS 4910.

BUS 4990 - Creative Inquiry in Business
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of four credits.

Cardiovascular Technology

CVT 2250 - Ultrasound Physics
3 Credits (3 Contact Hours)
Explanation of the basic principles and characteristics associated with diagnostic ultrasound. Preq: CVT 2260.

CVT 2260 - Introduction to Cardiovascular Sonography
3 Credits (3 Contact Hours)
Introduces students to patient care, patient confidentiality, blood components, lymphatics, cardiovascular pharmacology, heart embryology, cardiovascular anatomy and physiology, standard sonography views, and Doppler/instrumentation. Preq or concurrent enrollment: BIOL 2220.

CVT 3250 - Echocardiography Principles
4 Credits (3 Contact Hours)
Study of two-dimensional, m-mode, Doppler echocardiography and left ventricular systolic function. Includes discussion of various pathologies, the resulting echocardiographic findings and treatments. Preq: CVT 2250 and CVT 2260. Coreq: CVT 3251.

CVT 3251 - Echocardiography Principles Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CVT 3250. Coreq: CVT 3250.

CVT 3260 - Echocardiography Methods
4 Credits (3 Contact Hours)
Study of two-dimensional, Doppler echocardiography and transesophageal echocardiography. Includes discussion of various pathologies, the resulting echocardiographic findings and treatments. Preq: CVT 3250. Coreq: CVT 3261.

CVT 3261 - Echocardiography Methods Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CVT 3260. Coreq: CVT 3260.

CVT 3350 - Vascular Sonography Principles
4 Credits (3 Contact Hours)
Study of two-dimensional, color Doppler, spectral Doppler and other testing modalities in peripheral and cerebrovascular disease. Includes discussion of various pathologies, the resulting sonographic findings and treatments. Preq: CVT 2260. Coreq: CVT 3351.

CVT 3351 - Vascular Sonography Principles Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CVT 3350. Coreq: CVT 3350.

CVT 3360 - Vascular Sonography Methods
4 Credits (3 Contact Hours)
Study of two-dimensional, color Doppler, spectral Doppler and other testing modalities in peripheral arterial, abdominal vascular and intracranial cerebrovascular disease. Includes discussion of various pathologies, the resulting sonographic findings and treatments. Preq: CVT 3350. Coreq: CVT 3361.

CVT 3361 - Vascular Sonography Methods Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CVT 3360. Coreq: CVT 3360.
CVT 4240 - CVS Field Experience I
3 Credits (18 Contact Hours)
Students complete 4400 hours of uninterrupted, supervised work in a clinical care setting. Under direct supervision of GHS registered sonographers, students are introduced to scanning protocols and techniques, instructed in principles, techniques and applications of multiple diagnostic modalities, including echocardiography, vascular duplex imaging, Doppler, and plethysmography. Preq: CVT 3260 and 3360.

CVT 4250 - CVS Field Experience II
6 Credits (18 Contact Hours)
Intermediate level course expands on introductory skills learned in CVT 4240. Students apply scanning protocols and techniques, and improve their use of multiple diagnostic modalities, including echocardiography, vascular duplex imaging, Doppler, and plethysmography. Students become proficient with all aspects of paperwork and communications within the health care organization. Preq: CVT 4240.

CVT 4260 - CVS Field Experience III
6 Credits (18 Contact Hours)
In this advanced course, students complete 440 hours in a clinical setting under the supervision of registered sonographers. Students are tested in all aspects of fundamental principles, techniques and applications of multiple diagnostic modalities, including echocardiography, vascular duplex imaging, Doppler and plethysmography. Preq: CVT 4250.

Career and Technology Education

CTE 1150 - Contemporary Technological Problems
3 Credits (3 Contact Hours)
Provides students with an understanding of the problems and contributions of technology. Examples are taken from historical accounts and from analyses of contemporary technological intervention both in industrialized and nonindustrialized countries.

CTE 2210 - Exploring Technology
3 Credits (3 Contact Hours)
Covers a wide range of technological concepts along with familiar examples of how technology impacts our lives as individuals, a society, and a global community.

CTE 3100 - Designing Creative Instruction
3 Credits (2 Contact Hours)
Provides preservice teachers with opportunities to develop skills in technological literacy, design, inquiry-based instruction, and problem solving using a variety of media, with emphasis on their applications in the elementary curriculum. Preq: Junior standing in Early Childhood or Elementary Education. Coreq: CTE 3101.

CTE 3101 - Designing Creative Instruction Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CTE 3100. Coreq: CTE 3100.

Career Center Internship Program

INT 1010 - Off-Campus Internship Part-Time 1
0 Credits (0 Contact Hours)
Students participate in a part-time off-campus internship.

INT 1020 - Off-Campus Internship Part-Time 2
0 Credits (0 Contact Hours)
Students participate in a part-time off-campus internship.

INT 1030 - Off-Campus Internship Part-Time 3
0 Credits (0 Contact Hours)
Students participate in a part-time off-campus internship.

INT 1510 - UPIC Internship Part-Time 1
0 Credits (10 Contact Hours)
Students participate in a part-time University Professional Internship/Co-op Program.
INT 1520 - UPIC Internship Part-Time 2
0 Credits (10 Contact Hours)
Students participate in a part-time University Professional Internship/Co-op Program.

INT 1530 - UPIC Internship Part-Time 3
0 Credits (10 Contact Hours)
Students participate in a part-time University Professional Internship/Co-op Program.

INT 1540 - UPIC Internship Part-Time 4
0 Credits (10 Contact Hours)
Students participate in a part-time University Professional Internship/Co-op Program.

INT 2010 - Off-Campus Internship Full-Time I
0 Credits (0 Contact Hours)
Students participate in a full-time off-campus internship.

INT 2020 - Off-Campus Internship Full-Time 2
0 Credits (0 Contact Hours)
Students participate in a full-time off-campus internship.

INT 2030 - Off-Campus Internship Full-Time 3
0 Credits (0 Contact Hours)
Students participate in a full-time off-campus internship.

INT 2510 - UPIC Internship Full-Time 1
0 Credits (20 Contact Hours)
Students participate in a full-time University Professional Internship/Co-op Program.

INT 2520 - UPIC Internship Full-Time 2
0 Credits (20 Contact Hours)
Students participate in a part-time University Professional Internship/Co-op Program.

INT 2530 - UPIC Internship Full-Time 3
0 Credits (20 Contact Hours)
Students participate in a part-time University Professional Internship/Co-op Program.

INT 2540 - UPIC Internship Full-Time 4
0 Credits (20 Contact Hours)
Students participate in a part-time University Professional Internship/Co-op Program.

INT 3010 - International Internship
3 Credits (15 Contact Hours)
This three-module course provides students with a pre-departure curriculum, an international internship experience, and a post internship reacclimation curriculum. All on-campus settings are designed to provide meaningful, intentional career development and cultural awareness development. The international part-time internship requires a minimum of 160 hours. All hours must be completed and approved by the course instructor by the end of the eight weeks.

Chemical Engineering

CHE 1300 - Introduction to Chemical Engineering
3 Credits (3 Contact Hours)
Tools and methods for analyzing engineering problems with applications in chemical and biochemical processes, including development of process flow diagrams, numerical methods, graphing, and applied statistics. Problem-solving and computer skills are developed in the lecture and laboratory activities. Preq: CH 1010 and either ENGR 1020 or ENGR 1060, each with a C or better. Preq or concurrent enrollment: MATH 1060 or MATH 1070; and PHYS 1220.

CHE 1990 - Creative Inquiry in Chemical and Biomolecular Engineering
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. To be taken Pass/No Pass only. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

**CHE 2110 - Mass and Energy Balances**
4 Credits (3 Contact Hours)
Introduction to fundamental concepts of chemical engineering, including mass and energy balances, PVT relationships for gases and vapors, and elementary phase equilibria; problem-solving and computer skills are developed in lab. Preq: CH 1020 and MATH 1080 and PHYS 1220 and CHE 1300. Coreq: CHE 2111.

**CHE 2111 - Mass and Energy Balances Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CHE 2110. Coreq: CHE 2110.

**CHE 2200 - Chemical Engineering Thermodynamics I**
3 Credits (3 Contact Hours)
Topics include first and second laws of thermodynamics, ideal gases, PVT properties of real fluids, energy balances with chemical reactions, and thermodynamic properties of real fluids. Preq: CHE 2110 and MATH 2060.

**CHE 2300 - Fluids/Heat Transfer**
4 Credits (3 Contact Hours)
General principles of chemical engineering and study of fluid flow, fluid transportation, and heat transmission. Special emphasis is placed on theory and its practical application to design. Preq: CHE 2110. Preq or concurrent enrollment: CHE 2200 and MATH 2060. Coreq: CHE 2301.

**CHE 2301 - Fluids/Heat Transfer Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CHE 2300. Coreq: CHE 2300.

**CHE 2990 - Creative Inquiry in Chemical and Biomolecular Engineering**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. To be taken Pass/No Pass only. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

**CHE 3000 - Honors Seminar**
1 Credits (1 Contact Hours)
Acquaints students enrolled in the Departmental Honors Program with current research issues in the profession. This assists the student in preparing a research proposal for the Senior Thesis. To be taken Pass/No Pass only. Preq: CHE 2200 and CHE 2300; and admission to departmental honors program.

**CHE 3070 - Unit Operations Laboratory I**
3 Credits (2 Contact Hours)
Laboratory work in the unit operations of fluid flow, heat transfer, and evaporation. Stress is on the relation between theory and experimental results and the statistical interpretation of those results and on report preparation and presentation. Preq: CHE 2200 and CHE 2300. Coreq: CHE 3071.

**CHE 3071 - Unit Operations Laboratory I Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CHE 3070. Coreq: CHE 3070.

**CHE 3190 - Engineering Materials**
3 Credits (3 Contact Hours)
Introduction to the fundamental properties and behavior of engineering materials emphasizing polymers, metals, ceramics, and composite materials. Preq: CHE 2110. Preq or concurrent enrollment: CH 2230 and CHE 2200.

**CHE 3210 - Chemical Engineering Thermodynamics II**
3 Credits (3 Contact Hours)
Continuation of CHE 2200. Topics include thermodynamics of power cycles and refrigeration/liquefaction, thermodynamic properties of homogeneous mixtures, phase equilibria, and chemical reaction equilibria. Preq: CHE 2200 and MATH 2080.

**CHE 3300 - Mass Transfer and Separation Processes**
4 Credits (3 Contact Hours)
Study of mass transport fundamentals and application of these fundamentals to separation technologies, with emphasis on gas absorption, stripping, distillation, and liquid-liquid extraction. Preq: CHE 2200 and CHE 2300. Preq or concurrent enrollment: CHE 3210. Coreq: CHE 3301.

CHE 3301 - Mass Transfer and Separation Processes Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CHE 3300. Coreq: CHE 3300.

CHE 3530 - Process Dynamics and Control
3 Credits (3 Contact Hours)
Mathematical analysis of the dynamic response of process systems. Basic automatic control theory and design of control systems for process applications. Preq: CHE 2300 and MATH 2080. Preq or concurrent enrollment: CHE 3300.

CHE 3950 - Honors Research I
3 Credits (9 Contact Hours)
Individual research under the direction of a Chemical Engineering faculty member. Preq: CHE 3000.

CHE 3990 - Creative Inquiry in Chemical and Biomolecular Engineering
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

CHE 4010 - Transport Phenomena
3 Credits (3 Contact Hours)
Mathematical analysis of single and multidimensional steady-state and transient problems in momentum, energy, and mass transfer. Both the similarities and differences in these mechanisms are stressed. Preq: CHE 3300 and MATH 2080. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CHE 4070 - Unit Operations Laboratory II
3 Credits (1 Contact Hours)
Continuation of CHE 3070 with experiments primarily on the diffusional operations. Additional lecture material on report writing and general techniques for experimental measurements and analysis of data, including statistical design of experiments. Preq: CHE 3070 and CHE 3300. CHE 4071.

CHE 4071 - Unit Operations Laboratory II Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany CHE 4070. Coreq: CHE 4070.

CHE 4120 - Polymer Engineering
3 Credits (3 Contact Hours)
Design-oriented course in synthetic polymers. Topics include reactor design used in polymer production, effect of step versus addition kinetics on reactor design, epoxy curing reactions, polymer solubility, influence of polymerization and processing conditions on polymer crystallinity. Preq: CH 2240 and CH 3320. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CHE 4130 - Polymer Composite Engineering
3 Credits (3 Contact Hours)
Presents fundamental concepts of polymeric composite materials. Main topics include classification of polymeric matrices; flow behavior and visco-elastic properties of fiber precursors and polymeric matrices; and physical and mechanical properties of composites. Preq: CH 2240; and CHE 4120 or MSE 4150.

CHE 4140 - Green Engineering
3 Credits (3 Contact Hours)
Green chemistry/engineering principles are applied to process and product design. Green engineering metrics are applied to quantify the sustainability, life cycle and environmental impact of chemical technologies, processes and products. Emphasis is placed on industrial sustainability, product innovation, risk assessment, policy and societal implications. Preq: CHE 2110 and MATH 1080.

CHE 4150 - Alternative Energy
Addresses the technological environmental, political, social and economic fundamentals associated with using alternative energy sources to meet global energy needs. Engineering analysis is used to evaluate several alternative energy technologies, including biomass, geothermal, hydropower, nuclear, solar and wind. Preq: CHE 2200 and CHE 2300.

**CHE 4310 - Chemical Process Design I**
3 Credits (3 Contact Hours)
Steps in creating a chemical process design from original concept to successful completion and operation. Topics include process layout, equipment selection and sizing, safety and environmental evaluation, engineering economics, simulation, evaluation of alternatives, and optimization. Preq: CHE 3070 and CHE 3210 and CHE 3300. Preq or concurrent enrollment: CHE 4500.

**CHE 4330 - Process Design II**
3 Credits (1 Contact Hours)
Continuation of CHE 4310. Principles of process development, design, and optimization are applied in a comprehensive problem carried from a general statement of the problem to detailed design and economic evaluations. Preq: CHE 3300 and CHE 4070 and CHE 4310 and CHE 4500. Coreq: CHE 4331.

**CHE 4331 - Process Design II Laboratory**
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany CHE 4330. Coreq: CHE 4330.

**CHE 4430 - Safety, Environmental and Professional Practice I**
2 Credits (2 Contact Hours)
Preparation of senior chemical engineering students for entry into the profession with an emphasis on process safety. Timely information is presented on career options for chemical engineers, professional practice, and a host of safety-related topics. Outside speakers are used frequently. To be taken Pass/No Pass only. Preq or concurrent enrollment: CHE 4310.

**CHE 4440 - Safety, Environmental and Professional Practice II**
1 Credits (1 Contact Hours)
Students work on safety modules available from SACHE that culminate in a safety certificate. Working in groups, students present and discuss topics related to ethics, safety, the environment, and current events. To be taken Pass/No Pass only. Preq: CHE 4430. Preq or concurrent enrollment: CHE 4330.

**CHE 4450 - Selected Topics in Chemical Engineering**
3 Credits (3 Contact Hours)
Topics not covered in other courses, emphasizing current literature, research, and practice of chemical engineering. Topics vary from year to year. May be repeated, but only if different topics are covered. Preq: Consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CHE 4500 - Chemical Reaction Engineering**
3 Credits (3 Contact Hours)
Review of kinetics of chemical reactions and an introduction to the analysis and design of chemical reactors. Topics include homogeneous and heterogeneous reactions, batch and continuous flow reaction systems, catalysis, and design of industrial reactors. Preq: CHE 3210 and CHE 3300.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CHE 4910 - Special Projects in Chemical Engineering**
1-3 Credits (1-3 Contact Hours)
Topics requested by students or offered by faculty as the need arises. Topics may include review of current research in an area, technological advances, and national engineering goals. May be repeated for a maximum of six credits, but only if different topics are covered. Includes Honors sections.

**CHE 4950 - Honors Research II**
3 Credits (9 Contact Hours)
Individual research under the direction of a chemical engineering faculty member. Preq: CHE 3950.

**CHE 4970 - Honors Thesis**
1 Credits (1 Contact Hours)
Preparation of honors thesis based on research conducted in CHE 3950 and CHE 4950. Preq: CHE 4950.

**CHE 4990 - Creative Inquiry in Chemical and Biomolecular Engineering**
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

**Chemistry**

**CH 1010 - General Chemistry**
4 Credits (3 Contact Hours)
Introduction to the elementary concepts of chemistry through classroom and laboratory experience. Emphasizes chemical reactions and the use of symbolic representation, the mole concept and its applications and molecular structure. Includes Honors sections. Credit toward a degree will be given for only one of CH 1010 and CH 1050. Preq: CMPT score of 60 or higher; or CH 1040 or MATH 1050; or MATH 1010 or MATH 1020 or MATH 1030 with a C or better; or preq or concurrent enrollment: MATH 1040 or MATH 1060 or MATH 1070 or MATH 1080 or MATH 2060 or MATH 2080 or STAT 2300. Coreq: CH 1011.

**CH 1011 - General Chemistry Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CH 1010. Coreq: CH 1010.

**CH 1020 - General Chemistry**
4 Credits (3 Contact Hours)
Continuation of CH 1010, treating solutions, rates of reactions, chemical equilibrium, electrochemistry, chemistry of selected elements, and an introduction to organic chemistry. Credit toward a degree will be given for only one of CH 1020 or CH 1060. Includes Honors sections. Preq: CH 1010 with a C or better. Coreq: CH 1021.

**CH 1021 - General Chemistry Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CH 1020. Coreq: CH 1020.

**CH 1040 - Concepts in Chemistry**
2 Credits (2 Contact Hours)
Covers chemical ideas and mathematical skills as applied to important topics including the particulate nature of matter, visualization of chemical behavior, and application of mathematical principles to describe chemical systems. Students who have received credit for any other chemistry course will not be allowed to enroll in or receive credit for CH 1040. To be taken Pass/No Pass only.

**CH 1050 - Chemistry in Context I**
4 Credits (3 Contact Hours)
The chemistry of societal issues, including air quality, global warming, acid rain, and alternative energy sources is discussed in the context of their impact on society. May not be taken as a prerequisite for organic chemistry. Credit toward a degree will be given for only one of CH 1010 or CH 1050. Coreq: CH 1051.

**CH 1051 - Chemistry in Context I Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CH 1050. Coreq: CH 1050.

**CH 1060 - Chemistry in Context II**
4 Credits (3 Contact Hours)
Continuation of CH 1050. Topics include the chemistry of nuclear energy, new energy sources, nutrition, medicines, new materials, and genetic engineering. May not be taken as a prerequisite for organic chemistry. Credit toward a degree will be given for only one of CH 1020 or CH 1060. Preq: CH 1010 or CH 1050. Coreq: CH 1061.

**CH 1061 - Chemistry in Context II Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CH 1060. Coreq: CH 1060.

**CH 1410 - Chemistry Orientation**
1 Credits (1 Contact Hours)
Lectures, discussions, and demonstrations devoted to health and safety in chemistry laboratories; use of the chemical literature; and career planning. Preq or concurrent enrollment: CH 1010.

**CH 1520 - Chemistry Communication**
3 Credits (3 Contact Hours)
Methods for scientific communication, including oral, written, and electronic formats. Service-learning projects engage participants with community needs pertaining to chemistry issues.

**CH 1990 - Creative Inquiry in Chemistry I**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

**CH 2010 - Survey of Organic Chemistry**
3 Credits (3 Contact Hours)
Introduction to organic chemistry emphasizing nomenclature, classes of organic compounds, and chemistry of functional groups. For students needing a one-semester course in organic chemistry. Credit toward a degree will be given for only one of CH 2010 or CH 2230. Preq: CH 1020.

**CH 2020 - Survey of Organic Chemistry Laboratory**
1 Credits (3 Contact Hours)
Laboratory emphasizing standard techniques of organic laboratory analysis with the synthesis and characterization of organic molecules discussed in CH 2010. Credit will be given for only one of CH 2020 or CH 2270. Preq: CH 1020. Preq or concurrent enrollment: CH 2010.

**CH 2050 - Introduction to Inorganic Chemistry**
3 Credits (3 Contact Hours)
One semester treatment which emphasizes the properties and reactions of the more common chemical elements. Preq: CH 1020.

**CH 2230 - Organic Chemistry**
3 Credits (3 Contact Hours)
Introductory course in the principles of organic chemistry and the derivation of these principles from a study of the properties, preparations, and interrelationships of the important classes of organic compounds. Credit toward a degree will be given for only one of CH 2010 or CH 2230. Preq: CH 1020.

**CH 2240 - Organic Chemistry**
3 Credits (3 Contact Hours)
Continuation of CH 2230. Preq: CH 2230.

**CH 2270 - Organic Chemistry Laboratory**
1 Credits (3 Contact Hours)
Synthesis and properties of typical examples of the classes of organic compounds. Credit toward a degree will be given for only one of CH 2020 or CH 2270 or CH 2290. Preq or concurrent enrollment: CH 2230.

**CH 2280 - Organic Chemistry Laboratory**
1 Credits (3 Contact Hours)
Continuation of CH 2270. Preq: CH 2270. Preq or concurrent enrollment: CH 2240.

**CH 2290 - Organic Chemistry Laboratory**
1 Credits (3 Contact Hours)
One-semester laboratory for Chemical Engineering students. Credit toward a degree will be given for only one of CH 2270 or CH 2290. Preq: CH 2230.

**CH 2990 - Creative Inquiry in Chemistry II**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

**CH 3130 - Quantitative Analysis**
3 Credits (3 Contact Hours)
Fundamental principles of volumetric, gravimetric, and certain elementary instrumental chemical analyses. Preq or concurrent enrollment: CH 3150 or CH 3170.

**CH 3150 - Quantitative Analysis Laboratory**
2 Credits (6 Contact Hours)
Laboratory techniques of volumetric, gravimetric, and elementary instrumental chemical analyses. Credit toward a degree will be given for only one of CH 3150 or CH 3170. Preq or concurrent enrollment: CH 3130.

CH 3170 - Quantitative Analysis Laboratory
1 Credit (3 Contact Hours)
Standard techniques of analytical chemistry: gravimetric, volumetric, and instrumental. Credit toward a degree will be given for only one of CH 3150 or CH 3170. Preq or concurrent enrollment: CH 3130.

CH 3300 - Introduction to Physical Chemistry
3 Credits (3 Contact Hours)
One-semester treatment of physical chemistry emphasizing topics that are especially useful in the life sciences, agriculture, and medicine: chemical thermodynamics, equilibrium, solutions, kinetics, electrochemistry, macromolecules, and surface phenomena. Credit toward a degree will be given for only one of CH 3300 or CH 3310. Preq: MATH 1060.

CH 3310 - Physical Chemistry
3 Credits (3 Contact Hours)
Includes the gaseous state, thermodynamics, chemical equilibria, and atomic and molecular structure, from both experimental and theoretical points of view. Credit toward a degree will be given for only one of CH 3300 or CH 3310. Preq: MATH 2060 and PHYS 2210.

CH 3320 - Physical Chemistry
3 Credits (3 Contact Hours)
Continuation of CH 3310, including chemical kinetics, liquid and solid state, phase equilibria, solutions, electrochemistry and surfaces. Includes Honors sections. Preq: CH 3310 or CHE 2200.

CH 3390 - Physical Chemistry Laboratory
1 Credit (3 Contact Hours)
Experiments are selected to be of maximum value to Chemistry and Chemical Engineering majors. Preq or concurrent enrollment: CH 3310 or CHE 2200.

CH 3400 - Physical Chemistry Laboratory
1 Credit (3 Contact Hours)
Continuation of CH 3390. Preq or concurrent enrollment: CH 3320.

CH 3410 - Introduction to Research
1 Credit (1 Contact Hours)
Students are introduced to a variety of skills and topics related to the pursuit of independent research. The course addresses choosing a research topic, planning a research project, discovering and organizing prior work, keeping research records, laboratory safety and ethics in scientific research. Preq: CH 1020 and ENGL 1030.

CH 3600 - Chemical Biology
3 Credits (3 Contact Hours)
Introduction to the chemical foundations of biological phenomena, focusing on bioorganic, biophysical, bioinorganic, and bioanalytic chemistry principles. Preq: CH 2010 or CH 2230.

CH 3990 - Creative Inquiry in Chemistry III
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

CH 4000 - Selected Topics in Chemistry
1-3 Credits (1-3 Contact Hours)
Comprehensive study of topics of current interest in chemistry. May be repeated for a maximum of twelve credits, but only if different topics are covered.

CH 4010 - Organometallic Chemistry
3 Credits (3 Contact Hours)
Organometallic compounds are useful in applications ranging from large-scale industrial reactions to antibiotics, and this versatility arises from the chemically unique metalcarbon bond. Course begins with fundamental coordination chemistry, then progresses through ligand substitution, oxidative addition/reductive elimination, catalytic transformations and polymerization reactions. Includes honors sections. Preq: CH 2230.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CH 4020 - Inorganic Chemistry**  
3 Credits (3 Contact Hours)  
Basic principles of inorganic chemistry are discussed with special emphasis on atomic structure, chemical bonding, solid state, coordination chemistry, organometallic chemistry, and acid-base theories. The chemistry of certain selected elements is treated. Includes Honors sections. Preq: CH 3310 and CH 3320.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CH 4030 - Advanced Synthetic Techniques**  
2 Credits (6 Contact Hours)  
Introduction to advanced laboratory techniques in synthesis and characterization of inorganic and organic compounds. Laboratory sessions consist of a set of eight experiments in modern fields of chemistry, including superconductivity, buckminsterfullerene, bioinorganic chemistry, medicinal chemistry, asymmetric synthesis, and polymer chemistry. Preq: CH 2050 or CH 4020; and CH 2270; and CH 2280; and CH 3400 or CH 4120.

**CH 4040 - Bioinorganic Chemistry**  
3 Credits (3 Contact Hours)  
Covers fundamentals of bioinorganic chemistry with review of necessary inorganic and biochemical concepts. Topics include metal uptake, transport, and storage in biological systems; functions of metals in proteins; metal ion interactions with nucleic acids; physical methods used in bioinorganic chemistry; heavy element toxicity, radiopharmaceuticals and other metallodrugs. Includes Honors sections. Preq: BCHM 3010 or CH 2050.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CH 4060 - Mechanisms of Inorganic Reactions**  
3 Credits 3 Contact Hours  
Provides an introduction to the fundamentals of chemical kinetics and investigates the mechanisms of inorganic reactions, including substitution, electron transfer, and atom transfer reactions. Other factors in reaction mechanistic study, including linear free energy relationships, stereochemistry, catalysts, and isotope effects are introduced. Preq: CH 2050.

**CH 4110 - Instrumental Analysis**  
3 Credits (3 Contact Hours)  
Principles of operation and application of modern chemical instrumentation in the field of analytical chemistry. Topics include basic electronics, statistics, optical, mass, magnetic resonance, electron and x-ray spectrocopies, radiochemistry, and separation science. Preq: CH 3310. Preq or concurrent enrollment: CH 3320.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CH 4120 - Instrumental Analysis Laboratory**  
2 Credits (5 Contact Hours)  
Reinforces principles of chemical instrumentation described in CH 4110 by practical, hands-on experience. Aspects of sample preparation, standardization, data acquisition and interpretation, and report formulation procedures common in chemical analyses are considered for a range of modern instrumental methods. Preq or concurrent enrollment: CH 4110.

**CH 4130 - Chemistry of Aqueous Systems**  
3 Credits (3 Contact Hours)  
Study of chemical equilibria in aqueous systems, especially natural waters; acids and bases, dissolved CO2, precipitation and dissolution, oxidation-reduction, adsorption, etc. Includes Honors sections. Preq: CH 1020 or 1060.

**CH 4140 - Bioanalytical Chemistry**  
3 Credits (3 Contact Hours)  
Survey of selected areas of importance in bioanalytical chemistry. Fundamental principles, advanced topics, and applications of analytical measurements of biomolecules, bioassays, immunoassays, separations, mass spectrometry, method validation, macromolecular crystallography, microscopy, and imaging. Preq: CH 3130 and CH 4110.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CH 4210 - Advanced Organic Chemistry**  
3 Credits (3 Contact Hours)  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CH 4250 - Medicinal Chemistry**  
3 Credits (3 Contact Hours)  
Survey of the pharmaceutical drug discovery process. Covers discovery of candidate compounds, bioassay methods, and associated regulatory and commercial issues. Case studies are selected from the current literature. Preq: CH 2240.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CH 4270 - Organic Spectroscopy**  
3 Credits (2 Contact Hours)  
Survey of modern spectroscopic techniques used in the determination of molecular structure. Emphasizes the interpretation of spectra: nuclear magnetic resonance, ultraviolet, infrared, mass spectroscopy, optical rotatory dispersion, and circular dichroism. Includes Honors sections. Students are expected to have completed one year each of organic chemistry and physical chemistry. Coreq: CH 4271.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CH 4271 - Organic Spectroscopy Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany CH 4270. Coreq: CH 4270.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CH 4350 - Atomic and Molecular Structure**  
3 Credits (3 Contact Hours)  
Introduction to quantum theory and its application to atomic and molecular systems. Topics include harmonic oscillator, hydrogen atom, atomic and molecular orbital methods, vector model of the atom, atomic spectroscopy, and molecular spectroscopy. Includes Honors sections. Preq: CH 3320.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CH 4360 - Computational Quantum Chemistry and Electronic Structure Methods**  
3 Credits (3 Contact Hours)  
Hands-on introduction to electronic structure calculations. Topics include types of quantum mechanical calculations, the theory behind ab initio and density functional theory methods, basis sets and basis set effects. Emphasis is placed on understanding the results of calculations and relating them to basic chemical principles. Preq: CH 3320.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CH 4430 - Research Problems**  
1-6 Credits (3-18 Contact Hours)  
Original investigation of an assigned problem in a fundamental branch of chemistry. Work must be carried out under the supervision of a member of the staff. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Consent of instructor.

**CH 4440 - Research Problems**  
1-6 Credits (3-18 Contact Hours)  
Continuation of CH 4430. Original investigation of an assigned problem in a fundamental branch of chemistry. Work must be carried out under the supervision of a member of the staff. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Consent of instructor.

**CH 4500 - Chemistry Capstone**  
3 Credits (1 Contact Hours)  
Students undertake capstone projects in a team format. Projects necessitate the use of electronic and print resources, demonstrate expertise with a specific instrument or experimental technique, require strong collaboration within a team setting, and produce a peer-reviewed oral and written report. Preq: Senior standing. Coreq: CH 4501.

**CH 4501 - Chemistry Capstone Laboratory**  
0 Credits (6 Contact Hours)  
Non-credit laboratory to accompany CH 4500. Coreq: 4500.

**CH 4510 - Frontiers in Polymer Chemistry**
3 Credits (3 Contact Hours)
Survey of selected areas of current research in polymer science with particular emphasis on polymer synthesis. Although a text is required for review and reference, course is primarily literature based and focused on areas of high impact to multidisciplined technology. Preq: CH 2230 and CH 2240 and MSE 4150.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CH 4520 - Chemistry Communication II
1 Credits (1 Contact Hours)
Methods for scientific communication, including oral, written, and electronic formats. Student presentations focus on current chemical literature topics pertinent to their CH 4430/444 undergraduate research or results of that work are appropriate. Preq: CH 1520.

CH 4710 - Teaching Chemistry
3 Credits (3 Contact Hours)
Study of topics in chemistry addressed in the context of constructivist methodologies. Also considers laboratory work and management, laboratory safety, and the use of technology in the chemistry classroom. Preq: Any 3000-level chemistry course. Students who have not completed a 3000-level chemistry course but have high school teaching experience may request an override from the instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CH 4990 - Creative Inquiry in Chemistry IV
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

Chinese

CHIN 1010 - Elementary Chinese
4 Credits (3 Contact Hours)
Introductory course stressing speaking, listening, and writing. Attention is given to the sound system of Chinese to enable students to distinguish the four tones and to develop basic communication skills. Participation in cultural activities is encouraged. Coreq: CHIN 1011.

CHIN 1011 - Elementary Chinese Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany CHIN 1010. Coreq: CHIN 1010.

CHIN 1020 - Elementary Chinese
4 Credits (3 Contact Hours)

CHIN 1021 - Elementary Chinese Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany CHIN 1020. Coreq: CHIN 1020.

CHIN 2010 - Intermediate Chinese
3 Credits (3 Contact Hours)
Intermediate course with more emphasis on communication skills and structure. Reading and writing practice without phonetic aids; oral practice in and outside the class, paying special attention to idiomatic usage; introduction to cultural perspectives through readings and cultural activities. Preq: CHIN 1020. Coreq: CHIN 2011.

CHIN 2011 - Intermediate Chinese Laboratory
0 Credits (1 Contact Hours)

CHIN 2020 - Intermediate Chinese
3 Credits (3 Contact Hours)

CHIN 2021 - Intermediate Chinese Laboratory
0 Credits (1 Contact Hours)

**CHIN 2970 - Creative Inquiry in Chinese**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Arrangements with faculty members must be established prior to registration. Preq: Consent of faculty member(s).

**CHIN 3050 - Chinese Conversation and Composition I**
3 Credits (3 Contact Hours)
Practice in the spoken language emphasizing vocabulary, word-combinations, pronunciation, and comprehension. Learning practical language skills and intercultural communication by studying various topics. Preq: CHIN 2020

**CHIN 3060 - Chinese Conversation and Composition II**
3 Credits (3 Contact Hours)
Continuation of CHIN 3050. More practice in the spoken language emphasizing vocabulary, word combinations, pronunciation, and comprehension. Learning practical language skills and intercultural communication by studying various topics. Preq: CHIN 3050.

**CHIN (PHIL) 3120 - Philosophy in Ancient China**
3 Credits (3 Contact Hours)
Study of the history of Chinese philosophy from fifth century BCE, including Confucianism, Daoism, Moism, legalism, Buddhism, Neo-Daoism, and Neo-Confucianism. Examination of Chinese philosophers' views and arguments on questions of life and death, history and society, education and personal cultivation. May not be used to satisfy general modern language requirements. May also be offered as PHIL 3120.

**CHIN (PHIL) 3130 - Philosophy in Modern China**
3 Credits (3 Contact Hours)
Study of the history of Chinese philosophy from the 19th century BCE, including Confucianism, Daoism, Moism, legalism, Buddhism, Neo-Daoism, and Neo-Confucianism. Examination of Chinese philosophers' views and arguments on questions of life and death, history and society, education and personal cultivation. May not be used to satisfy general modern language requirements. May also be offered as PHIL 3130.

**CHIN 3160 - Chinese for International Trade I**
3 Credits (3 Contact Hours)
Study of spoken and written Chinese common to the Chinese-speaking business communities emphasizing business practices and writing/translating business letters and professional documents. Cross-cultural references are provided for comparative analyses of American and Chinese business behavior. Classes are conducted in Chinese. Preq or concurrent enrollment: CHIN 2020 and CHIN 3050.

**CHIN 3170 - Chinese for Health Professionals I**
3 Credits (3 Contact Hours)

**CHIN 3970 - Creative Inquiry in Chinese**
1-4 Credits (1-4 Contact Hours)
Students focus on a special research area under the guidance of a faculty member. After acquiring the requisite background, students formulate hypotheses for a group project, develop a critical framework, and initiate research on a specific topic.

**CHIN 3980 - Directed Reading**
3 Credits (3 Contact Hours)

**CHIN 4010 - Pre-Modern Chinese Literature in Translation**
3 Credits (3 Contact Hours)
Chinese literature from 8th century B.C.E. to 19th century C.E., including poetry, prose, drama, fiction, and literary criticism. All readings and discussions are in English.

**CHIN 4110 - Studies in the Chinese Language I: Literature**
3 Credits (3 Contact Hours)
Advanced training in the spoken and written language through readings in contemporary literature emphasizing vocabulary, syntax, and stylistics. All readings and discussions are in Chinese. Preq: CHIN 3060.
CHIN 4120 - Studies in the Chinese Language II: Social Issues
3 Credits (3 Contact Hours)
In-depth study of terminology and syntax for specific subject areas in contemporary social issues. All readings and discussions are in Chinese. Preq: CHIN 3060.

CHIN 4140 - Philosophy in Medieval China
3 Credits (3 Contact Hours)
Study of the history of Chinese philosophy from the 2nd century B.C.E. to the 18th century C.E., including the formation of Confucianism as national ideology, Neo-Daoism, Chinese Buddhism, and Neo-Confucianism. All readings and discussions are conducted in English. May not be used to satisfy general foreign language requirement. Includes Honors sections. May also be offered as PHIL 4140. Preq: CHIN 3120 or CHIN 3130 or PHIL 3120 or PHIL 3130 or PHIL 3140 or REL 3140.

CHIN 4160 - Chinese for International Trade II
3 Credits (3 Contact Hours)
Study of language, concepts, and the environment of Chinese-speaking markets of the world. Considers sociocultural, political, and economic issues relevant to the Chinese-speaking business world and the ramifications of these issues in global marketing. Classes are conducted in Chinese. Preq: CHIN 3160.

CHIN 4170 - Chinese for Health Professionals II
3 Credits (3 Contact Hours)
Continuation of CHIN 3170 with increased emphasis on managerial aspects of the health-care system in China. Taught in Chinese. Preq: CHIN 3170.

CHIN (ANTH) 4180 - Chinese Culture and Society
3 Credits (3 Contact Hours)
Examines basic cultural values and the patterns of Chinese social life. Focuses on Chinese social organization and interpersonal dynamics, including the family system, gender identities, social exchanges and networks. All readings and discussions are in English. May not be used to satisfy general modern language requirements. May also be offered as ANTH 4180.

CHIN 4970 - Creative Inquiry in Chinese
1-4 Credits (1-4 Contact Hours)
Continuation of research initiated in CHIN 3970. Students complete their projects and disseminate their research results. Preq: CHIN 3970.

CHIN 4980 - Independent Study
1-3 Credits (1-3 Contact Hours)
Supervised study and research on selected topics in Chinese studies. May be repeated for a maximum of six credits. Preq: Junior standing and consent of department chair.

CHIN 4990 - Selected Topics in Chinese Culture
3 Credits (3 Contact Hours)
Examination of various social and cultural topics, including art and literature, philosophical and religious traditions, health and healing, and folk and popular cultures. May be repeated for a maximum of six credits, but only if different topics are covered. Readings and discussions are in English. May not be used to satisfy general modern language requirements.

City and Regional Planning

CRP 4010 - Introduction to City and Regional Planning
3 Credits (3 Contact Hours)
Introduces students from other disciplines to city and regional planning. Spatial and nonspatial areas of the discipline are explored through a wide ranging lecture/seminar program. Preq: Consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CRP 4030 - Seminar on Planning Communication
3 Credits (3 Contact Hours)
In-depth analysis of methods to communicate planning and policy decisions effectively. Familiarizes students with the various communication skills needed by planners, policy makers, and other professionals to become successful practitioners. Preq: Consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
CRP (CE) 4120 - Urban Transportation Planning
3 Credits (3 Contact Hours)
Consideration of urban travel characteristics, characteristics of transportation systems, transportation and land-use studies, trip distribution and trip assignment models, city patterns and subdivision layout. May also be offered as CE 4120. Preq: CE 3110 with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CRP 4300 - The Nature of Geographic Information Systems (GIS)
3 Credits (2 Contact Hours)
Introduction to the theory and practical use of Geographic Information Systems (GIS). The course emphasizes geographic and statistical information and how it is represented and analyzed with computers. It introduces the concepts and components of a GIS and how they affect societal issues. Coreq: CRP 4301. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CRP 4301 - The Nature of Geographic Information Systems (GIS) Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CRP 4300. Coreq: CRP 4300. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

Civil Engineering

CE 1990 - Creative Inquiry in Civil Engineering
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of four credits. Preq: Consent of faculty member/mentor.

CE 2010 - Statics
3 Credits (3 Contact Hours)
Forces and force systems and their external effect on bodies, principally the condition of equilibrium. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. Includes Honors sections. Preq: PHYS 1220 with a C or better. Preq or concurrent enrollment: Either ENGR 1070 or ENGR 1410; and MATH 2060.

CE 2060 - Structural Mechanics
4 Credits (3 Contact Hours)
Builds on statics to develop relationships between external loads on structural elements of civil engineering interest and the resulting internal loads and deformations. Students are exposed to the development of stress and deformation formulas and the identification and use of significant mechanical properties of civil engineering materials. Preq: CE 2010 and MATH 2060, each with a C or better; and either ENGR 1090 or ENGR 1410. Coreq: CE 2061.

CE 2061 - Structural Mechanics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CE 2060. Coreq: CE 2060.

CE 2080 - Dynamics
2 Credits (2 Contact Hours)
Study of kinetics and kinematics of particles and rigid bodies, work and energy, impact and momentum. Preq: CE 2010 and MATH 2060, each with a C or better; and ENGR 1090 or ENGR 1410.

CE 2550 - Geomatics
3 Credits (2 Contact Hours)
Spatial data collection methods, including surveying, digital photogrammetry and remote sensing, and global positioning systems. Methods and technologies used to manage, manipulate, and analyze spatial and associated attribute data, including geographic information systems. Preq or concurrent enrollment: ENGR 2100. Coreq: CE 2551.

CE 2551 - Geomatics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CE 2550. Coreq: CE 2550.
CE 2990 - Creative Inquiry in Civil Engineering
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of four credits. Preq: Consent of faculty member/mentor.

CE 3010 - Structural Analysis
3 Credits (3 Contact Hours)
Calculation of design loads and load paths for buildings and other structures. Use of classical analysis techniques to determine support reactions, internal member forces, and structural displacements of statically determinate and indeterminate structural systems. Preq: CE 2060 with a C or better.

CE 3110 - Transportation Engineering Planning and Design
3 Credits (3 Contact Hours)
Covers planning, design, and operation of transportation facilities, including highways and airports. Includes economic, safety, and environmental considerations. Public transit systems are covered. Preq: CE 2550 with a C or better. Preq or concurrent enrollment: MATH 3020.

CE 3210 - Geotechnical Engineering
4 Credits (3 Contact Hours)
Mechanical and physical properties of soils and their relation to soil action in problems of engineering, such as classification, permeability, shearing strength, and consolidation: design of embankments and retaining walls with geotextiles. Preq: CE 2060 and GEOL 1010 and GEOL 1030, each with a C or better. Coreq: CE 3211.

CE 3211 - Geotechnical Engineering Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CE 3210. Coreq: CE 3210.

CE 3310 - Construction Engineering and Management
3 Credits (3 Contact Hours)
Considers construction contracts, technical specifications, cost estimating, project scheduling, cost control, materials management, quality control, and quality assurance. Preq: Junior standing.

CE 3410 - Introduction to Fluid Mechanics
4 Credits (3 Contact Hours)
Introduction to fluid mechanics, including hydrostatics and fluid flow. Includes principles of mass, momentum, and energy conservation. Other topics include conduit flow, pump systems, and open channel flow. Laboratory experiments familiarize students with laboratory techniques and instrumentation. The Effective Technical Communications Laboratory is used to prepare a presentation for a lab assignment. Preq: CE 2080 with a C or better or EM 2020 with a C or better. Coreq: CE 3411.

CE 3411 - Introduction to Fluid Mechanics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CE 3410. Coreq: CE 3410.

CE 3420 - Applied Hydraulics and Hydrology
3 Credits (3 Contact Hours)
Study of hydrologic cycle, including precipitation, evapotranspiration, infiltration, and runoff. Includes hydrograph analysis, gradually varied flow in open channel flow, design of stable channels, flood routing, groundwater hydraulics, flood frequency analysis, and hydrologic design. Preq: CE 3410 with a C or better.

CE 3510 - Civil Engineering Materials
4 Credits (3 Contact Hours)
Introduces students to material science and basic properties of construction materials such as aggregate, Portland cement, asphalt cement, concrete, steel, ceramics, wood, and fibers. Experiments in lab and field trips to nearby plants are required. Oral and written communication skills are an integral part of this course. Preq: ENGR 1090 or ENGR 1410 with a C or better; and GEOL 1010 and GEOL 1030, each with a C or better. Preq or concurrent enrollment: CE 2060 and MATH 3020. Coreq: CE 3511.

CE 3511 - Civil Engineering Materials Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CE 3510. Coreq: CE 3510.

CE 3520 - Economic Evaluation of Projects
Comparison of design alternatives based on engineering economic analysis. Introduces present worth, annual cost, rate of return, and benefit-cost ratio methods. Use of depreciation and taxation in project analysis.

**CE 3530 - Professional Seminar**
1 Credit (1 Contact Hour)
Discusses various professional topics related to skills and techniques for evaluating career opportunities, seeking and obtaining civil engineering employment, career development, professional registration, professional ethics, and other factors necessary for achieving success in a professional career. Enables students to make better decisions that will help them succeed in their careers. Preq: Junior standing.

**CE 3870 - Junior Honors Project**
1-3 Credits (1-3 Contact Hours)
Studies or laboratory investigations on special topics in the civil engineering field which are of interest to individual students and faculty members. Arranged on a project basis for a maximum of individual student effort under faculty guidance. May be repeated for a maximum of three credits. Preq: Junior standing in Civil Engineering Senior Departmental Honors Program.

**CE 3880 - Honors Research Topics**
1 Credit (0 Contact Hours)
Survey of ongoing research in the Civil Engineering Department to identify potential research topics for further individual study. Preq: Junior standing in Civil Engineering Senior Departmental Honors Program.

**CE 3890 - Honors Research Skills**
1 Credit (1 Contact Hours)
Research problem selection, research tools, research reports organization. Preq: CE 3880.

**CE 3990 - Creative Inquiry in Civil Engineering**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of four credits. Preq: Consent of faculty member/mentor.

**CE 4010 - Matrix Structural Analysis**
3 Credits (3 Contact Hours)
Analysis of determinate and indeterminate structures using the matrix formulation of the direct stiffness method. Consideration is given to commonly faced computer modeling issues and the nonlinear analysis of structures. Preq: CE 3010 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4020 - Reinforced Concrete Design**
3 Credits (3 Contact Hours)
Design of reinforced concrete beams, slabs, columns and footings using ultimate strength design. An introduction to working stress analysis is also included. Preq: CE 3010 with a C or better.

**CE 4040 - Masonry Structural Design**
3 Credits (3 Contact Hours)
Introduction to design of structural elements for masonry buildings, including lintels, walls, shear walls, columns, pilasters, and retaining walls. Reinforced and unreinforced elements of concrete or clay masonry are designed by allowable stress and strength design methods. Introduces construction techniques, materials, and terminology used in masonry. Preq: CE 3010 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4060 - Structural Steel Design**
3 Credits (3 Contact Hours)
Introduction to the design of structural elements found in steel buildings, in particular the design of steel tension members, beams, columns, beam-columns, and connections. Emphasizes the AISC-LRFD Specifications for steel design, though reference is made to the ASD Specification with comparisons made where appropriate. Preq: CE 3010 with a C or better.

**CE 4070 - Wood Design**
3 Credits (3 Contact Hours)
Introduction to wood design and engineering; properties of wood and wood-based materials; design of beams, columns, walls, roofs, panel systems, and connections. Preq: CE 3010 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4080 - Structural Loads and Systems**  
3 Credits (3 Contact Hours)  
In-depth discussion of minimum design loads and load combinations. Includes overview of various steel and concrete systems. Discusses practical selection and design issues and design of proprietary building materials and components such as steel joists, diaphragms, engineered wood products, etc. Preq: CE 3010 with a C or better.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4100 - Traffic Engineering: Operations**  
3 Credits (3 Contact Hours)  
Basic characteristics of motor-vehicle traffic, highway capacity, applications of traffic control devices, traffic design of parking facilities, engineering studies, traffic safety, traffic laws and ordinances, and public relations. Preq: CE 3110 with a C or better.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4110 - Roadway Geometric Design**  
3 Credits (2 Contact Hours)  
Geometric design of roadways, at-grade intersections, and interchanges in accordance with conditions imposed by driver ability, vehicle performance, safety, and economics. Preq: CE 3110 with a C or better. Coreq: CE 4111.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4111 - Roadway Geometric Design Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany CE 4110. Coreq: CE 4110.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE (CRP) 4120 - Urban Transportation Planning**  
3 Credits (3 Contact Hours)  
Consideration of urban travel characteristics, characteristics of transportation systems, transportation and land-use studies, trip distribution and trip assignment models, city patterns and subdivision layout. May also be offered as CRP 4120. Preq: CE 3110 with a C or better.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4210 - Geotechnical Engineering Design**  
3 Credits (3 Contact Hours)  
Study of the relationship of local geology to soil formations, groundwater, planning of site investigation, sampling procedures, determination of design parameters, foundation design, and settlement analysis. Preq: CE 3210 with a C or better.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4240 - Earth Slopes and Retaining Structures**  
3 Credits (3 Contact Hours)  
Considers the principles of geology, groundwater and seepage, soil strength, slope stability, and lateral earth pressure and their application to the design of excavations, earth fills, dams, and earth-retaining structures. Preq: CE 3210 with a C or better.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4250 - Soil-Structure Interaction**  
3 Credits (3 Contact Hours)  
Study of the interaction between soil and structural elements such as pile foundations and retaining structures subjected to static and dynamic loads; application of general purpose finite element software for solving soil-structure interaction problems; introduction to the theory of finite element method, beams on elastic foundation, p-y curves and advanced testing procedures. Preq: CE 3210 and CE 3010, each with a C or better.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4330 - Construction Planning and Scheduling**  
3 Credits (3 Contact Hours)  
Study of principles and applications of the Critical Path Method (CPM) and Project Evaluation and Review Techniques (PERT). Includes project breakdown and network graphics; identification of the critical path and resulting floats; definition and allocation of materials, equipment, and manpower resources; resource leveling, compression, and other network adjustments; and computer applications using
packaged routines. Preq: CE 3310 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4340 - Construction Estimating and Project Control**
3 Credits (3 Contact Hours)
Instruction in specifications, contracts, and bidding strategies; purchasing and subcontracting policies; accounting for materials, supplies, subcontracts, and labor; procedural details for estimating earthwork, reinforced concrete, steel, and masonry. Also considers overhead and profit items. Preq: CE 3310 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4350 - Infrastructure Project Planning**
3 Credits (3 Contact Hours)
Covers concepts related to planning, cost estimating, financing and executing public works projects from the agency owner perspective. Advanced concepts of engineering economic analysis, risk analysis and database management systems are addressed. Traditional and innovative project contracting strategies, including incentive contracts and public-private partnerships, are discussed. Preq: CE 3520 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4360 - Sustainable Construction**
3 Credits (3 Contact Hours)
Presents the "why," "what" and "how" for sustainable construction projects. Students gain a working understanding of how to minimize the negative impacts of buildings and other large construction projects. Preq: CE 3310 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4370 - Sustainable Energy Project Design and Analysis**
3 Credits (3 Contact Hours)
Students develop their technical and creative ability to plan and design for a sustainable future. Students perform quantitative analyses of the environmental and economic impacts of engineering alternatives. Students work in small groups and learn techniques for the collaborative, multidisciplinary approach required for sustainable solutions. Preq: CE 3310 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4380 - Construction Support Operations**
3 Credits (3 Contact Hours)
Describes activities necessary for the completion of a construction job although not specifically recognized as direct construction activities: general conditions, safety, security, quality assurance, value engineering; organizational support features and typical implementation procedures. Preq: CE 3310 and MATH 3020, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4390 - Construction Equipment Selection and Maintenance**
3 Credits (3 Contact Hours)
Methodology of selecting the right equipment of the right size for each task of the construction job on the basis of power-train characteristics, crew size, terrain conditions, and job requirements. Cycle time, cost, specifications, maintenance, replacement policy, monitoring. Preq: CE 3310 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE (BE) 4400 - Sustainable Energy Engineering**
3 Credits (2 Contact Hours)
Investigation into merging renewable energy resources, including detailed study of solar, wind, and bioenergy alternatives. Also includes principles, technologies, and performance evaluation of components for these technologies and an introduction to tidal, hydro, geothermal, and other energy; energy conservation; cogeneration; financial, economical, and other issues related to alternative energy sources. May also be offered as BE 4400. Preq: Junior standing in engineering. Coreq: CE 4401.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE (BE) 4401 - Sustainable Energy Engineering Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CE 4400. May also be offered as BE 4401. Coreq: CE 4400.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CE 4430 - Water Resources Engineering
3 Credits (3 Contact Hours)
Extension of the concepts of fluid mechanics to applications in water supply, water resource assessment, water transmission, water distribution networks, pump and pipe selection, pipe networks, and analysis of open channel appurtenances. Preq: CE 3410 with a C or better.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CE 4460 - Flood Hazards and Protective Design
3 Credits (3 Contact Hours)
Study of flood hazards and methods of protective design of the built environment; floodplain mapping and delineation; methods for determining base flood elevations. Discusses flood-resistant construction, flood proofing, and governmental regulations. Includes case studies and design projects. Preq or concurrent enrollment: CE 3420.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CE 4470 - Stormwater Management
3 Credits (3 Contact Hours)
Evaluation of peak discharges for urban and rural basins, design of highway drainage structures such as inlets and culverts; stormwater and receiving water quality; best management practices, detention and retention ponds, and erosion and sediment control. Preq: CE 3420 with a C or better. Preq or concurrent enrollment: EES 4010.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CE 4560 - Pavement Design and Construction
3 Credits (3 Contact Hours)
Introduction to design methods, construction practices, maintenance strategies, and decision making process related to pavements. Other topics, such as environmental considerations and special pavement types and materials, are also covered. Preq: CE 3110 and CE 3510, each with a C or better. Preq or concurrent enrollment: CE 3210.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CE 4570 - Materials Testing and Inspection
3 Credits (3 Contact Hours)
Introduction to the role of testing and inspection professionals in civil engineering projects. Uses a practical approach to applying concepts to real-world situations through the completion of several team projects such as material characterization, construction QC/QA, forensic evaluation, and proposal development. Preq: CE 3210 and CE 3510, each with a C or better.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CE 4590 - Capstone Design Project
3 Credits (1 Contact Hours)
Students apply creativity with their engineering knowledge in the solution of open-ended civil engineering problems. Problems are formulated and solutions are evaluated by faculty and practicing engineers. Communication skills are developed through presentations, correspondence and project reports. Students are expected to have completed all required 300-level CE courses and a Technical Design Requirement. Coreq: CE 4591.

CE 4591 - Capstone Design Project Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany CE 4590. Coreq: CE 4590.

CE 4620 - Coastal Engineering I
3 Credits (3 Contact Hours)
Introduction to coastal and oceanographic engineering principles, including wave mechanics, wave-structure interaction, coastal water-level fluctuations, coastal-zone processes, and design considerations for coastal structures and beach nourishment projects. Preq: CE 3410 with a C or better.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

CE (GEOL) 4820 - Groundwater and Contaminant Transport
3 Credits (3 Contact Hours)
Basic principles of groundwater hydrology and transport of contaminants in groundwater systems; groundwater system characteristics; steady and transient flow; well hydraulics, design, and testing; contaminant sources, movement and transformations. Preq: Junior standing in the College of Engineering, Computing and Applied Sciences and GEOL 1010. May also be offered as GEOL 4820. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4870 - Senior Honors Project**
1-3 Credits (1-3 Contact Hours)
Studies or laboratory investigations on special topics in civil engineering which are of interest to individual students and faculty members. Arranged on a project basis for a maximum of individual student effort under faculty guidance. May be repeated for a maximum of three credits. Preq: Senior standing in Civil Engineering Senior Departmental Honors Program.

**CE 4880 - Honors Research I**
2-3 Credits (2-3 Contact Hours)
Individual research under the direction of a Civil Engineering faculty member. Preq: CE 3890.

**CE 4890 - Honors Research II**
3 Credits (3 Contact Hours)
Individual research under the direction of a Civil Engineering faculty member. Preq: CE 4880.

**CE 4900 - Special Projects**
1-3 Credits (1-3 Contact Hours)
Studies or laboratory investigations on special topics in civil engineering which are of interest to individual students and staff members. Arranged on a project basis with a maximum of individual student effort and a minimum of staff guidance. May be repeated for a maximum of three credits. Preq: Senior standing.

**CE 4910 - Selected Topics in Civil Engineering**
1-6 Credits (1-6 Contact Hours)
Structured study of civil engineering topics not found in other courses. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Consent of instructor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CE 4990 - Creative Inquiry in Civil Engineering**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of four credits. Preq: Consent of faculty member/mentor.

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Clemson University

**CU 1000 - Clemson Connect**
0 Credits (0 Contact Hours)
Introduction to the learning experience at Clemson University. Includes instruction in information technology and information skills. To be taken Pass/No Pass only.

**CU 1010 - University Success Skills**
2 Credits (3 Contact Hours)
Introduction to a variety of topics critical to students' success. Topics include time management, goal setting, test taking, campus resources and policies, critical thinking, and diversity. Students are given opportunities to discover and practice many procedures, techniques, and tips. Limited to freshmen and first semester transfer students.

**CU 1100 - Introduction to Tutoring**
1 Credits (1 Contact Hours)
Students develop and reinforce skills in tutoring and communication through use of techniques based in educational research. To be taken Pass/No Pass only.

**CU 1110 - Introduction to Supplemental Instruction**
1 Credits (1 Contact Hours)
Students develop and reinforce interpersonal relationship skills in listening, decision making, communicating, group dynamics, leadership, assertiveness, time management, problem solving, and conflict resolution. To be taken Pass/No Pass only.

**CU 1200 - Introduction to Career Development**
1 Credits (1 Contact Hours)
This course educates students about career planning, equips them to evaluate prospective career fields, and enables them to pursue career aspirations. Upon completion, students have a greater awareness of their career interests, and understand the connection between their studies and their career goals.

**CU 1970 - New Student Seminar**
1-3 Credits (1-3 Contact Hours)
Introduction to the university academic environment. Class meeting instruction focuses on discussion of a topic selected by a faculty member. Includes additional online and workshop instruction in information technology, global citizenship and academic success skills. To be taken Pass/No Pass only.

**CU 2010 - Sustainability Leadership**
3 Credits (3 Contact Hours)
Participants learn how principles of environmental, social and economic sustainability apply in contexts ranging from personal lifestyle choices, to the built environment, to operation of public and private institutions. Participants also develop and practice skills to act as agents of change in the university and the broader community.

**College of Architecture, Arts and Humanities**

**CAAH 2010 - Cultural Literacies Across Media**
3 Credits (3 Contact Hours)
Hands-on practicum course in which students reflect critically on the cultural, aural, visual, professional and technological literacies learned as a result of a semester-long study abroad experience. May be repeated for a maximum of six credits. Preq: Enrollment in a study abroad program and ENGL 1030.

**College of Engineering and Science**

**CES 1900 - Creative Inquiry in Engineering and Science I**
1-3 Credits (1-3 Contact Hours)
Individual or group projects in engineering and/or science. Projects may be interdisciplinary and involve analysis, design, and/or implementation. Instruction in methods, tools, and equipment will be included when appropriate. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Consent of instructor.

**CES 2900 - Creative Inquiry in Engineering and Science II**
1-3 Credits (1-3 Contact Hours)
Individual or group projects in engineering and/or science. Projects may be interdisciplinary and involve analysis, design, and/or implementation. Instruction in methods, tools, and equipment will be included when appropriate. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Sophomore standing and consent of instructor.

**CES 3900 - Creative Inquiry in Engineering and Science III**
1-3 Credits (1-3 Contact Hours)
Individual or group projects in engineering and/or science. Projects may be interdisciplinary and involve analysis, design, and/or implementation. Instruction in methods, tools, and equipment will be included when appropriate. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Junior standing and consent of instructor.

**CES 4900 - Creative Inquiry in Engineering and Science IV**
1-3 Credits (1-3 Contact Hours)
Individual or group projects in engineering and/or science. Projects may be interdisciplinary and involve analysis, design, and/or implementation. Instruction in methods, tools, and equipment will be included when appropriate. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Senior standing and consent of instructor.

**Communication**
COMM 1010 - Communication Academic and Professional Development I
1 Credits (1 Contact Hours)
Introduces students to General Education and Communication Studies major requirements, explains connections between general education and major courses, explores careers in communication, and prepares students to develop digital portfolios, résumés, and interview skills specific to communication professions and/or graduate school. To be taken Pass/No Pass only.

COMM 1070 - Media Representations of Science and Technology
3 Credits (3 Contact Hours)
Examines mediated representations of science and technology from a communication perspective. Attention is paid to portrayals/coverage of science and technology in popular film, television, Internet, journalism, and other media. Students examine an array of theoretical issues and case studies in this area.

COMM 1500 - Introduction to Human Communication
3 Credits (2 Contact Hours)
Overview of theoretical approaches to the study of communication, including the theory and practice of interpersonal/small group/intercultural/public communication. Includes a laboratory. Coreq: COMM 1501.

COMM 1501 - Introduction to Human Communication Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany COMM 1500. Coreq: COMM 1500.

COMM 1620 - Forensic Laboratory
1 Credits (3 Contact Hours)
Research, preparation, and practice leading to participation in on-campus and intercollegiate debate and individual events competition. May be repeated for a maximum of four credits.

COMM 1630 - Advanced Forensic Laboratory
1 Credits (3 Contact Hours)
Advanced research, preparation, and practice leading to continued participation in on-campus and intercollegiate debate and individual events competition. May be repeated for a maximum of four credits. Preq: COMM 1620.

COMM 1800 - Introduction to Cross-Cultural Communication
3 Credits (3 Contact Hours)
Introductory course designed to provide an overview to intercultural communication questions stemming from the growing diversity and interconnectedness of the world. Students are challenged to learn about the ways people from different cultural backgrounds think, communicate and behave based on the value systems and worldviews that ground them.

COMM 2010 - Introduction to Communication Studies
4 Credits (3 Contact Hours)
Introduces Communication Studies majors to and prepares them for continued study in the discipline by providing them with an overview of important issues, areas of study, and approaches to the field. Includes a writing laboratory experience. Preq: COMM 1010. Coreq: COMM 2011.

COMM 2011 - Introduction to Communication Studies Laboratory
0 Credits (2 Contact Hours)

COMM 2020 - Communication Theory
3 Credits (3 Contact Hours)
Students explore the breadth and depth of theories within the major frameworks of the communication studies discipline. Preq: COMM 2010 with a C or better.

COMM 2030 - Mass Communication Theory
3 Credits (3 Contact Hours)
Survey of the breadth and history of theories of mass communication and mass media from the 19th century to the present. Emphasizes contemporary schools of thought, theoretical debates, and the continuing controversies in the field. Preq: COMM 2010 with a C or better.

COMM 2040 - Critical-Cultural Communication Theory
3 Credits (3 Contact Hours)
Survey of the breadth and history of critical-cultural theories of society, communication, media and power mass media from the 19th century to the present. Emphasizes contemporary schools of thought, theoretical debates, and the continuing controversies in the field. Preq: COMM 2010 with a C or better.
COMM 2100 - Quantitative Research Methods in Communication Studies
3 Credits (3 Contact Hours)
Explores methods of quantitative communication inquiry, including theory/research relationship, conducting studies, and utilizing statistical software. Methods may include experiments, surveys, and content analysis. Preq: COMM 2010 with a C or better.

COMM 2110 - Qualitative Research Methods in Communication Studies
3 Credits (3 Contact Hours)
Explores methods of qualitative communication inquiry, including theory/research relationship and conducting studies. Methods may include interviewing, focus groups, textual analysis, and ethnography. Preq: COMM 2010 with a C or better.

COMM 2120 - Critical-Cultural Research Methods in Communication Studies
3 Credits (3 Contact Hours)
Explores methods of critical-cultural communication inquiry, including theory/research relationships, conducting studies, and integrating multiple methods. Methods may include discourse analysis, historiography and participant observation. Preq: COMM 2010 with a C or better.

COMM 2500 - Public Speaking
3 Credits (3 Contact Hours)
Practical instruction in public speaking; practice in the preparation, delivery, and criticism of short speeches. Develops an understanding and knowledge of the process of communication. Includes a laboratory. Includes Honors sections. Coreq: COMM 2501.

COMM 2501 - Public Speaking Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany COMM 2500. Coreq: COMM 2500.

COMM 3010 - Communication Theory
3 Credits (3 Contact Hours)
Students explore the breadth and depth of theories within the major frameworks of the communication studies discipline.

COMM 3020 - Mass Communication Theory
3 Credits (3 Contact Hours)
Survey of the breadth and history of theories of mass communication and mass media from the 19th century to the present. Emphasizes contemporary schools of thought, theoretical debates, and the continuing controversies in the field.

COMM 3030 - Communication Law and Ethics
3 Credits (3 Contact Hours)
Major topics in communication law and free expression and in communication ethics. Preq: COMM 2010 with a C or better.

COMM 3050 - Persuasion
3 Credits (3 Contact Hours)
Study of the processes by which communication influences attitudes, beliefs, and behaviors in our personal, social, civic, and professional lives. After discussion of definitional and methodological issues, particular theories of persuasion are examined. Treatment of political, market-driven, and social persuasion concludes the course. Preq: COMM 2010 with a C or better.

COMM 3070 - Public Communication of Science and Technology
3 Credits (3 Contact Hours)
Examines the role of science and technology in society from a communication perspective. Particular attention is paid to this dynamic in public culture. Students examine an array of theoretical issues and case studies in this area. Preq: COMM 2010 with a C or better.

COMM 3080 - Public Communication and Popular Culture
3 Credits (3 Contact Hours)
Examines artifacts of popular culture, paying particular attention to their relationship to politics and public life. Explores the structures and constraints of the culture industry. Students apply communication principles to various examples. Preq: COMM 2010 with a C or better.

COMM 3090 - Visual Discourse and the Public
3 Credits (3 Contact Hours)
Examines the role of visuality in society and the cultural implications for ways of seeing. Using visual artifacts of various types, students learn the logic of visual representation. Preq: COMM 2010 with a C or better.

COMM 3150 - Critical-Cultural Communication Theory
3 Credits (3 Contact Hours)
Survey of the breadth and history of critical-cultural theories of society, communication, media and power mass media from the 19th century to the present. Emphasizes contemporary schools of thought, theoretical debates, and the continuing controversies in the field.

**COMM (WS) 3160 - Girlhood, Media, and Popular Culture**
3 Credits (3 Contact Hours)
Explores how the mass media and popular culture contribute to social constructions of girlhood. Employing the critical lens of feminist and communication theories, students examine mediated depictions of girls as well as how girls actively produce and negotiate media and popular culture. May also be offered as WS 3160. Preq: COMM 2010 with a C or better or WS 3010.

**COMM 3200 - Broadcast Production**
3 Credits (2 Contact Hours)
Explores the broadcast side of journalism. Students produce broadcast video packages, as well as newscasts. Students learn news writing, filming and video editing. Coreq: COMM 3201.

**COMM 3201 - Broadcast Production Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany COMM 3200. Coreq: COMM 3200.

**COMM 3210 - Communication Across Media Platforms**
3 Credits (3 Contact Hours)
Provides an overview of the communication convergence strategies and practices used across multiple media platforms, including print, broadcast, Internet and social media. Emphasis is placed on media law, ethics and communication practices used across multiple media platforms. Preq: COMM 2010 with a C or better.

**COMM 3220 - Communication Design**
3 Credits (2 Contact Hours)
Provides an overview of the communication theories, tools and techniques available to design, manipulate and convey technological messages and experiences in digital contexts. Provides knowledge and critical skills necessary to consider communication design as an important and inevitable component of communication studies careers.

**COMM 3221 - Communication Design Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany COMM 3220.

**COMM 3240 - Communication, Sport and Society**
3 Credits (3 Contact Hours)
Covers the cultural influence of communication about sports on society. Explores how communication enables cultural meanings and values to become associated and established within sports. Exposes students to the ways factors such as race, gender and nationalism manifest and perpetuate via communication about sports. Preq: COMM 2010 with a C or better.

**COMM 3250 - Survey of Sports Communication**
3 Credits (3 Contact Hours)
Covers fundamentals of communicating in a sports environment. Includes the basics of communicating for print and broadcast news, as well as communicating for sports information. Also covers ethical considerations in sports communications. Preq: COMM 2010 with a C or better.

**COMM 3260 - Public Relations in Sports**
3 Credits (3 Contact Hours)
Focuses on the preparation of professional sports communication materials for both internal and external audiences. Topics include the mechanics of creating press releases and other materials, as well as techniques in managing crises. Preq: COMM 2010 with a C or better.

**COMM 3270 - Sports Media Criticism**
3 Credits (3 Contact Hours)
Students gain in-depth understanding of sports communication issues through critically analyzing actual media coverage of sporting events, addressing social issues involved in college and professional sports, and developing an understanding of sports promotion and advertising. Preq: COMM 2010 with a C or better.

**COMM 3300 - Nonverbal Communication**
3 Credits (3 Contact Hours)
Develops a knowledge of the functions of nonverbal behaviors in human interaction. This includes the study of gesture and movement, physical appearance, vocal behavior, immediacy, time and space, and intercultural differences. Promotes understanding of nonverbal rules. Preq: COMM 2010 with a C or better.
COMM 3480 - Interpersonal Communication
3 Credits (3 Contact Hours)
Survey of the theories and research in interpersonal communication with emphasis on the application of research findings and developmental strategies for intra- and intercultural relationships. Preq: COMM 2010 with a C or better.

COMM 3500 - Small Group and Team Communication
3 Credits (3 Contact Hours)
Examines the principles and skills involved in effective small-group communication. Preq: COMM 2010 with a C or better.

COMM 3550 - Principles of Public Relations
3 Credits (2 Contact Hours)
Students learn the principles, theories, process, history and contexts of public relations. Preq: COMM 2010 with a C or better. Coreq: COMM 3551.

COMM 3551 - Principles of Public Relations Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany COMM 3550. Coreq: COMM 3550.

COMM 3560 - Crisis Communication
3 Credits (3 Contact Hours)
Examines communication processes that harm or help people's experiences of risks and crises. Students are exposed to dominant crisis communication theories and models. Preq: COMM 3550.

COMM 3570 - Public Relations Writing
3 Credits (3 Contact Hours)
Focuses on principles of editing and public relations writing applied to a variety of potential public relations careers. Students learn the job requirements of editorial positions in public relations, publications, and information management as defined by public relations agencies nonprofit organizations, and large corporations. Coreq: COMM 3571.

COMM 3571 - Public Relations Writing Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany COMM 3570. Coreq: COMM 3570.

COMM 3610 - Argumentation and Debate
3 Credits (3 Contact Hours)
Basic principles of argumentation with emphasis on developing skills in argumentative speech. The role of the advocate in contemporary society with an emphasis on and an appreciation of formal debate. Preq: COMM 2500.

COMM 3620 - Communication and Conflict Management
3 Credits (3 Contact Hours)
Introduces the study of communication practices in conflict situations within various personal and professional settings. Emphasis is on the central role of communication in the understanding and management of conflict.

COMM 3640 - Organizational Communication
3 Credits (3 Contact Hours)
Examination of the process, theories, and techniques of communications within small groups and other organized bodies. Preq: COMM 2010 with a C or better.

COMM 3660 - Special Topics in Communication
3 Credits (3 Contact Hours)
Consideration of select major areas of practice in the field with a focus on application of communication concepts. May be repeated for a maximum of nine credits, but only if different topics are covered.

COMM 3680 - Applied Communication
3 Credits (3 Contact Hours)
Students apply and develop practical knowledge and skills relevant to specific research areas in communication studies as determined by instructor. Areas may include organizational, health, media and technological communication.

COMM 3690 - Political Communication
3 Credits (3 Contact Hours)
Examination of the ways institutions and public opinion are shaped by communication practices, focusing on communication and political persuasion, political campaigns and political engagement. Preq: COMM 2010 with a C or better.
COMM 3700 - Survey of Brand Communications
3 Credits (3 Contact Hours)
Provides a historical perspective on the brand communications industry, introduces the concepts of the industry ecosystem and the players therein, and provides an overview of disciplines and the roles they play in the development of brand communication.

COMM 3710 - Brand Creation and Communication
3 Credits (3 Contact Hours)
Examines the role of communication in brand creation and the processes involved in the development of a brand. Students evaluate popular brands to understand their influence on consumers and the industry.

COMM 3720 - Digital Analytics in Brand Communications
3 Credits (3 Contact Hours)
Explores interactive technology, digital content, social media strategy, digital project management, digital outlets, and website technology in relation to brand communications and digital analytics.

COMM 3730 - Media Management in Brand Communications
3 Credits (3 Contact Hours)
Explores theory, strategy and practice of media management in all channels of paid media, as well as the integration of paid media with other components of brand communications.

COMM 3740 - Brand Communications and Media Strategy
3 Credits (3 Contact Hours)
Examines the creation of strategies that guide the development of content and communication plans intended to support the promotion of products and services.

COMM 3750 - Presentation Skills in Brand Communications
1 Credit (1 Contact Hours)
Focuses on the importance of presentation, body language, voice modulation, content and the theater involved in presenting ideas unique to brand communications contexts and professions.

COMM 3760 - Brand Communications Capstone Seminar
3 Credits (3 Contact Hours)
In-depth exploration and analysis of special topics in brand communications, culminating in a final client-based project documented in written, oral, visual and/or multimedia presentations. Students utilize the tenets of effective brand communications strategies while building upon communication fundamentals to build a final portfolio of work that reflects their interests.

COMM 3900 - Communication Internship
3 Credits (9 Contact Hours)
Preplanned, preapproved, faculty-supervised internship provides Communication Studies majors with field experience in areas related to their curriculum. May be repeated for a maximum of six credits. To be taken Pass/No Pass only. Preq: Communication or Sports Communication major or minor.

COMM 3990 - Creative Inquiry in Communication
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue small group work on a particular research topic or practical problem. Arrangements with mentors must be established prior to registration. Content varies. May be repeated for a maximum of nine credits. Preq: COMM 2010 with a C or better.

COMM 4000 - Communication and Globalization
3 Credits (3 Contact Hours)
In-depth examination of the role communication plays in globalization processes, including case studies of contemporary social, technical, professional and ethical issues. Preq: COMM 2010 with a C or better.

COMM 4020 - Mass Communication: History and Criticism
3 Credits (3 Contact Hours)
Critical examination of mass communication in America, including discussions of history, theory, and current issues in television, film, popular music, telecommunications, and other media. Preq: COMM 2010 with a C or better.

COMM 4040 - Media Communication and Social Identities
3 Credits (3 Contact Hours)
Examines the communication of individual and social identities in convergent and mass/social media, and popular culture. Focuses on the communication of identity portrayals and representations, communicative acts in response, and how individuals and groups navigate and
create their own media cultures. Addresses factors such as ability, faith, gender, race, age, nationality, subcultures, and/or other areas. Preq: COMM 2010 with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**COMM 4050 - Public Contest and Change**
3 Credits (3 Contact Hours)
Examines the role of public communication in the process of contesting social values and practices and in the subsequent change that sometimes occurs. Students explore the public's relationship with mass media as well as other forms of communication practices that can produce cultural change. Preq: COMM 2010 with a C or better and COMM 3050.

**COMM 4250 - Advanced Sports Communication**
3 Credits (3 Contact Hours)
Combination seminar and primary research class that explores contemporary sports communication issues. Students write position papers on seminar topics and conduct primary research on sports communication topics of their choice. Preq: COMM 3250.

**COMM 4260 - Social Media and Sports Communication**
3 Credits (3 Contact Hours)
Covers the influence of communication and social media in sports and how these technologies are changing the communicative infrastructure of sports. Students explore how social media is re-configuring sports media, how sports organizations are managing social media, and how social media affects fan behavior and athlete communication. Preq: COMM 2010 with a C or better.

**COMM 4270 - Communication in Sports Organizations**
3 Credits (3 Contact Hours)
Examines communication dynamics in sports organizations. Among others, topics may include identifying how sports organizations manage crisis communication, communication with stakeholders, sexual harassment, ethical issues, and dissent. Preq: COMM 2010 with a C or better.

**COMM 4280 - Interpersonal/Family Communication and Sport**
3 Credits (3 Contact Hours)
Examines how communication functions in interpersonal and family contexts as it pertains to sports. Exposes students to positive and negative communicative behavior with athletes, coaches and families. Challenges students to identify ways that sports can be a healthy, rather than destructive, communicative topic for families and interpersonal relationships. Preq: COMM 2010 with a C or better.

**COMM 4300 - Legal Communication**
3 Credits (3 Contact Hours)
Explores the theory and practice of communication in the legal setting, including the trial and appeal processes. Emphasizes the importance of effective communication in the legal profession.

**COMM 4310 - Legal Communication Trial**
3 Credits (3 Contact Hours)
Advanced study in communication and the law, legal analysis and the elements of trial preparation, including out of court preparation, jury selection, limited motion practice, opening statements, direct examination and cross examination of witnesses, closing arguments, and jury charges. May be repeated for a maximum of nine credits. Preq: COMM 4300.

**COMM (ENGL) 4510 - Film Theory and Criticism**
3 Credits (2 Contact Hours)
Advanced study into the theory of film/video making emphasizing understanding a variety of critical methods to approach a film. Examines the history of film theory and defines the many schools of film criticism, including realism, formalism, feminism, semiotics, Marxism, and expressionism. May also be offered as ENGL 4510. Preq: ENGL 3570. Coreq: COMM 4511. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**COMM (ENGL) 4511 - Film Theory and Criticism Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany COMM 4510. May also be offered as ENGL 4511. Coreq: COMM 4510. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**COMM 4550 - Gender Communication**
3 Credits (3 Contact Hours)
Explores the ways communication behavior and perceptions of communication behavior are affected by gender. The effects of gender on a
A variety of communication contexts are examined, including interpersonal, small group, organizational, and mass communication. Preq: COMM 2010 with a C or better.

**COMM 4560 - Public Relations for Associations and Nonprofits**
3 Credits (3 Contact Hours)
Explores principles of communication, editing and journalism applied to publications, public relations and advertising needs within associations and nonprofit organizations. Students learn the expectations of editorial positions in public relations and publications, as defined by trade associations, nonprofit organizations and large corporations. Preq: COMM 3550.

**COMM 4620 - Communication and Negotiation**
3 Credits (3 Contact Hours)
Building on the concepts and practices of conflict management, students develop knowledge and skills for distributive bargaining and integrative negotiation climates. Focuses on the objectives, goals, positions, interests, tactic, and other elements to negotiate successfully in a variety of situations.

**COMM 4640 - Advanced Organizational Communication**
3 Credits (3 Contact Hours)
Application of communication theory and research to the analysis of particular organizational communication processes. Students study significant issues and/or methods of intervention and innovation in organizational communication. Preq: COMM 3640. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**COMM 4660 - Advanced Special Topics in Communication**
3 Credits (3 Contact Hours)
Consideration of specialized areas of study in the field, emphasizing theoretical depth or extensive research. May be repeated for a maximum of nine credits, but only if different topics are covered. Preq: Junior or senior standing.

**COMM 4700 - Communication and Health**
3 Credits (3 Contact Hours)
Considers institutional and health care communication issues as well as the relationship between social issues, communication, and health. Preq: COMM 2010 with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**COMM 4710 - Health Communication in Communities**
3 Credits (3 Contact Hours)
Focuses on collective pursuits for health and well-being within communities, with specific emphasis on the primary role of communication in social organizing for health-related initiatives such as advocacy, activism, and campaigns.

**COMM 4720 - Communication in Health Organizations**
3 Credits (3 Contact Hours)
Focuses on communicative experiences of professionals working within the field of health and human services, as well as pressing institutional concerns for health-related organizations.

**COMM 4800 - Intercultural Communication**
3 Credits (3 Contact Hours)
Introduces the process of communication between and among individuals from different cultures or subcultures. Emphasizes the effect of cultural practices within various communication relational contexts such as interpersonal, small group, and organizational communication. Preq: COMM 2010 with a C or better.

**COMM (ENGL) 4910 - Classical Rhetoric**
3 Credits (3 Contact Hours)
Traces the development of rhetoric from Protagoras through Isocrates, Plato, Aristotle, Cicero and Quintilian and considers questions essential to understanding persuasive theory and practices. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**COMM (ENGL) 4920 - Modern Rhetoric**
3 Credits (3 Contact Hours)
Examines the "new rhetorics" of the 20th century, which are grounded in classical rhetoric but include findings from biology, psychology, linguistics and anthropology, among other disciplines. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
COMM 4950 - Senior Capstone Seminar
3 Credits (3 Contact Hours)
In-depth exploration and analysis of a special topic in Communication Studies, culminating in a senior project documented in written, oral, visual and/or multimedia presentations. Topics vary based on faculty expertise and research interests. May be repeated for a maximum of six credits. Preq: Senior standing in Communication and one of the following courses with a C or better: COMM 3010 or COMM 3020 or COMM 3150.

COMM 4960 - Honors Creative Inquiry Capstone
3 Credits (3 Contact Hours)
Capstone course for honors students in the department's creative inquiry sequence. Working with their departmental honors advisor, students apply theoretical understanding and research skills in completing a written product of conference or publication length/quality. Must be taken for a total of six credits over the course of two semesters. Preq: Two of the following courses with a C or better in each: COMM 3060 or COMM 3100 or COMM 3110; and Senior standing in Communication.

COMM 4980 - Communication Academic and Professional Development II
1 Credits (1 Contact Hours)
Students reflect upon curricular relationships among general education, major, and minor courses. They complete and revise digital portfolios for presentation to the major, University, graduate schools, or potential employers. Students participate in resume building, job seeking, and interviewing activities. Preq or concurrent enrollment: COMM 4950 or COMM 4960.

COMM 4990 - Independent Study
1-3 Credits (1-3 Contact Hours)
Tutorial work for students with special interests or projects in communication studies outside the scope of existing courses. May be repeated for a maximum of nine credits. Preq: Consent of department chair.

Computer Science

CPSC 1010 - Computer Science I
4 Credits (3 Contact Hours)
Introduction to problem solving and programming methods. Emphasis is placed on algorithm development. Includes use of appropriate tools and ethical issues involving computing are discussed. This is one of two normal entry-level courses for Computer Information Systems and Computer Science majors. Credit will only be given for one of CPSC 1010, 1060 or 1110. Includes Honors sections. Preq: CMPT score of 60 or higher; or CPSC 1040. Coreq: CPSC 1011.

CPSC 1011 - Computer Science I Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 1010. Coreq: CPSC 1010.

CPSC 1020 - Computer Science II
4 Credits (3 Contact Hours)
Continuation of CPSC 1010. Continued emphasis on problem solving and program development techniques. Examines typical numerical, nonnumerical, and data processing problems. Introduces basic data structures. Credit may not be received for both CPSC 1020 and 1070. Includes Honors sections. Preq: CPSC 1010 or CPSC 1110 with a C or better. Coreq: CPSC 1021.

CPSC 1021 - Computer Science II Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 1020. Coreq: CPSC 1020.

CPSC 1040 - Introduction to the Concepts and Logic of Computer Programming
2 Credits (1 Contact Hours)
Introduction to the concepts and logic of computer programming. Problem solving techniques are considered, and basic techniques are introduced for developing a programmed solution to a given problem. Not open to students who have received credit for CPSC 1010, CPSC 1070, CPSC 1110, CPSC 1570, ENGR 1020 or ENGR 1050. Coreq: CPSC 1041.

CPSC 1041 - Introduction to the Concepts and Logic of Computer Programming Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 1040. Coreq: CPSC 1040.

CPSC 1060 - Introduction to Programming in Java
4 Credits (3 Contact Hours)
Principles of software development, style and testing. Topics include procedural and object-oriented programming in the context of real-world applications. This is one of two normal entry-level courses for Computer Information Systems and Computer Science majors. Credit will be given for only one of CPSC 1010, 1060 or 1110. Preq: CMPT score of 60 or higher; or CPSC 1040. Coreq: CPSC 1061.

**CPSC 1061 - Introduction to Programming in Java Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 1060. Coreq: CPSC 1060.

**CPSC 1070 - Programming Methodology**
4 Credits (3 Contact Hours)
Introduction to programming techniques and methodology. Topics include structured programming, stepwise refinement, program design and implementation techniques, modularization criteria, program testing and verification, basic data structures, and analysis of algorithms. Credit may not be received for both CPSC 1020 and 1070. Preq: CPSC 1060. Coreq: CPSC 1071.

**CPSC 1071 - Programming Methodology Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 1070. Coreq: CPSC 1070.

**CPSC 1110 - Introduction to Programming in C**
3 Credits (2 Contact Hours)
Introduction to computer programming in C and its use in solving problems. Intended primarily for technical majors. Basic instruction in programming techniques, algorithms and standard Unix software development tools and utilities. Credit will be given for only one of CPSC 1010, 1060 or 1110. Preq: A CMPT score of 60 or higher or ENGR 1020 or ENGR 1050. Coreq: CPSC 1111.

**CPSC 1111 - Introduction to Programming in C Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 1110. Coreq: CPSC 1110.

**CPSC 1150 - Introduction to Computational Science**
3 Credits (3 Contact Hours)
Introduction to systems thinking. Includes development of dynamical systems models using visual modeling tools and development of dynamical systems using agent based software. Class material investigates elementary science and engineering models.

**CPSC 1200 - Introduction to Information Technology**
3 Credits (2 Contact Hours)

**CPSC 1201 - Introduction to Information Technology Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 1200. Coreq: CPSC 1200.

**CPSC 1210 - Computational Thinking**
3 Credits (2 Contact Hours)
Introduces the central idea of computer science, instill ideas and practices of computational thinking. Students engage in creative activities to learn how computing can change the world. Coreq: CPSC 1211.

**CPSC 1211 - Computational Thinking Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 1210. Coreq: CPSC 1210.

**CPSC 1610 - Introduction to Visual Basic Programming**
3 Credits (2 Contact Hours)
Introduction to programming using the Visual Basic language. Topics include simple and complex data types, arithmetic operations, control flow, files, and database programming. Several projects are implemented during the semester. Coreq: CPSC 1611.

**CPSC 1611 - Introduction to Visual Basic Programming Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 1610. Coreq: CPSC 1610.

**CPSC 1990 - Creative Inquiry in Computing**
Students engage in faculty-led research in the context of a team effort. May be repeated for a maximum of six credits.

**CPSC 2070 - Discrete Structures for Computing**
3 Credits (3 Contact Hours)
Introduces ideas and techniques from discrete structures that are widely used in the computing sciences. Topics emphasize techniques of rigorous argumentation and application to the computing disciplines. Preq: CPSC 1010 or CPSC 1060 or CPSC 1110; and MATH 1020 or MATH 1060 or MATH 1070.

**CPSC 2120 - Algorithms and Data Structures**
4 Credits (3 Contact Hours)
Study of data structures and algorithms fundamental to computer science; abstract data-type concepts; measures of program running time and time complexity; algorithm analysis and design techniques. Preq: CPSC 1020 with a C or better or CPSC 1070 with a C or better. Coreq: CPSC 2121.

**CPSC 2121 - Algorithms and Data Structures Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 2120. Coreq: CPSC 2120.

**CPSC 2150 - Software Development Foundations**
3 Credits (2 Contact Hours)
Intensive study of software development foundations. Advanced coverage of programming language primitives, function-level design principles, and standard development and debugging tools. Introductory coverage of module-level design principles, program specification and reasoning principles, and validation and verification techniques. Preq: CPSC 1020 with a C or better or 1070 with a C or better. Coreq: CPSC 2151.

**CPSC 2151 - Software Development Foundations Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 2150. Coreq: CPSC 2150.

**CPSC 2200 - Microcomputer Applications**
3 Credits (3 Contact Hours)
Applications of microcomputers to formulate and solve problem models. Emphasizes applications development in database and spreadsheet environments. Current software products are used. Students are expected to have experience with word processing and spreadsheet applications.

**CPSC 2310 - Introduction to Computer Organization**
4 Credits (3 Contact Hours)
Study of the machine architectures on which algorithms are implemented and requirements of architectures that support high-level languages, programming environments, and applications. Preq: CPSC 1020 with a C or better or 1070 with a C or better. Coreq: CPSC 2311.

**CPSC 2311 - Introduction to Computer Organization Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 2310. Coreq: CPSC 2310.

**CPSC 2810 - Selected Topics in Computer Science**
1-4 Credits (1-4 Contact Hours)
Areas of computer science in which new trends arise. Innovative approaches to a variety of problems in the use and understanding of basic computing concepts are developed and implemented. May be repeated for a maximum of eight credits, but only if different topics are covered.

**CPSC 2910 - Seminar in Professional Issues I**
1 Credits (1 Contact Hours)
Considers the impact of computer use on society. Discusses ethical use of software and protection of intellectual property rights. Profession is viewed historically; organizations important to the profession are discussed; the development process for standards is presented; and students are introduced to the professional literature. Preq: CPSC 1020 or CPSC 1070.

**CPSC 2920 - Computing, Ethics and Global Society**
3 Credits (2 Contact Hours)
Discussion of the concern for the way in which computers pose new ethical questions or pose new versions of standard moral problems and dilemmas. Application of ethical concepts and frameworks to guide the computer professional. Topics include the digital divide, privacy,
globalization, professional code of ethics, e-waste and intellectual property. Includes a small discussion breakout to discuss and analyze current topics related to computing and society. Preq: ENGL 1030. Coreq: CPSC 2921.

**CPSC 2921 - Computing, Ethics and Global Society Recitation**
0 Credits (1 Contact Hours)
Non-credit recitation section to accompany CPSC 2920. Coreq: CPSC 2920.

**CPSC 3120 - Introduction to Design and Analysis of Algorithms**
3 Credits (3 Contact Hours)
Introduction to algorithm design and analysis. Topics include advanced data structures, amortized analysis, dynamic programming, graph algorithms, intractability and applications. Preq: CPSC 2120.

**CPSC (ECE) 3220 - Introduction to Operating Systems**
3 Credits (3 Contact Hours)
Detailed study of management techniques for the control of computer hardware resources. Topics include interrupt systems, primitive level characteristics of hardware and the management of memory, processor, devices, and data. May also be offered as ECE 3220. Preq: CPSC 2120 and CPSC 2310, each with a C or better; or ECE 2230 and ECE 2720, each with a C or better.

**CPSC 3300 - Computer Systems Organization**
3 Credits (3 Contact Hours)
Introduction to the structure of computer systems. Various hardware/software configurations are explored and presented as integrated systems. Topics include digital logic, basic computer organization, computer arithmetic, memory organization, input/output organizations, interrupt processing, multiprocessors, and cluster computers. Preq: CPSC 2120 and CPSC 2310, each with a C or better.

**CPSC 3500 - Foundations of Computer Science**
3 Credits (3 Contact Hours)
Development of the theoretical foundations of programming, algorithms, languages, automata, computability, complexity, data structures, and operating systems; a broad range of fundamental topics is consolidated and extended in preparation for further study. Preq: CPSC 2070 and CPSC 2120, each with a C or better.

**CPSC (ECE) 3520 - Programming Systems**
3 Credits (3 Contact Hours)
An advanced course in programming languages and systems for computer engineering and computer science majors. The course objective is to enable a more complete understanding of programming topics and related supporting tools, including philosophy, methodology, formal syntax and semantics, and examples of programming paradigms, languages and development approaches. May also be offered as ECE 3520. Preq: ECE 2230; or CPSC 2120 and CPSC 2150. Preq or concurrent enrollment: CPSC 2070 or MATH 4190.

**CPSC 3600 - Networks and Network Programming**
3 Credits (3 Contact Hours)
Introduction to basic concepts of computer network technologies and network programming. Topics include network programming, layered protocol architectures, local and wide area networks, internetwork and intranetwork concepts, security. Socket level programming is introduced and used throughout the course. Preq: CPSC 2120 and CPSC 2150, each with a C or better.

**CPSC 3620 - Distributed and Cluster Computing**
3 Credits (3 Contact Hours)
Introduction to the basic technology of and programming techniques for distributed and cluster computing. Standard techniques for developing parallel solutions to problems are introduced and implemented. Software systems that provide high-level abstractions for data communications are considered.

**CPSC 3710 - Systems Analysis**
3 Credits (3 Contact Hours)
Incorporates a study of the decision-making process at all levels with the logical design of information systems. Extensive study of the system life cycle with emphasis on current as well as classical techniques for describing data flows, data structures, file design, etc. Preq: CPSC 3600.

**CPSC 3720 - Introduction to Software Engineering**
3 Credits (3 Contact Hours)
Intensive introduction to software engineering. Focuses on each major phase of the software lifecycle. Introductory coverage of requirements analysis, requirements modeling, design modeling, and project management. Intermediate coverage of module-level design principles, program specification and reasoning principles, and program validation and verification techniques. Preq: CPSC 2120 and CPSC 2150, each with a C or better.

**CPSC 3950 - Honors Seminar**
1 Credits (1 Contact Hours)
Research topics in various areas of computer science are presented. Methods for identifying and initiating research projects are considered. May be repeated for a maximum of two credits. Preq: Admission to Departmental Honors Program.

**CPSC 3990 - Advanced Creative Inquiry in Computing**
1-3 Credits (1-3 Contact Hours)
Upper-division students engage in faculty-led research in the context of a team effort. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Junior standing.

**CPSC 4040 - Computer Graphics Images**
3 Credits (3 Contact Hours)
Presents the theory and practice behind the generation and manipulation of two-dimensional digital images within a computer graphics context. Image representation and storage, sampling and reconstruction, color systems, affine and general warps, enhancement and morphology, compositing, morphing, and non-photorealistic transformations. Preq: CPSC 2120 and MATH 3110; or DPA 4010. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4050 - Computer Graphics**
3 Credits (3 Contact Hours)
Computational, mathematical, physical and perceptual principles underlying the production of effective three-dimensional computer graphics imagery. Preq: CPSC 2120 and MATH 3110; or DPA 4010. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4110 - Virtual Reality Systems**
3 Credits (3 Contact Hours)
Design and implementation of software systems necessary to create virtual environments. Discusses techniques for achieving real-time, dynamic display of photorealistic, synthetic images. Includes hands-on experience with electromagnetically-tracked, head-mounted displays and requires, as a final project, the design and construction of a virtual environment. Preq: CPSC 2120 and 2150, both with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4120 - Eye Tracking Methodology and Applications**
3 Credits (3 Contact Hours)
Introduction to the human visual system; visual perception; eye movements; eye tracking systems and applications in psychology, industrial engineering, marketing, and computer science; hands-on experience with real time, corneal-reflection eye trackers, experimental issues. Final project requires the execution and analysis of an eye tracking experiment. Preq: CPSC 2120 or MKT 4310 or PSYC 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4140 - Human and Computer Interaction**
3 Credits (3 Contact Hours)
Survey of human and computer interaction, its literature, history, and techniques. Covers cognitive and social models and limitations, hardware and software interface components, design methods, support for design, and evaluation methods. Preq: CPSC 2120 and 2150, each with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4150 - Mobile Device Software Development**
3 Credits (3 Contact Hours)
Detailed study of programming, tools, and design decisions involved in developing applications for mobile devices. Students design and implement a nontrivial software application for a mobile device. Preq: CPSC 2120 and CPSC 2150, each with a C or better.

**CPSC 4160 - 2-D Game Engine Construction**
3 Credits (3 Contact Hours)
Introduction to tools and techniques necessary to build 2-D games. Techniques draw from subject areas such as software engineering, algorithms, and artificial intelligence. Students employ techniques such as sprite animation, parallax scrolling, sound, AI incorporated into game sprites, and the construction of a game shell. Preq: CPSC 2120 and 2150, each with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4180 - Usable Privacy and Security**
3 Credits (3 Contact Hours)
Survey of the field of usable security and privacy with an emphasis on emerging technologies. Topics include authentication, location privacy, social network privacy, behavioral advertising, health privacy, anonymity, cryptocurrency, technical writing and ethical conduct of usable privacy and security research. Preq: CPSC 2150 or ECE 4490 or IE 4880 or PSYC 3100 or PSYC 4350 or POSC 4280 with a C or better.

**CPSC 4200 - Computer Security Principles**
3 Credits (3 Contact Hours)
Covers principles of information systems security, including security policies, cryptography, authentication, access control mechanisms, system evaluation models, auditing, and intrusion detection. Computer security system case studies are analyzed. Preq: CPSC 3220 with a C or better or ECE 3220 with a C or better and CPSC 3600 with a C or better or ECE 4380 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4240 - System Administration and Security**
3 Credits (3 Contact Hours)
Covers topics related to the administration and security of computer systems. Primary emphasis is on the administration and security of contemporary operating systems. Preq: CPSC 3220 with a C or better or ECE 3220 with a C or better and CPSC 3600 with a C or better or ECE 4380 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4280 - Design and Implementation of Programming Languages**
3 Credits (3 Contact Hours)
Overview of programming language structures and features and their implementation. Control and data structures found in various languages are studied. Also includes runtime organization and environment and implementation models. Preq: CPSC 2310 and 3500, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4300 - Applied Data Science**
3 Credits (3 Contact Hours)
Course covers applied methods and techniques in Data Science, including data scraping, cleaning, and storage; technical issues when working with different types of data; basic topics in machine learning; parallel and distributed computing; cloud computing; data visualization; and ethical issues in Data Science. Preq: CPSC 2120; and either STAT 2300 or STAT 3090.

**CPSC 4550 - Computational Science**
3 Credits (3 Contact Hours)
Introduction to the methods and problems of computational science. Uses problems from engineering and science to develop mathematical and computational solutions. Case studies use techniques from Grand Challenge problems. Emphasizes the use of networking, group development, and modern programming environments. Preq: MATH 1080 and MATH 3110. Students are expected to have previous programming experience in a higher level language.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4620 - Database Management Systems**
3 Credits (3 Contact Hours)
Introduction to database/data communications concepts as related to the design of online information systems. Problems involving structuring, creating, maintaining, and accessing multiple-user databases are presented and solutions developed. Comparison of several commercially available teleprocessing monitor and database management systems is made. Includes Honors sections Preq: CPSC 2120 and CPSC 2150, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4630 - On-line Systems**
3 Credits (3 Contact Hours)
In-depth study of the design and implementation of transaction processing systems and an introduction to basic communications concepts. A survey of commercially available software and a project using one of the systems are included. Preq: CPSC 4620.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4720 - Software Development Methodology**
3 Credits (3 Contact Hours)
Advanced topics in software development methodology. Techniques such as chief programmer teams, structured design and structured
walk-throughs are discussed and used in a major project. Emphasizes the application of these techniques to large-scale software implementation projects. Also includes additional topics such as mathematical foundations of structured programming and verification techniques. Includes Honors sections. Preq: CPSC 3720 with a C or better.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4770 - Distributed and Cluster Computing**
3 Credits (3 Contact Hours)
Introduction to the basic technology of and programming techniques for distributed and cluster computing. Standard techniques for developing parallel solutions to problems are introduced and implemented. Software systems that provide high-level abstractions for data communications are considered. Preq: CPSC 3600 with a C or better.

**CPSC (ECE) 4780 - General Purpose Computation on Graphical Processing Units**
3 Credits (3 Contact Hours)
Instruction in the design and implementation of highly parallel, GPU-based solutions to computationally intensive problems from a variety of disciplines. The OpenCL language with inter-operable OpenGL components is used. Applications to models of physical systems are discussed in detail. May also be offered as ECE 4780. Preq: CPSC 2120 or ECE 2230.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4810 - Independent Study**
1-3 Credits (1-3 Contact Hours)
Areas of computer science in which nonstandard problems arise. Innovative approaches to problem solutions which draw from a variety of support courses are developed and implemented. Emphasizes independent study and projects. May be repeated for a maximum of six credits, but only if different topics are covered. Includes Honors sections.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4820 - Special Topics in Computing**
3 Credits (3 Contact Hours)
In-depth treatment of topics not fully covered in regular courses. Topics vary from semester to semester. May be repeated, but only if different topics are covered.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CPSC 4890 - Programming Team Training Seminar**
1 Credits (1 Contact Hours)
This seminar-style course teaches advanced algorithmic problem-solving motivated by problems in the "competitive programming" domain. Class discussion includes algorithm design and analysis, implementation considerations, and practical applications. Preq: CPSC 2120.

**CPSC 4910 - Seminar in Professional Issues II**
3 Credits (2 Contact Hours)
Considers the impact of computing system development on society. Discusses ethical issues in the design and development of computer software. Students discuss standards for professional behavior, the professional's responsibility to the profession, and techniques for maintaining currency in a dynamic field. Preq: CPSC 3720 and junior standing. Coreq: CPSC 4911.

**CPSC 4911 - Seminar in Professional Issues II Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CPSC 4910. Coreq: CPSC 4910.

**CPSC 4950 - Senior Thesis Research (Honors)**
1-3 Credits (1-3 Contact Hours)
Directed individual research project for honors students supervised by departmental faculty. May be repeated for a maximum of six credits. Preq: Senior standing.

**Construction Science and Management**

**CSM 1000 - Introduction to Construction Science and Management**
3 Credits (3 Contact Hours)
Introduction to the construction industry and the Construction Science and Management Department. This course covers the fundamentals and applications of formal problem solving, critical thinking, and ethics. Preq: Construction Science and Management major.

**CSM 1500 - Construction Problem Solving**
3 Credits (3 Contact Hours)
Fundamentals and application of formal problem solving, critical thinking and ethics.

**CSM 2010 - Structures I**
3 Credits (3 Contact Hours)
Study of statically determinate structural components and systems, including force applications and distributions in structural elements and the resulting stress-strain patterns in axial, shear, and bearing mechanisms. Preq: MATH 1020 or MATH 1060; and PHYS 2070 and PHYS 2090; and Construction Science and Management or Architecture major.

**CSM 2020 - Structures II**
4 Credits (3 Contact Hours)
This course covers the study of force distribution and behavior in statically determinate structural components and systems; the analysis and design of basic reinforced concrete, steel, wood, and formwork components and systems; and the study of various types of soils and foundations as they relate to the construction process. Preq: CSM 2010; and Construction Science and Management or Architecture major. Coreq: CSM 2021.

**CSM 2021 - Structures II Laboratory**
0 Credits (2 Contact Hours)

**CSM 2030 - Materials and Methods of Construction I**
3 Credits (3 Contact Hours)
Descriptive study of the materials and methods of construction, focusing on nomenclature, building materials, and assembly of building systems consisting primarily of wood, masonry, residential interior and exterior finishes, and building foundations. Preq: Construction Science and Management or Architecture major. Preq or concurrent enrollment: CSM 1000 (Architecture majors do not need the prerequisite course, but must request a registration override from the instructor).

**CSM 2040 - Contract Documents**
3 Credits (2 Contact Hours)
Introduction to working drawings, specifications, and the various documents required to carry out a typical construction project. Preq: Construction Science and Management major, or consent of department chair. Coreq: CSM 2041 and CSM 2050.

**CSM 2041 - Contract Documents Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CSM 2040. Coreq: CSM 2040.

**CSM 2050 - Materials and Methods of Construction II**
3 Credits (3 Contact Hours)
Descriptive study of materials and methods of construction, focusing on nomenclature, building materials, and assembly of building systems consisting primarily of steel and concrete, in addition to roofing assemblies and interior and exterior commercial finishes. Preq: CSM 2030; and Construction Science and Management or Architecture major. Coreq: CSM 2040.

**CSM 3030 - Soils and Foundations**
3 Credits (3 Contact Hours)
Study of various types of soils and foundations, including soil testing, reports, compaction, stability, and function, as they relate to the construction process.

**CSM 3040 - Environmental Systems I**
3 Credits (3 Contact Hours)
Theory and practice of heating, ventilating, air conditioning, and plumbing systems for buildings. Preq: CSM 2050 and PHYS 2080 and PHYS 2100, and Construction Science and Management or Architecture major.

**CSM 3050 - Environmental Systems II**
3 Credits (3 Contact Hours)
Theory and practice of fire protection, specialty piping, lighting, and electrical systems for buildings. Preq: CSM 3040 and Construction Science and Management or Architecture major.

**CSM 3060 - Emerging Technologies in Construction**
Students are exposed to methods of planning and managing construction projects with technology. Various classes and uses of technology are discussed and students gain hands-on experience utilizing the technology in completing construction planning activities. Preq: Construction Science and Management major; and CSM 2040 and MGT 2180. Coreq: CSM 3061.

**CSM 3061 - Emerging Technologies in Construction Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CSM 3060. Coreq: CSM 3060.

**CSM 3070 - Principles and Practices of Sustainable Construction**
3 Credits (3 Contact Hours)
Focuses on the principles and practices of green building. Strategies to reduce energy, water, and material resources are explored from a contractor's perspective. The LEED rating system is reviewed and students develop the skills and knowledge needed to pass the Green Associates Exam. Preq: CSM 2030 and CSM 2040 and CSM 2050.

**CSM 3510 - Construction Estimating**
3 Credits (2 Contact Hours)
Study of basic estimating as applied to construction projects. Includes the take-off of material quantities, assigning labor and equipment production rates, and applying material prices, wage rates, and equipment costs to derive a total job cost. Preq: CSM 2040 and CSM 2050 and MGT 2180, all required MATH courses, Construction Science and Management major. Preq or concurrent enrollment: AGM 2210 and CSM 3030. Coreq: CSM 3511.

**CSM 3511 - Construction Estimating Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CSM 3510. Coreq: CSM 3510.

**CSM 3520 - Construction Scheduling**
3 Credits (2 Contact Hours)

**CSM 3521 - Construction Scheduling Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CSM 3520. Coreq: CSM 3520.

**CSM 3530 - Construction Estimating II**
3 Credits (2 Contact Hours)
Continuation of basic construction estimating with the additional component of computerized estimating. Includes material, labor, and equipment costs, production rates, bid ethics, constructability analysis, and understanding of other types of estimating procedures. Preq: CSM 3510 and Construction Science and Management major. Preq or concurrent enrollment: CSM 3040. Coreq: CSM 3520 and CSM 3531.

**CSM 3531 - Construction Estimating II Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany CSM 3530. Coreq: CSM 3530.

**CSM 4110 - Safety in Building Construction**
3 Credits (3 Contact Hours)

**CSM 4200 - Highway Construction and Contracting**
3 Credits (3 Contact Hours)
Study of contracting and construction of highways, including selection and use of equipment, construction of pavements, bridges, and drainage structures, and related processes. Preq: CSM 3030 and CSM 3520 and CSM 3530.

**CSM 4500 - Construction Internship**
1 Credits (1 Contact Hours)
Documentation of 800 hours of approved experience in the construction industry with evaluation of student portfolio and preparation and sitting for the American Institute of Constructors CPC Level I examination. Preq: Consent of department chair.

**CSM 4530 - Construction Project Management**
3 Credits (3 Contact Hours)
Study of construction business organization, methods of project delivery, field organization, policy, ethics, project management, control
systems, labor management relations, and productivity. Preq: CSM 3520 and CSM 3530, and Construction Science and Management major. Preq or concurrent enrollment: LAW 3220 and MGT 3070. Coreq: CSM 4110 and CSM 4610.

**CSM 4540 - Construction Capstone**
6 Credits (5 Contact Hours)
Students develop a capstone project that entails the knowledge obtained in all previous courses in the Construction Science and Management Program. Students must take the capstone course at Clemson University. Preq: CSM 4530 and Construction Science and Management major. Coreq: CSM 4541.

**CSM 4541 - Construction Capstone Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany CSM 4540. Coreq: CSM 4540.

**CSM 4550 - Reducing Adversarial Relations in Construction**
3 Credits (3 Contact Hours)
Focuses on the study of the delivery of projects and how adversarial relations can affect the successful completion of the venture. Topics include management of human resources, understanding the needs and processes of the participants, where problems lie, methods of avoiding and settling disputes. Preq: Construction Science and Management or Architecture major, and senior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**CSM 4610 - Construction Economics Seminar**
3 Credits (3 Contact Hours)

**CSM 4900 - Directed Studies**
1-3 Credits (1-3 Contact Hours)
Comprehensive studies and research of special topics not covered in other courses. Emphasizes field studies, research activities, and current developments in construction science. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Consent of instructor.

**CSM 4980 - Current Topics in Construction**
1-3 Credits (1-3 Contact Hours)
Study of current topics in the construction industry not central to other construction science courses. Specific titles and course descriptions are announced for each semester. May be repeated for a maximum of six credits. Preq: Consent of department chair.

### Cooperative Education

**COOP 1010 - Co-Op Education**
0 Credits (0 Contact Hours)
Cooperative education.

**COOP 1020 - Co-Op Education**
0 Credits (0 Contact Hours)
Cooperative education.

**COOP 1030 - Co-Op Education**
0 Credits (0 Contact Hours)
Cooperative education.

**COOP 1040 - Co-Op Education**
0 Credits (0 Contact Hours)
Cooperative education.

**COOP 1050 - Co-Op Education**
0 Credits (0 Contact Hours)
Cooperative education.

**COOP 2010 - Co-Op Education**

0 Credits (0 Contact Hours)
Cooperative education.

COOP 2020 - Co-Op Education
0 Credits (0 Contact Hours)
Cooperative education.

COOP 2030 - Co-Op Education
0 Credits (0 Contact Hours)
Cooperative education.

COOP 2040 - Co-Op Education
0 Credits (0 Contact Hours)
Cooperative education.

COOP 2050 - Co-Op Education
0 Credits (0 Contact Hours)
Cooperative education.

COOP 4010 - Co-Op Education
0 Credits (0 Contact Hours)
Cooperative education.

COOP 4020 - Co-Op Education
0 Credits (0 Contact Hours)
Cooperative education.

Dance

DANC 1300 - Tap Dance I
1 Credits (3 Contact Hours)
Introduces fundamentals and vocabulary of tap dancing with opportunities to develop rhythmic patterns of various origins. Applied dance fee is assessed.

DANC 1400 - Jazz Dance I
1 Credits (3 Contact Hours)
Introduces basic principles and fundamentals of jazz technique and explores flexibility and strength-building exercises. Applied dance fee is assessed.

DANC 1500 - Modern Dance I
1 Credits (3 Contact Hours)
Introduces basic principles of dance movement and vocabulary, and actively explores and applies different methods of body alignment and theory. Applied dance fee is assessed.

DANC 1600 - Ballet Dance I
1 Credits (3 Contact Hours)
Introduces basic principles and fundamentals of classical ballet, with emphasis on good technique, center work, and across the floor work. Applied dance fee is assessed.

DANC 3300 - University Dance Company
1 Credits (3 Contact Hours)
Performance ensemble for advanced dance students. Provides opportunities to learn and develop choreographic skills as well as to improve personal dance techniques. Company is selected by audition. May include public recital(s). May be repeated for a maximum of 24 credits. Applied dance fee is assessed.

Design Studies

DSGN 3700 - Design Principles
Students develop graphic skills, including plans, sections, elevations, axonometric and perspective drawings, and develop creative problem solving skills incorporating precedent studies, contextual analysis, concept development, modeling and presentation skills. Course is offered only during the summer at study abroad locations. Preq: ARCH 1010. Coreq: DSGN 3701.

**DSGN 3701 - Design Principles Laboratory**
0 Credits (10 Contact Hours)
Non-credit laboratory to accompany DSGN 3700. Coreq: DSGN 3700.

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**Digital Production Arts**

**DPA 1990 - Creative Inquiry in Digital Production Arts**
1-3 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities related to digital production arts. These creative inquiry projects are typically pursued in a teamwork environment and may be interdisciplinary. Arrangements with mentors must be established prior to registration.

**DPA 3070 - Studio Methods for Digital Production**
3 Credits (1 Contact Hours)
Exposes students to current studio practice in the development of 3-D computer graphics and animation for film, electronic games, and visualization. Topics include modeling, rigging, animation, texturing, lighting, rendering, compositing and editing. Open source tools are used so methods are transportable to most computing environments. Coreq: DPA 3071.

**DPA 3071 - Studio Methods for Digital Production Laboratory**
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany DPA 3070. Coreq: DPA 3070.

**DPA 3990 - Advanced Creative Inquiry in Digital Production Arts**
1-3 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities related to digital production arts. These creative inquiry projects are typically pursued in a teamwork environment and may be interdisciplinary. Arrangements with mentors must be established prior to registration. Preq: Junior standing.

**DPA 4000 - Technical Foundations of Digital Production I**
3 Credits (3 Contact Hours)
The technical, conceptual, and algorithmic foundations of computer graphics. Covers the Unix operating system, scripting, C programming, and an interactive graphics API. Not open to Computer Engineering, Computer Information Systems or Computer Science majors. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**DPA 4010 - Technical Foundations of Digital Production II**
3 Credits (3 Contact Hours)
The mathematical and algorithmic foundations of computer graphics. Covers spatial data structures, object oriented programming in C++, mathematics for graphics, and 3-D graphics API. Preq: DPA 4000. Not open to Computer Science, Computer Engineering, or Computer Information Systems majors. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**DPA 4020 - Visual Foundations of Digital Production I**
3 Credits (6 Contact Hours)
Presents the visual foundations underlying computer graphics production. Covers perspective, observational drawing, color and value, principles of composition and design, and storyboarding. Incorporates the studio method, involves students in hands-on work and the critique process, and stresses examples from the history of art, animation and film. Not open to Architecture or Visual Arts majors. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**DPA 4030 - Visual Foundations of Digital Production II**
3 Credits (6 Contact Hours)
Extends the foundational visual principles underlying computer graphics production begun in DPA 4020. Stresses representation of the figure in drawing and the use of cameras. Incorporates the studio method and the critique process, and stresses examples from the history of art, animation and film. Preq: DPA 4020. Not open to Architecture or Visual Arts majors.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**DPA 4810 - Independent Study**
1-3 Credits (1-3 Contact Hours)
An individualized course of study is designed by the student in consultation with a faculty member who agrees to provide guidance.

**DPA 4820 - Special Topics in Digital Production Arts**
3 Credits (3 Contact Hours)
In-depth treatment of topics in digital production not fully covered in regular courses. Topics vary from semester to semester. May be repeated for a maximum of six credits, but only if different topics are covered.

**DPA 4830 - Special Studio Topics in Digital Production Arts**
3 Credits (6 Contact Hours)
In-depth treatment of topics in digital production with a studio focus not fully covered in regular courses. Topics vary from semester to semester. May be repeated for a maximum of six credits, but only if different topics are covered.

**Early Childhood Education**

**EDEC 2200 - Family, School, and Community Relationships**
3 Credits (3 Contact Hours)
Historical trends, theoretical models, and strategies of effective family/school/community relationships are examined. Special emphasis is placed on multicultural issues and on programs that support collaborative interaction with families that benefit children. Meets Read to Succeed requirements. Preq: EDEC 3000. Coreq: EDEC 3020.

**EDEC 3000 - Foundations of Early Childhood Education**
3 Credits (3 Contact Hours)
Philosophical and historical foundations of early childhood education, societal changes and influences, needs of young children and families, program differentiation, and future trends are examined through coursework and experiential activities. Preq: ED 1050 and Sophomore standing. Coreq: EDEC 3010.

**EDEC 3010 - Practicum in Early Childhood Settings I**
1 Credits (3 Contact Hours)

**EDEC 3020 - Practicum in Early Childhood Settings II**
1 Credits (3 Contact Hours)
Experiences in early childhood settings that provide opportunities for working with young children in a variety of settings. Practicum I and II focus on child care settings for children ages three to four. Practicum II emphasizes building relationships with families of young children. Preq: EDEC 3010. Coreq: EDEC 2200.

**EDEC 3030 - Practicum in Early Childhood Settings III**
1 Credits (3 Contact Hours)
Experiences in early childhood settings that provide opportunities for working with young children in a variety of settings. Practicum III focuses on child care settings for children from birth to age two. This experience allows students to understand the developmental needs and capabilities of very young children. Preq EDEC 3020. Coreq: EDEC 3360.

**EDEC 3040 - Practicum in Early Childhood Settings IV**
1 Credits (3 Contact Hours)
Experiences in early childhood settings that provide opportunities for working with young children in a variety of settings. Practicum IV focuses on four-year-old kindergartens in public school settings. This experience emphasizes the transition to formal school settings for young children. Preq: EDEC 3030. Coreq: EDEC 4200 and EDEC 4500.

**EDEC 3360 - Concepts of Play and Social Development of Infants and Young Children**
3 Credits (3 Contact Hours)
Study of the behavior of the preschool child from infancy through age five. Focus is placed on the role of play in influencing cognitive, social, emotional, physical, and language development. Includes Honors sections. Preq: EDEC 2200. Coreq: EDEC 3030.

**EDEC 4000 - Observation and Assessment in Clinical Settings**
3 Credits (9 Contact Hours)
Students engage in clinical experiences in early childhood settings observing, guiding, and assessing young children, birth to age eight, in a variety of high quality preschool and primary settings. Meets Read to Succeed requirements. To be taken Pass/No Pass only. Preq: EDEC 4500. Coreq: EDEC 4300 and EDEC 4400 and EDEC 4600 and EDLT 4590.

**EDEC 4200 - Early Childhood Science**
3 Credits (2 Contact Hours)
Students develop knowledge, skills, and attitudes needed to foster science education among young children. Emphasizes teaching strategies and techniques appropriate for young children (birth to age eight), understanding the unique learning needs of special populations, and integrating science across the curriculum. Preq: EDEC 3360. Coreq: EDEC 3040 and EDEC 4201 and EDEC 4500.

**EDEC 4201 - Early Childhood Science Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany EDEC 4200. Coreq: EDEC 4200.

**EDEC 4300 - Early Childhood Mathematics**
3 Credits (3 Contact Hours)
Examination of theories and methods of teaching mathematics in terms of how young children develop mathematical thinking. Topics include problem solving, current issues, diversity, current technologies, reflective teaching, and applications of math in everyday life. Preq: General Education mathematics requirement; admission to the professional level. Preq: MATH 1150 and MATH 1160 and MATH 2160 and EDEC 4500. Coreq: EDEC 4000 and EDEC 4400 and EDEC 4600.

**EDEC 4400 - Early Childhood English Language Arts**
3 Credits (3 Contact Hours)
Examination of language arts across the early childhood curriculum. Focus is on early literacy skills, oral language development, writing development, and process-oriented writing strategies. Writing assessment and future professional development opportunities in writing instruction are also discussed. Meets Read to Succeed requirements. Preq: EDEC 4500. Coreq: EDEC 4000 and EDEC 4300 and EDEC 4400 and EDEC 4600.

**EDEC 4500 - Early Childhood Curriculum and Social Studies Methods**
3 Credits (3 Contact Hours)
Focus is on identifying and understanding the curricular needs of young children and how to connect content areas through the development of integrated thematic social studies units. Meets Read to Succeed requirements. Preq: EDEC 3360. Coreq: EDEC 3040 and EDEC 4200.

**EDEC 4600 - Critical Issues and Cultural Diversity in Early Childhood Education**
3 Credits (3 Contact Hours)
In depth analysis of current and critical issues in early childhood education. Topics include critical multiculturalism education, examination of issues of equity and access, early childhood assessment, working in diverse settings, and meeting the educational needs of all learners. Meets Read to Succeed requirements. Preq: EDEC 4500. Coreq: EDEC 4000 and EDEC 4300 and EDEC 4400.

**EDEC 4840 - Directed Teaching in Early Childhood Education**
9 Credits (1 Contact Hours)
Supervised observation and teaching experiences in cooperation with nursery schools, kindergartens, and early elementary schools. Restricted to seniors or graduates who have completed prerequisite courses and have the cumulative grade-point average for graduation. Preq: EDEC 4000 and EDEC 4300 and EDEC 4400 and EDEC 4600. Coreq: EDEC 4841 and EDEC 4850.

**EDEC 4841 - Directed Teaching in Early Childhood Education Laboratory**
0 Credits (24 Contact Hours)
Non-credit laboratory to accompany EDEC 4840. Coreq: EDEC 4840.

**EDEC 4850 - Early Childhood Capstone**
3 Credits (3 Contact Hours)
Taken concurrently with student teaching. Students strengthen connections between theory and pedagogy; analyze and solve contemporary problems in early childhood education; and reflect upon their personal growth as educators. Preq: EDEC 4000 and EDEC 4300 and EDEC 4400 and EDEC 4600. Coreq: EDEC 4840.

**East Asian Studies**

**EAS 1110 - Introduction to Chinese Language and Culture**
3 Credits (3 Contact Hours)
Introductory course for beginners to Chinese language skills and cultural aspects. Topics are selected for learners to interact and communicate addressing everyday situations. The course may not be used as a substitute for any other CHIN course.

EAS 1120 - Introduction to Japanese Language and Culture
3 Credits (3 Contact Hours)
Introductory course for beginners to Japanese language skills and cultural aspects. Topics are selected for learners to interact and communicate addressing everyday situations. The course may not be used as a substitute for any other JAPN course.

EAS 1230 - Introduction to China
3 Credits (3 Contact Hours)
Introduction to various aspects of Chinese civilization, including geography, ethnic groups, language, history, philosophy, religion, literature, arts, architecture, and social customs. All readings and discussions are in English.

**Economics**

**ECON 2000 - Economic Concepts**
3 Credits (3 Contact Hours)
One-semester survey of basic economic concepts that offers an overview of both microeconomics and macroeconomics. Not intended for business majors or other students seeking a comprehensive introduction to economic analysis and its applications. Credit will not be given to students who have received credit for ECON 2110 or 2120.

**ECON 2110 - Principles of Microeconomics**
3 Credits (3 Contact Hours)
Introduction to economic reasoning and its application to the study of the behavior of consumers and business firms. Particular topics include competition, monopoly, international trade, and the impact of selected public policies. Intended as the first of a two-semester sequence in the foundations of economics. Includes Honors sections.

**ECON 2120 - Principles of Macroeconomics**
3 Credits (3 Contact Hours)
Continuation of ECON 2110 in which fundamental economic principles are applied to the study of aggregate economic performance. Topics include the forces determining the rates of inflation, unemployment, and economic growth, with particular emphasis on the influence of fiscal and monetary policies through financial markets. Includes Honors sections. Preq: ECON 2110.

**ECON 3010 - Economics of Labor**
3 Credits (3 Contact Hours)
Introduces students to the economics of the labor market and labor relations. Considers the theories of wages and employment, determination, unemployment, investment in human capital, discrimination, and public policy toward the labor market. Also considers the role of labor unions. May not be used to satisfy requirements for a degree in Economics. Preq: ECON 2110.

**ECON 3020 - Money and Banking**
3 Credits (3 Contact Hours)
Considers the function of money and banking in both the product and financial markets. Special emphasis is placed on monetary theory and current problems of monetary policy. May not be used to satisfy requirements for a degree in Economics. Preq: ECON 2120.

**ECON 3030 - Economics and Sports**
3 Credits (3 Contact Hours)
Economic analysis of sports teams, leagues, and institutions. Analyzes basic economic issues using sports data. May not be used to satisfy requirements for a degree in Economics. Credit will not be given to students who have completed ECON 4260. Preq: ECON 2110.

**ECON (MGT) 3060 - Managerial Economics**
3 Credits (3 Contact Hours)
Uses tools of economic analysis in classifying problems in organizing and evaluating information, and in comparing alternative courses of action. Bridges the gap between economic theory and managerial practices. May not be used to satisfy requirements for a degree in Economics. May also be offered as MGT 3060. Preq: ECON 2110.

**ECON 3070 - Arbitration**
3 Credits (3 Contact Hours)
Analyzes dispute settlement procedures emphasizing mediation, fact-finding, and arbitration as they are used to resolve labor-management disputes in the public and private sectors. Preq: Consent of instructor.
ECON 3090 - Government and Business
3 Credits (3 Contact Hours)
Relationships between government and business, including, among other topics, government efforts to enforce competition; to regulate public utilities; and to protect the special interest of laborers, farmers, and consumers. May not be used to satisfy requirements for a degree in Economics. Preq: ECON 2110.

ECON 3100 - International Economy
3 Credits (3 Contact Hours)
Studies of the process of international commerce. Covers basic theory of trade and exchange rates, institutional and legal environment, current policy issues. Not open to students who have taken ECON 4120. May not be used to satisfy requirements for a degree in Economics. Preq: ECON 2110 and ECON 2120.

ECON 3140 - Intermediate Microeconomics
3 Credits (3 Contact Hours)
Analytical study of basic concepts of value and distribution under alternative market conditions. Includes Honors sections. Preq: ECON 2110.

ECON 3150 - Intermediate Macroeconomics
3 Credits (3 Contact Hours)
Macroeconomic problems of inflation and unemployment are focal points. Includes statistics (measures of real output and the price level) and theory (covering the sources of short-run fluctuations and long-run growth). Analyzes appropriate public policies addressing these issues. Includes Honors sections. Preq: ECON 2120.

ECON 3190 - Environmental Economics
3 Credits (3 Contact Hours)
Study of the application of economic logic to issues surrounding environmental management and policy. Examines individual, firm, and collective decision making as well as the evolution of regulatory approaches for controlling environmental use. Preq: ECON 3140.

ECON (ELE) 3210 - Economics of Innovation
3 Credits (3 Contact Hours)
Examines the nature of entrepreneurship and the contribution of innovation to economic growth. Investigates the organizational and institutional sources of innovation in different firms and different countries as well as the work of economic theorists concerning the role entrepreneurs play in bringing new products to market. May also be offered as ELE 3210. Preq: ECON 3060 or ECON 3140.

ECON 3250 - Personnel Economics
3 Credits (3 Contact Hours)
Study of various compensation and personnel practices firms employ. Explains when each of those practices should be followed to elicit the desired employee effort and labor force quality. Topics include piece-rate and time-rate systems, seniority-based incentive schemes, promotion contests, evaluation systems, mandatory retirement, and up-or-out rules. Preq: ECON 2110.

ECON 3400 - Behavioral Economics
3 Credits (3 Contact Hours)
Introduces the economic, sociological, and psychological aspects of decision making under uncertainty. Presents the psychology of prediction, intuitive prediction: biases and corrective procedures. Topics also include framing, choice with costly information, and social influences on individual behavior. Preq: ECON 2110.

ECON 3440 - Economics of Institutions and Property Rights
3 Credits (3 Contact Hours)
Study of fundamental property rights structures and institutions in the capitalist economy and the arrangements that create incentives to produce and exchange. Preq: ECON 2110 and ECON 2120.

ECON 3500 - Moral and Ethical Aspects of a Market Economy
3 Credits (3 Contact Hours)
Can a market system produce results that are fundamentally just? Is justice possible without voluntary exchange? Applies both economic and philosophical analyses to these questions. Emphasizes the causes, consequences, and morality of the distribution of wealth and income in a free-market system. Includes Honors sections. Preq: ECON 3140.

ECON 3600 - Public Choice
3 Credits (3 Contact Hours)
Covers the economic approach to political activities and institutions. Topics include voting, voting rules, constitutions, political competition, political business cycles, vote trading, interest groups, bureaucracy, committees, legislators, executives, and judges. Designed for Economics and non-Economics majors and requires only basic skills in microeconomics. Preq: ECON 2110.
ECON 3900 - Junior Honors Research
1 Credits (1 Contact Hours)
Readings and research in conjunction with an approved economics course at the 3000 or 4000 level. Honors status required. May be repeated for a maximum of three credits.

ECON 3970 - Creative Inquiry in Economics I
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of four credits.

ECON 4010 - Labor Market Analysis
3 Credits (3 Contact Hours)
Develops the methods of economic analysis of labor markets. Requires students to apply these methods to problems of the labor market. Topics include labor demand and supply, human capital, occupational choice, compensating wage differentials, organizational wage structures and incentive systems, unemployment, and discrimination. Preq: ECON 3140.

ECON 4020 - Law and Economics
3 Credits (3 Contact Hours)
Application of economics to the law of property, torts, and contracts; regulation of markets, business organizations, and financial transactions; distribution of income and wealth; and criminal law. Preq: ECON 2110. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECON 4040 - Comparative Economic Systems
3 Credits (3 Contact Hours)
Comparative analytical and historical study of the principal economic systems which have been important in the modern world including, among others, capitalism and socialism. Preq: ECON 3140.

ECON 4050 - Introduction to Econometrics
4 Credits (3 Contact Hours)
Introduction to methods of quantitative analysis of economic data. Reviews basic statistical methods and probability distribution. Topics include data management using professional statistical software applications; multiple regression analysis; hypothesis testing under conditions of multicollinearity, heteroscedasticity, and serial correlation. Preq: ECON 2110 and ECON 2120; and either MATH 1080 or MATH 2070; and MATH 3020 or STAT 3090 or STAT 3300. Coreq: ECON 4051. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECON 4051 - Introduction to Econometrics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ECON 4050. Coreq: ECON 4050. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECON 4060 - Advanced Econometrics
3 Credits (3 Contact Hours)
Reviews statistical inference using multiple regression (OLS) analysis and model specification. Topics include multicollinearity, heteroscedasticity, and serial correlation; two-staged least squares and instrumental variables models; simultaneous equations models; limited dependent variable models using maximum likelihood estimation and time-series analysis; and presentation of results in technical writing. Preq: ECON 4050. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECON 4100 - Economic Development
3 Credits (3 Contact Hours)
Consideration and analysis of economic and related problems of underdeveloped countries. Attention is given to national and international programs designed to accelerate solution of these problems. Preq: ECON 3140. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECON 4110 - Economics of Education
Analysis of economic issues related to education. The decision to invest in education, elementary and secondary school markets and reform, the market for college education, teacher labor markets, and education's effects on economic growth and income distribution. Preq: ECON 3140.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4120 - International Microeconomics**

3 Credits (3 Contact Hours)

Analysis of the essential aspects of international economic linkages. Discusses gains and redistributive effects of trade and the barriers to trade within the context of a variety of economic models. Also discusses the history of trade policy and the political economy of its determination. Preq: ECON 3140.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4130 - International Macroeconomics**

3 Credits (3 Contact Hours)

Examination of macroeconomic linkages between an individual country and the rest of the world and how these linkages are affected by the choice of exchange rate regimes. Topics include the relation between domestic and foreign interest rates and exchange rates and the ability to pursue independent monetary policies. Preq: ECON 3150.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4190 - Economics of Defense**

3 Credits (3 Contact Hours)

Examines the American defense establishment in terms of resources utilized, alternative uses, and the contribution to the national economy and scientific progress generated by resources in a defense use. Discusses economic problems inherent in shifting resources between defense and nondefense uses and among alternative defense uses. Preq: ECON 3140.

**ECON 4200 - Public Sector Economics**

3 Credits (3 Contact Hours)

Study of the role of government and its proper functions and limitations in a market. Provision of goods and services by all levels of government and instruments of taxation are evaluated according to efficiency and equity criteria. Contemporary public sector issues are emphasized throughout. Preq: ECON 3140.

**ECON 4220 - Monetary Economics**

3 Credits (3 Contact Hours)

Intensive study of the role of monetary factors in economic change. Modern monetary theories and their empirical relevance for policy are developed against a background of monetary history and institutions. Preq: ECON 3140 and ECON 3150.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4230 - Economics of Health**

3 Credits (3 Contact Hours)

Applies microeconomic theory to examine the demand for health services and medical care, the market for medical insurance, the behavior of physicians and hospitals, and the role of government in health-care provision and regulation. Preq: ECON 3140.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4240 - Organization of Industries**

3 Credits (3 Contact Hours)

Empirical, historical, and theoretical analyses of market structure and concentration in American industry: the effects of oligopoly, monopoly, and cartelization upon price, output, and other policies of the firm; antitrust and other public policies and problems are studied. Preq: ECON 3140.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4250 - Antitrust Economics**

3 Credits (3 Contact Hours)

Analysis of the economic and legal issues created by the exercise of market power. The motivation and execution of government policy towards mergers, predatory conduct, and various restraints of trade are intensively examined. Preq: ECON 3090 or ECON 3140.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
**ECON 4260 - Seminar in Sports Economics**  
3 Credits (3 Contact Hours)  
Economic analysis of sports teams, leagues, and institutions. Topics include antitrust issues, public funding of sports venues, labor relations, wagering markets, athlete compensation, and application of economic principles to sports settings. Empirical research project is cornerstone of course. Includes Honors sections. Preq: ECON 3140 and ECON 4050.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4270 - Development of the American Economy**  
3 Credits (3 Contact Hours)  
Explores several topics relevant to understanding the American experience. Considers the institutions and developments critical to America's ascendancy from a small country to a dominant global economic power. Investigates immigration, innovation, education, finance, and the changing role of race and gender in the economy. Preq: ECON 3140 and ECON 3150.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4280 - Cost-Benefit Analysis**  
3 Credits (3 Contact Hours)  
Develops techniques for the appraisal of public expenditure programs with particular emphasis on investment in infrastructure. Topics include choice of an appropriate discount rate and the calculation of social costs and benefits in the presence of market distortions. Preq: ECON 3140.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4290 - Economics of Energy Markets**  
3 Credits (3 Contact Hours)  
This course examines the economics of energy markets and energy policy. The unique features and characteristics of these important and interrelated markets are explored, and participants gain practical experience in connecting economic concepts to recent energy-related events and energy policy issues. Preq: ECON 3140.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4300 - Topics in Mathematical Economics**  
3 Credits (3 Contact Hours)  
This course develops the mathematical tools underlying economic analysis and prepares students for doing advanced theoretical work in economics. The topics covered in this course provide excellent preparation for advanced economics courses, and lay the foundation for doing quantitative analysis associated with both career work and graduate study in economics. Preq: ECON 3140; and either MATH 1080 or MATH 2070.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4350 - Family Economics**  
3 Credits (3 Contact Hours)  
Analysis of economic aspects of the family. Economics of marriage, divorce, fertility, public policies affecting the family, women's labor force participation, and the gender gap are studied using main economic theories and empirical studies. Preq: ECON 3140.

**ECON 4400 - Game Theory**  
3 Credits (3 Contact Hours)  
Introduction to the formal analysis of strategic interaction among rational, self-interested rivals. Basic theoretical aspects of games are discussed and applied to such topics as bargaining, voting, auctions, and oligopoly. Preq: ECON 3140 and either MATH 1060 or MATH 2070; or ECON 4300.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4550 - Applied Microeconomic Research**  
3 Credits (3 Contact Hours)  
Students conduct research in applied microeconomics. Topics vary according to student and professor interests. Students read papers in the literature, formulate their own economic hypotheses, and collect and analyze data to test those hypotheses. May be repeated for a maximum of nine credits, but only if different topics are covered. Preq: ECON 3140.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON (AGRB) 4570 - Natural Resource Use, Technology, and Policy**
Focuses on economic analyses of actual, efficient, and sustainable uses of natural resources, impacts of technologies that affect these uses, and policies that affect development and use of such technologies. Resource-technology-policy combinations may vary, but an example is crude oil, hybrid automotive engines, and fuel economy standards. May also be offered as AGRB 4570. Preq: MATH 1020 or MATH 1060; and AGRB 3570 or ECON 3140.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECON 4910 - Senior Honors Thesis Research**
3 Credits (3 Contact Hours)
Reading and research for the Senior Honors Thesis. Preq: ECON 3140 and ECON 3150 and senior honors standing.

**ECON 4920 - Senior Honors Thesis Writing**
3 Credits (3 Contact Hours)
Writing and oral presentation of the Senior Honors Thesis. Preq: ECON 4910.

**ECON 4960 - Independent Study**
1-3 Credits (1-3 Contact Hours)
Research and writing on a selected economics topic chosen by the student. A written proposal must be approved by the instructor prior to the start of the semester. May be repeated for a maximum of six credits. Preq: ECON 3140.

**ECON 4970 - Creative Inquiry in Economics II**
1-3 Credits (1-3 Contact Hours)
Engages students in research projects selected by the Economics Department faculty. Research projects vary depending on faculty and student interest. May be repeated for a maximum of six credits. Preq: ECON 3140.

**ECON 4980 - Selected Topics in Economics**
3 Credits (3 Contact Hours)
In-depth treatment of topics not covered fully in regular courses. Topics vary from year to year. May be repeated for a maximum of nine credits, but only if different topics are covered. Includes Honors sections. Preq: ECON 3140 and ECON 3150.

**ECON 4990 - Senior Seminar in Economics**
1-3 Credits (1-3 Contact Hours)
Discussion of topics of current interest in economics. Students conduct directed research on a particular topic. Preq: Consent of instructor.

**Education**

**ED 1010 - Effective Strategies for College Success**
3 Credits (3 Contact Hours)
Provides knowledge of specific strategies to increase academic success for college students. Includes instruction in strategies to address engagement and participation, organizational and study skills, test taking, note taking, reading content area text, and writing.

**ED 1030 - Introduction to Content Specific Learning Strategies**
2 Credits (2 Contact Hours)
Through direct experiences, students develop strategies to become proficient problem solvers, design and perform experiments to test hypotheses, analyze connections between core content areas, construct meaning from reading in various disciplines, identify and use resources to improve learning, and communicate effectively. Students must be accepted into and have completed the first two years of the Emerging Scholars pre-college program to enroll in this course.

**ED 1050 - Orientation to Education**
2 Credits (2 Contact Hours)
Introduction to teaching addresses basic program requirements, College of Education Conceptual Framework, state evaluation system, the nature of the diverse and multicultural classroom, standards and practices of professional conduct and requirements in teaching. A field experience involving tutoring in a P-12 classroom is required. Coreq: ED 1051.

**ED 1051 - Orientation to Education Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany ED 1050. Coreq: ED 1050.

**ED 1900 - Leadership, Citizenship, and Community Service**
Provides active learning opportunities for students to understand better the system of government, learn the mechanics of how leadership can influence education and other initiatives, and develop interpersonal skills that will assist them throughout their professional lives. Culminates with a service learning plan for the students' local community.

**ED 1970 - Creative Inquiry in Education**  
1-4 Credits (1-4 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

**ED 2970 - Creative Inquiry in Education**  
1-4 Credits (1-4 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

**ED 3220 - Responding to Emergencies**  
3 Credits (2 Contact Hours)  
Provides the citizen responder with the knowledge and skills necessary in a variety of emergencies to help sustain life and to minimize pain and the consequences of injury until professional help arrives. Includes first aid, CPR, and automated external defibrillation (AED). Coreq: ED 3221.

**ED 3221 - Responding to Emergencies Laboratory**  
0 Credits (1 Contact Hours)  
Non-credit laboratory to accompany ED 3220. Coreq: ED 3220.

**ED 3970 - Creative Inquiry in Education**  
1-4 Credits (1-4 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

**ED 4050 - Multiculturalism**  
3 Credits (3 Contact Hours)  
Introduces prospective teachers to the influence of culture on learning from an anthropological and historical perspective. Preq: HIST 1720 or HIST 1730.

**ED 4380 - Selected Topics in Education**  
1-3 Credits (1-3 Contact Hours)  
Specific education topics not found in other courses are selected for in-depth study. May be repeated for a maximum of 12 credits, but only if different topics are covered.

**ED 4390 - Independent Study in Education**  
1-3 Credits (1-3 Contact Hours)  
Study of selected topics in education under the direction of a faculty member chosen by the student. Student and faculty member develop a course of study different from any existing courses and designed for the individual student. May be repeated for a maximum of 12 credits, but only if different topics are covered.

**ED 4410 - Middle School Curriculum**  
3 Credits (3 Contact Hours)  
Concepts and methods for teaching middle school students. Discusses nature of middle school students, teacher characteristics, curricular and co-curricular programs, organization, and teaching. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ED 4900 - Classroom Learning Environments**  
3 Credits (3 Contact Hours)  
Course addresses both theoretical and practical understanding of classroom learning environments. Students learn ways to cultivate and maintain a student-centered learning environment that is safe, flexible, organized, positive, inclusive and collaborative. Preq: EDF 3020.

**ED 4970 - Creative Inquiry in Education**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

**ED 4990 - Education Honors Capstone**
1-6 Credits (1-6 Contact Hours)
Students seeking departmental honors complete honors research under faculty mentors. Students take a minimum of six hours across at least two semesters. May be repeated for a maximum of 12 credits. Preq or concurrent enrollment: EDF 3010 and EDF3020. Coreq: ED 4991.

**ED 4991 - Education Honors Capstone Laboratory**
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany ED 4990. Coreq: ED 4990.

**ED 8711 - STEAM Transdisciplinary Teaching Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ED 8710. Includes a field placement and focuses on the instructional content of STEAM teachers, including subject-matter alignment, discipline integration, and ways to employ problem-solving skills. Focus is on STEAM-based practices such as problem-based, inquiry-rich, authentic tasks, and ways to integrate technology across the curriculum. Coreq: ED 8700.

**Education and Human Development**

**EDHD 3110 - Creative Inquiry in Education and Human Development**
1-3 Credits (3-9 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of nine credits.

**EDHD 4210 - Undergraduate Independent Study in Education and Human Development**
1-3 Credits (3-9 Contact Hours)
Student studies selected topics in education under the direction of a faculty member chosen by the student. Student and faculty member develop an individualized course of study different from any existing courses. May be repeated for a maximum of 12 credits.

**EDHD 4310 - Selected Topics in Education and Human Development**
1-3 Credits (3-9 Contact Hours)
Specific topics not found in other courses are selected for in-depth study. May be repeated for a maximum of 12 credits, but only if different topics are covered.

**Educational Counseling**

**EDC 1990 - Creative Inquiry in Counselor Education**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

**EDC 2340 - Introduction to Addictions: Basic Education and Prevention**
3 Credits (3 Contact Hours)
Basic review of addictions and chemical dependence. Gives future educators skills in the identification of chemical abuse, techniques for intervention, and methods of prevention education. SOC 3960 and 3970 are recommended as follow-up courses for those interested in pursuing the topic.

**EDC 2990 - Creative Inquiry in Counselor Education**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.
EDC 3900 - Student Development Theory, Leadership, and Counseling Skills for Student Leaders
3 Credits (3 Contact Hours)
Introduction to theoretical and practical applications of student development and leadership on the university campus. Develops skills assisting students with leadership development, problem solving, conflict resolution, confrontation, and referral. Explores legal and ethical issues for practitioners and effective utilization of resources available on the campus. May be repeated for a maximum of nine credits.

EDC 3990 - Creative Inquiry in Counselor Education
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

EDC 4990 - Creative Inquiry in Counselor Education
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

Educational Foundations

EDF 3010 - Principles of American Education
3 Credits (3 Contact Hours)
Study of the legal basis, historical development, characteristics, and functions of educational institutions in the United States. Includes Honors sections. Preq: Sophomore standing and a 2.0 minimum grade-point average.

EDF 3020 - Educational Psychology
3 Credits (3 Contact Hours)
Introduction to classroom use of objectives, motivation theories, learning theories, tests and measurements, classroom management, and knowledge of exceptional learners. Includes Honors sections. Preq: Sophomore standing and a 2.0 minimum grade-point average.

EDF 3080 - Classroom Assessment
3 Credits (3 Contact Hours)
Introduction to classroom assessment and standardized testing. Preq: EDF 3020 and junior standing.

EDF 3150 - Technology Skills for Learning
1 Credits (2 Contact Hours)
Students develop technology skills, such as creating Web pages and multimedia presentations in the context of general education class requirements. Products developed are linked within the School of Education e-portfolio. Preq: Admission to Teacher Education program and ED 1050.

EDF (HIST) 3200 - History of United States Public Education
3 Credits (3 Contact Hours)
Historical survey of the development of United States public schools. May also be offered as HIST 3200. Preq: Junior standing.

EDF 3340 - Child Growth and Development
3 Credits (3 Contact Hours)
Introduction to lifespan development. Heavy emphasis is placed on the physical, social, emotional, and cognitive characteristics. Includes a minimum of five one-hour observation-participation visits to an elementary school. Includes Honors sections. Preq: Sophomore standing and a 2.0 minimum grade-point average.

EDF 3350 - Adolescent Growth and Development
3 Credits (3 Contact Hours)
Introduction to lifespan development. Emphasizes the physical, social, emotional, and cognitive characteristics of the 10- to 18-year old and the educational implications of those developmental characteristics. Includes Honors sections. Preq: Sophomore standing and a 2.0 minimum grade-point average.

EDF 4060 - Philosophy, Schooling, and Educational Policy
EDF 4250 - Instructional Technology Strategies
1 Credits (2 Contact Hours)
Helps future teachers learn to use technology effectively in support of content area instruction. To be taken concurrently with either methods classes or during student teaching as directed by major. Preq: EDF 3150 or EDF 4800.

EDF (AGED) 4800 - Foundations of Digital Media and Learning
3 Credits (2 Contact Hours)
Critical use of digital media for leadership and learning within societal and educational contexts. Course focuses on learner impact while exploring and evaluating technology-enhanced applications. Competencies with new media literacies are developed and cultural, ethical and participatory implications are addressed. Designed to meet Read to Succeed requirements. Registration preference may be given to students enrolled in a teacher education program. May also be offered as AGED 4800. Coreq: EDF 4801.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EDF (AGED) 4801 - Foundations of Digital Media and Learning Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany EDF 4800. May also be offered as AGED 4801.Coreq: EDF 4800.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EDF (AGED) 4820 - Advanced Educational Applications of Microcomputers
3 Credits (2 Contact Hours)
Provides students with the knowledge and skills needed to apply microcomputer technology to the utilization and generation of educational software in accordance with sound educational principles. May also be offered as AGED 4820. Preq: AGED 4800 or EDF 4800. Coreq: EDF 4821.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EDF (AGED) 4821 - Advanced Educational Applications of Microcomputers Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany EDF 4820. May also be offered as AGED 4821. Coreq: EDF 4820.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EDF 4900 - Classroom Management
3 Credits (3 Contact Hours)
Aids students in developing strategies and plans to manage a classroom effectively. Topics include both time and behavioral management. Students learn how to prevent problems as well as address problems once they have occurred.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EDF 4970 - Instructional Media in the Classroom
3 Credits (3 Contact Hours)
Integrated approach to the use of audiovisual media stressing systematic planning, selection, utilization, and evaluation as well as production of materials and equipment operation. Preq: 2.0 minimum grade-point average.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

Electrical and Computer Engineering

ECE 1010 - Robots in Business and Society
3 Credits (3 Contact Hours)
Explores the significant role robotics and automation play in society. Students gain an appreciation of the ethics, economics, psychology, politics and technologies that must be considered in the use of robots.

ECE 1990 - Creative Inquiry in Electrical and Computer Engineering
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

**ECE 2010 - Logic and Computing Devices**
2 Credits (2 Contact Hours)
Introduction to Boolean algebra and digital logic. Topics include number systems and representation of information; Boolean operators and algebra; expression minimization; combinational circuits, including adders, comparators, decoders and multiplexors; sequential logic, including flip-flops, shift registers, counters and memory. Includes Honors sections. Preq: MATH 1080 and PHYS 1220, each with a C or better.

**ECE 2020 - Electric Circuits I**
3 Credits (3 Contact Hours)
Study of DC resistive circuits, Kirchhoff's Laws, Nodal and Mesh emphasis, sources, Thevenin's and Norton's theorems, RC, RL, RCL circuit solutions with initial condition using homogenous or nonhomogenous ordinary differential equations having constant coefficients. Develop sinusoidal steady state solution. Includes Honors sections. Preq: MATH 1080 and PHYS 1220, each with a C or better. Preq or concurrent enrollment: PHYS 2210 with a C or better.

**ECE 2040 - Circuit Analysis Problems I**
1 Credits (3 Contact Hours)
Analysis and solution of electrical network problems using mesh and nodal analysis, Thevenin's and Norton's theorems and equivalent circuits and other circuit analysis from ECE 2020. Preq or concurrent enrollment: ECE 2020 with a C or better.

**ECE 2070 - Basic Electrical Engineering**
2 Credits (2 Contact Hours)
A first course in electrical engineering to provide non-Electrical Engineering majors with a knowledge of DC and AC circuit theory, AC power, and numerous electrical devices, apparatus, and digital systems. Credit may not be received for both ECE 2070 and ECE 3080. Preq: MATH 2060 and PHYS 2210.

**ECE 2080 - Basic Electrical Engineering Laboratory**
1 Credits (2 Contact Hours)
Laboratory to accompany ECE 2070. Basic electrical circuits and instrumentation. Preq or concurrent enrollment: ECE 2070.

**ECE 2090 - Logic and Computing Devices Laboratory**
1 Credits (2 Contact Hours)
Introduction to designing, building, simulating and testing digital logic circuits. Topics include SSI and MSI ICs; general combinational circuits; adders, decoders and multiplexors; general sequential circuits; shift registers, counters and memory. Includes Honors sections. Preq or concurrent enrollment: ECE 2010 with a C or better.

**ECE 2110 - Electrical Engineering Laboratory I**
1 Credits (2 Contact Hours)
Principles of measurement and instruments used to measure parameters and dynamic variables in electric circuits, steady state and transient measurements in DC and AC circuits, and data analysis methods are included. Preq or concurrent enrollment: ECE 2020 with a C or better.

**ECE 2120 - Electrical Engineering Laboratory II**
1 Credits (2 Contact Hours)
Emphasizes measurement techniques in AC steady-state circuits and comparison to theoretical predictions. Two-port network methodology and transfer functions are studied experimentally and related to analysis using transform techniques. Preq: ECE 2020 and ECE 2110, each with a C or better. Preq or concurrent enrollment: ECE 2620 with a C or better.

**ECE 2220 - Systems Programming Concepts for Computer Engineering**
3 Credits (3 Contact Hours)
Development of computer systems programming and code reading techniques. Tools, programming languages, libraries, operating systems, and hardware. Code reading is emphasized. Programming projects reinforce course topics. Preq: CPSC 1110 with a C or better.

**ECE 2230 - Computer Systems Engineering**
3 Credits (3 Contact Hours)
Analysis of implementation techniques for systems software. Applying engineering principles including code reading to the design of data structures and algorithms for low level computer systems, embedded systems, and hardware/software systems. Includes coverage of address translation, memory management, file systems, and process management. Preq: ECE 2220 with a C or better.

**ECE 2620 - Electric Circuits II**
3 Credits (3 Contact Hours)
Continuation of the study of electric circuits, including three-phase circuits, complex frequency and network functions, frequency response, two-port parameters, magnetically-coupled circuits, Laplace transforms, and ideal op amps. Includes Honors sections. Preq: ECE 2020 and MATH 2060 and PHYS 2210, each with a C or better. Preq or concurrent enrollment: MATH 2080 with a C or better.

**ECE 2630 - Circuit Analysis Problems II**
1 Credit (3 Contact Hours)
Analysis of basic AC circuit analysis techniques to analyze the transient and steady-state behavior of both simple and complex circuits. Preq or concurrent enrollment: ECE 2620 and MATH 2080, each with a C or better.

**ECE 2720 - Computer Organization**
3 Credits (3 Contact Hours)
Introductory course in computer organization and architecture. Topics include CPUs, memory, I/O, processor families, busses, peripherals, microarchitectures, and instruction sets. Includes Honors sections. Preq: ECE 2010 and CPSC 1110, each with a C or better.

**ECE 2730 - Computer Organization Laboratory**
1 Credit (2 Contact Hours)
Laboratory enhances students' understanding of computer organization via assignments involving assembly language programming. Topics include basic syntax, branching and loops, addressing modes, arrays and pointers, subroutines and stacks. Includes Honors sections. Preq or concurrent enrollment: ECE 2720 with a C or better.

**ECE 2990 - Creative Inquiry in Electrical and Computer Engineering**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Includes Honors sections. Preq: Consent of faculty member/mentor.

**ECE 3000 - Junior Honors Seminar**
1 Credit (2 Contact Hours)
Acquaints students enrolled in the Departmental Honors Program with current research activities in the Department. Faculty provide seminars where research interests are summarized. Seminars are planned to prepare students in choosing research topics for their senior theses.

**ECE 3080 - Fundamentals of Electrical Engineering**
3 Credits (3 Contact Hours)
A first course in electrical engineering to provide non-Electrical Engineering majors with a knowledge DC and AC circuit theory, AC power distribution, numerous electrical devices, digital systems, instrumentation and measurement systems, electronics, electromechanics, and electric motors. Credit may not be received for both ECE 2070 and 3080. Preq: MATH 2060 and PHYS 2210.

**ECE 3110 - Electrical Engineering Laboratory III**
1 Credit (2 Contact Hours)
Measurements and characteristics of electronic devices and circuits; use of manual and automated instruments to acquire data; oral and written engineering reports. Preq: ECE 2120 and ECE 2620 and MATH 2080 and PHYS 2210, each with a C or better. Preq or concurrent enrollment: ECE 3200 with a C or better.

**ECE 3120 - Electrical Engineering Laboratory IV**
1 Credit (2 Contact Hours)
Design and characterization of functional circuits using solid-state devices; use of manual and automated instruments for measurements; statistical analysis of data; preparation of engineering reports. Preq: ECE 3110 and ECE 3200, each with a C or better. Preq or concurrent enrollment: ECE 3210 with a C or better.

**ECE 3170 - Random Signal Analysis**
3 Credits (3 Contact Hours)
Introduction to engineering problems of a probabilistic nature. Systems transformations, statistical averages, simulation, and estimation of system parameters. Includes Honors sections. Preq: ECE 2620 and MATH 2080, each with a C or better. Preq or concurrent enrollment: ECE 3300 with a C or better.

**ECE 3200 - Electronics I**
3 Credits (3 Contact Hours)
Introduction to electronic materials and devices; principles of design; design of DC and AC circuits using diodes, bipolar junction transistors, field-effect transistors and use of transistors in digital circuits. Includes Honors sections. Preq: ECE 2620 and MATH 2080 and PHYS 2210, each with a C or better.
ECE 3210 - Electronics II
3 Credits (3 Contact Hours)
Analysis and design of discrete amplifier circuits at low and high frequencies; operational amplifiers, frequency response, feedback, stability, and applications of analog integrated circuits. Preq: ECE 3200 with a C or better.

ECE (CPSC) 3220 - Introduction to Operating Systems
3 Credits (3 Contact Hours)
Detailed study of management techniques for the control of computer hardware resources. Topics include interrupt systems, primitive level characteristics of hardware and the management of memory, processor, devices, and data. May also be offered as CPSC 3220. Preq: CPSC 2120 and CPSC 2310, each with a C or better; or ECE 2230 and ECE 2720, each with a C or better.

ECE 3270 - Digital Computer Design
3 Credits (3 Contact Hours)
Design of high-speed ALUs, control and timing circuitry, and asynchronous systems; hands-on system prototyping with HDLs for FPGA devices; current hardware topics related to computer design using modern design methodologies and CAD tools; and principles of system design for testability. Preq: ECE 3710 with a C or better.

ECE 3290 - Computer Systems Structures
3 Credits (3 Contact Hours)
Fundamental structures and issues that arise in the analysis and implementation of computer systems. Topics include operating systems structures and data structures and their relationship to computer organization. Engineering science background for computer systems design. Preq: ECE 2230 and ECE 2720, each with a C or better.

ECE 3300 - Signals, Systems, and Transforms
3 Credits (3 Contact Hours)
Study of systems models, analysis of signals, Fourier series and transforms, sampling and Z transforms, discrete Fourier transforms. Includes Honors sections. Preq: ECE 2620 and MATH 2080, each with a C or better.

ECE (CPSC) 3520 - Programming Systems
3 Credits (3 Contact Hours)
An advanced course in programming languages and systems for computer engineering and computer science majors. The course objective is to enable a more complete understanding of programming topics and related supporting tools, including philosophy, methodology, formal syntax and semantics, and examples of programming paradigms, languages and development approaches. May also be offered as CPSC 3520. Preq: ECE 2230; or CPSC 2120 and CPSC 2150, each with a C or better. Preq or concurrent enrollment: CPSC 2070 or MATH 4190, each with a C or better.

ECE 3600 - Electric Power Engineering
3 Credits (3 Contact Hours)
Presents the basic principles of power systems, energy conversion, electromagnetic induction and developed forces. Topics include power and energy concepts and analysis; the basics of electric power generation, transmission, and distribution; synchronous machines, induction motors, and DC motors. Preq: ECE 2620 and PHYS 2210, each with a C or better.

ECE 3710 - Microcontroller Interfacing
3 Credits (3 Contact Hours)
Discusses the programming and interfacing of microcontrollers in order to control their integrated devices and external peripherals. Topics include memory and I/O; interrupts, counters and timers; ADCs and DACs; PWMs; and parallel and serial communication. Preq: ECE 2620 and ECE 2720, each with a C or better. Preq or concurrent enrollment: ECE 3200 with a C or better.

ECE 3720 - Microcontroller Interfacing Laboratory
1 Credits (3 Contact Hours)
Emphasizes microcontroller programming and interfacing for controlling various types of hardware. Topics include reading and writing to RAM, applications of a digital latch, keypad interfacing, interrupts, clock pulse generation, pulse width modulation, serial interfaces, and A-to-D and D-to-A conversion. Preq or concurrent enrollment: ECE 3710 with a C or better.

ECE 3800 - Electromagnetics
3 Credits (3 Contact Hours)
Topics in electrostatics include static electric charge, force, field (Coulomb's and Gauss's laws), flux, potential, energy, dielectrics, boundary conditions, and capacitance. Topics in magnetostatics include steady electric current, magnetic field (Biot-Savart and Ampere's law), force, flux, energy, boundary conditions, and inductance. Preq: ECE 2620 and MATH 2060 and PHYS 2210, each with a C or better.

ECE 3810 - Fields, Waves, and Circuits
3 Credits (3 Contact Hours)
Covers foundation of circuit theory, transmission lines and circuits, plane-wave propagation, radiation, and antennas. Preq: ECE 3800 and MATH 2080, each with a C or better.

ECE 3990 - Creative Inquiry in Electrical and Computer Engineering
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Includes Honors sections. Preq: Consent of faculty member/mentor.

ECE 4040 - Semiconductor Devices
3 Credits (3 Contact Hours)
Consideration of the principles of operation, external characteristics, and applications of some of the more important semiconductor devices presently available. Preq: ECE 3200 with a C or better. Preq or concurrent enrollment: MATH 3110 or MATH 4340, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4050 - Design Projects in Electrical and Computer Engineering
1-3 Credits (1-3 Contact Hours)
Individually defined projects oriented toward providing experience in establishment of objectives and criteria, synthesis, analysis, construction, testing, and evaluation. Develops student creativity through the solution of open-ended problems. Includes individual instruction in design methodology. May be repeated for a maximum of three credits. Preq: ECE 3300 or ECE 4090, each with a C or better; and consent of project supervisor.

ECE 4060 - Introduction to Microelectronics Processing
3 Credits (3 Contact Hours)
Microelectronic processing, MOS and bipolar monolithic circuit fabrication, thick and thin film hybrid fabrication, applications to linear and digital circuits, fundamentals of device design. Preq: ECE 3200 with a C or better. Preq or concurrent enrollment: MATH 3110 or MATH 4340, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4090 - Introduction to Linear Control Systems
3 Credits (3 Contact Hours)
Introduction to classical linear control systems. Topics include continuous and discrete descriptions of systems, time and frequency response, stability, system specification, system design of continuous and discrete systems. Preq: ECE 3300 with a C or better.

ECE 4120 - Electrical Machines Laboratory
1 Credits (2 Contact Hours)
Selected experiments to familiarize students with characteristics of transformers, DC and AC motors and generators. Measurement techniques and component modeling are included. Preq or concurrent enrollment: ECE 3600.

ECE 4160 - Smart Grid
3 Credits (3 Contact Hours)
This introductory course on smart grid covers the concepts and technologies that transform the traditional power system into an intelligent power system, now referred to as the smart grid. The interdisciplinary technologies needed for this transformation are introduced in this course.

ECE 4170 - Elements of Software Engineering
3 Credits (3 Contact Hours)
Foundations of software design, reasoning about software, the calculus of programs, survey of formal specification techniques and design languages. Preq: ECE 3220 and ECE 3520 and MATH 4190, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4180 - Power System Analysis
3 Credits (3 Contact Hours)
Study of power system planning and operational problems. Topics include load flow, economic dispatch, fault studies, transient stability, and control of problems. System modeling and computer solutions are emphasized through class projects. Preq: ECE 3600 and ECE 3800, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
ECE 4190 - Electric Machines and Drives
3 Credits (3 Contact Hours)
Performance, characteristics, and modeling of AC and DC machines during steady-state and transient conditions. Introduction to power electronics devices and their use in adjustable speed motor drives. Preq: ECE 3210 and ECE 3600 and ECE 3800, each with a C or better. Preq or concurrent enrollment: MATH 4340 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4200 - Renewable Energy Penetration on the Power Grid
3 Credits (3 Contact Hours)
Introduces the basic definition of electrical power, interfacing primary sources, generator/load characteristics, and renewable energy resources. Topics include solar energy grid interfacing, wind energy grid interfacing, battery charging/management, harmonic distortion, voltage sags, and national standards. Preq: ECE 2070 or ECE 3200, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4220 - Electronic System Design I
3 Credits (2 Contact Hours)
Emphasizes the application of theory and skills to the design, building, and testing of an electronic system with both analog and digital components. Application varies each semester. Computer software tools are used extensively in the design process. Preq: ECE 3210 and ECE 3300 and ECE 3600 and ECE 3710 and ECE 3810, each with a C or better. Coreq: ECE 4221.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4221 - Electronic System Design I Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ECE 4220. Coreq: ECE 4220.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4270 - Communications Systems
3 Credits (3 Contact Hours)
Study of communication systems design and analysis. Topics include signals and spectra, baseband signaling and detection in noise, digital and analog modulation and demodulation techniques, communications link budget analysis. Preq: ECE 3170 and ECE 3300, each with a C or better.

ECE 4290 - Organization of Computers
3 Credits (3 Contact Hours)
Computer organization and architecture. Topics include a review of logic circuits, bus structures, memory organization, interrupt structures, arithmetic units, input-output structures, state generation, central processor organization, control function implementation, and data communication. Registered Transfer Language (RTL) for description and design of digital systems. Preq: ECE 2720 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4300 - Digital Communications
3 Credits (3 Contact Hours)
Introduction to modern digital communication systems, emphasizing modulation and detection, taking into account the effects of noise. Includes Honors sections. Preq: ECE 3170 and ECE 3300, each with a C or better; and consent of instructor. Consent is not required for honors students.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4310 - Introduction to Computer Vision
3 Credits (3 Contact Hours)
The purpose of a computer vision system is to take data, usually in the form of one or more images, and produce information. This course covers the mainstream theories of computer vision used to build such systems. Several examples, such as optical character recognition, are implemented in assignments.

ECE 4320 - Instrumentation
3 Credits (3 Contact Hours)
Theory and analysis of transducers and related circuits and instrumentation. Generalized configurations and performance characteristics of instruments are considered. Transducer devices for measuring physical parameters such as motion, force, torque, pressure, flow, and temperature are discussed. Preq: ECE 3210 with a C or better. Preq or concurrent enrollment: MATH 3110 or MATH 4340, each with a C
ECE 4350 - Grounding and Shielding
3 Credits (3 Contact Hours)
Introduction to electromagnetic compatibility concepts and techniques for students who will be designing or working with electronic systems when they graduate. Topics include electromagnetic interference and noise control, crosstalk and signal integrity, grounding, filtering, shielding, circuit board layout, lighting and electrostatic discharge protection. Preq: ECE 3810 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4360 - Microwave Circuits
3 Credits (3 Contact Hours)
Analysis of microwave networks comprising transmission lines, waveguides, passive elements, interconnects, and active solid state microwave circuits. Use of modern CAD tools to design RF/Microwave passive/active networks. Fabrication of typical circuits. Preq: ECE 3810 with a C or better. Preq or concurrent enrollment: MATH 3110 or MATH 4340, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4370 - Microelectromechanical Systems
3 Credits (3 Contact Hours)
Introduction to the basic materials in current microelectromechanical systems (MEMS), as well as the fundamental sensing and actuation mechanisms therein. Students also learn the basic fabrication techniques for bulk and surface micromachining, discuss the primary forces in MEMS devices, and study the basic micro mechanical structures and microfluidics. Preq: CH 1020 and PHYS 1220; and senior status.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4380 - Computer Communications
3 Credits (3 Contact Hours)
Digital data transmission techniques, modems and communications channels, communications software and protocols, multiprocessors and distributed processing; concurrency and cooperation of dispersed processors. Preq: Senior standing in Electrical or Computer Engineering or Computer Science.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4390 - Fiber Optics
3 Credits (3 Contact Hours)
Covers the underlying principles of design for optical fibers in practical systems. Examines optical fiber as a wave-guide using wave optics and ray optics. Discusses design criteria for using mono- and multi-mode fibers. Other topics include fabrication, measurement. Preq: ECE 3810 with a C or better. Preq or concurrent enrollment: MATH 4340 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4400 - Performance Analysis of Local Computer Networks
3 Credits (3 Contact Hours)
Introduction to methods of modeling and performance analysis of local computer networks. Topics include basic queueing models based on probability theory and random processes, performance driven network design, and software defined networking methods. Preq: ECE 2720 and ECE 3170, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4420 - Knowledge Engineering
3 Credits (3 Contact Hours)
Introduction to the theoretical and practical aspects of knowledge engineering or applied artificial intelligence. Topics include symbolic representation structures and manipulation, unification, production systems and structures, rule-based and expert systems, planning and AI system architectures; system design in PROLOG and LISP. Project is required. Preq: ECE 3220 and ECE 3520, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4460 - Antennas and Propagation
3 Credits (3 Contact Hours)
Study of the theoretical and practical aspects of antenna design and utilization, input impedances, structural considerations, and wave propagation. Preq: ECE 3300 and ECE 3810; and one of MATH 3110 or MATH 4340, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECE 4490 - Computer Network Security**

3 Credits (1 Contact Hours)
Hands-on practicum in the administration and security of modern network service emphasizing intrusion prevention techniques, detection, and recovery. Preq: Senior standing in Computer Engineering or Electrical Engineering. Coreq: ECE 4491.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECE 4491 - Computer Network Security Laboratory**

0 Credits (4 Contact Hours)
Non-credit laboratory to accompany ECE 4490. Coreq: ECE 4490.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECE 4530 - Software Practicum**

3 Credits (1 Contact Hours)
Students design and implement a software system that satisfies both a requirements and specifications document. The resulting system is tested for compliance. Preq: ECE 3220 and ECE 3520, each with a C or better. Coreq: ECE 4531.

**ECE 4531 - Software Practicum Laboratory**

0 Credits (6 Contact Hours)
Non-credit laboratory to accompany ECE 4530. Coreq: ECE 4530.

**ECE 4550 - Robot Manipulators**

3 Credits (3 Contact Hours)
Analysis of robot manipulator systems with special focus on interaction of these technologies with society. Emphasis is on rigid-link robot manipulator systems. Topics include history of robot technology, kinematics, dynamics, control, and operator interfaces. Case studies reinforce impact of robot technology on society and vice versa. Preq: MATH 2060 and MATH 3110, each with a C or better.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECE (ME) 4570 - Fundamentals of Wind Power**

3 Credits (3 Contact Hours)
Introduces wind turbine systems, including wind energy potential and application to power generation. Topics include wind energy principles, wind site assessment, wind turbine components, power generation machinery control systems, connection to the electric grid, and maintenance. May also be offered as ME 4570. Preq: ECE 2070 or ECE 3200 with a C or better.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECE 4590 - Integrated Circuit Design**

3 Credits (2 Contact Hours)
Design concepts and factors influencing the choice of technology; fundamental MOS device design; silicon foundries, custom and semicustom integrated circuits; computer-aided design software/hardware trends and future developments; hands-on use of CAD tools to design standard library cells; systems design considerations, testing, and packaging. Preq: ECE 3210 with a C or better. Preq or concurrent enrollment: MATH 3110 or MATH 4340, each with a C or better. Coreq: ECE 4591.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECE 4591 - Integrated Circuit Design Laboratory**

0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ECE 4590. Coreq: ECE 4590.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ECE 4600 - Computer-Aided Analysis and Design**

3 Credits (3 Contact Hours)
Principles and methods suited to the solution of engineering problems on the digital computer. Topics include widely used methods for the solution of the systems of algebraic and/or differential equations which arise in modeling of engineering systems, data approximation and curve fitting, continuous system simulation languages, and design-oriented programming systems. Preq: ECE 2620 and MATH 3110 and MATH 4340, each with a C or better.
ECE 4610 - Fundamentals of Solar Energy
3 Credits (3 Contact Hours)
Introduces solar energy conversion systems. Topics include environmental benefits of solar energy, solar thermal systems, concentration solar power, photovoltaic (PV) cell design and manufacturing, sizing of PV system, hybrid photovoltaic/thermal systems, energy storage, and urban/rural applications. Preq: ECE 3200 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4670 - Introduction to Digital Signal Processing
3 Credits (3 Contact Hours)
Introduction to characteristics, design, and applications of discrete time systems; design of digital filters; introduction to the Fast Fourier Transform (FFT); LSI hardware for signal processing applications. Preq: ECE 3300 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4680 - Embedded Computing
3 Credits (2 Contact Hours)
Principles of using computing in the larger context of a system. Topics include bus and processor design types (e.g. microprocessor, microcontroller, DSP), codecs, digital circuit power management, real time scheduling, and embedded operating systems. Lab work consists of projects on embedded hardware (e.g. PC-104+). Preq: ECE 2230 and ECE 3710, each with a C or better. Coreq: ECE 4681.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4681 - Embedded Computing Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ECE 4680. Coreq: ECE 4680.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4700 - Vehicle Electronics
3 Credits (3 Contact Hours)
Introduction to vehicle electronic systems and networks. Topics include a review of electronic systems in automotive and aerospace applications; vehicle components, sensors and actuators; communication busses; electric power generation and distribution in vehicle systems; vehicle diagnostics; reliability; and trends in vehicle system design. Preq: ECE 3200 with a C or better.

ECE 4710 - Electric Vehicles and Energy Storage
3 Credits (3 Contact Hours)
Introduction to hybrid electric propulsion systems and energy storage systems. Topics include a review of fundamentals of electric vehicles and hybrid electric vehicles architectures covering reasons for hybridization, energy analysis of architecture and components; overview of energy storage systems (batteries and supercapacitors); modeling of components; vehicle simulation; and supervisory control. Preq: ECE 3200 with a C or better.

ECE 4730 - Introduction to Parallel Systems
3 Credits (3 Contact Hours)
Introduces parallel computer architectures and their programming. Includes an introduction to MPI and OpenMP and a number of engineering problems, including numerical simulations. Introduces scalability analysis. Preq: ECE 3220 or ECE 3290, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE (CPSC) 4780 - General Purpose Computation on Graphical Processing Units
3 Credits (3 Contact Hours)
Instruction in the design and implementation of highly parallel, GPU-based solutions to computationally intensive problems from a variety of disciplines. The OpenCL language with inter-operable OpenGL components is used. Applications to models of physical systems are discussed in detail. May also be offered as CPSC 4780. Preq: CPSC 2120 or ECE 2230.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4910 - Undergraduate Honors Research
1-6 Credits (1-6 Contact Hours)
Individual research projects conducted under the direct supervision and guidance of a faculty member. May be repeated for a maximum of six credits.
ECE 4920 - Special Problems
1-3 Credits (1-3 Contact Hours)
Special assignment in electrical or computer engineering. Some typical assignments include computer programs, term papers, technical literature searches, hardware projects, and design project leadership. May be taken only once for credit. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4930 - Selected Topics
1-3 Credits (1-3 Contact Hours)
Classroom study of current and new technical developments in electrical and computer engineering. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Consent of instructor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ECE 4950 - Integrated System Design I
2 Credits (1 Contact Hours)
Considers engineering design of systems in a continuous process of project definition, planning, execution, and evaluation. This process includes consideration of both technical and non-technical factors in design. Strong emphasis is placed on the development of effective technical communications skills, particularly oral communications competency. Preq: Electrical Engineering major and ECE 3200 and ECE 3300 and ECE 3600 and ECE 3800, each with a C or better; or Computer Engineering major and ECE 3200 and ECE 3220 and ECE 3300 and ECE 3520 and ECE 3710, each with a C or better. Preq or concurrent enrollment: ECE 4090 with a C or better. Coreq: ECE 4951.

ECE 4951 - Integrated System Design I Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ECE 4950. Coreq: ECE 4950.

ECE 4960 - Integrated System Design II
2 Credits (6 Contact Hours)
Project-oriented course which brings together electrical and computer engineering students of dissimilar training in teams or project groups. Group assignments are designed to develop an appreciation for individual and creative thinking, as well as team effort. Preq: Electrical Engineering major and ECE 3210 and ECE 3710 and ECE 3810 and ECE 4090 and ECE 4950, each with a C or better; or Computer Engineering major and ECE 3270 and ECE 4090 and ECE 4950, each with a C or better.

ECE 4990 - Creative Inquiry in Electrical and Computer Engineering
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Includes Honors sections. Preq: Consent of faculty member/mentor.

Elementary Education

EDEL 3040 - Instructional Planning, Management, and Communications
3 Credits (3 Contact Hours)
Provides students with knowledge and techniques for short- and long-term planning of developmentally appropriate lessons. Students learn how to structure ADEPT lessons and activities to meet the needs of students; and learn techniques for time and behavior management, organization and effective communication with school audiences. Preq: EDF 3340 and admission to the professional level.

EDEL 3100 - Arts in the Elementary School
3 Credits (2 Contact Hours)
Introduces skills, theories and practices used to integrate visual arts, drama, music and dance in the elementary classroom. Emphasizes philosophies associated with art education, content information, curriculum for diverse learners, and use of tools, media, materials and techniques. Preq: Admission to Elementary Education, Special Education or Early Childhood Education majors. Coreq: EDEL 3101.

EDEL 3101 - Arts in the Elementary School Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany EDEL 3100. Coreq: EDEL 3100.

EDEL 3110 - Teaching Diverse Populations
Preservice teachers examine the role of teachers as they relate to culturally appropriate curricula, instruction, and evaluation. Preq: Admission to the professional level.

**EDEL 3210 - Physical Education Methods and Content for Classroom Teachers**
3 Credits (3 Contact Hours)
Provides education majors with a basic understanding of the methods and techniques utilized in teaching elementary physical education. Emphasizes acquiring a basic understanding of the movement education approach and the ability to teach integrated lessons utilizing this approach. Preq: Junior standing; and admission to the professional level; and EDF 3020 and EDF 3340. Preq or concurrent enrollment: EDEL 3100.

**EDEL 4010 - Elementary Field Experience**
3 Credits (1 Contact Hours)
Practical classroom experience prior to the student teaching semester for Elementary Education majors. For a twelve-week period, students spend two days per week in schools observing, tutoring individuals, conducting small group activities, and teaching the class. Students attend seminars on topics related to field experience. Preq: EDF 3340 and EDEL 3100 and EDEL 3210 and EDEL 4520, and admission to the professional level. Coreq: EDEL 4011.

**EDEL 4011 - Elementary Field Experience Laboratory**
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany EDEL 4010. Coreq: EDEL 4010.

**EDEL 4050 - Social Justice and 21st Century Learners**
3 Credits (3 Contact Hours)
This course uses a social justice framework to identify cases of inequity in classrooms and extend a critical eye towards the institutions and societal structures that perpetuate them. Students consider ways to become agents of change by working to remove obstacles to equity. Preq: Admission to the professional level. Coreq: EDLT 4620 and EDLT 4630 and EDLT 4670.

**EDEL 4510 - Elementary Methods in Science Teaching**
3 Credits (2 Contact Hours)
Development of process skills, technical skills, and attitudes needed to foster increased confidence and commitment to the teaching of elementary science, with emphasis on teaching strategies and techniques and their implications for what we know of how children learn science. Includes Honors sections. Preq: BIOL 1090 and PHSC 1170 and PHSC 1180; and admission to the professional level. Coreq: EDEL 4511.

**EDEL 4511 - Elementary Methods in Science Teaching Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany EDEL 4510. Coreq: EDEL 4510.

**EDEL 4520 - Elementary Methods in Mathematics Teaching**
3 Credits (2 Contact Hours)
Special emphasis is given to the development of understanding, skills, and attitudes in the elementary curriculum with focus on strategies, techniques, and materials for teaching elementary mathematics. Includes honors sections. Preq: MATH 1150 and MATH 1160 and MATH 2160 and MATH 3160; and admission to the professional level. Coreq: EDEL 4521 and EDLT 4620.

**EDEL 4521 - Elementary Methods in Mathematics Teaching Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany EDEL 4520. Coreq: 4520.

**EDEL 4580 - Health Education Methods and Content for the Classroom Teacher**
3 Credits (3 Contact Hours)
Study of the content, methodology, and resource materials necessary for teaching comprehensive health education in public schools. Emphasizes the National Health Education Standards and the health behaviors of youth that are allied with the Coordinated School Health Program. Preq: Minimum grade-point average of 2.0.

**EDEL 4820 - Capstone Seminar in Elementary Teaching**
3 Credits (2 Contact Hours)
Students strengthen connections between theory and pedagogy; analyze and solve contemporary problems in elementary education; and reflect upon their personal growth as educators within a social justice framework. Preq: EDEL 3100 and EDEL 3210 and EDEL 4010 and EDEL 4510 and EDEL 4520 and EDEL 4870 and EDEL 4880 and EDLT 4610; and admission to the professional level. Coreq: EDEL 4821 and EDEL 4830.

**EDEL 4821 - Capstone Seminar in Elementary Teaching Laboratory**
EDEL 4830 - Directed Teaching in the Elementary School
9 Credits (27 Contact Hours)
Supervised observation and teaching experience in cooperation with selected elementary schools. Restricted to seniors or graduates who have completed prerequisite courses. Preq: EDEL 3100 and EDEL 3210 and EDEL 4010 and EDEL 4510 and EDEL 4520 and EDEL 4870 and EDEL 4880 and EDLT 4610; and admission to the professional level; and consent of area committee chair. Coreq: EDEL 4820.

EDEL 4870 - Elementary Methods in Social Studies Teaching
3 Credits (2 Contact Hours)
Introduction to methods, materials, and techniques needed to teach social studies in the elementary schools. Preq: GEOG 1030; and HIST 1010 or HIST 1020; and admission to the professional level. Coreq: EDEL 4871.

EDEL 4871 - Elementary Methods in Social Studies Teaching Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany EDEL 4870. Coreq: EDEL 4870.

EDEL 4880 - Elementary Methods in Language Arts Teaching
3 Credits (2 Contact Hours)
Introduction for pre-service teachers to the skills of the language arts other than reading and the methods, materials, and techniques needed to teach these skills to students in the elementary school. Preq: ENGL 1030 or ENGL 3850; and admission to the professional level. Coreq: EDEL 4881.

EDEL 4881 - Elementary Methods in Language Arts Teaching Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany EDEL 4880. Coreq: EDEL 4880.

Engineering

ENGR 1000 - Major Discovery Seminar
1 Credits (1 Contact Hours)
Introduction to the engineering majors offered by Clemson University. Also includes information about the engineering profession, best student practices and potential career paths. Invited presenters and faculty provide lectures and demonstrations. To be taken Pass/No Pass only.

ENGR 1020 - Engineering Disciplines and Skills
2 Credits (1 Contact Hours)
Provides solid foundation of skills to solve engineering problems. Students demonstrate problem solving techniques with spreadsheets, dimensions and units; use modeling techniques and interpret validity of experimental results. Students design projects on multi-discipline teams. Introduces professional and societal issues appropriate to engineering. Various forms of technical communication are emphasized. Includes Honors sections. Preq: MATH 1050 with a C or better; or preq or concurrent enrollment in MATH 1040 or MATH 1060 with a C or better; or a score of 65 or better on the Clemson Mathematics Placement Test (CMPT). Coreq: ENGR 1021.

ENGR 1021 - Engineering Disciplines and Skills Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ENGR 1020. Coreq: ENGR 1020.

ENGR 1050 - Engineering Discipline and Skills I
1 Credits (1 Contact Hours)
Provides solid foundation of skills to solve engineering problems. Students demonstrate problem solving techniques with spreadsheets, dimensions and units. Introduces professional and societal issues appropriate to engineering. Includes Honors sections. Preq: MATH 1050 with a C or better; or preq or concurrent enrollment in MATH 1040 or MATH 1060 with a C or better; or a score of 65 or better on the Clemson Mathematics Placement Test (CMPT). Coreq: ENGR 1021.

ENGR 1060 - Engineering Discipline and Skills II
1 Credits (1 Contact Hours)
Continuation of topics introduced in ENGR 1050. Students demonstrate problem solving techniques using spreadsheet and modeling techniques, and by interpreting validity of experimental results. Students complete projects on multi-discipline teams. Various forms of technical communication are emphasized. Includes Honors sections. Preq: ENGR 1050 with a C or better.
ENGR 1070 - Programming and Problem Solving I
1 Credits (1 Contact Hours)
Students formulate and solve engineering problems using MATLAB: estimate answers for comparison to computed solutions; read, interpret and write programs, instructions and output (both written and graphical); and debug. Includes Honors sections. Preq: ENGR 1020 with a C or better; or preq or concurrent enrollment in ENGR 1060 with a C or better.

ENGR 1080 - Programming and Problem Solving II
1 Credits (1 Contact Hours)
Continuation of topics introduced in ENGR 1070. Students formulate and solve engineering problems using MATLAB; read, interpret and write programs; utilize trendlines; iterate/loops; evaluate and compose conditional statements; and debug. Includes Honors sections. Preq: ENGR 1070 with a C or better; and one of ENGR 1020 or ENGR 1060 with a C or better.

ENGR 1090 - Programming and Problem Solving Applications
1 Credits (1 Contact Hours)
Students formulate and solve engineering problems on multi-discipline teams using MATLAB. Various forms of technical communication are emphasized. Includes Honors sections. Preq or concurrent enrollment: ENGR 1080 with a C or better.

ENGR 1150 - Engineering Design and Modeling
3 Credits (2 Contact Hours)
Introduction to engineering graphics and machine design. Students use hand sketching and CAD tools to visualize, communicate, rapid prototype, and analyze engineering problems. SOLIDWORKS software is used. Credit toward a degree will be given for only one of ENGR 1150, 1160, 2080, 2090 and 2100. Coreq: ENGR 1151.

ENGR 1151 - Engineering Design and Modeling Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ENGR 1150. Coreq: ENGR 1150.

ENGR 1160 - Engineering Graphics and Computer-Aided Design
3 Credits (2 Contact Hours)
Students use 2-D and 3-D drawings to visualize and analyze engineering problems. 2-D applications include site plans, contour maps, watershed, floodplains, road design, and architectural drawings. 3-D applications include models, orthographic views, and rapid prototype. Credit toward a degree will be given for only one of ENGR 1150, 1160, 2080, 2090 and 2100. Coreq: ENGR 1161.

ENGR 1161 - Engineering Graphics and Computer-Aided Design Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ENGR 1160. Coreq: ENGR 1160.

ENGR 1300 - Engineering Fundamentals
2 Credits (1 Contact Hours)
Students formulate and solve engineering problems using advanced spreadsheet applications, dimensional analysis, graphical representation of various physical phenomena, mathematical models and statistics. Various forms of technical communication are emphasized. Credit toward a degree will be given for only one of ENGR 1300 or 1410. Preq: ENGR 1060. Preq or concurrent enrollment: MATH 1060 or MATH 1070. Coreq: ENGR 1301.

ENGR 1301 - Engineering Fundamentals Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ENGR 1300. Coreq: ENGR 1300.

ENGR 1410 - Programming and Problem Solving
3 Credits (2 Contact Hours)
Students formulate and solve engineering problems using MATLAB; estimate answers for comparison to computed solutions; read, interpret and write programs, instructions and output; iterate, evaluate conditional statements; and debug. Various forms of technical communication are emphasized. Credit toward a degree will be given for only one of ENGR 1300 or ENGR 1410. Includes Honors sections. Preq: ENGR 1020 with a C or better; or preq or concurrent enrollment: ENGR 1060 with a C or better. Coreq: ENGR 1411.

ENGR 1411 - Programming and Problem Solving Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ENGR 1410. Coreq: ENGR 1410.

ENGR 1490 - Introduction to Engineering
2 Credits (2 Contact Hours)
Introduction to the engineering profession and engineering disciplines, highlighting the industries based in South Carolina, for the purpose
of assisting students in their selection of an engineering major. Professional, ethical and societal issues appropriate to engineering are introduced. Various forms of technical communication are emphasized.

**ENGR 1510 - Engineering Skills**
2 Credits (1 Contact Hours)
Provides students a solid foundation of skills for solving engineering problems. Students demonstrate problem solving techniques with dimensions and units, use modeling techniques, and interpret a variety of experimental results. Students also design projects on multi-discipline teams. Coreq: ENGR 1511.

**ENGR 1511 - Engineering Skills Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ENGR 1510. Coreq: ENGR 1510.

**ENGR 1520 - Engineering Computer Skills**
2 Credits (1 Contact Hours)
Continuation of ENGR 1510. Students demonstrate problem solving techniques using modeling and by interpreting validity of experimental results using computer software Microsoft Excel and MATLAB. Course focuses on algorithms; estimation of answers; and reading, interpreting and writing instructions in both Excel and MATLAB; and provides introduction to matrices. Preq: ENGR 1510 with a C or better. Coreq: ENGR 1521.

**ENGR 1521 - Engineering Computer Skills Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ENGR 1520. Coreq: ENGR 1520.

**ENGR 1530 - Engineering Foundation Skills**
4 Credits (3 Contact Hours)
Students gain a solid foundation of skills to solve engineering problems. Students demonstrate problem solving techniques with dimensions and units using modeling, interpreting experimental results, using Microsoft Excel and MATLAB. This course focuses on algorithms; estimation of answers; and reading, interpreting and writing instructions in both Excel and MATLAB; and provides an introduction to matrices. Coreq: ENGR 1531.

**ENGR 1531 - Engineering Foundation Skills Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ENGR 1530. Coreq: ENGR 1530.

**ENGR 1640 - Engineering MATLAB Programming**
3 Credits (2 Contact Hours)
Continuation of topics introduced in ENGR 1520 or 1530. Students formulate and solve engineering problems using MATLAB. Coverage includes conditional statements, iteration, and recursion using looping structures. Students formulate and solve engineering problems on multi-discipline teams using MATLAB. Various forms of technical communication are emphasized. Preq: ENGR 1520 or ENGR 1530 with a C or better. Coreq: ENGR 1641.

**ENGR 1641 - Engineering MATLAB Programming Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ENGR 1640. Coreq: ENGR 1640.

**ENGR 1900 - Special Projects in Engineering I**
1-3 Credits (1-3 Contact Hours)
Individual or group projects in engineering. Projects may be interdisciplinary in nature and may involve analysis, design, and/or implementation. Instruction in use of necessary tools and test equipment is included when appropriate. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Consent of instructor.

**ENGR 2080 - Engineering Graphics and Machine Design**
2 Credits (1 Contact Hours)
Introduction to engineering graphics and machine design. Sketching and CAD tools are used to visualize, communicate, rapid prototype and analyze engineering problems. Credit toward a degree will be given only for ENGR 1150, 1160, 2080, 2090, or 2100. Includes Honors sections. Preq or concurrent enrollment for Honors students: ENGR 1410 and MATH 1080. Coreq: ENGR 2081.

**ENGR 2081 - Engineering Graphics and Machine Design Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ENGR 2080. Coreq: ENGR 2080.

**ENGR 2090 - Introduction to Engineering/Computer Graphics**
2 Credits (1 Contact Hours)
Introduction to engineering graphics principles. Sketching and CAD tools are used to visualize, communicate, and perform graphical analysis of engineering problems. Credit toward a degree will be given for only one of ENGR 1150, 1160, 2080, 2090, or 2100. Coreq: ENGR 2091.

ENGR 2091 - Introduction to Engineering/Computer Graphics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENGR 2090. Coreq: ENGR 2090.

ENGR 2100 - Computer-Aided Design and Engineering Applications
2 Credits (1 Contact Hours)
Introduction to graphics applications for engineering and related professions. 2-D and 3-D drawings are used to visualize, communicate, rapid prototype and analyze engineering problems. Engineering applications include site plans, contour plots, grading, and architectural, transportation and hydrology drawings. Credit toward a degree will be given for only one of ENGR 2080, 2090, or 2100. Includes honors sections. Coreq: ENGR 2101.

ENGR 2101 - Computer-Aided Design and Engineering Applications Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany ENGR 2100. Coreq: ENGR 2100.

ENGR 2200 - Evaluating Innovations: Fixtures, Fads and Flops
3 Credits (3 Contact Hours)
Introduces foundational theories used to critically analyze the success of consumer products and other technological innovations. Case studies are utilized to exhibit the interactions between innovation and society. Critical thinking skills are emphasized.

ENGR 2210 - Technology, Culture and Design
3 Credits (3 Contact Hours)
Survey of designed objects from early mankind to the present, with an emphasis on the materials and technological advances that ushered in each era and the impact that those technologies and designs had on society. Includes readings and discussion of the value and meaning of technology and designed objects.

ENGR 2900 - Special Projects in Engineering II
1-3 Credits (1-3 Contact Hours)
Individual or group projects in engineering. Projects may be interdisciplinary in nature and may involve analysis, design, and/or implementation. Instruction in use of necessary tools and test equipment is included when appropriate. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Sophomore standing and consent of instructor.

ENGR 3900 - Special Projects in Engineering III
1-3 Credits (1-3 Contact Hours)
Individual or group projects in engineering. Projects may be interdisciplinary in nature and may involve analysis, design, and/or implementation. Instruction in use of necessary tools and test equipment is included when appropriate. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Junior standing and consent of instructor.

ENGR 4900 - Special Projects in Engineering IV
1-3 Credits (1-3 Contact Hours)
Individual or group projects in engineering. Projects may be interdisciplinary in nature and may involve analysis, design, and/or implementation. Instruction in use of necessary tools and test equipment is included when appropriate. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Senior standing and consent of instructor.

Engineering Mechanics

EM 2020 - Engineering Mechanics: Dynamics
3 Credits (3 Contact Hours)
Continuation of CE 2010. Principal topics are kinematics and kinetics of particles and rigid bodies of finite size. Techniques of vector mathematics are employed. Includes Honors sections. Preq: CE 2010 and MATH 2060.

English

ENGL 1010 - Composition I
ENGL 1020 - Composition II  
3 Credits (3 Contact Hours)  
Continued emphasis on correct and effective expression; training in the organization and writing of the research report. Preq: ENGL 1010.

ENGL 1030 - Composition and Rhetoric  
3 Credits (3 Contact Hours)  
Training in composing correct and effective expository and argumentative essays, including writing documented essays. Students who have received credit for ENGL 1020 will not be allowed to enroll in or receive credit for ENGL 1030. Includes Honors sections. Coreq: ENGL 1031.

ENGL 1031 - Accelerated Composition Laboratory  
0 Credits (1 Contact Hours)  
Non-credit laboratory to accompany ENGL 1030. Coreq: ENGL 1030.

ENGL 1110 - English as a Second Language  
3 Credits (3 Contact Hours)  
Special course for students learning English as a second language. Intensive study and drill in American English pronunciation and listening comprehension. Required of all foreign students who do not make a satisfactory grade on screening examination in oral English. To be taken Pass/No Pass only. Carries no credit for graduation. Coreq: ENGL 1111.

ENGL 1111 - English as a Second Language Laboratory  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany ENGL 1110. Coreq: ENGL 1110.

ENGL 2020 - The Major Forms of Literature  
3 Credits (3 Contact Hours)  
Study of the basic structures and elements of fiction, poetry, and drama, including literary and critical theory, with readings in American, British, and world literature. Proficiency in composition must be demonstrated. Includes Honors sections. Preq: ENGL 1030.

ENGL 2120 - World Literature  
3 Credits (3 Contact Hours)  
Introduction to selected works from the Americas Africa, Asia, Europe, and the Middle East from ancient to modern eras, with emphasis on major authors. Includes Honors sections. Preq: ENGL 1030.

ENGL 2130 - British Literature  
3 Credits (3 Contact Hours)  
Introduction to selected authors and major periods of the British literary tradition, from the Middle Ages to World War II, with attention to poetry, fiction, and drama. Includes Honors sections. Preq: ENGL 1030.

ENGL 2140 - American Literature  
3 Credits (3 Contact Hours)  
Introduction to selected authors and major periods of the American literary tradition from 1620 to 1945. Includes Honors sections. Preq: ENGL 1030.

ENGL 2150 - Literature in 20th- and 21st-Century Contexts  
3 Credits (3 Contact Hours)  
Introduction to major contemporary cultural movements via selected authors in 20th- and 21st-century literature, primarily American and British, with attention to poetry, fiction, and drama since World War II. Includes Honors sections. Preq: ENGL 1030.

ENGL 2310 - Introduction to Journalism  
3 Credits (3 Contact Hours)  
Instruction and practice in writing for mass media; editorial responsibilities. Preq: ENGL 1030.

ENGL 3000 - Professional Development  
2 Credits (2 Contact Hours)  
Orientation to the English major as a discipline and as a preparation for a range of careers. Introduction to and assistance with the compilation of the digital portfolio as a place to collect, synthesize and reflect on learning.

ENGL (GW) 3010 - Great Books of the Western World
Introduces Great Works minor. Includes readings about the Great Books concept, as well as various great books from the humanities, arts and natural and social sciences. Includes Honors sections. May also be offered as GW 3010. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3040 - Business Writing**
3 Credits (3 Contact Hours)
Introduction to audience, context, purpose, and writing strategies for texts common in professional business settings: memoranda, letters, reports, and proposals. Includes individual and team projects. Preq: Junior standing.

**ENGL 3100 - Critical Writing About Literature**
3 Credits (3 Contact Hours)
Terms and techniques for literary analysis, including close reading, vocabulary for analysis, research and writing skills, casebook study of critical approaches. Discussion of poetry and genres preferred. Preq or concurrent enrollment: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150

**ENGL 3120 - Advanced Composition**
3 Credits (3 Contact Hours)
Workshop in practical writing focusing on principles and style. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3140 - Technical Writing**
3 Credits (3 Contact Hours)
Intensive, project-based application of principles of audience, context, purpose, and writing strategies of technical writing: proposals, reports, communication deliverables. Individual and team projects. Includes Honors sections. Preq: Junior standing.

**ENGL 3150 - Scientific Writing and Communication**
3 Credits (3 Contact Hours)
Study and practice of rhetorical conventions in professional scientific communication through the analysis and writing of major genres. Focuses on principles, strategies, and styles of scientific argumentation and audience adaptation in written, oral, and visual media. Intended for students majoring in the sciences. Preq: ENGL 1030; and BIOL 1030 or BIOL 1100; and Junior standing.

**ENGL 3320 - Visual Communication**
3 Credits (3 Contact Hours)
Hands-on survey of visual communication theories and practices used by technical communicators in business and industry environments. Class meets regularly in computer classrooms. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3330 - Writing for the News Media**
3 Credits (3 Contact Hours)
Practical experience in gathering and writing news and feature copy for the media, preparing for an array of writing styles as demanded by the broad spectrum of print and media outlets. Examination of the modern media specialist, laws governing the profession, and journalistic ethics. Preq: ENGL 2310.

**ENGL 3370 - Creative Inquiry: English**
1-3 Credits (1-3 Contact Hours)
Students pursue scholarly activities individually or in teams under the direction of a faculty member. Creative Inquiry projects may be interdisciplinary. Arrangements with faculty must be established prior to registration. May be repeated for a maximum of nine credits. Preq: Consent of instructor.

**ENGL 3450 - The Structure of Fiction**
3 Credits (3 Contact Hours)
Introduction to the creative writing and critical study of prose fiction.

**ENGL 3460 - The Structure of Poetry**
3 Credits (3 Contact Hours)
Introduction to the creative writing and critical study of poetry.

**ENGL (THEA) 3470 - The Structure of Drama**
3 Credits (3 Contact Hours)
Introduction to the creative writing and critical study of drama. May also be offered as THEA 3470.

**ENGL 3480 - The Structure of the Screenplay**
3 Credits (3 Contact Hours)
Introduction to the creative writing and critical study of the screenplay. Screenplays vary from semester to semester. May be repeated once for credit with consent of instructor.

**ENGL 3490 - Technology and the Popular Imagination**
3 Credits (3 Contact Hours)
Examines relationship between technology and fiction and creative nonfictional texts, including print, film, and electronic media. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3500 - Mythology**
3 Credits (3 Contact Hours)
Study of the great myths of the world emphasizing their applications to literature. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3530 - American Literatures of Race, Ethnicity and Migration**
3 Credits (3 Contact Hours)
Examination of U.S. American literary texts that respond to the histories and competing theories of race, ethnicity, migration, empire or diaspora. May include attention to Native American, African American, Latina/o, Chicana/o, Asian American, Jewish American, and Arab American literature. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3540 - Literature of the Middle East and North Africa**
3 Credits (3 Contact Hours)
A study of literary texts of the Middle East and North Africa, with emphasis on literature originally published in languages such as Arabic, Persian, Turkish or Hebrew. Attention may be given to translation, diaspora and migration within or from the region. Conducted in English. No knowledge of foreign languages is required. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3550 - Global Studies in Popular Culture**
3 Credits (3 Contact Hours)
Examination of the nature, functions, history, and effect of global culture upon societies throughout our digitally connected world of various media, such as best sellers, popular magazines, television, movies, Internet, gaming platforms, and emerging electronic genres. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3560 - Science Fiction**
3 Credits (3 Contact Hours)
Readings in science fiction from the 17th century to the present, with special emphasis on writers since Verne and Wells. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3570 - Film**
3 Credits (2 Contact Hours)
Examination of the film medium as an art form: its history, how films are made, why certain types of films (western, horror movies, etc.) have become popular, and how critical theories provide standards for judging film. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150. Coreq: ENGL 3571.

**ENGL 3571 - Film Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENGL 3570. Coreq: ENGL 3570.

**ENGL 3670 - Special Topics for Honors Students**
3 Credits (3 Contact Hours)
Varied topics of general interest in literature, language, rhetoric, or culture for all honors students. Specific topics announced each semester. May be repeated for a maximum of nine credits. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3800 - British and American Women Writers**
3 Credits (3 Contact Hours)
Poetry, drama, fiction, and prose by established and little-known women writers in Britain and America. Particular attention to works treating themes and issues concerning women's lives. Readings on such topics as women and work, education, religion, creativity. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3850 - Children's Literature**
3 Credits (3 Contact Hours)
Reading and analysis in a wide range of authors, illustrators, and genres appropriate for children from preschool through eighth grade,
classic as well as modern. Critical approaches include historical, thematic, and social. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3860 - Adolescent Literature**  
3 Credits (3 Contact Hours)  
Reading and analysis of literature written for readers age 12-18. Emphasis is on historical context, chief themes and motifs, and censorship issues, as well as connections with classic literature. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3960 - British Literature Survey I**  
3 Credits (3 Contact Hours)  
Examines key texts in British literature to 1789. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3970 - British Literature Survey II**  
3 Credits (3 Contact Hours)  
Examines key texts of British literature from 1789 to the present. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3980 - American Literature Survey I**  
3 Credits (3 Contact Hours)  
Examines key texts of American literature from beginnings of European settlement to the Civil War in historical context. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 3990 - American Literature Survey II**  
3 Credits (3 Contact Hours)  
Examines key texts of American literature from the Civil War to the present in historical context. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

**ENGL 4000 - The English Language**  
3 Credits (3 Contact Hours)  
Studies in English usage and historical development of the language. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4010 - Grammar Survey**  
3 Credits (3 Contact Hours)  
Survey of modern grammars with a focus on exploring the impact structural grammar has had on traditional grammar. Recommended for English teachers. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4030 - The Classics in Translation**  
3 Credits (3 Contact Hours)  
Examination of Homer's Iliad and Odyssey, Virgil's Aeneid, and Ovid's Metamorphoses. A few shorter works by other Greek and Roman writers may also be read. Preq: ENGL 3100.

**ENGL 4070 - The Medieval Period**  
3 Credits (3 Contact Hours)  
Selected works of Old and Middle English literature, exclusive of Chaucer. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4080 - Chaucer**  
3 Credits (3 Contact Hours)  
Selected readings in Middle English from The Canterbury Tales and other works by Chaucer. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4100 - Drama of English Renaissance**  
3 Credits (3 Contact Hours)  
Selected readings in non-Shakespearean dramatic literature of the 16th and 17th centuries. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
ENGL 4110 - Shakespeare
3 Credits (3 Contact Hours)
Study of selected tragedies, comedies, and history plays of Shakespeare. Required of all English majors. Preq or concurrent enrollment: ENGL 3100
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4140 - Milton
3 Credits (3 Contact Hours)
Development of Milton's art and thought from the minor poems and selected prose through Paradise Lost, Paradise Regained, and Samson Agonistes, set against the background of the late Renaissance. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4150 - The Restoration and Eighteenth Century
3 Credits (3 Contact Hours)
Readings in Dryden, Swift, Pope, and Dr. Johnson. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4160 - The Romantic Period
3 Credits (3 Contact Hours)
Readings from the poetry and critical prose of Blake, Wordsworth, Coleridge, Byron, Shelley, Keats, and other representative figures. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4170 - The Victorian Period
3 Credits (3 Contact Hours)
Reading from the poetry and nonfiction prose of selected Victorian authors, including works of Carlyle, Tennyson, Browning, Arnold, and other representative figures. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4180 - The English Novel
3 Credits (3 Contact Hours)
Study of the English novel from its 18th century beginnings through the Victorian Period. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4190 - Postcolonial and World Literatures
3 Credits (3 Contact Hours)
Selected readings in post-colonial literature and theory, focusing on issues of nationalism, migration, resistance, race, language, and master narratives. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4200 - American Literature to 1799
3 Credits (3 Contact Hours)
Focused study of authors, movements, themes, critical approaches, and genres in literature of colonial and early national America from early European explorations of the continent to 1799. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4210 - American Literature from 1800 to 1899
3 Credits (3 Contact Hours)
Focused study of authors, movements, themes, critical approaches, and genres in the poetry and prose of major American authors and literary movements from the nineteenth century. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4220 - Topics in Writing Poetry
3 Credits (3 Contact Hours)
Examines the craft, technique and/or formal choices of one or more contemporary poets. Emphasizes the practice of writing poetry. Preq: ENGL 3450 or ENGL 3460 or ENGL 3470 or ENGL 3480.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4230 - Topics in Writing Fiction**
3 Credits (3 Contact Hours)
Examines the craft, technique and stylistic choices of one or more contemporary fiction writers. Emphasizes the practice of writing fiction. Preq: ENGL 3450 or ENGL 3460 or ENGL 3470 or ENGL 3480.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4250 - The American Novel**
3 Credits (3 Contact Hours)
Survey of the most significant forms and themes of the American novel from its beginnings to 1900. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4260 - Southern Literature**
3 Credits (3 Contact Hours)
Intellectual and literary achievement of the South from 1607 to the present, with emphasis on the writers of the 19th century. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4280 - Contemporary Literature**
3 Credits (3 Contact Hours)
Focuses on American, British, and other fiction, poetry, and drama from Post-World War II to the present. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL (THEA) 4290 - Dramatic Literature I**
3 Credits (3 Contact Hours)
Selected reading in the dramatic literature from the classical era of Greece and Rome to the Renaissance. May also be offered as THEA 4290. Preq: ENGL 3100 or PA 1010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL (THEA) 4300 - Dramatic Literature II**
3 Credits (3 Contact Hours)
Principles and progress of drama from the Restoration to the present; analysis of representative plays; critical reports; discussion of trends in dramatic literature. May also be offered as THEA 4300. Preq: ENGL 3100 or PA 1010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4310 - Modern Poetry**
3 Credits (3 Contact Hours)
The modern tradition in English and American poetry from Yeats to the present; relevant critical essays. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4320 - Modern Fiction**
3 Credits (3 Contact Hours)
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4330 - The Anglo-Irish Literary Tradition**
3 Credits (3 Contact Hours)
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4340 - Environmental Literature**  
3 Credits (3 Contact Hours)  
Survey of literature that examines the relationship between human beings and the natural world, including analysis of environmental themes in myths and legends and in selected poetry and prose of 19th- and 20th-century England and America. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4350 - Literary Criticism**  
3 Credits (3 Contact Hours)  
Major critical approaches to literature. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL (WS) 4360 - Feminist Literary Criticism**  
3 Credits (3 Contact Hours)  
Introduces the germinal works of feminist literary theory and criticism. Outlines the development of modern literary criticism by studying feminist versions of the major critical methodologies. May also be offered as WS 4360. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4370 - Directed Studies**  
1-3 Credits (1-3 Contact Hours)  
Class and tutorial work for students with special interests or projects in American, British, or European literature outside the scope of existing courses. Applications must be approved during the registration period of the semester preceding the one in which directed studies will occur. May be repeated by arrangement with the department. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4380 - Departmental Honors Research**  
3 Credits (3 Contact Hours)  
Research for the preparation of an honors project. Preq: ENGL 3100.

**ENGL 4390 - Departmental Honors Project**  
3 Credits (3 Contact Hours)  
Preparation of an honors project. Preq: ENGL 3100.

**ENGL 4400 - Literary Theory**  
3 Credits (3 Contact Hours)  
Examination of how approaches such as Marxism, Psychoanalysis, Feminism, Deconstruction, New Historicism, Post-Colonialism, Cultural Studies, and Queer Theory answer the question, "What is literature?" Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4410 - Literary Editing**  
3 Credits (3 Contact Hours)  
Examination of how the theories and practices of editing construct texts, stressing the problems and objectives of editing and providing practical experience with literary editing. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4420 - Cultural Studies**  
3 Credits (3 Contact Hours)  
Investigation of the similarities and connections between a wide variety of cultural products, events, and practices - from fast food to opera to online shopping - using theories ranging from Marxism to hybridity. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4430 - Theories of World Literature**
3 Credits (3 Contact Hours)
Examination of the historical and contemporary theories of world literature, including theories of worldliness, planetarity, globalism, and late capitalism. These theories are used in pursuit of world literature on a worldwide and planetary scale. Preq: ENGL 3100.

ENGL 4440 - Renaissance Literature
3 Credits (3 Contact Hours)
Selected readings in non-Shakespearean British literature from 1500-1660. Includes drama, poetry, and prose. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4450 - Fiction Workshop
3 Credits (3 Contact Hours)
Workshop in the creative writing of prose fiction. May be repeated once for credit. Preq: ENGL 3450. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4460 - Poetry Workshop
3 Credits (3 Contact Hours)
Workshop in the creative writing of poetry. May be repeated once for credit. Preq: ENGL 3460. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL (THEA) 4470 - Playwriting Workshop
3 Credits (3 Contact Hours)
Workshop in the creative writing of plays. May be repeated once. Preq: ENGL 3470 or THEA 3470. May also be offered as THEA 4470. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4480 - Screenwriting Workshop
3 Credits (3 Contact Hours)
Workshop in the creative writing of screenplays. May be repeated once for credit. Preq: ENGL 3480. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4490 - Creative Non-Fiction
3 Credits (3 Contact Hours)
Advanced workshop in writing non-fiction prose for magazine and free-lance markets. Preq: ENGL 3450 or ENGL 3460. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4500 - Film Genres
3 Credits (2 Contact Hours)
Advanced study of films that have similar subjects, themes, and techniques, including such genres as the Western, horror, gangster, science fiction, musical, and/or screwball comedy. Also considers nontraditional genres, screen irony, genre theory, and historical evolution of genres. Topics vary. Preq: ENGL 3570. Coreq: ENGL 4501. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4501 - Film Genres Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENGL 4500. Coreq: ENGL 4500. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL (COMM) 4510 - Film Theory and Criticism
3 Credits (2 Contact Hours)
Advanced study into the theory of film/video making emphasizing understanding a variety of critical methods to approach a film. Examines the history of film theory and defines the many schools of film criticism, including realism, formalism, feminism, semiotics, Marxism, and expressionism. May also be offered as COMM 4510. Preq: ENGL 3570. Coreq: ENGL 4511. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL (COMM) 4511 - Film Theory and Criticism Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENGL 4510. May also be offered as COMM 4511. Coreq: ENGL 4510. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4520 - Great Directors**
3 Credits (2 Contact Hours)
Intensive study of one to three film directors emphasizing understanding the entire canon of each director. Students study similarities in techniques, shifts in thematic emphasis, and critical methodologies for approaching the works of each director. Topics vary. Preq: ENGL 3570. Coreq: ENGL 4521. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4521 - Great Directors Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENGL 4520. Coreq: ENGL 4520. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4530 - Sexuality and the Cinema**
3 Credits (2 Contact Hours)
Examination of male/female sexual roles and their evolution in American genre films, avant-garde cinema, and international films. Includes the study of movies in relation to cultural values and social stereotypes, introduction to feminist film theory, and consideration of film pornography. Preq: ENGL 3570. Coreq: ENGL 4531. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4531 - Sexuality and the Cinema Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENGL 4530. Coreq: ENGL 4530. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL (LANG) 4540 - Selected Topics in International Film**
3 Credits (2 Contact Hours)
Presents subtitled films of specific world cultures and basic film theory and discourse applicable to the selected areas. Taught in English. May be repeated for a maximum of six credits with consent of department chair. May also be offered as LANG 4540. Coreq: ENGL 4541.

**ENGL (LANG) 4541 - Selected Topics in International Film Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENGL 4540. May also be offered as LANG 4541. Coreq: ENGL 4540.

**ENGL 4550 - American Humor**
3 Credits (3 Contact Hours)
Native American humor of the 19th and 20th centuries. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL (HUM) 4560 - Literature and Arts of the Holocaust**
3 Credits (3 Contact Hours)
Addresses the Holocaust through literature, art, architecture, music, and film. Beginning with historical, political, and economic forces that contributed to the Holocaust, course then focuses on highly diverse creative responses to this event - responses that often reflect the difficulties and politics of these commemorative gestures. May also be offered as HUM 4560. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENGL 4570 - Global Hollywood**
3 Credits (2 Contact Hours)

**ENGL 4571 - Global Hollywood Laboratory**
ENGL 4570 - Adaptations of World Classics
3 Credits (2 Contact Hours)
Study of selected film and/or other media adaptations of classics in world literature, with attention to adaptation theory, language, form, history and culture. Topics vary. May also be offered as WCIN 4570. Preq: ENGL 3570. Coreq: ENGL 4581.

ENGL 4580 - Adaptations of World Classics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENGL 4570. May also be offered as WCIN 4571. Coreq: ENGL 4570.

ENGL 4581 - Adaptations of World Classics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENGL 4580. May also be offered as WCIN 4581. Coreq: ENGL 4580.

ENGL 4590 - Special Topics in Language, Criticism, Theory
3 Credits (3 Contact Hours)
Advanced studies in topics not central to other English courses, such as certain authors, works, genres, themes, or areas of knowledge and culture. Specific topics are announced when offered. May be repeated once for credit with department chair's consent. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4600 - Issues in Writing Technologies
3 Credits (3 Contact Hours)
Examination of writing technologies from different historical periods. Investigates how writing is understood, circulated, legislated, and protected in terms of its production technology. Preq: ENGL 3100; and ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4630 - Topics in Literature to 1699
3 Credits (3 Contact Hours)
Selected readings in literature from antiquity through the 17th century for focused study of authors, movements, themes, critical approaches, and genres. Topics vary and are constructed by individual faculty. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4640 - Topics in Literature from 1700 to 1899
3 Credits (3 Contact Hours)
Selected readings in 18th- and 19th-century literature for focused study of authors, movements, themes, critical approaches, and genres. Special topics vary and are constructed by individual faculty. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4650 - Topics in Literature from 1900
3 Credits (3 Contact Hours)
Selected readings in 20th- and 21st-century literature for focused study of authors, movements, themes, critical approaches, and genres. Topics vary and are constructed by individual faculty. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4750 - Writing for Electronic Media
3 Credits (3 Contact Hours)
Workshop in new forms of writing and hypertextual design for interactive electronic media, including social networks, online and video communities. May be repeated once for credit at the undergraduate level. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4760 - Filmmaking for Mobile Media
3 Credits (2 Contact Hours)
Students apply their knowledge of film theory and techniques through low-to-no-budget digital videos for dissemination on mobile media devices such as smartphones and tablet computers. Students will learn to operate low-budget video equipment and edit video on professional editing software in a hands-on workshop. May also be offered as WCIN 4760. Preq: DPA 3070 or ENGL 3570. Coreq: ENGL 4761.
ENGL 4761 - Filmmaking for Mobile Media Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENGL 4760. May also be offered as WCIN 4761. Coreq: ENGL 4760.

ENGL 4780 - Digital Literacy
3 Credits (3 Contact Hours)
Examines how technology has expanded ideas of literacies and texts. Includes reading, studying and analyzing print and digital texts to determine how digital techniques change patterns of reading and how readers make sense of electronic texts. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4820 - African American Literature to 1920
3 Credits (3 Contact Hours)
Critical examination of the development of the African American literary tradition from the Colonial Period to the Harlem Renaissance. Considers the historical and cultural contexts of a variety of texts, themes and theories. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4830 - African American Literature from 1920 to the Present
3 Credits (3 Contact Hours)
Critical examination of the development of the African American literary tradition from the Harlem Renaissance to the present. Considers historical and cultural contexts of a variety of texts, themes, theories and literary movements. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL (EDSC) 4850 - Composition and Language Studies for Teachers
3 Credits (3 Contact Hours)
Examines the principles and practices of composing and teaching composition. Includes a historical study of English language with attention to phonology, morphology, syntax, semantics, and practical aspects of language grammars. Serves as a practicum in composing and assessing processes, collaborative learning, writers purposes, audience expectations, and language conventions. May also be offered as EDSC 4850. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4870 - Topics in Book History
3 Credits (3 Contact Hours)
Examines the material and theoretical constructions of the book. Covers both historical and contemporary dimensions of dissemination, reception, artistry, and influence of books. Preq: ENGL 1030. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4880 - Genre and Activity Theory
3 Credits (3 Contact Hours)
Examination of the forms that texts take, of the print and digital media in which they are composed, and of the ways they circulate among experts, in the public, and around the world. Preq: Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4890 - Special Topics in Writing and Publication Studies
3 Credits (3 Contact Hours)
Selected readings from topics in writing and publication studies, emphasizing areas such as major theories, practices, research, and critical approaches. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4900 - Advanced Technical and Business Writing
3 Credits (3 Contact Hours)
Advanced work in writing proposals, manuals, reports and publishable articles. Client-based and collaborative writing. Preq: ENGL 3040 or ENGL 3140. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
ENGL (COMM) 4910 - Classical Rhetoric
3 Credits (3 Contact Hours)
Traces the development of rhetoric from Protagoras through Isocrates, Plato, Aristotle, Cicero and Quintillian and considers questions essential to understanding persuasive theory and practices. May also be offered as COMM 4910. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL (COMM) 4920 - Modern Rhetoric
3 Credits (3 Contact Hours)
Examines the "new rhetorics" of the 20th century, which are grounded in classical rhetoric but include findings from biology, psychology, linguistics and anthropology, among other disciplines. May also be offered as COMM 4920. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4940 - Writing About Science
3 Credits (3 Contact Hours)
Advanced work in scientific writing and editing for peer and lay audiences. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4950 - Technical Editing
3 Credits (3 Contact Hours)
Practical experience in editing and preparing technical manuscripts for publication. General introduction to the functions of the technical editor. Preq: ENGL 3140.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4960 - Senior Seminar
3 Credits (3 Contact Hours)
Capstone course requiring participation and a substantial essay, allowing graduating English majors the chance to work closely with faculty and other English majors on a special topic in the advanced study of literature, rhetoric, writing, and/or publication studies. Preq: ENGL 3100 and Senior standing in English.

ENGL 4980 - Writing Center Theory and Practice
3 Credits (3 Contact Hours)
Preparation for students to work in the Clemson University Writing Center. Required of all undergraduate Writing Fellows. Preq: Sophomore standing and consent of instructor. Coreq: ENGL 4981.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4981 - Writing Center Theory and Practice Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany ENGL 4980. Coreq: ENGL 4980.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENGL 4990 - Practicum in Writing
0-3 Credits (0-3 Contact Hours)
Students apply their knowledge of concepts and principles to a substantive project involving writing, editing and/or publication activities. Emphasis is on practical experience in print, digital and online forums for academic, private or public readership. To be taken Pass/No Pass only. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150; and Junior standing.

Entomology

ENT 2000 - Six-Legged Science
3 Credits (3 Contact Hours)
Introduction to insects, their various relationships with humans, other animals, and plants. The general nature of this course makes it beneficial to all students regardless of specialty. Not open to students who have received credit for ENT 3010 or equivalent.

ENT 2010 - Selected Topics
1 Credits (1 Contact Hours)
Discussion course covering topics dealing with insects and related arthropods. Subjects are chosen to reflect issues of current interest as well as those having significance in human history. May be repeated for a maximum of three credits.

ENT 3000 - Environmental Entomology
3 Credits (3 Contact Hours)
Exploration of diversity and roles of insects in natural and affected environments, impact of insects and pesticides on environmental quality, and discussion of environmental ethics in entomological science. Preq: BIOL 1030 or BIOL 1040.

ENT (BIOL) 3010 - Insect Biology and Diversity
4 Credits (3 Contact Hours)
Introduction to the study of insects, with emphasis on their structure, function, ecology, and behavior. Identification of commonly encountered species is highlighted. Relationships between insect and human populations are discussed. Control technologies are introduced, with emphasis on environmentally responsible tactics. Offered fall semester only. May also be offered as BIOL 3010. Coreq: ENT 3011.

ENT (BIOL) 3011 - Insect Biology and Diversity Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENT 3010. May also be offered as BIOL 3011. Coreq: ENT 3010.

ENT 3080 - Apiculture
3 Credits (2 Contact Hours)
Detailed study of the honey bee and its economic importance in pollination and honey production. Attention is given to bee behavior, colony management, equipment, honey-plant identification, and honey production and processing. Preq: BIOL 1040 and BIOL 1060 and consent of instructor. Coreq: ENT 3081.

ENT 3081 - Apiculture Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENT 3080. Coreq: ENT 3080.

ENT (BIOL) 4000 - Insect Morphology
4 Credits (3 Contact Hours)
Study of insect structure in relation to function and of the variation of form in insects. Includes Honors sections. May also be offered as BIOL 4000. Preq: ENT 3010. Coreq: ENT 4001.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENT (BIOL) 4001 - Insect Morphology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENT 4000. May also be offered as BIOL 4001. Coreq: ENT 4000.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENT 4040 - Urban Entomology
3 Credits (3 Contact Hours)
Study of pests common to the urban environment with emphasis on arthropod pest biology, pest importance, and management strategies. Students learn both theoretical and practical aspects of urban pest management. Includes Honors sections. Preq: BIOL 1030 and BIOL 1040; or BIOL 1100 and BIOL 1110; or ENT 3010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENT (PLPA) 4060 - Diseases and Insects of Turfgrasses
2 Credits (2 Contact Hours)
Host-parasite relationships, symptomatology, diagnosis, economics, and control of infectious diseases of turfgrasses and life histories, diagnosis, and control of important insect pests of turfgrasses. May also be offered as PLPA 4060. Preq: ENT 3010 and PLPA 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ENT 4070 - Applied Agricultural Entomology
3 Credits (2 Contact Hours)
Topics include recognition, biology, damage, and control of economically important insects and mites found on major Southeastern field, fruit, nut, and vegetable crops. Principles and practices of crop protection, including pesticide application, economic basis for decision making, and development of scouting programs are introduced. Preq: ENT 3010. Coreq: ENT 4071.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT 4071 - Applied Agricultural Entomology Laboratory**

0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENT 4070. Coreq: ENT 4070.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT (PLPA) 4080 - Diseases and Insects of Turfgrasses Laboratory**

1 Credits (3 Contact Hours)
Laboratory to complement PLPA 4060 or ENT 4060 to learn symptomatology, diagnosis, and control of infectious diseases of turfgrasses and diagnosis of damage caused by important insect pests of turfgrasses. May also be offered as PLPA 4080. Preq: PLPA 4060 or ENT 4060.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT 4090 - Urban Entomology Laboratory**

1 Credits (3 Contact Hours)
Identification of household and structural pests common to the urban environment. Students also gain hands-on experience in termite and general pest control. Includes Honors sections. Preq: BIOL 1030 and BIOL 1040; or BIOL 1100 and BIOL 1110; or ENT 3010. Preq or concurrent enrollment: ENT 4040.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT (BIOL) 4150 - Insect Taxonomy**

3 Credits (1 Contact Hours)
Identification of the principal families of the major orders of adult insects. Laboratory work consists of intensive practice of such identification. Lecture material deals with theoretical discussion of taxonomic features observed in the laboratory. May also be offered as BIOL 4150. Preq: BIOL 4000 or ENT 4000. Coreq: ENT 4151.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT (BIOL) 4151 - Insect Taxonomy Laboratory**

0 Credits (6 Contact Hours)
Non-credit laboratory to accompany ENT 4150. May also be offered as BIOL 4151. Coreq: ENT 4150.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT 4200 - Systematics and Biodiversity**

4 Credits (3 Contact Hours)
Introduces systematic biology and the methods by which biologists recognize species, reconstruct the history of life, and use phylogenetic trees to study ecological and evolutionary processes. Preq: BIOL 1100 and BIOL 1110. Coreq: ENT 4201.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT 4201 - Systematics and Biodiversity Laboratory**

0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENT 4200. Coreq: ENT 4200.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT (BIOL) 4360 - Insect Behavior**

3 Credits (2 Contact Hours)
Fundamentals of insect behavior in an evolutionary and ecological perspective. Laboratory emphasizes generation and testing of hypotheses and observation, description, and quantification of insect behavior. May also be offered as BIOL 4360. Preq: ENT 3010. Coreq: ENT 4361.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT (BIOL) 4361 - Insect Behavior Laboratory**

0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENT 4360. May also be offered as BIOL 4361. Coreq: ENT 4360.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT 4610 - Directed Research in Entomology**  
1-3 Credits (1-3 Contact Hours)  
Development of a senior thesis based on a research problem in a selected entomological area. Emphasis is on integrating the knowledge gained in the student's program with the results of the research project. May be repeated for a maximum of three credits. Preq: Senior standing and consent of instructor.

**ENT (BIOL, WFB) 4690 - Aquatic Insects**  
3 Credits (1 Contact Hours)  
Identification, life history, habitats, and interrelationships of aquatic insects; techniques of qualitative field collecting; important literature and research workers. Includes Honors sections. May also be offered as BIOL 4690 or WFB 4890. Preq: BIOL 1100 and BIOL 1110 and sophomore standing. Coreq: ENT 4691.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT (BIOL, WFB) 4691 - Aquatic Insects Laboratory**  
0 Credits (6 Contact Hours)  
Non-credit laboratory to accompany ENT 4690. May also be offered as BIOL 4691 or WFB 4691. Coreq: ENT 4690.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT 4900 - Practicum**  
1-4 Credits (1-4 Contact Hours)  
Supervised entomological learning opportunity providing highly individualized experiences to complement other programs and courses. Must be prearranged at least two months in advance. Students must file written reports midway during enrollment period and at its conclusion and must appear for oral evaluation at the end of the period. Preq: Junior standing and consent of instructor.

**ENT 4950 - Insect Biotechnology**  
3 Credits (3 Contact Hours)  
Considers many unique genetic features exhibited by insects and describes the applications of biotechnology to enhance useful products from insects and to affect the control of destructive insects.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENT (PES) 4960 - Selected Topics in Creative Inquiry**  
1-2 Credits (1-2 Contact Hours)  
Disciplinary and multidisciplinary projects with the goal of developing the student's ability to discover, analyze, evaluate, and present data. Students are required to document their activities in their ePortfolios. May be repeated for a maximum of six credits. Preq: Consent of instructor. May also be offered as PES 4960.

**ENT (PES) 4970 - Selected Topics in Creative Inquiry Laboratory**  
1-2 Credits (1-2 Contact Hours)  
Disciplinary and multidisciplinary research project with the goal of developing the student's ability to conduct research along with analysis, evaluation and presentation of results. Students are required to document their research activities in their ePortfolios. May be repeated for a maximum of six credits. Preq: Consent of instructor. May also be offered as PES 4970.

**ENT 4980 - Special Topics in Entomology**  
1-4 Credits (1-4 Contact Hours)  
Lecture and discussion coverage of selected topics in entomology, biodiversity and agricultural biology. May be repeated for a maximum of nine credits, but only if different topics are covered.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**Entrepreneurship**

**ENTR 1010 - Entrepreneurial Mindset**  
2 Credits (2 Contact Hours)  
Examines the key ingredients that drive success for entrepreneurs, and explores how entrepreneurs capitalize on new ideas and bring them
Students gain valuable insight into how entrepreneurs start companies, and probe the unique mindset that often accompanies a successful entrepreneur.

**ENTR 1020 - Entrepreneurial Marketing**  
3 Credits (3 Contact Hours)  
The critical topic of entrepreneurial sales and marketing is introduced. Entrepreneurs are notorious for generating and developing good ideas; however, too often they do so in a vacuum and ignore the critical issue known as a go-to-market strategy.

**ENTR 1030 - Social Entrepreneurship**  
3 Credits (3 Contact Hours)  
Capitalists are known for serving markets and extracting profits. Volunteers are known for working to solve social problems. Governments are charged with providing basic shared services to their citizens. This course explores how these well-intentioned, but often ill-fitting groups, create self-sustaining profitable businesses.

**ENTR 1040 - Technology Entrepreneurship**  
3 Credits (3 Contact Hours)  
Introduces the thought processes and entrepreneurial methods by which big problems in business, industry and society can be solved by new or improved technologies. Students study successful technology businesses and apply these skills through a team project.

**ENTR 1090 - Creative Inquiry in Entrepreneurship**  
1-3 Credits (1-3 Contact Hours)  
Students plan, develop, and execute a research project related to the field of entrepreneurship, and present their findings. The development of the project includes lectures about research design, conduct, and data analysis. May be repeated for a maximum of six credits.

**ENTR 2010 - Selected Topics in Entrepreneurship**  
3 Credits (3 Contact Hours)  
Examination of selected topics in entrepreneurship based on developments in the field and faculty interests. Emphasis is placed on the strategic formulation and application of topics to support entrepreneurial thinking. May be repeated for a maximum of six credits, but only if different topics are covered.

**ENTR 2020 - Internship in Entrepreneurship**  
1-3 Credits (1-3 Contact Hours)  
Faculty-supervised entrepreneurial internship to give students learning opportunities that support their classroom experiences. At least 150 hours of internship work are required for each credit hour received. Course enrollment and internship must occur in the same semester. To be taken Pass/No Pass only. May be repeated for a maximum of three credits. Preq: Minimum cumulative grade-point average of 2.0 and consent of instructor.

**Environmental and Natural Resources**

**ENR 1010 - Introduction to Environmental and Natural Resources I**  
1 Credits (1 Contact Hours)  
Informative overview of environmental and natural resources and their impact on society. Education and career opportunities are emphasized.

**ENR 1020 - Introduction to Environmental and Natural Resources II**  
1 Credits (1 Contact Hours)  
Survey of environmental and natural resource topics in the news and in primary literature. Emphasis is placed on learning to research and interpret scientific information. Aspects of technical writing and career development are also explored.

**ENR 3020 - Natural Resources Measurements**  
3 Credits (2 Contact Hours)  
Introduction to measurements of natural resources including land, vegetation, animal habitat, water quality and quantity, climate, and recreation. Remote sensing techniques are also introduced. May not be taken for credit by Forest Resource Management majors. Preq or concurrent enrollment: STAT 2300. Coreq: ENR 3021.

**ENR 3021 - Natural Resources Measurements Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany ENR 3020. Coreq: ENR 3020.

**ENR 3120 - Environmental Risks and Society**
3 Credits (3 Contact Hours)
Examines the perception, analysis and management of natural and technological risks in modern society, such as how society responds to natural or human-caused disasters and global environmental challenges; and the roles of experts, the government and the general public. Case studies foster debate and critical analysis of controversial issues. Preq: Junior standing. Students must have completed the General Education mathematics requirement.

**ENR (BIOL) 4130 - Restoration Ecology**
3 Credits (3 Contact Hours)
Applies ecological principles to the restoration of disturbed terrestrial, wetland, and aquatic ecosystems. Includes the restoration of soils and waterways, of flora and fauna, and of natural ecological processes such as plant succession and nutrient cycling. May also be offered as BIOL 4130. Preq: BIOL 3130 or BIOL 4410 or WFB 3130.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENR (FOR) 4160 - Forest Policy and Administration**
3 Credits (3 Contact Hours)
Introduction to the development, principles, and legal provisions of forest policy in the United States and an examination of administrative and executive management in forestry. May also be offered as FOR 4160.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENR 4290 - Environmental Law and Policy**
3 Credits (3 Contact Hours)
Develops an understanding of the three branches of government that affect and dictate use and protection of natural resources. Attention is given to major federal environmental statutes. Includes examination of how policy is developed, implemented, and evaluated in the public and private sectors. Preq: Junior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENR (FOR) 4340 - Geographic Information Systems for Natural Resources**
3 Credits (2 Contact Hours)
Develops competence in geographic information systems (GIS) technology and its application to various spatial analysis problems in natural resources. Topics include data development and management, spatial analysis techniques, critical review of GIS applications, needs analysis and institutional context. GIS hardware and software, hands-on application. Credit may be received for only one of ENR 4340 or FOR 4340. May also be offered as FOR 4340. Coreq: ENR 4341.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENR (FOR) 4341 - Geographic Information Systems for Natural Resources Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ENR 4340. May also be offered as FOR 4341. Coreq: ENR 4340.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ENR 4500 - Conservation Issues**
3 Credits (3 Contact Hours)
Interactive study and discussion of issues related to the conservation of natural resources, emphasizing current issues in the conservation of biodiversity, identification of conflicting issues between consumptive and nonconsumptive resource management, and development of viable solutions for conservation of natural resources. Preq: BIOL 3130 or WFB 3130.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**Environmental Engineering and Science**

**EES 2010 - Environmental Engineering Fundamentals I**
3 Credits (3 Contact Hours)
Overview of topics and engineering application areas that comprise the environmental engineering profession. Significant emphasis is given to development of oral and written communication skills needed by the engineering professional and application of engineering fundamentals to environmental systems. Preq: CH 1010; and ENGR 1020 or ENGR 1060; and MATH 1080, each with a grade of C or better. Preq or concurrent enrollment: CHE 1300 or ENGR 1070 or ENGR 1410.

**EES 2020 - Environmental Engineering Fundamentals II**
4 Credits (3 Contact Hours)
Overview of fundamentals related to environmental engineering processes, including water treatment, wastewater treatment, solid and hazardous waste management, air pollution control, risk assessment, and pollutions prevention strategies. Laboratories cover measurement techniques and applications to process engineering. Preq: CH 1020; and EES 2010; and CHE 1300 or ENGR 1090 or ENGR 1410. Students must have a C or better in EES 2010 and ENGR 1090 or ENGR 1410 to meet the prerequisite requirement. Coreq: EES 2021.

EES 2021 - Environmental Engineering Fundamentals II Laboratory
0 Credits (3 Contact Hours)

EES 3000 - Honors Seminar: Introduction to Research in Environmental Engineering
1 Credits (1 Contact Hours)
Provides an introduction to environmental engineering research. Students attend seminars describing how a research program is developed, including the scientific method and hypothesis testing. Students are expected to write and revise a research proposal, which is reviewed by the faculty advisor. Preq: Consent of instructor and membership in Calhoun Honors College.

EES 3010 - Honors Research in Environmental Engineering I
3 Credits (9 Contact Hours)
In this portion of the undergraduate honors research program in environmental engineering, students begin their environmental engineering research project. Preq: EES 3000 and consent of instructor and membership in the Calhoun Honors College.

EES 3030 - Water Treatment Systems
2 Credits (2 Contact Hours)
Study of fundamental principles, rational design considerations, and operational procedures of the unit operations and processes employed in water treatment. Introduces the integration of unit operations and processes into water treatment systems. Preq: EES 2020 with a C or better. Coreq: EES 3040 and EES 3050.

EES 3040 - Wastewater Treatment Systems
2 Credits (2 Contact Hours)
Study of fundamental principles, rational design considerations, and operational procedures of the unit operations and processes employed in wastewater treatment. Both physicochemical and biological treatment techniques are discussed. Introduces the integration of unit operations and processes into wastewater treatment systems. Preq: EES 2020 with a C or better. Coreq: EES 3030 and EES 3050.

EES 3050 - Water and Wastewater Treatment Laboratory
1 Credits (3 Contact Hours)
Laboratory exercises to accompany EES 3030 and EES 3040 in selected water and wastewater treatment operations and processes. Emphasis is on understanding of fundamental principles and operational procedures, experimental design, data analysis, use of experimental data in engineering design applications, and writing of engineering reports. Preq: EES 2020 with a C or better. Coreq: EES 3030 and EES 3040.

EES 3100 - Introduction to Nuclear Engineering
3 Credits (3 Contact Hours)
Technological, industrial and medical applications of ionizing radiation and radioactive materials. Topics to be covered include basic nuclear physics, interactions of radiation with matter, radiation detection and measurement, fission reactors, and the nuclear fuel cycle.

EES 4000 - Honors Research in Environmental Engineering II
3 Credits (9 Contact Hours)
Continuation of EES 3010. Students continue research work on their honors environmental engineering project. Preq: EES 3010 and consent of instructor and membership in the Calhoun Honors College.

EES 4010 - Environmental Engineering
3 Credits (3 Contact Hours)
Introduction to the field of environmental engineering. Topics include environmental phenomena, impact of pollutants in the aquatic environment, solid-waste management, air pollution control, radiological health, and simple water and wastewater treatment systems. Preq: Junior standing in the College of Engineering, Computing and Applied Sciences. Preq or concurrent enrollment: CE 3410 or CHE 2300 or ME 3080; or GEOL 4820 and either GEOL 4150 or MATH 2060. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EES 4020 - Water and Waste Treatment Systems
3 Credits (3 Contact Hours)
Study of fundamental principles, rational design considerations, and operational procedures of the unit operations and processes employed in water and waste treatment. Both physicochemical and biological treatment techniques are discussed. Introduces the integration of unit
operations and processes into water and waste treatment systems. Preq: EES 2020 or EES 4010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EES 4090 - Introduction to Nuclear Engineering and Radiological Sciences
3 Credits (3 Contact Hours)
Technological, industrial and medical applications of ionizing radiation and radioactive materials. Topics to be covered include basic nuclear physics, interactions of radiation with matter, radiation detection and measurement, fission reactors, and the nuclear fuel cycle. Preq: MATH 2080 with a C or better.

EES 4100 - Environmental Radiation Protection I
3 Credits (3 Contact Hours)
Fundamental principles of radiological health and radiation safety. Topics include radiation fundamentals, basic concepts of environmental radiation protection, internal and external dosimetry, environmental dose calculations and radiation protection standards. Preq: PHYS 2210 with a grade of C or better.

EES 4110 - Ionizing Radiation Detection and Measurement
3 Credits (2 Contact Hours)
Laboratory exercises in ionizing radiation detection and measurements. Topics include nuclear electronics; counting statistics; radiation interactions; basic gas, scintillation, and semiconductor detectors; gamma-ray spectroscopy; health physics survey instrumentation; and thermoluminescent dosimetry. Preq: EES 4100. Coreq: EES 4111.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EES 4111 - Ionizing Radiation Detection and Measurement Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany EES 4110. Coreq: EES 4110.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EES 4120 - Nuclear Fuel Cycle and Radioactive Waste Management
3 Credits (3 Contact Hours)
Materials flow throughout the nuclear fuel cycle emphasizing safe handling of radioactive material; environmental aspects of fuel cycle activities; radioactive waste management; nuclear nonproliferation and safeguards; nuclear forensics. Preq: EES 4090.

EES 4140 - Radioecology
3 Credits (3 Contact Hours)
An introduction to the relationships between ionizing radiation or radioactive substances and the environment. Topics include sources of environmental radioactivity; transport processes and bioavailability; impacts of ionizing radiation on various subunits within the biosphere; and methods and techniques related to risk assessment and decision making. Preq: BIOL 1030 or BIOL 1110; and CH 1020 or CH 1060; and MATH 1060 or MATH 1070; and PHYS 2080 or PHYS 2210.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EES 4270 - Ecohydrology
3 Credits (3 Contact Hours)
Focuses on the understanding of the mechanisms that control the circulation of water among atmosphere, soil, and plants. The spatial and temporal linkages between soil moisture dynamics and climate, soil, and vegetation are explored. Plant strategies in water use and hydrologic controls of ecosystems are integral components of this course. May also be offered as BE 4270 or GEOL 4270. Preq: CE 3410 or CHE 2300 or ME 3080.

EES 4300 - Air Pollution Engineering
3 Credits (3 Contact Hours)
Introductory course in air pollution and its control. Topics include air pollutants and effects, sources, dispersion models, engineering controls, and air-quality legislation. Preq: EES 2020 or EES 4010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EES 4370 - Biodegradation and Bioremediation
3 Credits (3 Contact Hours)
Basic principles of biodegradation for major classes of organic and inorganic contaminants, including halogenated aliphatic and aromatic compounds, fuel hydrocarbons, pesticides and nitrated energetic compounds, metals, and radionuclides. The basic science of microbiology and chemistry, and how these are used to develop bioremediation strategies and technologies, are discussed. Preq: One of EES 2020 or EES 4010; and one of CH 2010 or CH 2230; and one of MICR 3050 or MICR 4130.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**EES 4500 - Professional Seminar**
1 Credits (1 Contact Hour)
Covers various topics related to skills and techniques for evaluating career opportunities, seeking and obtaining environmental engineering employment, career development, professional registration, professional ethics, and other factors necessary for achieving success in a professional career. Course enables students to make decisions that will help them succeed in their careers. Preq or concurrent enrollment: EES 3030 and EES 3040 and EES 3050 and EES 4300.

**EES (BE, FOR) 4510 - Newman Seminar and Lecture Series in Natural Resources Engineering**
1 Credits (2 Contact Hours)
Topics dealing with development and protection of land, air, water, and related resources are covered by seminar with instructor and invited lecturers. Current environmental and/or resource conservation issues are addressed. Includes Honors sections. May also be offered as BE 4510 or FOR 4510. Preq: Senior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**EES 4750 - Capstone Design Project**
3 Credits (1 Contact Hours)
Students apply creativity and their engineering knowledge to solve open-ended environmental engineering problems. Problems are formulated and solutions are evaluated by faculty and practicing engineers. Oral and written communication skills are developed through presentations, correspondence and project reports. Preq: CE 3410 and EES 3030 and EES 3040 and EES 3050 and EES 4300; and an engineering grade point average of 2.0 or better. Coreq: EES 4751.

**EES 4751 - Capstone Design Project Laboratory**
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany EES 4750 Coreq: EES 4750.

**EES 4800 - Environmental Risk Assessment**
3 Credits (3 Contact Hours)
Quantitative estimation of human health risk posed by the release of a contaminant to the environment. Topics include methods for analyzing emission rate, environmental transport, exposure, and health effects; methods of uncertainty analysis; and the role of risk assessment in environmental regulation and environmental decision making. Preq: EES 2020 or EES 4010; and MATH 2080 with a grade of C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**EES (BE) 4840 - Municipal Solid Waste Management**
3 Credits (3 Contact Hours)
Introduction to the problems, regulations, collection, handling, recycling, and disposal of municipal solid wastes in the urban and rural sectors. Emphasizes an integrated waste-management system with resource recovery, composting, incineration, landfill disposals, and their costs. May also be offered as BE 4840. Preq: EES 2020 or EES 4010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**EES 4850 - Hazardous Waste Management**
3 Credits (3 Contact Hours)
Introduction to the problems, regulations, treatment, and ultimate disposal of hazardous and toxic materials. Spill cleanup, groundwater transport, land disposal, incineration, and treatment technologies are discussed. Preq: EES 2020 or EES 4010; and CH 2010 or CH 2230.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**EES 4860 - Environmental Sustainability**
3 Credits (3 Contact Hours)
Topics include sustainable engineering and industrial ecology with emphasis on pollution prevention methods using source reduction, recycling assessments, treatment to reduce disposal, life-cycle assessment and design for the environment. Emphasizes case studies. Preq: Junior standing in College of Engineering, Computing and Applied Sciences.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**EES 4900 - Special Projects**
1-3 Credits (1-3 Contact Hours)
Studies or laboratory investigations on special topics in the environmental engineering and science field. Arranged on a project basis with a
maximum of individual student effort and a minimum of staff guidance. May be repeated for a maximum of three credits. Includes Honors sections. Preq: Consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**EES 4910 - Selected Topics in Environmental Engineering**
1-3 Credits (1-3 Contact Hours)
Study of the dynamic role of environmental engineering in maintaining environmental quality. A comprehensive study of any phase of environmental engineering. May be repeated for credit, but only if different topics are covered. Preq: Consent of department chair.

**EES 4950 - Honors Thesis in Environmental Engineering**
1 Credits (1 Contact Hours)
Continuation of EES 4000. Students complete their honors thesis in environmental engineering and give an oral presentation of the results. Preq: EES 4000 and consent of instructor and membership in the Calhoun Honors College.

**Environmental Science and Policy**

**ENSP 1250 - Sustainable Resource Use**
3 Credits (3 Contact Hours)
This course explores the challenges our society faces in making the transition to renewable resource use in a way that is truly sustainable environmentally, economically and socially. The conflicting demands of each system will be examined and used to critically examine possible solutions using a systems based approach. May also be offered as GEOL 1250.

**ENSP 2000 - Introduction to Environmental Science**
3 Credits (3 Contact Hours)
Basic principles of environmental science, including ecology, energy, resources, waste management; and air, water, and soil pollution. Consideration of issues, specific cases, investigative approaches, and remedial actions. Preq or concurrent enrollment: Any course that satisfies the Natural Science with a Lab General Education requirement. See the Undergraduate Announcements for current listing of courses.

**ENSP 2010 - Introduction to Environmental Science for Education Majors**
3 Credits (3 Contact Hours)
Introduction to basic principles of environmental science, including physical science of the environment, energy, resources, waste management, and air and water pollution. Emphasizes the practical applications to demonstrations and activities appropriate for the elementary school classroom. Credit toward a degree will be given for only one of ENSP 2000 and ENSP 2010. Preq: BIOL 1090 and PHSC 1170 and PHSC 1180. Preq or concurrent enrollment: MATH 3160.

**ENSP (PES) 3150 - Environment and Agriculture**
3 Credits (3 Contact Hours)
Survey of the interrelationships of the environment and current agriculture and agricultural practices to include both the environmental impacts of agriculture and the role of agriculture in conservation and improving the environment. Includes Honors sections. Preq: Sophomore standing and one of the following combinations: BIOL 1040 and BIOL 1060; or BIOL 1100 and BIOL 1110; or CH 1010 and CH 1020; or CH 1050 and CH 1060. May also be offered as PES 3150.

**ENSP 4000 - Studies in Environmental Science**
3 Credits (3 Contact Hours)
Study of historical perspectives, attitudes, and government policy within the framework of environmental case studies to illustrate the interaction between human and natural factors as they mutually affect the environment and man's ability to deal with that environment. Preq: AGRB 3570 or BE 2120 or CHE 2100 or EES 2010 or ENSP 2000 or WFB 4300.

**ENSP 4720 - Environmental Planning and Control**
2 Credits (2 Contact Hours)
Application of planning and control to effective environmental quality improvement. Considers water supply and treatment, wastewater treatment and disposal, solid waste disposal, air pollution abatement, and land use and zoning from the standpoint of control. Not intended for graduate students in engineering. Preq: Consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**Environmental Toxicology**
ETOX 4000 - Wildlife Toxicology
3 Credits (3 Contact Hours)
Assessment of impacts of toxic substances on reproduction, health, and well-being of wildlife species; acute and chronic effects of agricultural chemicals, pesticides, hazardous waste, industrial waste, and oil releases are discussed. Preq: [BCHM 3010 or BCHM 3050; or both CH 2230 and CH 2270] and [BIOL 1040 and BIOL 1060; or BIOL 1110] and WFB 3500.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ETOX 4210 - Chemical Sources and Fate in Environmental Systems
3 Credits (3 Contact Hours)
Discusses chemical cycles in the environment on global and microcosm scales. Examines the dependence of fate processes on physical and chemical properties and environmental conditions. Addresses breakdown, movement, and transport of selected toxicants to illustrate the mechanisms that govern chemical fate. Includes Honors sections. Preq: CH 2230 and CH 2270.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ETOX 4300 - Toxicology
3 Credits (3 Contact Hours)
Basic principles of toxicology, including quantitation of toxicity, toxicokinetics, biochemical action of poisons, and environmental toxicology, are studied. Acute and chronic effects of various classes of poisons (e.g., pesticides, drugs, metals, and industrial pollutants) are discussed in relation to typical routes of exposure and regulatory testing methods. Preq: CH 2230 and CH 2270; and one of BIOL 2110 or BCHM 3010 or BCHM 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ETOX 4370 - Ecotoxicology
3 Credits (3 Contact Hours)
Study of the effects of stressors on the ecosystem. Explores the integrative relationships that comprise the field of ecotoxicology in a hierarchical format that focuses on the various levels of ecological organization. Preq: ETOX 4300.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ETOX 4460 - Soil and Water Quality: Fundamentals
3 Credits (3 Contact Hours)
Studies those aspects of water quality that are influenced by soil systems. Many water quality concerns arise from land-applied chemicals, natural or manufactured. Basic soil and water chemistry principles including sorption, solution chemistry, and soil chemical transport are studied. Preq: CH 2240.

ETOX 4470 - Soil and Water Quality: Applications
3 Credits (3 Contact Hours)
Potential for water quality concerns arising from land application of natural or manufactured chemicals is varied. Case studies of potential water quality concerns related to fertilizers, pesticides, biosolids, manures, and other sources are presented. Practices that can improve water quality are also studied and evaluated. Preq: CH 2240.

ETOX (GEOL, PES) 4850 - Environmental Soil Chemistry
3 Credits (3 Contact Hours)
Study of soil chemical processes (sorption, desorption, ion exchange, precipitation, dissolution, and redox reactions) of nutrients and inorganic and organic contaminants in soils and organic matter. Chemical complex equilibria and adsorption phenomena at the solid (soil, sediment, and mineral) water interface are emphasized. Preq: CH 1020 or PES 2020. May also be offered as GEOL 4850 or PES 4850.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

Executive Leadership and Entrepreneurship

ELE 3010 - Entrepreneurial Foundations
3 Credits (3 Contact Hours)
Examination of foundational topics in entrepreneurship and their interconnections. Topics include creativity and idea generation, building effective founding teams, generating business models, achieving product-market fit, establishing legitimacy, and strategies for effective communication. Preq: MGT 2010.

ELE 3020 - Entrepreneurial Resource Acquisition
3 Credits (3 Contact Hours)
Introduction to core topics of entrepreneurial resource acquisition, including funding sources, timing considerations, and deal structures. The focal perspective is that of an entrepreneur looking to secure financing for a venture pursuit. Preq: Sophomore standing.

**ELE 3030 - Family Business**
3 Credits (3 Contact Hours)
In-depth examination of the unique aspects of a family business, including the lifecycles and development stages, distinctive advantages, unique challenges, and specific tensions that family firms face that non-family firms typically do not. Preq: Sophomore standing.

**ELE (MKT) 3140 - New Venture Creation I**
3 Credits (3 Contact Hours)
First in a two-part series that continues with MGT 3150 assessing entrepreneurial opportunities. Focuses on creativity, idea generation, market opportunity analysis, strategy, and methods of entry. Opportunity analysis may be developed into a full new venture plan in ELE 3150 or MGT 3150.

**ELE (MGT) 3150 - New Venture Creation**
3 Credits (3 Contact Hours)
Through the development of a business plan, the course focuses on creating an organization capable of effectively exploiting a viable opportunity. Topics include organization strategy and design, start-up capital, operations and sourcing issues, leadership, team building, and management of rapid growth.

**ELE (ECON) 3210 - Economics of Innovation**
3 Credits (3 Contact Hours)
Examines the nature of entrepreneurship and the contribution of innovation to economic growth. Investigates the organizational and institutional sources of innovation in different firms and different countries as well as the work of economic theorists concerning the role entrepreneurs play in bringing new products to market. May also be offered as ECON 3210. Preq: ECON 3060 or ECON 3140.

**ELE 3560 - Social Science of Entrepreneurship**
3 Credits (3 Contact Hours)
Examines those areas of the social sciences that have direct relevance for entrepreneurs. Topics include processes by which entrepreneurs are shaped by social institutions such as the family and community, public policy implications and influences on entrepreneurship, risk perception, decision making, motivation, leadership, and group dynamics. May also be offered as PSYC 3560 or SOC 3560. Preq: SOC 2010 or SOC 2020 or SOC 2350 or PSYC 2010 or POSC 1010 or POSC 1020 or POSC 1040.

**ELE 4000 - Technology Entrepreneurship**
3 Credits (3 Contact Hours)
Introduction to technology entrepreneurship emphasizing ideation, opportunity assessment, market and technology forecasting, intellectual property protection, financial modeling and business valuation, project management, and cross-functional team building. Preq: Junior standing in the College of Engineering, Computing and Applied Sciences. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**ELE 4010 - Venture Testing**
3 Credits (3 Contact Hours)
Students evaluate the feasibility of a chosen business concept in the marketplace, applying lean start-up and other key principles learned in ELE 3010 in practice. Students may choose to further develop, refine, and formalize these business concepts in ELE 4020. Preq: ELE 3010.

**ELE 4020 - Venture Creation**
3 Credits (3 Contact Hours)
Through the development of a business plan, the course focuses on creating an organization capable of effectively exploiting a viable opportunity. Topics include organization strategy and design, start-up capital, operations and sourcing issues, leadership, team building, and management of rapid growth. Preq: ELE 3010.

**ELE 4030 - Venture Growth**
3 Credits (3 Contact Hours)
Presentation and application of key aspects of managing, leading, and growing entrepreneurial ventures. Attention is given to the functional and relational interdependencies that entrepreneurial leaders must account for and manage in their organizations, which students experience directly through extensive use of a computer-based simulation. Preq: ELE 3010.

**ELE (AGM) 4190 - Agribusiness Innovation and Entrepreneurship**
3 Credits (3 Contact Hours)
Emphasis on assessing students' abilities as agribusiness entrepreneurs, evaluating the feasibility of a business idea, creating strategies for organizing and marketing the agricultural business, exploring pricing for products or services, developing capital needs and sound financial
statements, and researching, developing, and writing a comprehensive plan for the business. Preq: AGM 2190 or AGM 3190 or AAGRB 3020 or AGRB 3190 or MGT 2010. May also be offered as AGM 4190.

**ELE 4990 - Special Topics in Entrepreneurship**
3-6 Credits (3-6 Contact Hours)
Examination of selected topics in entrepreneurship based on developments in the field and faculty interests. Emphasis is on the application of topics to entrepreneurial thinking, behavior, and success. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Sophomore standing.

**Experimental Statistics**

**STAT 2220 - Statistics in Everyday Life**
3 Credits (3 Contact Hours)
Focuses on the role of statistics in a variety of areas including politics, medicine, environmental issues, advertising, and sports. Students explore common statistical misconceptions and develop an understanding of how principles of probability and statistics affect many aspects of everyday life. Not open to students who have received credit for MATH 3020 or STAT 3090. Includes Honors sections. Preq: Any MATH course or a score of 50 or higher on the Clemson Mathematics Placement Test.

**STAT 2300 - Statistical Methods I**
3 Credits (2 Contact Hours)
Basic concepts and methods of statistical inference; organization and presentation of data, elementary probability, measures of central tendency and variation, tests of significance, sampling, simple linear regression and correlation. Stresses the role of statistics in interpreting research and the general application of the methods. Statistical microcomputer software is used. Not open to students who have received credit for STAT 3090 or MATH 3020. Includes Honors sections. Preq: Any MATH course or STAT 2220 or a 65 or better on the Clemson Mathematics Placement Test. Coreq: STAT 2301.

**STAT 2301 - Statistical Methods I Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany STAT 2300. Coreq: STAT 2300.

**STAT 3090 - Introductory Business Statistics**
3 Credits (3 Contact Hours)
Introductory probability and statistics for business students, particularly those who will take MGT 3100. Topics include descriptive statistics, probability, expectations, binomial, normal, sampling distributions, one and two sample estimation and testing. Preq: MATH 1060 or MATH 1070 or MATH 2070 or MATH 2100.

**STAT 3300 - Statistical Methods II**
3 Credits (3 Contact Hours)
Principle topics include collecting and summarizing data, probability distributions, analysis of categorical data, introduction to multiple linear regression, experimental design, analysis of variance, and non-parametric methods. Statistical computer software is used. Not open to students who have received credit for MATH 4020. Preq: MATH 3020 with a C or better or STAT 2300 with a C or better.

**STAT 4020 - Introduction to Statistical Computing**
3 Credits (3 Contact Hours)
Introduction to statistical computing packages. Topics include data importation, basic descriptive statistic computation, basic graphic preparation, and statistical analysis methods and procedures. Preq: IE 3610 or MATH 3020 or MGT 3100 or STAT 2300. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**STAT 4110 - Statistical Methods for Process Development and Control**
3 Credits (3 Contact Hours)
Experimental design techniques for use in process development, application of screening experiments and response surface experiments, techniques for process control with implications for product quality control. Includes discussions of the use of statistical computer analyses and interpretations including computer-generated graphics. Preq: MATH 2060. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**STAT 4620 - Statistics Applied to Economics**
3 Credits (3 Contact Hours)
Continuation of EXST 3010 emphasizing statistical methods used in the collection, analysis, presentation, and interpretation of economic data. Special attention is given to time-series analysis, the construction of index numbers, and the designing of samples for surveys in the
Family and Community Studies

FCS 2010 - Introduction to Human Rights
3 Credits (3 Contact Hours)
Exploration of the philosophical origins of human rights, contemporary debates, key human rights documents, and mechanisms of human rights enforcement within the nation state and internationally.

Finance

FIN 2010 - Introduction to Personal Finance
1 Credit (1 Contact Hour)
Provides an introductory overview of personal finance with an emphasis on budgeting; consumer credit, including student loans, credit cards, and basic bank loans; personal bank services; and purchasing an automobile and property insurance.

FIN 3010 - Personal Finance
3 Credits (3 Contact Hours)
Analysis of the preparations of personal financial plans. Topics include savings and budgeting, personal taxes, housing and automobile decisions, loans, insurance needs, investments, and retirement needs. May not be counted toward a major or minor in Financial Management.

FIN 3040 - Risk and Insurance
3 Credits (3 Contact Hours)
Studies the nature of risk and the role of insurance in risk management from individual and business viewpoints. Topics include probability, theory of the firm under uncertainty, insurance carriers and contracts, underwriting, and regulation. Preq: FIN 3060 or FIN 3110.

FIN 3050 - Investment Analysis
3 Credits (3 Contact Hours)
Study of techniques useful in analyzing alternative investment opportunities with emphasis on corporate securities. Investment planning and portfolio management are considered. Preq: FIN 3060 or FIN 3110, each with a C or better.

FIN 3060 - Corporation Finance
3 Credits (3 Contact Hours)
Introduction to financial management of nonfinancial firms. Includes such topics as analysis of financial statements, financial forecasting, capital budgeting, working capital management, and long-term financing decisions. Credit may not be received for both FIN 3060 and FIN 3110. Preq: ACCT 2010; and one of the following courses: IE 3610 or MATH 3020 or PSYC 3090 or STAT 2300 or STAT 3090 or STAT 4110.

FIN 3070 - Principles of Real Estate
3 Credits (3 Contact Hours)
Acquaints students with the theories, practices, and principles that govern real estate markets. Major emphasis is on specifics of real estate brokerage, property rights, and ownership; making real estate investment decisions; and financing real estate investments. Preq: FIN 3060 or FIN 3110, each with a C or better.

FIN 3080 - Financial Institutions and Markets
3 Credits (3 Contact Hours)
Study of the various types of financial institutions and of topics critical to the financial institutions practitioner. Topics include financial regulations, financial security types and their yields, interest rate risk management, foreign currency risks management, and stock index futures. Preq: FIN 3060 or FIN 3110, each with a C or better.

FIN 3110 - Financial Management I
3 Credits (3 Contact Hours)
First in a two-course sequence to provide in-depth exposure to the theory and practice of corporate financial management and to demonstrate how financial management techniques are applied in decision making. Credit may not be received for both FIN 3060 and FIN 3110. Includes Honors sections. Preq: ACCT 2010 with a C or better; and one of the following: IE 3610 or MATH 3020 or PSYC 3090 or STAT 2300 or STAT 3090 or STAT 3300.
FIN 3120 - Financial Management II
3 Credits (3 Contact Hours)
Continuation of the two-course sequence that begins with FIN 3110. Includes Honors sections. Preq: FIN 3060 or FIN 3110, each with a C or better.

FIN 3980 - Creative Inquiry in Finance
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Consent of faculty member/mentor.

FIN 3990 - Finance Internship
1-3 Credits (1-3 Contact Hours)
Pre-planned, preapproved, faculty-supervised internships to give students on-the-job learning in support of classroom education. Internships must be no fewer than six full-time, consecutive weeks with the same internship provider. Restricted to students with a major or minor in Financial Management. To be taken Pass/No Pass only. Preq: Consent of instructor.

FIN 4010 - Corporate Financial Analysis
3 Credits (3 Contact Hours)
In this course, students explore the potential needs of financial statement end users (managers, investors, creditors) so different perspectives can be considered when decisions are made. Students also learn to interpret and convert raw numerical data into information about profitability and risk in order to assess the value of a firm. Preq: ACCT 3110 and FIN 3120, each with a C or better; and Financial Management major.

FIN 4020 - Corporate Valuation
3 Credits (3 Contact Hours)
Study of the decision process and analytical techniques used in evaluating corporate investment and financing decisions. Topics include capital budgeting, capital structure and bankruptcy, valuation, corporate governance, executive compensation, mergers and acquisitions, and restructuring. Includes Honors sections. Preq: FIN 3120 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FIN 4030 - Spreadsheet Applications in Finance
3 Credits (3 Contact Hours)
Using a combination of lectures and assignments emphasizing small-scale applications, this course focuses on the development of spreadsheet skills in corporate finance. Beginning with the theoretical base established in previous courses, students work through problems related to the time value of money, capital budgeting, and valuation using spreadsheet analysis. Credit toward a degree will be given for only one of FIN 4030 or 4040. Preq: FIN 3120 with a C or better; and CPSC 2200 or MGT 2180.

FIN 4040 - Financial Modeling
3 Credits (3 Contact Hours)
Helps students develop the practical skills that combine theory, business planning, and forecasting needed to make financial decisions. Emphasizes the use of spreadsheet software used to set up and solve these models. Topics include financial statement analysis, valuation, and cost of capital. Includes Honors sections. Credit toward a degree will be given for only one of FIN 4030 and 4040. Preq: FIN 3120 with a C or better; and either CPSC 2200 or MGT 2180; and consent of instructor.

FIN 4050 - Portfolio Management and Theory
3 Credits (3 Contact Hours)
Introduction to portfolio management. Includes the underlying theory, managing the equity and the fixed-income portfolios, portfolio evaluation, options-pricing theory, futures markets and instruments. Includes Honors sections. Preq: FIN 3050 with a C or better.

FIN 4060 - Analysis and Use of Derivatives
3 Credits (3 Contact Hours)
Consideration of the option pricing theory and strategy techniques most commonly used in the market for options. Also considers an overview of the futures markets. Special emphasis is given to interest-rate futures, stock-index futures, and foreign-exchange futures. Includes Honors sections. Preq: FIN 3050 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FIN 4080 - Management of Financial Institutions
3 Credits (3 Contact Hours)
Detailed study of the operational, marketing, and regulatory aspects of the management of depository financial institutions. Emphasizes decision making through the extensive use of cases. Preq: FIN 3080 with a C or better.

FIN 4090 - Professional Financial Planning
3 Credits (3 Contact Hours)
Concepts and practical implementation of professional financial planning focusing on essentials of budgeting and saving, risk management, tax planning, investment planning, and retirement and estate planning. Emphasizes integrating these elements into a comprehensive personal financial plan. Preq: ACCT 4040 and ACCT 4080 and FIN 3040 and FIN 4050.

FIN 4100 - Research in Finance
1-3 Credits (1-3 Contact Hours)
Directed research for students interested in careers in finance. Research topic is selected by student and approved by instructor. A formal research paper is required. Includes Honors sections. Preq: FIN 3060 or FIN 3120; and consent of instructor.

FIN 4110 - International Financial Management
3 Credits (3 Contact Hours)
Extension of the principles of finance to the international context. Focuses on implications of the existence of multiple currencies and the operations across borders of sovereign nation-states for the multinational corporation. Preq: FIN 3060 or 3120 with a C or better.

FIN 4150 - Real Estate Investment
3 Credits (3 Contact Hours)
Focuses on the structure and analysis of real estate investment emphasizing financial theory and analysis technique. Case study and project-oriented homework assignments facilitate the understanding of real estate investments. Preq: FIN 3070 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FIN 4160 - Real Estate Valuation
3 Credits (3 Contact Hours)
Advanced course in commercial real estate valuation. Topics include income capitalization, cash equivalency, highest and best use analysis, the cost approach, the direct sales comparison approach, and DCF analysis. Preq: FIN 3070 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FIN 4170 - Real Estate Finance
3 Credits (3 Contact Hours)
Advanced course applying financial analysis and theory to real estate. Emphasizes mortgage credit analysis and current financing techniques for residential and commercial properties. Topics include financial institutions, syndications, and construction financing. Preq: FIN 3070 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FIN 4680 - International Internship in Finance
3 Credits (3 Contact Hours)
Pre-planned, pre-approved internship completed in conjunction with a Clemson Study Abroad program. Internship must be no fewer than eight weeks and be a minimum of 30 hours per week. Preq: Financial Management major or minor; and consent of instructor.

FIN 4980 - Creative Inquiry in Finance
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Consent of faculty member/mentor.

FIN 4990 - Special Topics in Finance
3 Credits (3 Contact Hours)
In-depth examination of specialized topics in finance. Topics vary depending on developments in the profession and interests of faculty. May be repeated for a maximum of six credits if different topics are covered. Preq: FIN 3120 with a C or better.

Food Science

FDSC 1010 - Introduction to Food Science and Human Nutrition
1 Credits (1 Contact Hours)
Introductory course providing an overview of career opportunities in both food science and human nutrition disciplines. Provides an orientation to principles related to food and human nutrition.

**FDSC 1020 - Perspectives in Food and Nutrition Sciences**  
1 Credits (1 Contact Hours)  
Discussion course covering topics related to food science and human nutrition. Subjects include topics of current interest and involve familiarization with scientific literature in nutrition and food sciences. Preq: Food Science and Human Nutrition major or Food Science minor.

**FDSC 2010 - Introduction to Food**  
2 Credits (2 Contact Hours)  
Study of food and food products emphasizing nutrients, nutrient needs, and the relationship between nutrient intake and health. Also discusses food additives, nutritional awareness (including nutrition labeling), food protection, and the influence of processing on nutritional quality of food.

**FDSC 2140 - Food Resources and Society**  
3 Credits (3 Contact Hours)  
Introduces the basics of food science (food chemistry, food microbiology, and food processing principles) and relates how advances in food science have paralleled societal advances and created social controversy.

**FDSC 2150 - Culinary Fundamentals**  
2 Credits (1 Contact Hours)  
Emphasizes the safe handling of food utilizing recognized procedures in equipment safety and sanitation. Cooking methods are investigated, along with ingredient functionality and flavor development. Organizational skills utilized in a real-world environment assist students in preparing, presenting and evaluating their finished products. Preq: Food Science and Human Nutrition major. Coreq: FDSC 2151.

**FDSC 2151 - Culinary Fundamentals Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany FDSC 2150. Preq: Food Science and Human Nutrition major. Coreq: FDSC 2150.

**FDSC 2160 - Fundamentals of Baking Science**  
2 Credits (1 Contact Hours)  
Emphasizes the science of baking, ingredient functionality, formulas and Bakers Percentages, and various mixing methods used to produce an array of baked products. Organizational skills, utilized in a real world environment, assist students in preparing, presenting and evaluating their finished products. Preq: Food Science and Human Nutrition major. Coreq: FDSC 2161.

**FDSC 2161 - Fundamentals of Baking Science Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany FDSC 2160. Preq: Food Science and Human Nutrition major. Coreq: FDSC 2160.

**FDSC 2500 - Culinary Science Internship**  
0 Credits (0 Contact Hours)  
Students experience the science and art of food preparation, with the ultimate object of improving the ease of manufacture as well as the overall quality and nutrition of the food produced. Students are able to observe, interact, and practice principles of culinary sciences. To be taken Pass/No Pass only. Preq: FDSC 2150.

**FDSC 3010 - Food Regulation and Policy**  
3 Credits (3 Contact Hours)  
Introduction to the origin and practice of food laws and regulations in the United States and other countries. Regulatory agencies (FSIS, FDA, EPA, etc.) are covered, as well as globalization and the impact of the Food Safety Modernization Act (FSMA) on the import and export of food products.

**FDSC 3040 - Evaluation of Dairy Products**  
2 Credits (1 Contact Hours)  
Emphasizes sensory evaluation of dairy products. Discusses basic principles of organoleptic evaluation, fundamental rules for scoring and grading dairy products; evaluation of all classes of dairy products based on established grades and score cards. Preq: Food Science and Human Nutrition major or Food Science minor; and STAT 2300. Coreq: FDSC 3041.

**FDSC 3041 - Evaluation of Dairy Products Laboratory**  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany FDSC 3040. Coreq: FDSC 3040.
FDSC 3060 - Institutional Food Service Management
3 Credits (3 Contact Hours)
Principles of management of resources in institutional food service systems. Emphasizes financial management, menu planning, principles of quantity food production, and safety and sanitation. Preq: Food Science and Human Nutrition major.

FDSC 3070 - Restaurant Food Service Management
3 Credits (3 Contact Hours)
Essentials of successful operation of restaurants, including menu design and pricing, marketing, customer satisfaction, purchasing, kitchen operations, and employment relationships.

FDSC 3500 - Food Science Internship
0 Credits (0 Contact Hours)
Summer internship offered by the Food, Nutrition and Packaging Sciences Department and the Clemson Micro-Creamery and Food Manufacturing Industries. Students observe, interact, and practice principles of food science within the food industry. To be taken Pass/No Pass only. Preq: FDSC 2140.

FDSC 4010 - Food Chemistry I
3 Credits (3 Contact Hours)
Basic composition, structure, and properties of food and the chemistry of changes occurring during processing utilization. Includes Honors sections. Preq: BCHM 3050; and Food Science and Human Nutrition major or Food Science minor or Packaging Science major or minor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4020 - Food Chemistry II
3 Credits (3 Contact Hours)
Application of theory and procedures for quantitative and qualitative analysis of food ingredients and food products. Methods for protein, moisture, lipid, carbohydrate, ash, fiber, rancidity, color, and vitamin analyses and tests for functional properties of ingredients are examined. Includes Honors sections. Preq: FDSC 4010 and Food Science and Human Nutrition major or Food Science minor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4030 - Food Chemistry and Analysis
2 Credits (1 Contact Hours)
Principles of analytical procedures and techniques used to quantitatively and qualitatively determine chemical composition of foods, and elucidate the physio-chemical properties of food materials. Laboratories provide experience in critical thinking, performing food analysis, and analyzing data. Preq: FDSC 4010 and Food Science and Human Nutrition major or Food Science minor. Coreq: FDSC 4031. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4031 - Food Chemistry and Analysis Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FDSC 4030. Coreq: FDSC 4030. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4040 - Food Preservation and Processing
3 Credits (3 Contact Hours)
Principles of food preservation applied to canning, dehydration, freezing, fermentation, irradiation, packaging, additives and extrusion, and the importance of plant sanitation and water treatment. Preq: Food Science and Human Nutrition major or Food Science minor or Packaging Science major or minor; and FDSC 4010 and MICR 3050; and one of PHYS 1220 or PHYS 2000 or PHYS 2070. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4060 - Food Preservation and Processing Laboratory I
1 Credits (3 Contact Hours)
Laboratory exercises on preservation methods, equipment utilized, and processes followed in food manufacture. Preq or concurrent enrollment: FDSC 4040. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4070 - Quantity Food Production
2 Credits (1 Contact Hours)
Principles of the production of food in quantity for use in food service systems. Emphasizes functions of components of foods and of ingredients in food, and focuses on the quality of the final product, on safe production of food, and on proper use of equipment. Preq: Food Science and Human Nutrition major or Food Science minor, or Packaging Science major or minor. Coreq: FDSC 4071.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4071 - Quantity Food Production Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany FDSC 4070. Coreq: FDSC 4070.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4080 - Food Process Engineering
4 Credits (3 Contact Hours)
Study of basic engineering principles and their application in food processing operations. Emphasizes the relation between engineering principles and fundamentals of food processing. Preq: Food Science and Human Nutrition major or Food Science minor; and CH 1020 and FDSC 2140; and one of MATH 1020 or MATH 1060; and one of PHYS 1220 or PHYS 2000 or PHYS 2070. Coreq: FDSC 4081.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4081 - Food Process Engineering Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FDSC 4080. Coreq: FDSC 4080.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC (PKSC) 4090 - Total Quality Management for the Food and Packaging Industries
3 Credits (3 Contact Hours)
Introduction to the principles of modern quality management emphasizing quality standards and issues and the practices necessary for food processing and packaging companies to survive in a customer-driven marketplace. May also be offered as PKSC 4090. Preq: STAT 2300.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4100 - Food Product Development
4 Credits (3 Contact Hours)
A strategic and systems approach to integrated product development practices for developing new food products within a team setting. Focuses on the Stage-Gate process for moving from product idea to launch and application of sensory analysis techniques. Preq: Food Science and Human Nutrition major or Food Science minor; and Junior standing. Preq or concurrent enrollment: FDSC 4030. Coreq: FDSC 4101.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4101 - Food Product Development Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FDSC 4100. Coreq: FDSC 4100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4170 - Seminar
1 Credits (1 Contact Hours)
Literature research and oral presentation of a current food science topic. Preq: Food Science and Human Nutrition major.

FDSC 4180 - Seminar
1 Credits (1 Contact Hours)
Literature research and oral presentation of a current food science topic. Preq: Food Science major.

FDSC 4200 - Special Topics in Food Science
1-3 Credits (1-3 Contact Hours)
Special topics in food science not covered in other courses. May be repeated for a maximum of 12 credits, but only if different topics are covered. Includes Honors sections. Preq: Consent of instructor.

FDSC 4210 - Special Problems in Food Science
1-4 Credits (1-4 Contact Hours)
Independent research investigation in food science areas not conducted in other courses. May be repeated for a maximum of 12 credits. Includes Honors sections. Preq: Consent of instructor.

FDSC 4300 - Dairy Processing and Sanitation
3 Credits (2 Contact Hours)
Processing, manufacture and distribution of fluid, frozen, cultured and other dairy products. Emphasizes sanitation in a commercial food processing plant environment, chemical and microbiological aspects, processing procedures, equipment operation, ingredient applications, formulation and functional properties. Preq: CH 1020; and either both BIOL 1040 and BIOL 1060, or BIOL 1110. Coreq: FDSC 4301. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4301 - Dairy Processing and Sanitation Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FDSC 4300. Coreq: FDSC 4300. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FDSC 4500 - Creative Inquiry in Food Science
1-6 Credits (1-6 Contact Hours)
Individual or small team research experience in close collaboration with a faculty member. Expands undergraduate learning by application of the scientific method. Research is selected by the student with approval of faculty. May be repeated for a maximum of ten credits.

FDSC 4910 - Practicum
1-4 Credits (1-4 Contact Hours)
Supervised experiential opportunities in the food industry. May be repeated for a maximum of 12 credits. Preq: Food Science and Human Nutrition major and Junior standing and consent of department chair.

FDSC 4950 - Senior Honors Research in Food Science
3 Credits (1 Contact Hours)
With professor supervision, students select a well-defined research question, plan the experimental design, perform data collection and results analysis, and prepare a project summary. Preq: Membership in Calhoun Honors College. Coreq: FDSC 4951.

FDSC 4951 - Senior Honors Research in Food Science Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany FDSC 4950. Coreq: FDSC 4950.

FDSC 4960 - Senior Honors Research in Food Science
3 Credits (1 Contact Hours)
Continuation of FDSC 4950. Students complete an advanced, mentored, two-semester research project under a single research advisor, culminating in an advisor approved honors thesis, in-depth written report or portfolio of work. An oral project summary presentation is required. Preq: Membership in Calhoun Honors College. Coreq: FDSC 4961.

FDSC 4961 - Senior Honors Research in Food Science Laboratory
0 Credits (6 Contact Hours)

Forestry

FOR 1010 - Introduction to Forestry
1 Credits (1 Contact Hours)
Informative sketch of forestry, forests, and forestry tasks of the nation. Includes education and career opportunities for foresters.

FOR 2050 - Dendrology
2 Credits (1 Contact Hours)
Classification, nomenclature, and identification of the principal forest trees of the United States, their geographical distribution, ecological requirements, and economic importance. Includes field identification of native trees and commonly planted exotics of the Southeast. Preq: BIOL 1030 and BIOL 1050. Coreq: FOR 2051 and FOR 2210.

FOR 2051 - Dendrology Laboratory
FOR 2060 - Forestry Ecology
3 Credits (2 Contact Hours)
Study of the nature of forests and forest trees, how they grow, reproduce, and their relationships to the physical and biological environment. Offered spring semester only. Preq: BIOL 1030 and BIOL 1050; or FOR 2050; or PES 2020. Coreq: FOR 2061.

FOR 2061 - Forestry Ecology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 2060. Coreq: FOR 2060.

FOR 2210 - Forest Biology
3 Credits (3 Contact Hours)
Study of woody plant form and function, wood properties, general physiology and forest biomes of North America. Presented as a companion course to dendrology lab. Preq: BIOL 1030 and BIOL 1050. Coreq: FOR 2050.

FOR 2270 - Arboricultural Field Techniques
1 Credits (3 Contact Hours)
Skills and techniques required to safely climb trees for tree maintenance. Emphasizes safety, proper equipment, and basic tree maintenance treatments. To be taken Pass/No Pass only.

FOR 2510 - Forest Communities
2 Credits (6 Contact Hours)
Study of forest plant species and their successful status and habitat requirements with respect to landform, soil type, and other appropriate aspects of site classification. Preq: FOR 2050.

FOR 2520 - Forest Operations
1 Credit (3 Contact Hours)
Introduction and tour of forest operations activities throughout South Carolina. Includes timber harvesting, site preparation, and applied silvicultural processes. Preq: Junior standing.

FOR 2530 - Forest Mensuration
4 Credits (12 Contact Hours)
Introduction to measurements of land, individual trees, forest stands, forest products, and the application of mensurational techniques to the statistical and physical design of forest sampling methods, including measurement techniques of non-timber components of forest resources. Preq: FOR 2050.

FOR 2540 - Forest Products (Summer Camp)
1 Credit (3 Contact Hours)
Tour of the forest products industry of South Carolina emphasizing those products and processes of some distinction or special interest. Preq: FOR 2050.

FOR 3020 - Forest Biometrics
2 Credits (1 Contact Hour)
Application of statistical methods to forestry problems, including sampling theory and methods, growth measurements and prediction, and application of micro-computing to analysis of forestry data. Preq: FOR 2530. Preq or concurrent enrollment: STAT 2300. Coreq: FOR 3021.

FOR 3021 - Forest Biometrics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 3020. Coreq: FOR 3020.

FOR 3040 - Forest Resource Economics
3 Credits (3 Contact Hours)
Economic problems and principles involved in the utilization of forest resources and distribution of forest products. Includes analysis of integrated forest operations. Preq: AGRB 2570 or ECON 2000 or ECON 2110 or ECON 2120.

FOR 3080 - Remote Sensing in Forestry
2 Credits (1 Contact Hours)
Introduction to remote sensing, aerial photo interpretation, computer mapping, aerial photo timber estimating, and geographical information systems. Preq: FOR 2510 and FOR 2520 and FOR 2530 and FOR 2540. Coreq: FOR 3081.
FOR 3081 - Remote Sensing in Forestry Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 3080. Coreq: FOR 3080.

FOR 3140 - Harvesting and Forest Products
4 Credits (3 Contact Hours)
Harvesting of forest products, structure and properties of economically important timbers, and production and properties of primary forest products. Preq: FOR 2510 and FOR 2520 and FOR 2530 and FOR 2540. Coreq: FOR 3141.

FOR 3141 - Harvesting and Forest Products Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 3140. Coreq: FOR 3140.

FOR 3410 - Wood Procurement Practices in the Forest Industry
3 Credits (3 Contact Hours)
Study of wood raw material procurement practices currently employed by the forest products industry, including pulp, paper, and related areas. Preq: FOR 2510 and FOR 2520 and FOR 2530 and FOR 2540.

FOR 4060 - Forested Watershed Management
2 Credits (1 Contact Hours)
Lectures and discussions on measurements and processes affecting water quality and quantity within watersheds. Introduction to hydrologic principles, geomorphology, and water quality assessment. Discusses best management practices for silviculture and development of a watershed management plan. Coreq: FOR 4061.

FOR 4061 - Forested Watershed Management Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 4060. Coreq: FOR 4060.

FOR 4080 - Wood and Paper Products
3 Credits (3 Contact Hours)
Study of wood structures and identification; physical and mechanical properties of wood products; standard testing procedures; manufacture of lumber, plywood, oriented strand board; drying, preservation, grading, and use of wood products. Also discusses common grades of paper and paperboard; fiber sources; pulping and paper-making equipment and processes; chemical recovery process; and environmental issues. Preq: Junior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4100 - Harvesting Processes
4 Credits (3 Contact Hours)
Study of forest harvesting processes with detailed analysis of production, cost, environmental impacts, safety, transportation, and business considerations. Preq: Senior standing. Coreq: FOR 4101.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4101 - Harvesting Processes Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 4100. Coreq: FOR 4100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4130 - Integrated Forest Pest Management
4 Credits (3 Contact Hours)
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4131 - Integrated Forest Pest Management Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 4130. Coreq: FOR 4130.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
FOR 4150 - Forest Wildlife Management
3 Credits (2 Contact Hours)
Principles, practices, and problems of wildlife management emphasizing upland forest game species. Habitat manipulation through use of appropriate silvicultural practices in association with other techniques is evaluated. Preq: FOR 4650. Coreq: FOR 4151.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4151 - Forest Wildlife Management Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 4150. Coreq: FOR 4150.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR (ENR) 4160 - Forest Policy and Administration
3 Credits (3 Contact Hours)
Introduction to the development, principles, and legal provisions of forest policy in the United States and an examination of administrative and executive management in forestry. May also be offered as ENR 4160.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4170 - Forest Resource Management and Regulation
3 Credits (3 Contact Hours)
Fundamental principles and analytical techniques in planning, management, and optimization of forest operations. Preq: FOR 3020 and FOR 3080 and FOR 4180 and FOR 4650.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4180 - Forest Resource Valuation
3 Credits (3 Contact Hours)
Analysis of capital investment tools and their application to decision making among forestry investment alternatives; valuation of land, timber, and other resources associated with forestry, including the impact of inflation and taxes. Preq: FOR 3040.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4190 - Senior Problems
1-3 Credits (1-3 Contact Hours)
Problems chosen with faculty approval in selected areas of forestry. With department chair's approval, may be repeated once for credit. Preq: Senior standing.

FOR 4230 - Current Issues in Natural Resources
2 Credits (2 Contact Hours)
Lectures in various fields of forestry delivered by selected representatives from forest industries, consultants, agencies, associations, and other forestry operations. Will not be taught when enrollment is less than 15. To be taken Pass/No Pass only. Preq: Junior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4250 - Forest Resource Management Plans
2 Credits (1 Contact Hours)

FOR 4251 - Forest Resource Management Plans Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 4250. Coreq: FOR 4250.

FOR 4260 - Forest Resource Management Plans Seminar
1 Credits (1 Contact Hours)
In-depth exploration of topics and problems presented in FOR 4250. To earn honors credit, students must be enrolled in corequisite FOR 4250 and earn a B or better in both courses. Includes Honors sections. Preq: Senior standing and consent of instructor. Preq or concurrent enrollment: FOR 4250.

FOR (HORT) 4270 - Urban Tree Care
3 Credits (3 Contact Hours)
Principles, practices, and problems of protecting and maintaining trees in urban and recreational areas. Examines environmental and biological factors affecting trees in high-use areas, their management and cultural requirements, and the practices necessary for their protection and care as valuable assets in the landscape. May also be offered as HORT 4270. Preq: FOR 2050 or HORT 3030. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4310 - Recreation Resource Planning in Forest Management
2 Credits (1 Contact Hours)
Analysis of forest recreation as a component of multiple-use forest management; techniques of planning; physical and biological effects on forest environments; and forest site, user, and facility management. Coreq: FOR 4311. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4311 - Recreation Resource Planning in Forest Management Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 4310. Coreq: FOR 4310. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4330 - GPS Applications
3 Credits (2 Contact Hours)
Develops competence in global positioning system (GPS) technology, including theory, methods, and application to natural resources mapping. Topics include basic concepts of GPS; projection systems; types of data; mission planning; and data capture, correction, and export to geographical information systems (GIS). Preq: Senior standing. Coreq: FOR 4331. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4331 - GPS Applications Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 4330. Coreq: FOR 4330. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR (ENR) 4340 - Geographic Information Systems for Natural Resources
3 Credits (2 Contact Hours)
Develops competence in geographic information systems (GIS) technology and its application to various spatial analysis problems in natural resources. Topics include data development and management, spatial analysis techniques, critical review of GIS applications, needs analysis and institutional context. GIS hardware and software, hands-on application. Credit may be received for only one of ENR 4340 or FOR 4340. May also be offered as ENR 4340. Coreq: FOR 4341. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR (ENR) 4341 - Geographic Information Systems for Natural Resources Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 4340. May also be offered as ENR4341. Coreq: FOR 4340. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4410 - Properties of Wood Products
3 Credits (3 Contact Hours)
Basic properties of wood, including the hygroscopic, thermal, electrical, mechanical, and chemical properties; standard testing procedures for wood. Preq: Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4420 - Manufacture of Wood Products
3 Credits (3 Contact Hours)
Study of the manufacture of lumber, plywood, poles, piles; drying, preservation, grading, and uses of wood products. Considers the manufacture of particleboard, flakeboard, oriented-strand board, fiberboard, and paper products. Includes physical, mechanical, and chemical properties and their applications. Preq: Consent of instructor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
FOR 4440 - Forest Products Marketing and International Trade
3 Credits (3 Contact Hours)
Study of marketing and international trade practices currently employed by the forest products industry and the application of basic marketing principles and global trade concepts in the industry's current and future environment. Preq: FOR 4420.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4470 - Special Problems in Forest Products
1-3 Credits (1-3 Contact Hours)
Laboratory, library, or field study of problems in selected areas of forest products. Emphasizes the planning and execution of research and the reporting of results. Research must be conducted under the guidance of a Forest Products faculty member. May be repeated for a maximum of three credits, but only if different topics are covered. Preq: Senior standing and consent of instructor.

FOR (BE, EES) 4510 - Newman Seminar and Lecture Series in Natural Resources Engineering
1 Credits (2 Contact Hours)
Topics dealing with development and protection of land, air, water, and related resources are covered by seminar with instructor and invited lecturers. Current environmental and/or resource conservation issues are addressed. Includes Honors sections. May also be offered as BE 4510 or EES 4510. Preq: Senior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4610 - Silviculture Honors Seminar I
1 Credits (1 Contact Hours)
In-depth exploration of topics and problems presented in FOR 4650. To earn honors credit, students must be enrolled in FOR 4650 and earn a B or better in both courses. Preq: Junior standing and consent of instructor. Preq or concurrent enrollment: FOR 4650.

FOR 4630 - Silviculture Honors Seminar II
1 Credits (1 Contact Hours)
In-depth exploration of topics and problems presented in FOR 4650. To earn honors credit, students must be enrolled in FOR 4650 and earn a B or better in both courses. Preq: Junior standing and consent of instructor. Preq or concurrent enrollment: FOR 4650.

FOR 4650 - Silviculture
4 Credits (3 Contact Hours)
Discussion of the theory and practice of manipulating forests to meet the needs and values of landowners and society in accordance with biological, ecological, and economic principles. Preq: FOR 2060 and FOR 2510 and FOR 2520 and FOR 2530 and FOR 2540. Coreq: FOR 4651.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4651 - Silviculture Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FOR 4650. Coreq: FOR 4650.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FOR 4800 - Selected Topics in Urban Forestry
1-3 Credits (1-3 Contact Hours)
Study of selected and varied topics, problems, and issues in urban forestry and arboriculture through readings, class discussion, and individual and group projects. Preq: FOR 4270 or HORT 4270.

FOR 4930 - Selected Topics in Forest Resources
1-15 Credits (1-15 Contact Hours)
Specialized topics not covered in other courses that explore current areas of research and management in forest resources in a format of lecture, lab, or both. May be repeated for a maximum of 15 credits, but only if different topics are covered. Preq: Junior standing.

FOR 4980 - Senior Portfolio
1 Credits (1 Contact Hours)
Collection of Web-based materials representing the creative and scientific papers, presentations, and résumés written by students to satisfy curriculum requirements. Students are informed in FNR 1020 and regularly thereafter regarding the format and content of their portfolios. Preq or concurrent enrollment: FOR 4250.
Forestry and Natural Resources

FNR 1020 - Forestry and Natural Resources Freshman Portfolio
1 Credits (1 Contact Hours)
Informative sketch of forestry, wildlife biology, and natural resources; education and career opportunities for natural resource professionals. Students initiate their Web-based student portfolios, which showcase their skills and experiences (e.g., resumes, accomplishments, and work samples) during their undergraduate degree. To be taken Pass/No Pass only. Restricted to students enrolled in one of the following majors: Environmental and Natural Resources; or Forest Resource Management; or Wildlife and Fisheries Biology.

FNR 2040 - Soil Information Systems
4 Credits (3 Contact Hours)
Includes input, storage, analysis, and output of soil information through the use of global positioning systems, direct/remote sensing, geographic information systems, and web soil survey. Provides fundamental knowledge of the role of soils in forest and wildlife management. Preq: One of the following combinations: CH 1010 and CH1020; or CH 1050 and CH 1060. Coreq: FNR 2041.

FNR 2041 - Soil Information Systems Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FNR 2040. Coreq: FNR 2040.

FNR 4660 - Stream Ecology
3 Credits (2 Contact Hours)
Covers the ecology of flowing water systems. Topics include geomorphology, physical and chemical factors of streams, biology of stream-dwelling organisms, trophic relationships, competition, colonization, drift, community structure, disturbance, and human impacts. Preq: Junior standing. Coreq: FNR 4661.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FNR 4661 - Stream Ecology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FNR 4660. Coreq: FNR 4660.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

FNR 4700 - Creative Inquiry
1-3 Credits (1-3 Contact Hours)
Multi-semester commitment to participate in forestry and natural resources research with a group of peers, mentored by a faculty member or advanced graduate student. Students learn to collect, analyze, evaluate, and present information. May be repeated for a maximum of six credits. Preq: Consent of instructor.

FNR 4900 - Field Training in Natural Resources
3 Credits (9 Contact Hours)
Four to eight week internship in which students work in natural resources. Students have supervised management responsibility. Total of 135 hours required. Must be arranged at least two months in advance. Preq: Senior standing in one of the following majors: Environmental and Natural Resources; or Forestry; or Wildlife and Fisheries Biology.

FNR 4910 - Senior Honors Thesis I
3 Credits (3 Contact Hours)
Individual research for students in the Forestry and Natural Resources Honors Program. Focuses on developing a plan of research under the direction of a faculty advisory committee. Preq: Senior standing, membership in Calhoun Honors College, and consent of instructor.

FNR 4920 - Senior Honors Thesis II
3 Credits (3 Contact Hours)
Individual natural resources research for students in the Forestry and Natural Resources Honors Program. Focuses on data collection, analysis, report writing, and oral presentation. Preq: FNR 4910.

FNR 4990 - Natural Resources Seminar
1 Credits (1 Contact Hours)
Exploration of current literature and research in natural resources. Students participate in the analysis of research findings, utilizing skills acquired in their undergraduate programs. May be repeated for maximum of two credits.

French
FR 1010 - Elementary French
4 Credits (3 Contact Hours)
Multimedia course for beginners that combines video, audio, and print to teach the fundamentals of the French language and culture. Emphasizes communicative proficiency (listening comprehension, speaking, reading, and writing). Coreq: FR 1011.

FR 1011 - Elementary French Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany FR 1010. Coreq: FR 1010.

FR 1020 - Elementary French
4 Credits (3 Contact Hours)
Continuation of FR 1010; three hours a week of classroom instruction and one hour a week in the language laboratory. Preq: FR 1010 or a score of F1020 on the Modern Language Placement Test. Coreq: FR 1021.

FR 1021 - Elementary French Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany FR 1020. Coreq: FR 1020.

FR 1040 - Basic French
4 Credits (3 Contact Hours)
Intensive one-semester program combining FR 1010 and 1020 for students who have previously studied French. Includes fundamentals of grammar and vocabulary as a foundation for building written and oral proficiency. Coreq: FR 1041.

FR 1041 - Basic French Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany FR 1040. Coreq: FR 1040.

FR 1510 - French for Graduate Students
3 Credits (3 Contact Hours)
Intensive program only for graduate students preparing for the reading examination in French. A minimum grade of B on a final examination will satisfy graduate school modern language requirement.

FR 2010 - Intermediate French
3 Credits (3 Contact Hours)

FR 2011 - Intermediate French Laboratory
0 Credits (1 Contact Hours)

FR 2020 - Intermediate French
3 Credits (3 Contact Hours)

FR 2021 - Intermediate French Laboratory
0 Credits (1 Contact Hours)

FR 2970 - Creative Inquiry in French
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Arrangements with faculty members must be established prior to registration. Preq: Consent of faculty member.

FR 2990 - Foreign Language Drama Laboratory
1 Credits (3 Contact Hours)
Participation in foreign drama productions. No formal class meetings, but an average of three hours per week in a foreign language drama workshop for production. May be repeated for a maximum of three credits. Preq: Consent of instructor directing the play.
FR 3000 - Survey of French Literature
3 Credits (3 Contact Hours)
Study of selected masterpieces of French literature in their artistic, cultural, and historical context. May include theme and genre studies. Preq: FR 3050.

FR 3040 - French Short Story
3 Credits (3 Contact Hours)
Introduction to the study of French narrative literature and the elements of critical analysis through the examination of short stories spanning the medieval era to the present from both France and Francophone countries. Preq: FR 3050.

FR 3050 - Intermediate French Conversation and Composition I
3 Credits (3 Contact Hours)
Practice in the spoken language stressing vocabulary building, pronunciation, intonation, and comprehension. Requires written work to increase accuracy and assignments in the language laboratory. Preq: FR 2020 or a score of F3050 on the Modern Language Placement Test.

FR 3060 - Intensive Language and Culture in Belgium
3 Credits (3 Contact Hours)
Intensive one-semester course for students participating in the Clemson French Immersion program in Belgium. Includes the study of language and Belgian cultural heritage with an emphasis on integration into local student life, immersion in contemporary Belgian society, and participation in cultural traditions.

FR 3070 - French Civilization
3 Credits (3 Contact Hours)
Study of significant aspects of French culture from its origins to the present. Preq: FR 3050.

FR 3080 - French Linguistics I: Phonetics, Phonology, and Morphology
3 Credits (3 Contact Hours)
Study of the fundamental sound patterns, melodic structure, and work-formation processes of modern standard French. Preq: FR 3040 or FR 3050.

FR 3090 - French Linguistics II: Syntax and Semantics
3 Credits (3 Contact Hours)
Study of the fundamental structures of French syntax and semantics. Preq: FR 3040 or FR 3050.

FR 3100 – CLIP Summer Immersion Program
6 Credits (6 Contact Hours)
Conducted entirely in French for eight hours daily, this summer immersion program consists of activities that combine interrelating cultural topics with language skill practice. Frequent opportunities to converse with native speakers during meals and on excursions. Students receive six credits, three of which may be taken in lieu of FR 2020. Preq: FR 2010.

FR 3120 - Writing in French I
3 Credits (3 Contact Hours)
Study of the vocabulary, syntax, and stylistics in short compositions and creative papers in French, on both fiction and non-fiction topics. Preq: FR 2020.

FR 3160 - French for International Trade I
3 Credits (3 Contact Hours)
Spoken and written French common to the French-speaking world of business and industry, emphasizing business practices and writing and translating business letters and professional reports. Cross-cultural references provide opportunity for comparative and contrastive analyses of American and French cultural patterns in a business setting. Preq or concurrent enrollment: FR 2020 and FR 3050.

FR 3170 - Contemporary French Civilization
3 Credits (3 Contact Hours)
Study of significant aspects of France today; the country, its economy, government, and society. Taught in French. Preq: FR 3050.

FR 3180 - French for Health Professionals I
3 Credits (3 Contact Hours)
Medical concepts and terminology in French. This course is designed for students who plan to work in the health care professions. Preq: FR 3050.

FR 3200 - Studies in French Theatre
3 Credits (3 Contact Hours)
Explores a variety of genres (medieval farce, classical comedy and tragedy, romantic melodrama, and the Nouveau Théâtre) with emphasis on staging. Class materials consist of scripts, videotaped performances, and theoretical readings on issues pertaining to spectacle in social, political, and artistic terms. May be repeated for a maximum of six credits. Preq: FR 3050.

**FR 3570 - Selected Topics in the Culture of Paris**
3 Credits (3 Contact Hours)
On-site study of Paris and its relationship to France and Europe through readings, lectures, field trips, small student-group explorations, and reporting sessions. All activities are conducted in French. Preq: FR 2020.

**FR 3630 - French and Francophone Poetry**
3 Credits (3 Contact Hours)
Study of traditions and major works of French and/or Francophone poetry in their historical, cultural, and aesthetic contexts. Topics may include genres, periods, traditions (romanticism, symbolism, cubism, surrealism), or themes. Preq: FR 3050.

**FR 3830 - French-Language News**
1 Credits (1 Contact Hours)

**FR 3910 - Survey of French Literature (Honors)**
1 Credits (1 Contact Hours)
One-hour independent study to allow honors students to pursue supervised research on a topic relating to the literary, cultural, and artistic movement in France. Preq: Membership in Calhoun Honors College. Preq or concurrent enrollment: FR 3000.

**FR 3970 - Creative Inquiry in French**
1-4 Credits (1-4 Contact Hours)
Students focus on a special research area under the guidance of a faculty member. After acquiring the requisite background, students formulate hypotheses for a group project, develop a critical framework, and initiate research on a specific topic.

**FR 3980 - Directed Reading**
1-3 Credits (1-3 Contact Hours)
Directed study of selected topics in French literature, language, and culture. May be repeated for a maximum of six credits. Preq: Consent of department chair.

**FR 4000 - Modern French Literature**
3 Credits (3 Contact Hours)
Study of selected works of 20th-century French literature in their artistic, cultural, and historical context. Preq: FR 3050.

**FR 4090 - Writing in French II**
3 Credits (3 Contact Hours)
Intensive study of syntax and stylistics through composition and translations. Preq: Senior standing.

**FR 4100 - Francophone Literature**
3 Credits (3 Contact Hours)
Study of selected works of francophone literature emphasizing Africa and the Caribbean in their artistic, cultural, historical, and political contexts. Preq: FR 3050.

**FR 4110 - Advanced French Conversation and Composition**
3 Credits (3 Contact Hours)
Continuation of FR 3050 emphasizing greater fluency and sophistication in oral and written expression. Preq: FR 3050.

**FR 4120 - French and Francophone Cinema**
3 Credits (2 Contact Hours)
Examination of cinematic practice as a discourse and the role it plays in the representation of social relations, particularly race, ethnicity, class, power, sex, and gender in the French-speaking world. May include a study of major directors, genres, and movements. Taught in French. Films with English subtitles. Preq: FR 3050. Coreq: FR 4121.

**FR 4121 - French and Francophone Cinema Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany FR 4120. Coreq: FR 4120.
FR 4150 - Translation Seminar
3 Credits (3 Contact Hours)
Methods and theory of translation and a comparison of French and English structures. Practical exercises in translating from French to English and vice versa in a variety of texts. Preq: FR 3050.

FR 4160 - French for International Trade II
3 Credits (3 Contact Hours)
Study of language and cultural environment of the French-speaking markets of the world, including the linguistic and cultural idioms that support global marketing in general and the international marketing of textiles, agricultural products, and tourism in particular. Preq: FR 3160.

FR 4180 - French for Health Professionals II
3 Credits (3 Contact Hours)
Advanced study in medical concepts and terminology in French. This course is designed for students who plan to work in the health care professions. Case studies of health and health care in the Francophone world are also included. Preq: FR 3180.

FR 4200 - French Enlightenment, Revolution and Romanticism
3 Credits (3 Contact Hours)
Cultural and literary studies of the century and a half (1715-1851) in which France occupied the center stage of world history and its modern institutions came into being. Emphasizes the free intellectual inquiry championed by philosophers and the romantic melancholy in the aftermath of the Revolution. Preq: FR 3050.

FR 4380 - French Honors Research
3 Credits (3 Contact Hours)
Individual honors research conducted under the direction of Language Department faculty. May not be used to satisfy requirements for the major in Modern Languages, French or Language and International Trade or the minor in French. Preq: Junior standing and membership in Calhoun Honors College.

FR 4390 - French Honors Thesis
3 Credits (3 Contact Hours)
Individual honors research conducted and thesis completed under the direction of Language Department faculty member. May not be used to satisfy requirements for the major in Modern Languages-French or Language and International Trade or the minor in French. Preq: Junior standing and FR 4380 and membership in Calhoun Honors College.

FR 4750 - Advanced French Seminar
3 Credits (3 Contact Hours)
Concentrated research and discussion on an advanced topic in French literature, film, drama, music, or philosophy. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: FR 3040 or FR 3050 and Senior standing.

FR 4760 - Advanced Seminar on French Thought
3 Credits (3 Contact Hours)
Research and discussion of an advanced topic, text, or group of texts with a particular focus on French theory and philosophy but including works of French literature. Conducted in English. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Senior standing.

FR 4770 - Advanced Seminar on the French and Francophone Novel
3 Credits (3 Contact Hours)
Examination of the French novel and/or narrative prose focusing on a theme, genre, or period. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: FR 3040 or FR 3050 and Senior standing.

FR 4910 - Modern French Literature (Honors)
1 Credits (1 Contact Hours)
Independent study to allow honors students to pursue in depth an author, work, movement, or genre related to contemporary French culture, art, or literature. Preq or concurrent enrollment: FR 4000 and membership in Calhoun Honors College.

FR 4920 - The French Corporation (Honors)
1 Credits (1 Contact Hours)
Independent study to allow honors students to pursue an in-depth study of the organization, structure, functions, and economic role of a French business enterprise. Preq or concurrent enrollment: FR 4170 and membership in Calhoun Honors College.

FR 4970 - Creative Inquiry in French
1-4 Credits (1-4 Contact Hours)
Continuation of research initiated in FR 3970. Students complete their projects and disseminate their research results. Preq: FR 3970.

**FR 4980 - Independent Study**
1-3 Credits (1-3 Contact Hours)
Directed study of a selected topic in French literature, language, or culture. May be repeated for a maximum of six credits. Preq: Consent of department chair.

**FR 4990 - Selected Topics in French Literature**
3 Credits (3 Contact Hours)
Selected topics that have characterized French literature, language, and culture. May be repeated for a maximum of six credits. Preq: Consent of department chair.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

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**Genetics**

**GEN 1030 - Careers in Biochemistry and Genetics**
1 Credit (1 Contact Hour)
Introduction to biochemistry and genetics career paths, professional organizations, ethical issues, and requirements for advanced study. Also gives students training in design of a professional portfolio. Students may not receive credit for both BCHM 1030 and GEN 1030. Preq: Biochemistry or Genetics major.

**GEN 3000 - Fundamental Genetics**
3 Credits (3 Contact Hours)
Introductory course covering fundamental principles of genetics in prokaryotes and eukaryotes. Emphasizes Mendelian genetics, physical and chemical basis of heredity, and population genetics. Preq: BIOL 1030 or BIOL 1100.

**GEN 3020 - Molecular and General Genetics**
3 Credits (3 Contact Hours)
Rapidly-paced course covering Mendelian and molecular genetics, with introductory coverage of quantitative and population genetics. Emphasizes the molecular basis of heredity and gene expression in prokaryotes and eukaryotes and modern genetic technology. Includes Honors sections. Preq: BIOL 1100 with C or better.

**GEN (BCHM) 3040 - Molecular Biology Laboratory**
2 Credits (4 Contact Hours)
Introduces fundamental molecular biology laboratory techniques commonly used in biochemistry, genetics, and molecular biology research. Principles and applications of these techniques are also discussed. May also be offered as BCHM 3040. Preq: BIOL 1100. Preq or concurrent enrollment: BCHM 3010 or GEN 3020.

**GEN (BIOL) 4050 - Molecular Genetics of Eukaryotes**
3 Credits (3 Contact Hours)
Molecular genetic analyses of eukaryotes in relation to mutations and repair, complex phenotypes, biochemical pathways, short- and long-term regulation of gene expression, and evolution. May also be offered as BIOL 4050. Preq: BCHM 3010 or BCHM 3050; and GEN 3000 and GEN 3020.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEN 4100 - Population and Quantitative Genetics**
3 Credits (3 Contact Hours)
Classical and computational genetics topics, including Mendelian vs. non-Mendelian inheritance, genetic variation, evolutionary, conservation, coalescent theory, molecular evolution, quantitative trait locus, and association mapping in the framework of population and quantitative genetics. Includes Honors sections. Preq: STAT 2300 and GEN 3020, each with C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEN 4110 - Population and Quantitative Genetics Laboratory**
2 Credits (4 Contact Hours)
Crosses are performed using eukaryotic organisms with appropriate markers, and molecular markers are amplified, sequenced, and analyzed. Collected data are used to test hypotheses regarding possible modes of inheritance and for patterns of molecular evolution. Population and molecular evolutionary genetics concepts are also examined. Preq or concurrent enrollment: GEN 4100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEN 4200 - Molecular Genetics and Gene Regulation**
3 Credits (3 Contact Hours)
Molecular genetics, including replication, transcription and translation, gene expression, recombinant DNA technology, developmental, human, cancer, and behavioral genetics. Includes Honors sections. Preq: BCHM 3010 and GEN 3020, each with C or better.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEN 4210 - Molecular Genetics and Gene Regulation Laboratory**
2 Credits (4 Contact Hours)
Explores molecular genetics techniques (transformation, cloning, PCR, gel electrophoresis, Southern Blotting, reporter genes, gene mapping) using prokaryotic and eukaryotic organisms. Preq or concurrent enrollment: GEN 4200.

**GEN (BCHM) 4400 - Bioinformatics**
3 Credits (3 Contact Hours)
Theory and application of computational technology to analysis of the genome, transcriptome, and proteome. Includes Honors sections. May also be offered as BCHM 4400. Preq: BCHM 3010 or BCHM 3050 or GEN 3000 or GEN 3020, with C or better.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEN 4500 - Comparative Genetics**
3 Credits (3 Contact Hours)
Outlines the genome structure, function, and evolution based on available complete genome sequences. Topics include the evolution of multigene families, origin of eukaryotic organelles, molecular phylogeny, gene duplication, domain shuffling, transposition, and horizontal gene transfer. Includes Honors sections. Preq: GEN 4200 with a C or better.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEN 4700 - Human Genetics**
3 Credits (3 Contact Hours)
Basic principles of inheritance; population, molecular and biochemical genetics; cytogenetics; immunogenetics; complex traits; cancer genetics; treatment of genetic disorders; genetic screening and counseling; and the Human Genome Project. Preq: BCHM 3010 or BCHM 3050, with a C or better; and GEN 3000 or GEN 3020, with C or better.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEN 4900 - Selected Topics in Genetics**
1-4 Credits (1-4 Contact Hours)
Comprehensive study of selected topics not covered in other courses. May be repeated for a maximum of eight credits, but only if different topics are covered. Preq: Consent of instructor.

**GEN 4910 - Directed Research in Genetics**
1-8 Credits (3-24 Contact Hours)
Orientation in genetic research (i.e. experimental planning, execution, and reporting). May be repeated for a maximum of 20 credits. Includes Honors sections. Preq: Consent of instructor.

**GEN 4920 - Honors Thesis in Genetics**
1 Credits (1 Contact Hours)
Students complete a senior thesis and oral presentation detailing their honors research in genetics. To be taken Pass/No Pass only. Preq or concurrent enrollment: Students are expected to have completed or be concurrently enrolled in their second semester of an Honors section of GEN 4910 for a minimum of four credits when registering for this course.

**GEN 4930 - Senior Seminar**
2 Credits (2 Contact Hours)
Analysis and discussion of papers from the primary literature in the life sciences particularly in genetics. Students find pertinent articles in the primary literature and present and analyze the selected reading. Includes Honors sections. Preq: BCHM 3010 and GEN 3020, each with a C or better; and one of the following with a C or better: GEN 4100 or GEN 4200 or GEN 4500.

**Geography**
GEOG 1010 - Introduction to Geography
3 Credits (3 Contact Hours)
Survey of the nature of geography emphasizing the discipline's organizing themes of earth science, relations between people and their environments, interrelations between places, locational analysis, and area studies.

GEOG 1030 - World Regional Geography
3 Credits (3 Contact Hours)
Systematic and descriptive survey of the major regions of the world, including their physical and cultural features. Provides a global context for courses in the social sciences and humanities.

GEOG 1060 - Geography of the Physical Environment
4 Credits (3 Contact Hours)
Examines the condition of the physical environment, especially the earth's surface and the processes that act on it. Topics range from earth-sun relations to the evolution of landscapes; human habitats and human alteration of the environment. Coreq: GEOG 1061.

GEOG 1061 - Geography of the Physical Environment Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GEOG 1060. Coreq: GEOG 1060.

GEOG 3010 - Political Geography
3 Credits (3 Contact Hours)
Geographic basis of states: sovereignty, territory, power within states, relations between states. The geography of international affairs. Preq: GEOG 1010 or GEOG 1030.

GEOG 3020 - Economic Geography
3 Credits (3 Contact Hours)
Spatial analysis of economic activity emphasizing regional economics and development. Topics include world population; technology and economic development; principles of spatial interaction; and geography of agriculture, energy manufacturing, and tertiary activities. Preq: GEOG 1010 or GEOG 1030.

GEOG 3030 - Urban Geography
3 Credits (3 Contact Hours)
Historical and contemporary survey of the urban world, with particular attention paid to the relationship between people and urban places. Topics include the rise of cities, urban hierarchies, urban land use, and the social geography of cities. Preq: GEOG 1010 or GEOG 1030.

GEOG 3050 - Cultural Geography
3 Credits (3 Contact Hours)
Broad examination of the basic cultural variables in the human occupation of the earth using ecological, spatial, regional, and historical approaches. Topics vary but may include cultural areas and distributions, cultural change, cultural landscape, and cultural ecology. Preq: GEOG 1010 or GEOG 1030.

GEOG 3060 - Historical Geography
3 Credits (3 Contact Hours)
Exploration of geographical change and the varied patterns of past human activities and people's relationships with the physical environment. Case studies from around the world are used to emphasize key themes in historical geography. Preq: GEOG 1010 or GEOG 1030.

GEOG 3300 - Geography of the Middle East and North Africa
3 Credits (3 Contact Hours)
Thematic survey of a world region extending from Morocco to Afghanistan. Emphasizes climate, environment, social geography, historical development of the regional culture of Islam, and common problems facing the area today. Preq: GEOG 1010 or GEOG 1030.

GEOG 3400 - Geography of Latin America
3 Credits (3 Contact Hours)
Introduction to the physical, economic, political, and human/cultural geography of Latin America. Special focus is on regional unity and diversity and the historical interaction of man and environment.

GEOG 3600 - Geography of Africa
3 Credits (3 Contact Hours)
Study of how tropical, or sub-Saharan, Africa functions in the modern world. Africa's physical environments, peoples and cultures, colonial and post-colonial history, and ideologies of economic development. Five basic themes are covered: population, natural resources, environmental quality, political organization, economic development. Preq: GEOG 1010 or GEOG 1030.
**GEOG 3990 - Creative Inquiry in Geography**  
1-3 Credits (1-3 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of nine credits. Preq: GEOG 1010 or 1030.

**GEOG 4010 - Studies in Geography**  
3 Credits (3 Contact Hours)  
Intensive study of the geography of a selected world region, such as North America, Europe, or the Middle East, or the geography of a topic, such as the geography of oil or the geography of underdevelopment. May be repeated once for credit with departmental consent. Preq: GEOG 1010 or GEOG 1030.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOG 4100 - Geography of the American South**  
3 Credits (3 Contact Hours)  
Study of the geography of the American South in its changing complexities across almost 400 years of development. Preq: GEOG 1010 or GEOG 1030.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOG 4200 - Historical Geography of the United States**  
3 Credits (3 Contact Hours)  
Survey that places the spatial concepts of geography into a time sequence with special emphasis upon the United States. Preq: GEOG 1010 or GEOG 1030.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOG (PRTM) 4300 - World Geography of Parks and Equivalent Reserves**  
3 Credits (3 Contact Hours)  
Major international patterns in the provision and use of urban and rural parks and recreation are examined. May also be offered as PRTM 4300. Preq: 2.0 cumulative grade-point average.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOG 4400 - Geography of Historic Preservation**  
3 Credits (3 Contact Hours)  
Aspects of historic preservation emphasizing sites and structures in their geographical, historical, and socioeconomic contexts. Examples are drawn from American architectural styles and settlement forms. Preq: GEOG 1010 or GEOG 1030.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOG 4990 - Independent Study in Geography**  
3 Credits (0 Contact Hours)  
Study of selected topics in geography under the direction of a faculty member chosen by the student. Student and faculty member develop a course of study designed for the individual student and approved by the department chair prior to registration.

**Geology**

**GEOL 1000 - Current Topics in Geology**  
1 Credits (1 Contact Hours)  
Lectures and demonstrations covering topics of current interest in the different fields of geology. Recent research developments and career opportunities in the geosciences are emphasized.

**GEOL 1010 - Physical Geology**  
3 Credits (3 Contact Hours)  
Study of the minerals and rocks that compose earth's crust, their origins and transformations. Emphasizes geological processes, both internal and external, by which changes are produced on or in the earth. Includes Honors sections.

**GEOL 1030 - Physical Geology Laboratory**
1 Credits (2 Contact Hours)
Laboratory to accompany GEOL 1010. Provides instruction in the identification of minerals and rocks and in the interpretation of geologic processes through study of topographic maps. Field trips provide direct observation of processes and results. Includes Honors sections. Preq or concurrent enrollment: GEOL 1010.

GEOL 1120 - Earth Resources
3 Credits (3 Contact Hours)
Survey of earth's mineral, energy, water, and land resources and environmental and societal impacts associated with the use of these resources.

GEOL 1140 - Earth Resources Laboratory
1 Credits (2 Contact Hours)
Laboratory to accompany GEOL 1120. Provides instruction in the identification of ore and gem minerals and of other earth materials of economic importance. Land and water resources are explored through the use of topographic maps, aerial photographs, remotely sensed images, and field trips.

GEOL 1200 - Natural Hazards
3 Credits (3 Contact Hours)
This class explains the scientific causes of various natural hazards (earthquakes, volcanoes, hurricanes, tsunamis, etc.) Additionally, topics explore how economic, social, and political factors influence our preparedness for and response to disasters. Discussions also examine moral dilemmas resulting from technological limits on our ability to predict and prevent such events.

GEOL (ENSP) 1250 - Sustainable Resource Use
3 Credits (3 Contact Hours)
This course explores the challenges our society faces in making the transition to renewable resource use in a way that is truly sustainable environmentally, economically and socially. The conflicting demands of each system will be examined and used to critically examine possible solutions using a systems based approach. May also be offered as ENSP 1250.

GEOL 2020 - Earth History
4 Credits (3 Contact Hours)
Survey of the earth's geologic history emphasizing how the continents and ocean basins have evolved through geologic time. Evolution of life from the beginning of the fossil record through the present; identification of fossil plants and animals and interpretation of earth's past through study of geologic maps. Field trips illustrate principles. Includes Honors sections. Preq: GEOL 1010 and GEOL 1030. Coreq: GEOL 2021.

GEOL 2021 - Earth History Laboratory
0 Credits (3 Contact Hours)

GEOL 2050 - Mineralogy and Introductory Petrology
3 Credits (3 Contact Hours)

GEOL 2070 - Mineralogy and Introductory Petrology Laboratory
1 Credits (3 Contact Hours)
Identification of rock-forming minerals and important ore minerals based on their physical properties. Includes hand specimen petrology of igneous, sedimentary, and metamorphic rocks. Credit toward a degree will be given for only one of GEOL 2070 or GEOL 2080. Coreq: GEOL 2050.

GEOL 2080 - Mineralogy and Petrography Laboratory
2 Credits (6 Contact Hours)
Identification of rock-forming minerals and important ore minerals based on their physical and optical properties. Hand specimen petrology and petrography of igneous, sedimentary, and metamorphic rocks. Study of minerals in thin section using polarizing microscope. Credit toward a degree will be given for only one of GEOL 2070 or 2080. Preq or concurrent enrollment: GEOL 2050.

GEOL 2100 - Geology of the National Parks
3 Credits (3 Contact Hours)
Survey of selected national parks and monuments emphasizing the dynamic geological processes that have shaped the landscapes of these areas. Special attention is focused on parks exhibiting recent geological activity related to volcanoes, earthquakes, and glaciers. Slides and films are used to highlight specific geological features.
GEOL 2110 - Geoanalysis I
4 Credits (3 Contact Hours)
Students develop a working knowledge of statistical methods used to formulate and solve problems in the earth sciences. Emphasis is on sampling methods and experimental design for geologic settings and on formulating and evaluating hypotheses using statistical inference of data sets. Preq or concurrent enrollment: MATH 1080. Coreq: GEOL 2111.

GEOL 2111 - Geoanalysis I Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GEOL 2110. Coreq: GEOL 2110.

GEOL 2120 - Geoanalysis II
4 Credits (3 Contact Hours)
Students develop a working knowledge of deterministic methods used to formulate and solve problems in the earth sciences. Emphasis is on developing conceptual models from geologic field observations, formulating idealized problems, and analyzing and interpreting solutions. Special focus is on using computer software to support analyses. Preq: GEOL 2110 and MATH 1080. Coreq: GEOL 2121.

GEOL 2121 - Geoanalysis II Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GEOL 2120. Coreq: GEOL 2120.

GEOL (ASTR) 2200 - Planetary Science
3 Credits (3 Contact Hours)
Survey of the formation and evolution of planetary bodies. Emphasizes the origin of planetary material and comparative study of the primary processes operative on planetary surfaces. Describes major features of the planets and moons in our solar system, as revealed by recent space missions. May also be offered as ASTR 2200.

GEOL 2700 - Experiences in Sustainable Development: Water
3 Credits (3 Contact Hours)
Integrates cross-disciplinary perspectives on sustainability through active student participation in real-world development projects. Focuses on identifying and overcoming environmental, technical, social/organizational, and economic barriers to the sustainability of water resources. Emphasizes small-scale international water resources development.

GEOL 2750 - Field Methods
3 Credits (1 Contact Hours)
Introduction to geologic field methods, emphasizing traditional and emerging techniques. Students gain competency in using standard mapping tools, making appropriate measurements, mapping geologic formations found in the Piedmont and Blue Ridge, converting field data to digital format, making geologic maps, and presenting their data in accepted formats. Preq: GEOL 1010. Coreq: GEOL 2751.

GEOL 2751 - Field Methods Laboratory
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany GEOL 2750. Coreq: GEOL 2750.

GEOL 2910 - Introduction to Research I
1 Credit (1 Contact Hours)
Required group learning and research experience for Geology majors (open to others with consent of instructor). Introduction to problem solving through case studies and interdisciplinary team approaches. Focus is on, but not limited to, research approaches in geology. Social and ethical contexts, communication skills, and professional development are incorporated.

GEOL 2920 - Introduction to Research II
1 Credit (1 Contact Hours)
Required group learning and research experience for Geology majors (open to others with consent of instructor). Introduction to problem solving through case studies and interdisciplinary team approaches. Focus is on, but not limited to, research approaches in geology. Social and ethical contexts, communication skills, and professional development are incorporated. Preq: GEOL 2910.

GEOL 3000 - Environmental Geology
3 Credits (3 Contact Hours)
Discussion-oriented introduction to relationships of man to his physical surroundings and problems resulting from upsetting the established equilibria of geologic systems; man's role as a geologic agent, environmental conservation and management. Includes Honors sections. Preq: GEOL 1010.

GEOL 3020 - Structural Geology
4 Credits (3 Contact Hours)
Diverse geological structures of the earth, their description, origin, and field recognition. Practical problems in interpreting geologic structures are utilized, in addition to theoretical considerations of the mechanics and causes of tectonism. Includes Honors sections. Preq: GEOL 2020. Coreq: GEOL 3021.

GEOL 3021 - Structural Geology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GEOL 3020. Coreq: GEOL 3021.

GEOL 3130 - Sedimentology and Stratigraphy
4 Credits (3 Contact Hours)
Topics include origin, composition, and texture of sediments and sedimentary rocks; sedimentation processes, depositional environments, facies relationships, and diagenesis; introduction to stratigraphic methods and geochronology. Laboratory involves description and classification of hand specimens and thin sections and analytical methods. Preq: GEOL 2050. Coreq: GEOL 3131.

GEOL 3131 - Sedimentology and Stratigraphy Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GEOL 3130. Coreq: GEOL 3130.

GEOL 3140 - Sedimentary Petrology
3 Credits (2 Contact Hours)
Origin, composition, and texture of sediments and sedimentary rocks, including both siliciclastic and chemical varieties. Interpretation of tectonic settings, depositional systems, facies relationships, and diagenesis. Laboratory involves description and classification of hand specimens and thin sections and analytical methods. Includes Honors sections. Preq: GEOL 2050. Coreq: GEOL 3141.

GEOL 3141 - Sedimentary Petrology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GEOL 3140. Coreq: GEOL 3140.

GEOL 3160 - Igneous and Metamorphic Petrology
3 Credits (2 Contact Hours)
Classification, occurrence, and origin of igneous and metamorphic rocks. Discussion of the chemical and physical processes involved in magmatic crystallization and metamorphism. Laboratory study of igneous and metamorphic rocks in hand specimen and thin section. Includes Honors sections. Preq: GEOL 2050. Coreq: GEOL 3161.

GEOL 3161 - Igneous and Metamorphic Petrology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GEOL 3160. Coreq: GEOL 3160.

GEOL 3180 - Introduction to Geochemistry
3 Credits (3 Contact Hours)
Introduction to distribution of elements in the core, mantle, and crust of the earth. Control of rock type on trace element content in soils and sediments. Weathering; soil and regolith formation; water-sediment interrelations; solubility, mobility and bioavailability in relation to redox, pH and complexation; biogeochemical cycles of selected elements. Preq: GEOL 2050.

GEOL 3600 - Geology and Castles of Scotland
3 Credits (1 Contact Hours)
Students spend two weeks in Scotland exploring its diverse geology and visiting medieval castles and ancient stone mountains. Highlights include studying the unconformity at Siccar Point made famous by James Hutton, the father of modern geology; and travelling "The Rock Route" through the Scottish Highlands, where modern ideas about mountain building were birthed. Coreq: GEOL 3601.

GEOL 3601 - Geology and Castles of Scotland Laboratory
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany GEOL 3600. Coreq: GEOL 3600.

GEOL 3700 - Western United States Field Study
3 Credits (1 Contact Hours)
Field excursion to a geologic region in the western United States. Students visit sites where the stratigraphy and structure are well exposed, studying a variety of landforms and the geologic processes responsible for their formation. Pre-trip sessions are held on campus. Additional fees are required. May be repeated for a maximum of six credits. Preq: GEOL 1010. Coreq: GEOL 3701.

GEOL 3701 - Western United States Field Study Laboratory
**GEOL 3750 - Bahamian Field Study**

3 Credits (1 Contact Hours)

Students develop an understanding of Bahamian geology, culture, and social structure (including the influences of historical context and natural environments). Students stay one week on Andros Island in the Bahamas, traveling by van and boat to various sites. Additional fees are required. Includes Honors sections. Preq: GEOL 1010. Coreq: GEOL 3751.

**GEOL 3751 - Bahamian Field Study Laboratory**

0 Credits (4 Contact Hours)

Non-credit laboratory to accompany GEOL 3750. Coreq: GEOL 3750.

**GEOL 3800 - Caribbean Field Studies**

3 Credits (3 Contact Hours)

This field-based course explores the geologic evolution of the Caribbean volcanic island arc system. Students visit the island of Dominica and observe firsthand a boiling lake, fumaroles, hot springs, geologic hazards, and deposits from numerous volcanic eruptions, and how humans have adapted to this volcanically active tropical paradise. Preq: GEOL 1010.

**GEOL 3910 - Research Methods I**

2 Credits (2 Contact Hours)

Required group learning and research experience for Geology majors (open to others with consent of instructor). Introduction to problem solving through case studies and interdisciplinary team approaches. Focus is on, but not limited to, research methods in geology. Social and ethical contexts, communication skills, and professional development are incorporated. Preq or concurrent enrollment: GEOL 2910.

**GEOL 3920 - Research Methods II**

2 Credits (2 Contact Hours)

Required group learning and research experience for Geology majors (open to others with consent of instructor). Introduction to problem solving through case studies and interdisciplinary team approaches. Focus is on, but not limited to, research methods in geology. Social and ethical contexts, communication skills, and professional development are incorporated. Preq: GEOL 3910. Preq or concurrent enrollment: GEOL 2910.

**GEOL 4030 - Invertebrate Paleontology**

3 Credits (2 Contact Hours)

Study of life of past geologic ages as shown by fossilized remains of ancient animals, with emphasis on the invertebrates. Preq: GEOL 1020. Coreq: GEOL 4031.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4031 - Invertebrate Paleontology Laboratory**

0 Credits (3 Contact Hours)

Non-credit laboratory to accompany GEOL 4030. Coreq: GEOL 4030.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4050 - Surficial Geology**

4 Credits (3 Contact Hours)

Study of surface features of the earth and the processes that produce them. Analysis of landforms including their form, nature, origin, development, and rates and patterns of change. Laboratory studies emphasize terrain analysis and the mechanics of surficial geological processes. Preq: GEOL 2020 and GEOL 3000. Coreq: GEOL 4051.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4051 - Surficial Geology Laboratory**

0 Credits (3 Contact Hours)

Non-credit laboratory to accompany GEOL 4050. Coreq: GEOL 4050.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4090 - Environmental and Exploration Geophysics**

4 Credits (3 Contact Hours)

Students develop an understanding of the principles and methods used to acquire, analyze, and interpret geophysical data. Emphasis on seismic/radar, gravimetric, and electromagnetic methods. Applications to hydrogeology, environmental engineering and science, soil
science, contaminant transport and remediation, near surface geology, geotechnical problems, oil and gas exploration, and carbon sequestration. Includes Honors sections. Preq: Junior standing. Coreq: GEOL 4091. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4091 - Environmental and Exploration Geophysics Laboratory**

0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GEOL 4090. Coreq: GEOL 4090.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4110 - Research Problems**

1-3 Credits (1-3 Contact Hours)
Field, laboratory, or library study of an approved topic in geology. Topic would be one not normally covered in formal courses, but may be an extension of a course. Taught either semester. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Consent of instructor.

**GEOL 4130 - Stratigraphy**

3 Credits (2 Contact Hours)
Analysis of stratified rocks as the repository of earth history and the conceptual framework used to synthesize the world geologic record as a coherent whole. Emphasizes not only traditional lithostratigraphy but also modern seismic stratigraphy, biostratigraphy, magnetostratigraphy, and current stratigraphic issues. Preq: GEOL 3140. Coreq: GEOL 4131.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4131 - Stratigraphy Laboratory**

0 Credits (2 Contact Hours)
Non-credit laboratory to accompany GEOL 4130. Coreq: GEOL 4130.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4150 - Analysis of Geological Processes**

4 Credits (3 Contact Hours)
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4151 - Analysis of Geological Processes Laboratory**

0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GEOL 4150. Coreq: GEOL 4150.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4210 - GIS Applications in Geology**

3 Credits (1 Contact Hours)
Introduction to geographic information systems with applications to current geological and hydrological problems. Topics include the use of global positioning systems, spatial analysis, and image analysis. Hands-on training with geographic information systems software and techniques is covered in lab. Preq: Junior standing. Coreq: GEOL 4211.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4211 - GIS Applications in Geology Laboratory**

0 Credits (4 Contact Hours)
Non-credit laboratory to accompany GEOL 4210. Coreq: GEOL 4210.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4270 - Ecohydrology**

3 Credits (3 Contact Hours)
Focuses on the understanding of the mechanisms that control the circulation of water among atmosphere, soil, and plants. The spatial and temporal linkages between soil moisture dynamics and climate, soil, and vegetation are explored. Plant strategies in water use and
hydrologic controls of ecosystems are integral components of this course. May also be offered as BE 4270 or ESS 4270. Preq: CE 3410 or CHE 2300 or ME 3080.

**GEOL 4510 - Selected Topics in Hydrogeology**

1-4 Credits (1-3 Contact Hours)

Selected topics in hydrogeology emphasizing new developments in the field. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Consent of instructor. Coreq: GEOL 4511.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4511 - Selected Topics in Hydrogeology Laboratory**

0 Credits (1-3 Contact Hours)

Non-credit laboratory to accompany GEOL 4510. Coreq: GEOL 4510.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4590 - Biogeochemistry**

3 Credits (3 Contact Hours)

Examines how biology directs mass and energy transfer between the lithosphere, biosphere, hydrosphere, and atmosphere. Scale of examination ranges from molecular to global. Topics include element cycling, the mineral-microbe/plant interface, biomineralization, and biogeochemical applications to bioremediation, ecology, environmental toxicology, and biotechnology. Preq: GEOL 3180; and CH 2010 or CH 2230.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4750 - Summer Geology Field Camp**

6 Credits (10 Contact Hours)

Introduction to field techniques emphasizing methods applied to hydrogeology. Includes description and mapping of hydrogeologic units and structures using outcrop data and lithologic and geophysical well logs. Also covers construction of potentiometric maps from water level data, performance of pumping tests on mapped aquifers, and analysis of data to determine aquifer characteristics. Preq: GEOL 2050 and GEOL 3020.

**GEOL (CE) 4820 - Groundwater and Contaminant Transport**

3 Credits (3 Contact Hours)

Basic principles of groundwater hydrology and transport of contaminants in groundwater systems; groundwater system characteristics; steady and transient flow; well hydraulics, design, and testing; contaminant sources, movement and transformations. Preq: Junior standing in the College of Engineering, Computing and Applied Sciences and GEOL 1010. May also be offered as CE 4820.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL (ETOX, PES) 4850 - Environmental Soil Chemistry**

3 Credits (3 Contact Hours)

Study of soil chemical processes (sorption, desorption, ion exchange, precipitation, dissolution, and redox reactions) of nutrients and inorganic and organic contaminants in soils and organic matter. Chemical complex equilibria and adsorption phenomena at the solid (soil, sediment, and mineral) water interface are emphasized. Preq: CH 1020 or PES 2020. May also be offered as ETOX 4850 or PES 4850.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**GEOL 4910 - Research Synthesis I**

3 Credits (2 Contact Hours)

Required capstone group learning and research experience for Geology majors (open to others with consent of instructor). Involves synthesis of applied geology and other approaches for problem solving through collaborative teams. Course is the culmination of a sequence of case studies incorporating social and ethical contexts, communication skills, and professional development. Preq: GEOL 3920. Coreq: GEOL 4911.

**GEOL 4911 - Research Synthesis I Laboratory**

0 Credits (3 Contact Hours)

Non-credit laboratory to accompany GEOL 4910. Coreq: GEOL 4910.

**GEOL 4920 - Research Synthesis II**

3 Credits (2 Contact Hours)

Required capstone group learning and research experience for Geology majors (open to others with consent of instructor). Involves synthesis of applied geology and other approaches for problem solving through collaborative teams. Course is the culmination of a
sequence of case studies incorporating social and ethical contexts, communication skills, and professional development. Preq: GEOL 4910. Coreq: GEOL 4921.

**GEOL 4921 - Research Synthesis II Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GEOL 4920. Coreq: GEOL 4920.

**German**

**GER 1010 - Elementary German**
4 Credits (3 Contact Hours)
Course for beginners in which, through conversation, composition, and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory. Coreq: GER 1011.

**GER 1011 - Elementary German Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany GER 1010. Coreq: GER 1010.

**GER 1020 - Elementary German**
4 Credits (3 Contact Hours)
Continuation of GER 1010; three hours a week of classroom instruction and one hour a week in the language laboratory. Preq: GER 1010 or a score of G1020 on the Modern Language Placement Test. Coreq: GER 1021.

**GER 1021 - Elementary German Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany GER 1020. Coreq: GER 1020.

**GER 1040 - Basic German**
4 Credits (3 Contact Hours)
Intensive one-semester program combining GER 1010 and 1020 for students who have previously studied German. Includes fundamentals of grammar and vocabulary as a foundation for written and oral proficiency. Coreq: GER 1041.

**GER 1041 - Basic German Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany GER 1040. Coreq: GER 1040.

**GER 1510 - German for Graduate Students**
3 Credits (3 Contact Hours)
Intensive program only for graduate students preparing for the reading examination in German. A minimum grade of B on a final examination will satisfy graduate school modern language requirement.

**GER 2010 - Intermediate German**
3 Credits (3 Contact Hours)

**GER 2011 - Intermediate German Laboratory**
0 Credits (1 Contact Hours)

**GER 2020 - Intermediate German**
3 Credits (3 Contact Hours)
Emphasizes reading nontechnical German prose more rapidly. Writing, speaking, and listening skills continue to be developed. Includes literary and cultural perspectives. Includes Honors sections. Preq: GER 2010 or a score of G2020 on the Modern Language Placement Test. Coreq: GER 2021.

**GER 2021 - Intermediate German Laboratory**
0 Credits (1 Contact Hours)
GER 2600 - Selected Topics in German Literature
3 Credits (3 Contact Hours)
Study of significant aspects of German literature. Conducted in English.

GER 2970 - Creative Inquiry in German
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Arrangements with faculty members must be established prior to registration. Preq: Consent of faculty member.

GER 2990 - Foreign Language Drama Laboratory
1 Credit (3 Contact Hours)
Participation in foreign language drama productions. No formal class meetings, but an average of three hours per week in a foreign language drama workshop for production. May be repeated for a maximum of three credits. Preq: Consent of instructor directing the play.

GER 3050 - German Conversation and Composition
3 Credits (3 Contact Hours)
Training in spoken and written German emphasizing vocabulary acquisition, oral and written communication strategies, appropriate linguistic formulations for specific cultural contexts, and stylistics. Preq: GER 2020 or a score of G3050 on the Modern Language Placement Test.

GER 3060 - The German Short Story
3 Credits (3 Contact Hours)
Examines the Austrian, German, and Swiss short story as a distinct literary genre that flourished particularly after 1945. Provides ample conversation and composition practice, as well as an introduction to principles of literary prose analysis. Preq: GER 2020 or a score of G3050 on the Modern Language Placement Test.

GER 3100 - Summer Immersion Program
6 Credits (6 Contact Hours)
Conducted entirely in German for eight hours daily. Program consists of activities that combine interrelating cultural topics with language skill practice. Frequent opportunities to converse with native speakers during meals and on excursions. Students receive six credits, three of which may be taken in lieu of GER 2020. Preq: GER 2010.

GER 3160 - German for International Trade I
3 Credits (3 Contact Hours)
Spoken and written German common to the German-speaking world of business and industry emphasizing business practices and writing and translating business letters and professional reports. Cross-cultural references provide opportunity for comparative and contrastive analysis of American and German cultural patterns in a business setting. Preq: GER 2020. Preq or concurrent enrollment: GER 3050.

GER 3400 - German Culture
3 Credits (3 Contact Hours)
Examines the cultures of German-speaking nations from their origins to the present. Emphasizes the Federal Republic of Germany both before and after the German unification of 1990. Preq: GER 2020.

GER 3600 - German Literature to 1832
3 Credits (3 Contact Hours)
Examines selected topics in German literature from the Middle Ages to 1832. Readings may include works by Lessing, Goethe, Schiller, and the Romantics. Preq or concurrent enrollment: GER 3050 or GER 3060.

GER 3610 - German Literature from 1832 to Modernism
3 Credits (3 Contact Hours)
Examines drama, poetry, and prose from the Biedermeier period through naturalism and realism to the advent of modernism. Preq: GER 3050 or GER 3060.

GER 3690 - Special Topics in German Literature
3 Credits (3 Contact Hours)
Study of a significant aspect of German literature. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: GER 3050 or GER 3060.

GER 3970 - Creative Inquiry in German
1-4 Credits (1-4 Contact Hours)
Students focus on a special research area under the guidance of a faculty member. After acquiring the requisite background, students formulate hypotheses for a group project, develop a critical framework, and initiate research on a specific topic.
GER 3980 - Directed Reading
1-3 Credits (1-3 Contact Hours)
Directed study of selected topics in German literature, language, and culture. May be repeated for a maximum of six credits. Preq: Consent of department chair.

GER 4050 - Advanced Contemporary German Language
3 Credits (3 Contact Hours)
Advanced study of spoken and written contemporary German based on modern autobiographical texts, eyewitness accounts of recent historical events, and media coverage of current events. Employs Internet, print and audio texts, TV programs, and photo series. Preq: One 3000-level German course.

GER 4160 - German for International Trade II
3 Credits (3 Contact Hours)
Study of language and cultural environment of the German-speaking markets of the world, including linguistic and cultural idioms that support global marketing in general and the international marketing of textiles, agricultural products, and tourism in particular. Preq: GER 3160.

GER 4170 - Topics in German for International Trade
3 Credits (3 Contact Hours)
Examination and analysis of selected topics related to the business culture and economy of Germany, Austria, Switzerland, the European Union, or the European Free Trade Association. Topics may include the reconstruction of Eastern Germany's economy, the expansion of the European Union, or current events of economic importance. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: One 3000-level German course.

GER 4500 - Advanced Studies in German Drama
3 Credits (3 Contact Hours)
Extensive study of a major theme or aspect of German drama. May include recorded live performances, stage design, theatre architecture, and the music and art of the theatre. Preq: GER 3050 or GER 3060.

GER 4550 - German Film
3 Credits (2 Contact Hours)
Overview of German cinema including the expressionist classics of the Weimar Republic, entertainment and documentary movies of the Nazi era, classics of the postwar New German Wave (West Germany), distinctive East German films, and vanguard contemporary films. Preq: GER 3050 or GER 3060. Coreq: GER 4551.

GER 4551 - German Film Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GER 4550. Coreq: GER 4550.

GER 4600 - Modernism in German Literature
3 Credits (3 Contact Hours)
Study of major works of German literature and culture in the modernist era (1888-1933). May include drama, music, philosophy, and the plastic arts. Preq: GER 3050 or GER 3060.

GER 4610 - German Literature Since 1933
3 Credits (3 Contact Hours)
Study of selected authors, texts, or genres in contemporary German literature. Preq: GER 3050 or GER 3060.

GER 4750 - Advanced German Seminar
3 Credits (3 Contact Hours)
Concentrated research and discussion on advanced topics, works, or texts in German literature, film, art, drama, music, or philosophy. Conducted in German. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: One 4000-level German course.

GER 4760 - Advanced Seminar in German Thought
3 Credits (3 Contact Hours)
Concentrated research and discussion on advanced topics, works or texts in German literature, film, art, drama, music or philosophy. Conducted in English. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Senior standing.

GER 4970 - Creative Inquiry in German
1-4 Credits (1-4 Contact Hours)
Continuation of research initiated in GER 3970. Students complete their project and disseminate their research results. Preq: GER 3970.
GER 4980 - Independent Study
1-3 Credits (1-3 Contact Hours)
Supervised study of selected topics in German literature, language, or culture. May be repeated for a maximum of six credits. Preq: Consent of department chair.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

Graphic Communications

GC 1010 - Orientation to Graphic Communications
1 Credits (1 Contact Hours)
Introduction to the curriculum and the industry, including its processes, products, and careers. Emphasizes the attributes most desirable for successful entry and advancement up a variety of career ladders.

GC 1020 - Computer Art and CAD Foundations
4 Credits (2 Contact Hours)
Graphic Communications industries make extensive use of software and best practices from concept through production. This course provides a solid foundation in drawing, imaging and layout software; packaging structure and 3-D CAD; design principles and problem solving relative to audience, need, typography, color, materials, printing and end use. Includes Honors sections. Coreq: GC 1021.

GC 1021 - Computer Art and CAD Foundations Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany GC 1020. Coreq: GC 1020.

GC 1030 - Graphic Communications I for Packaging Science
4 Credits (2 Contact Hours)
Emphasizes the interrelationships of packaging and graphic arts. Topics include theory and practice in packaging requirements relative to basic graphic arts concepts, principles, and practices; layout; design; electronic copy preparation; the printing processes of offset lithography; screen printing; gravure; and flexography. Includes digital and specialty printing processes, environmental, health, and safety concerns. Coreq: GC 1031.

GC 1031 - Graphic Communications I for Packaging Science Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany GC 1030. Coreq: GC 1030.

GC 1040 - Graphic Communications I
4 Credits (2 Contact Hours)
Emphasizes basic graphic arts industry concepts, principles, and practices, with laboratory applications in graphic design, digital layout, image capture/manipulation, offset lithography, screen printing, flexography, digital printing variable data, finishing operations and color management. Also covers gravure, letterpress, and specialty printing processes, along with environmental, health, and safety concerns. Includes Honors sections. Preq: GC 1020. Coreq: GC 1041.

GC 1041 - Graphic Communications I Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany GC 1040. Coreq: GC 1040.

GC 1990 - Creative Inquiry in Graphic Communications I
1-3 Credits (1-3 Contact Hours)
Under the direction of a faculty member, students pursue approved scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Freshman standing and consent of faculty member/mentor.

GC 2070 - Graphic Communications II
4 Credits (2 Contact Hours)
Intermediate course for graphic communications and graphic arts specialists, which builds upon student experiences from previous courses. Emphasis is on theory and problem solving, as well as broadening skills in layout, copy preparation, lithographic and screen printing presswork. Additional areas of focus include typesetting imposition, basic electronic halftone theory, wide format technology and markets, basic methods for quality control, computer hardware, software, and networks and servers for the graphics industry. Includes Honors sections. Preq: GC 1010 and GC 1020 and GC 1040. Coreq: GC 2071.
GC 2071 - Graphic Communications II Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany GC 2070. Coreq: GC 2070.

GC 2400 - Introduction to Web Design and Development
3 Credits (2 Contact Hours)
Designed to build the students' knowledge of web design and development to an intermediate level. Students learn the fundamental languages and markups for front-end web programming, and are introduced to some of the more complex web topics, including Web to Print, Responsive Web Design, and Server Technology. Preq: GC 1020 and GC 1040. Coreq: GC 2401.

GC 2401 - Introduction to Web Design and Development Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GC 2400. Coreq: GC 2400.

GC 2510 - Special Projects in Graphic Communications I
1-3 Credits (1-3 Contact Hours)
Advanced projects covering theory and/or practices beyond the scope of regular coursework. The subject of work is determined by the instructor in consultation with the student, usually before the term begins or shortly thereafter. The student is expected to work independently and at a level consistent with the amount of work normally associated with the specific credit hours enrolled in. Written project approval is required prior to registration. May be repeated for a maximum of six credits with approval of advisor. Preq: Sophomore standing and acceptance of written proposal by and consent of advisor.

GC 2990 - Creative Inquiry in Graphic Communications II
1-3 Credits (1-3 Contact Hours)
Under the direction of a faculty member, students pursue approved scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Sophomore standing.

GC 3400 - Digital Imaging and eMedia
4 Credits (2 Contact Hours)
Centered around digital imaging, this course explores digital graphic communications photography, video and web design. The photography segment concentrates on manual camera capture; the video segment introduces the basic process of filmmaking; and the web segment covers basic coding and design. Online marketing tools and social media are also explored. Preq: GC 1020 and GC 1040. Coreq: GC 3401.

GC 3401 - Digital Imaging and eMedia Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany GC 3400. Coreq: GC 3400.

GC 3460 - Ink and Substrates
3 Credits (2 Contact Hours)
Emphasizes basic graphic arts industry concepts, principles and practices, with laboratory applications in graphics. This course provides an in-depth study of the properties of inks and substrates used in offset lithography, flexography, gravure, screen printing and digital printing applications. The interrelationship between inks, substrates and printing is examined. Preq: GC 2070. Coreq: GC 3461.

GC 3461 - Ink and Substrates Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GC 3460. Coreq: GC 3460.

GC 3500 - Graphic Communications Internship I
1 Credits (3 Contact Hours)
Full-time supervised employment in an industrial in-plant setting for expansion of experience with materials and processes, production people, and organizations. Preq: GC 1040 and Graphic Communications major and consent of instructor. Preq or concurrent enrollment: COOP 2010.

GC 3510 - Special Projects in Graphic Communications II
1-3 Credits (1-3 Contact Hours)
Advanced projects covering theory and/or practices beyond the scope of regular coursework. The subject of work is determined by the instructor in consultation with the student, usually before the term begins or shortly thereafter. The student is expected to work independently and at a level consistent with the amount of work normally associated with the specific credit hours enrolled in. Written project approval is required prior to registration. May be repeated for a maximum of six credits with approval of advisor. Preq: Junior standing and acceptance of written proposal by and consent of advisor.
GC 3990 - Creative Inquiry in Graphic Communications III
1-3 Credits (1-3 Contact Hours)
Under the direction of a faculty member, students pursue approved scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Junior standing and consent of faculty member/mentor.

GC 4060 - Package and Specialty Printing
4 Credits (2 Contact Hours)
In depth study of the problems and processes for printing and converting in package label and specialty printing industries. Flexographic prepress, workflow, proofing, printing, die making, die cutting, converting, inventory marks, and consumer experience graphics are covered. New developments and trends are explored as well. Laboratory techniques in prepress, printing and converting. Includes Honors sections. Preq: GC 2070 and GC 3400 and GC 3500. Coreq: GC 4061.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4061 - Package and Specialty Printing Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany GC 4060. Coreq: GC 4060.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4070 - Advanced Flexographic Methods
4 Credits (2 Contact Hours)
In-depth study of the methods used in flexographic printing and converting of porous and nonporous substrates. Theory and laboratory applications include setting standards for process color, preparation of plate systems, ink mixing and color matching, testing of films and foils, analysis of recent developments, and prediction of future markets. Preq: GC 4060. Coreq: GC 4071.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4071 - Advanced Flexographic Methods Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany GC 4070. Coreq: GC 4070.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4400 - Commercial Printing
4 Credits (2 Contact Hours)
Advances skills learned in previous graphic communications courses and applies the knowledge to large format presses. Students work from the design conception stage through all aspects of preparation, production, and finishing. Emphasizes understanding and incorporating emerging technologies into the production workflow. Includes Honors sections. Preq: GC 2070 and GC 3400 and GC 3500. Coreq: GC 4401.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4401 - Commercial Printing Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany GC 4400. Coreq: GC 4400.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4440 - Current Developments and Trends in Graphic Communications
4 Credits (2 Contact Hours)
Advanced course for Graphic Communications majors. Emphasizes the theory and technical developments that affect process and equipment selection. Topics include color theory and application, electronic color scanning, electronic prepress and communications, gravure color quality control and analysis. Includes Honors sections. Preq: GC 4060 and GC 4400. Coreq: GC 4441.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4441 - Current Developments and Trends in Graphic Communications Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany GC 4440. Coreq: GC 4440.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
GC 4450 - Advanced Screen Printing Methods
3 Credits (2 Contact Hours)
In-depth study of the systems and materials used with the screen printing process. Emphasizes techniques of control and procedures for establishing screen printing methods and standards. Preq: GC 2070. Coreq: GC 4451. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4451 - Advanced Screen Printing Methods Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GC 4450. Coreq: GC 4450. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4480 - Planning and Controlling Printing Functions
3 Credits (2 Contact Hours)
Study of systems for setting printing production standards, estimating, scheduling, job planning, and the selection of new hardware and technologies. Includes Honors sections. Preq: GC 3500 and GC 4060 and GC 4400 and GC 4500. Coreq: GC 4481. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4481 - Planning and Controlling Printing Functions Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany GC 4480. Coreq: GC 4480. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4500 - Graphic Communications Internship II
1 Credits (3 Contact Hours)
Continuation of GC 3500. Preq: GC 3500; and either GC 4060 or GC 4400. Preq or concurrent enrollment: COOP 2020.

GC 4510 - Special Projects in Graphic Communications
1-6 Credits (1-6 Contact Hours)
Advanced projects covering theory and/or practices going beyond the scope of regular coursework. Written project approval is required before registering. May be repeated for a maximum of six credits with advisor's approval. Includes Honors sections. Preq: Junior standing and completion of three graphic communications courses.

GC 4550 - Advanced Graphic Communications Internship
1 Credits (3 Contact Hours)
Full-time employment in an industry directly or indirectly related to printing. Work site and job must be approved in advance. Preq: GC 3500 and consent.

GC 4800 - Senior Seminar in Graphic Communications
2 Credits (2 Contact Hours)
Study of current trends and issues in the graphic communications industry. Class centers around group discussions dealing with relevant topics facing the graphic communications manager today. Students draw upon academic experiences, internship experiences, and library research to facilitate discussion. Must be taken during student's last semester on campus. Preq: GC 4060 and GC 4400 and GC 4500.

GC 4900 - Graphic Communications Selected Topics
1-3 Credits (1-3 Contact Hours)
Subjects not covered in other graphic communications courses; organized according to industry trends and student needs. May be repeated for a maximum of 18 credits, but only if different topics are covered. Preq: Consent of instructor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

GC 4990 - Creative Inquiry in Graphic Communications IV
1-3 Credits (1-3 Contact Hours)
Under the direction of a faculty member, students pursue approved scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Senior standing.
Great Works

GW 3010 - Great Books of the Western World
3 Credits (3 Contact Hours)
Introduces Great Works minor. Includes readings about the Great Books concept, as well as various great books from the humanities, arts and natural and social sciences. Includes Honors sections. May also be offered as ENGL 3010. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

GW 4020 - Great Works of Science
3 Credits (3 Contact Hours)
Understanding of science in terms of its history and its approach to problem-solving through study of selected great works. Emphasis is on developing students' abilities to reflect on the problems and methodologies encountered in the scientific method. Includes Honors sections.

GW 4030 - Special Topics in Continental Literature
3 Credits (3 Contact Hours)
Important primary texts written in modern European languages are taught in English. Content varies according to instructor. Includes Honors sections. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

GW 4050 - The Darwinian Revolution
3 Credits (3 Contact Hours)
Examination of Charles Darwin's The Origin of Species and its cultural impact from his time to ours. Topics include the contemporaneous reception of Darwin's work, the Scopes Monkey Trial, and more recent controversies over Creationism and Intelligent Design. Includes Honors sections. Preq: ENGL 2020 or ENGL 2120 or ENGL 2130 or ENGL 2140 or ENGL 2150.

Health

HLTH 2020 - Introduction to Public Health
3 Credits (3 Contact Hours)
Examination of the forces that have influenced current health delivery systems, health practices, and trends. General systems theory is introduced. Health majors are given enrollment priority.

HLTH 2030 - Overview of Health Care Systems
3 Credits (3 Contact Hours)
Introduction to the health care delivery system including public health and health care components. Examines and discusses individual and public expectations of need and demand for health care and delivery of public health and health care services.

HLTH 2400 - Determinants of Health Behavior
3 Credits (3 Contact Hours)
Analysis of health behaviors based on psychological, social, cultural, and environmental factors. Introduces health behavior theories. Preq: HLTH 2020 or HLTH 2980 and Health Science major.

HLTH 2500 - Health and Fitness
3 Credits (3 Contact Hours)
Study of interrelationship between health and fitness. Emphasizes the cardiovascular system and benefits of exercise.

HLTH 2600 - Medical Terminology and Communication
3 Credits (3 Contact Hours)
Skills in building, analyzing, defining, pronouncing, and spelling medical terms related to the human body are developed and applied through electronic communication. Preq: Junior standing.

HLTH 2980 - Human Health and Disease
3 Credits (3 Contact Hours)
Study of good health practices emphasizing lifestyles and measures of health. Health majors are given enrollment priority.

HLTH 3010 - Fieldwork in Health Careers
3 Credits (3 Contact Hours)
Using experiential and online learning methods, this course provides opportunities for students to building understanding of the healthcare system, learn about health care careers and enhance leadership skills.

HLTH 3030 - Public Health Communication
3 Credits (3 Contact Hours)
Introduction to the use of health and communication theory and social marketing strategies to create effective, evidence-based, culturally appropriate health communication messages and campaigns. Preq: HLTH 2400 and HLTH 2980.

HLTH 3050 - Body Response to Health Behaviors
3 Credits (3 Contact Hours)
Positive benefits and the negative impact of certain behaviors at cellular, organ, and body-system levels are examined. The pathways of selected injury and disease are explored. Expected physiological changes are applied in identifying strategies for promoting health in the presence (or absence) of disease. Health majors are given enrollment priority. Preq or concurrent enrollment: BIOL 2230.

HLTH 3100 - Women's Health Issues
3 Credits (3 Contact Hours)
Exploration of specific health needs of women, with emphasis on understanding and preventing problems of women's health. Health majors are given enrollment priority. Preq: Junior standing.

HLTH 3150 - Social Epidemiology
3 Credits (3 Contact Hours)
Exploration of the current problems and issues associated with the health of population groups. The interrelationships of biological, sociocultural, behavioral, environmental, political, and economic risk factors and the health and illness patterns of those in population groups are examined. Preq: HLTH 2980.

HLTH 3200 - Health Maintenance for Men
3 Credits (3 Contact Hours)
Exploration of specific health maintenance needs of men, with emphasis on understanding and preventing problems of men's health. Health majors are given enrollment priority. Preq: Sophomore standing.

HLTH 3400 - Health Promotion Program Planning
3 Credits (3 Contact Hours)
Students develop skills to conduct community health needs assessments and to plan and evaluate theoretically grounded health promotion intervention programs for diverse populations. Best practices for specific health behavior change interventions are identified. Preq: HLTH 2400 and HLTH 2980.

HLTH (AGRB) 3610 - Introduction to Health Care Economics
3 Credits (3 Contact Hours)
Introductory course in which students learn the basic economics of the institutions comprising the health-care industry. Topics include the underlying supply, demand, and institutional factors impacting health-care availability and cost of health care. May also be offered as AGRB 3610.

HLTH 3800 - Epidemiology
3 Credits (3 Contact Hours)
Introduces epidemiological principles and methods used in the study of the origin, distribution, and control of disease. Health majors are given enrollment priority. Preq: STAT 2300 and at least one 2000-level HLTH course.

HLTH 3950 - Honors Research Seminar
3 Credits (3 Contact Hours)
Students review basic steps in the development of an honors research proposal and develop a draft of the proposal under the supervision of a faculty mentor. Students are also required to attend research presentations of senior departmental honors students. Preq: HLTH 3800 and Junior standing.

HLTH 3980 - Health Appraisal Skills
3 Credits (6 Contact Hours)
Utilizes laboratory experiences to measure health risk, interpret laboratory health data, and design personal health programs. Restricted to Health Science majors. Preq: HLTH 2980.

HLTH 4000 - Selected Topics in Health
1-6 Credits (3-18 Contact Hours)
Topics in health selected to meet special and individualized interests of students. May be repeated for a maximum of nine credits, but only if different topics are covered. Preq: Junior standing and consent of instructor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HLTH 4010 - Health Consumerism
3 Credits (3 Contact Hours)
Exploration of consumer decisions regarding health products and services emphasizing strategies for decision making. Health majors are given enrollment priority. Preq: Junior standing.

**HLTH 4020 - Principles of Health Fitness**
4 Credits (3 Contact Hours)
Students apply current theories concerning physiological effects of exercise to select populations; understand the relationship between exercise and various chronic diseases; and design, execute, and evaluate exercise programs in terms of safety and effectiveness. Students must be certified in CPR to enroll in this course. Preq: HLTH 3980. Preq or concurrent enrollment: BIOL 2230. Coreq: HLTH 4021.

**HLTH 4021 - Principles of Health Fitness Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany HLTH 4020. Coreq: HLTH 4020.

**HLTH 4100 - Maternal and Child Health**
3 Credits (3 Contact Hours)
Focuses on key issues concerning the health status and needs of mothers and children. Topics include primary health care, measurement and indicators of health status, health of minorities, role of families, and major programmatic interventions towards the health needs of these two groups. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HLTH 4110 - Health Needs of High Risk Children**
3 Credits (3 Contact Hours)
Analysis and evaluation of health needs of high-risk families and special needs children from the prenatal period to age six. Emphasizes health maintenance and early intervention strategies. Preq: HLTH 4100.

**HLTH 4150 - Public Health Issues in Obesity and Eating Disorders**
3 Credits (3 Contact Hours)
In-depth review of prevalence, risk factors, consequences, and treatments of obesity and other eating disorders. Focuses on the public health importance of cultural norms, prevention, and early intervention related to obesity and eating disorders. Preq: Junior standing in Health Science.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HLTH 4180 - Professional Development for CVT**
3 Credits (3 Contact Hours)
Course addresses general academic and professional development requirements for students pursuing the Cardiovascular Imaging Leadership Concentration of the Health Science degree. Preq: Consent of instructor.

**HLTH 4190 - Health Science Internship Preparation Seminar**
1 Credits (1 Contact Hours)
Preparation for internship experience. Includes topics such as resume development, interviewing skills, internship agency selection, and responsibilities of student, department, and agency. Preq: Junior standing in Health Science and a minimum GPA of 2.0.

**HLTH 4200 - Health Science Internship**
1-6 Credits (1-6 Contact Hours)
Under supervision in an approved agency, students have an opportunity for on-the-job experiences. Students are placed in an agency and develop personal/professional goals and objectives appropriate to the setting, population, and health issues. Students create a comprehensive exit portfolio in a digital format. May be repeated for a maximum of six credits. Preq: HLTH 4190 and a minimum grade-point average of 2.0 and Junior standing in Health Science.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HLTH 4300 - Health Promotion of the Aged**
3 Credits (3 Contact Hours)
Focuses on analysis and evaluation of health issues and health problems of the aged. Emphasizes concepts of positive health behaviors. Health majors are given enrollment priority. Preq: HLTH 2980.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HLTH 4310 - Public and Environmental Health**
3 Credits (3 Contact Hours)
Principles of environmental health emphasizing understanding various health concerns created by the interactions of people with their environment. Students evaluate the impact of environmental factors on public health policy decisions. Meets specific area of need in environmental health issues.

**HLTH 4400 - Managing Health Service Organizations**
3 Credits (3 Contact Hours)
Provides the conceptual and theoretical foundation of management and organizational theory of health service organizations. Focuses on the role of health services managers and how they modify and maintain organizations. Preq: HLTH 2030.

**HLTH 4500 - Applied Health Strategies**
3 Credits (3 Contact Hours)
Students plan, implement, and evaluate strategies to promote health through individual behavior changes. Both healthful and unhealthful behaviors are included. Examples include smoking cessation, weight management, and stress management. Preq: Health Science major. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HLTH 4600 - Health Information Systems**
3 Credits (3 Contact Hours)
Focuses on the application of information systems to patient care and management support systems. Provides a general understanding of how the information needs of health professionals and health service organizations can be met through the proper acquisition, storage, analysis, retrieval, and presentation of data. Preq: HLTH 4400.

**HLTH 4700 - Global Health**
3 Credits (3 Contact Hours)
Deepens students' knowledge of global health and how public health work is conducted internationally. Introduction to assessment of international health needs and designing, implementing, managing, and evaluating public health programs in international settings. Preq: HLTH 2980.

**HLTH 4750 - Principles of Health Care Operations Management and Research**
3 Credits (3 Contact Hours)
Provides a foundation in concepts, structure, and analysis that enables an understanding of the importance of production/operations management within health care organizations and systems. Includes training in operations research methods and objectives. Preq: Junior standing.

**HLTH 4780 - Health Policy Ethics and Law**
3 Credits (3 Contact Hours)
Critical examination of the legal and ethical dimensions of public health policy formation and change and how legal, ethical, and policy considerations influence health services administration and delivery. Preq: Junior standing and Health Science major or Language and International Health major.

**HLTH 4790 - Financial Management and Budgeting for Health Service Organizations**
3 Credits (3 Contact Hours)
Overview of basic principles of budgeting and financial management and analysis for health services organizations. Techniques for financial management are provided with an emphasis on health services environments. Preq: HLTH 2030.

**HLTH 4800 - Community Health Promotion**
3 Credits (3 Contact Hours)
Focuses on the participatory approach in the planning and implementation of community health programs. Emphasizes professional ethics, needs assessment, coalition building, proposal writing, and implementation of special events in the community. Preq: HLTH 2400 and HLTH 2980.

**HLTH 4850 - Introduction to GIS for Public Health**
4 Credits (3 Contact Hours)
Introduces students to the theory and application of geographic information systems (GIS) in the context of public health and epidemiology addressing both spatial information and methods and technology used to solve spatial inquiry in health and disease prevention. Coreq: HLTH 4851.

**HLTH 4851 - Introduction to GIS for Public Health Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany HLTH 4850. Provides students with a hands-on familiarity with the methods and technology used to solve spatial inquiry in healthcare and disease prevention using GIS. Coreq: HLTH 4850.
HLTH 4900 - Research and Evaluation Strategies for Public Health
3 Credits (3 Contact Hours)
Discussion of research in health. Focuses on analysis of reported research. Ethical, moral, and legal issues are discussed. Preq: HLTH 3800.

HLTH 4950 - Honors Thesis Seminar
3 Credits (3 Contact Hours)
Senior honors thesis seminar in public health sciences. Independent research is conducted under the supervision and guidance of a faculty mentor for students enrolled in departmental honors program in support of an honors thesis/service learning research project. Preq: HLTH 3950 and Senior standing.

HLTH 4960 - Honors Research Colloquium
1 Credit (1 Contact Hours)
Students enrolled in departmental honors present independent research conducted under the supervision of a faculty member in a public research forum to other honors students and public health professionals and/or submit a paper or presentation based on this research for publication. Preq: HLTH 4950 and Senior standing.

HLTH 4970 - Creative Inquiry in Public Health
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of 12 credits.

HLTH 4980 - Improving Population Health
3 Credits (3 Contact Hours)
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HLTH 4990 - Independent Study
1-3 Credits (1-3 Contact Hours)
Study of selected problems in health under the direction of faculty member chosen by the student. Student and faculty member develop a course of study designed for the individual student and approved by the department chair prior to registration. May be repeated for a maximum of six credits. Preq: Junior standing.

Health Care Genetics

HCG (NURS) 3330 - Health Care Genetics
3 Credits (3 Contact Hours)
Focuses on the new genetics and the implications for health care professionals. Discussion includes applications of the evolving genetics technology and services to changing life stages. Issues of ethics relevant to various genetic disorders is also addressed. May also be offered as NURS 3330. Preq: BIOL 2220 with a C or better.

Health, Education and Human Development

HEHD 1990 - Creative Inquiry I
1-3 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue a first phase of scholarly activities in teams. These creative inquiry projects may be discipline-specific or interdisciplinary in nature. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Consent of instructor.

HEHD 2990 - Creative Inquiry II
1-3 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue a second phase of scholarly activities in teams. These creative inquiry projects may be discipline-specific or interdisciplinary in nature. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Sophomore standing, consent of instructor.
HEHD 3990 - Creative Inquiry III
1-3 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue a third phase of scholarly activities in teams. These creative inquiry projects may be discipline-specific or interdisciplinary in nature. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Junior standing, consent of instructor.

HEHD 4000 - Introduction to Leadership Theories and Concepts
3 Credits (2 Contact Hours)
Interdisciplinary course introduces students to the nature of leadership. Students gain a broad understanding of the history and origins of leadership, theoretical approaches to leadership, and the essence of contemporary leadership. Students are encouraged to test their ability to apply these concepts to life experiences. Preq: Junior standing. Coreq: HEHD 4001.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HEHD 4001 - Introduction to Leadership Theories and Concepts Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany HEHD 4000. Coreq: HEHD 4000.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HEHD 4100 - Leadership Behavior and Civic Engagement
3 Credits (2 Contact Hours)
Students couple concepts of social justice and civic engagement with theoretical foundations from HEHD 4000 to complete a comprehensive theory to practice project. Students are introduced to a comprehensive leadership skill set to become active change agents for the common good. Preq: HEHD 4000. Coreq: HEHD 4101.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HEHD 4101 - Leadership Behavior and Civic Engagement Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany HEHD 4100. Coreq: HEHD 4100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HEHD 4200 - Leadership Application and Experience
3 Credits (2 Contact Hours)
Students are immersed in a practical leadership experience utilizing knowledge and skills gained in HEHD 4000 and 4100. Students identify an issue or problem and practice leadership by developing and implementing a community project. Students are challenged to commit themselves to long-term engagement as agents of change. Preq: HEHD 4100. Coreq: HEHD 4201.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HEHD 4201 - Leadership Application and Experience Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany HEHD 4200. Coreq: HEHD 4200.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HEHD 4990 - Creative Inquiry IV
1-3 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue a fourth phase of scholarly activities in teams. These creative inquiry projects may be discipline-specific or interdisciplinary in nature. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Senior standing and consent of instructor.

History

HIST 1000 - Higher Education and Clemson
2 Credits (2 Contact Hours)
Introduction to higher education and its background and development in the United States, emphasizing land-grant institutions and Clemson University in particular.
HIST 1010 - History of the United States
3 Credits (3 Contact Hours)
Political, economic, and social development of the American people from the period of discovery to the end of Reconstruction. Includes Honors sections.

HIST 1020 - History of the United States
3 Credits (3 Contact Hours)
Political, economic, and social development of the American people from the end of Reconstruction to the present. Includes Honors sections.

HIST 1220 - History, Technology, and Society
3 Credits (3 Contact Hours)
Topics in the history of technology with emphasis on how technology affects society and how society shapes technology. Emphasis is on 19th and 20th century America, but some material from other periods of Western Civilization and other world regions may be discussed. Includes Honors sections.

HIST 1240 - Environmental History Survey
3 Credits (3 Contact Hours)
Introduction to environmental history, in the United States and globally, with emphasis on changing attitudes toward the environment and the interaction between science and public policy. Includes Honors sections.

HIST 1720 - The West and the World I
3 Credits (3 Contact Hours)
Examines the history of the West from early times until 1648. After a comparative evaluation of the emergence of civilization around the globe, course concentrates on the history of the peoples of Europe up to the age of European exploration and overseas expansion. Includes Honors sections.

HIST 1730 - The West and the World II
3 Credits (3 Contact Hours)
Surveys the history of the West in modern times, from the late 17th century to the present. Particular emphasis is placed on Europe's interaction with non-western societies. Through cross-cultural comparisons, European history is placed in global context. Includes Honors sections.

HIST 1930 - Modern World History
3 Credits (3 Contact Hours)
Political, economic, social, and cultural history of the modern world from the 19th century to the present.

HIST 1980 - Current History
1 Credits (1 Contact Hours)
Examination of major events and problem areas in the news emphasizing their historical context and possible long-range significance. May be repeated for a maximum of three credits. Does not count toward the requirements of the major or minor in History.

HIST 2000 - Fort Hill Internship
1-3 Credits (1-3 Contact Hours)
Provides practical experience in public history museum work and/or historical preservation in the setting of Fort Hill. May be repeated for a maximum of three credits. To be taken Pass/No Pass only. Preq: Consent of internship director.

HIST 2010 - Prelaw Internship
1-3 Credits (1-3 Contact Hours)
Faculty-supervised internship in a law firm or other legal setting. Introduces students to the workings of the legal system. To be taken Pass/No Pass only. Preq: History major and sophomore standing.

HIST 2020 - Internship
1-3 Credits (1-3 Contact Hours)
Exposes History majors to hands-on experience in research, analysis, and public presentation of historical scholarship. May include working with faculty on research projects, in museums or historical organizations, or at sites. May be repeated for a maximum of three credits. To be taken Pass/No Pass only. Preq: Sophomore standing.

HIST 2890 - Creative Inquiry in History
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These
creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of nine credits. Preq: Consent of faculty member/mentor.

**HIST 2990 - Seminar: The Historian's Craft**
3 Credits (3 Contact Hours)
Writing and speaking intensive course to introduce History majors to study of what history is and what a historian does, including historiography, research techniques, ethics of the historical profession, and forms of presentation. Preq: History major.

**HIST 3000 - History of Colonial America**
3 Credits (3 Contact Hours)
Development of American institutions and customs in the period before 1776. Considerable emphasis is placed on the imperial relations between Great Britain and her colonies and upon the movement towards and the philosophy of the American Revolution.

**HIST 3010 - American Revolution and the New Nation**
3 Credits (3 Contact Hours)
Study of the various historical explanations leading to an understanding of the American Revolution, the establishment of the nation under the Constitution, and the first decade of the new nation. Special emphasis is on developing an understanding of individual motivation and ideological development present during the last four decades of the 18th century.

**HIST 3020 - Age of Jefferson, Jackson, and Calhoun**
3 Credits (3 Contact Hours)
Formation and growing pains of the new nation through the Federal and Middle periods of its history emphasizing economic and political development, the westward movement, and the conflicting forces of nationalism and sectionalism.

**HIST 3030 - Civil War and Reconstruction**
3 Credits (3 Contact Hours)
Study of the political, military, and social aspects of the sectional conflict and of the era of Reconstruction. Some emphasis is placed on the historical controversies inspired by the period.

**HIST 3040 - Industrialism and the Progressive Era**
3 Credits (3 Contact Hours)
Study of American society in the period between the 1880s and 1930s. Emphasizes the effects of industrialization and urbanization on the American people.

**HIST 3050 - The United States in the Jazz Age, Depression, and War: 1918-1945**
3 Credits (3 Contact Hours)
Starting at Armistice Day, 1918, course analyzes the dawn of the age of mass consumption and mass communication, the Crash of 1929, Franklin Roosevelt and the New Deal, the gathering war clouds in Europe and Asia, and the Great Crusade of World War II. Preq: Sophomore standing.

**HIST 3060 - The United States in the Postwar World: 1945 to 1975**
3 Credits (3 Contact Hours)
Examination of the American experience from the end of World War II through the period of the Korean and Vietnam wars, the Cold War, the Civil Rights movement, the counter-culture of the 1960s, assassinations, and Watergate.

**HIST 3080 - The United States in the Age of Reagan and Clinton: 1975 to the Present**
3 Credits (3 Contact Hours)
The United States and the world in the recent era of economic and political upheaval, the end of the Cold War, the rise of the global economy and terrorism, social and cultural change, and deepening political and social divisions. Preq: Sophomore standing.

**HIST (REL) 3100 - History of Religion in the United States**
3 Credits (3 Contact Hours)
Development of religion in the U.S. from the Colonial period to the 20th century. Attention is devoted to analyzing the broad currents in religious movements and religious thought that have given shape to the American pluralistic experience. May also be offered as REL 3100.

**HIST 3110 - African American History to 1877**
3 Credits (3 Contact Hours)
Study of the African-American experience in the United States from the African past through slavery to 1877.

**HIST 3120 - African American History from 1877 to the Present**
3 Credits (3 Contact Hours)
Study of African American experience in the United States from 1877 to the present.
HIST 3130 - History of South Carolina
3 Credits (3 Contact Hours)
Political, economic, and social development of South Carolina from 1670 to the present. Includes Honors sections.

HIST 3140 - History of the South to 1865
3 Credits (3 Contact Hours)
Origins and development of political, social, economic, and cultural institutions of the South from the Colonial period to the end of the Civil War and the role of the South in the nation's development.

HIST 3160 - American Social History
3 Credits (3 Contact Hours)
Study of American society, including the relationship among classes, ethnic groups, regions, and sexes, from the Colonial period to the present.

HIST 3170 - History of Native American Religion and Culture
3 Credits (3 Contact Hours)
Study of Native American religion and culture from the pre-Columbian era to the present. Examines how Native American religious traditions in a variety of cultural contexts of North America have impacted, and have been impacted by, changing historical circumstances. May also be offered as REL 3170.

HIST 3180 - History of American Women
3 Credits (3 Contact Hours)
Survey course of the history of American women emphasizing the changing role of women in American culture and society.

HIST 3190 - Gender and Law in United States History
3 Credits (3 Contact Hours)
Survey of how law has reflected and created distinctions on the basis of gender and sexuality throughout United States history. Emphasizes the relationship between legal rules and social conditions and the way in which groups have challenged these legal categories over time.

HIST (EDF) 3200 - History of United States Public Education
3 Credits (3 Contact Hours)
Historical survey of the development of United States public schools. May also be offered as EDF 3200. Preq: Junior standing.

HIST 3210 - History of Science
3 Credits (3 Contact Hours)
Survey of the development of science in the Western world, emphasizing the period from the Renaissance to the present.

HIST 3220 - History of Technology
3 Credits (3 Contact Hours)
History of the major developments in Western technology and their relationships to the societies and cultures in which they flourished.

HIST 3230 - History of American Technology
3 Credits (3 Contact Hours)
History of developments in technology and their role in American life with particular emphasis on the American Industrial Revolution and the 20th century.

HIST 3240 - History of the South, 1865 to the Present
3 Credits (3 Contact Hours)
Development of political, social, and cultural institutions of the South from the end of the Civil War to the present and the South's relationship to the rest of the nation.

HIST 3250 - American Economic Development
3 Credits (3 Contact Hours)
Economic development of the United States from Colonial to recent times, emphasizing the institutional development of agriculture, banking, business and labor, and government regulations and policy.

HIST 3260 - History of American Transportation
3 Credits (3 Contact Hours)
Examines the principal forms of transportation in the United States from colonial times to the present, including water, road, canal, railroad, internal combustion, and air. Emphasizes technological developments and economic, geographic, and social impact of specific transport forms.
HIST 3270 - American Business History
3 Credits (3 Contact Hours)
Survey of the history of American business using a case-study approach. Focuses on the effects that policies and institutions have on individual businesses.

HIST 3280 - United States Legal History to 1890
3 Credits (3 Contact Hours)
Survey of the American legal system in its historical perspective from Colonial times to 1890. Emphasizes the relationship between law and society, the way in which the practice of law changed American society, and the way in which social development affected both the theory and practice of the law.

HIST 3290 - United States Legal History Since 1890
3 Credits (3 Contact Hours)
Examination of the social, cultural, intellectual, economic, and political forces that have helped shape the law in the U.S. since 1890.

HIST 3300 - History of Modern China
3 Credits (3 Contact Hours)
Growth and development of Chinese civilization from ancient times to the present. Emphasis is on 20th century China, particularly since the rise to power of the Communist regime.

HIST 3330 - History of Modern Japan
3 Credits (3 Contact Hours)
Origin and development of Japanese civilization with particular emphasis on modern Japan from mid-19th century to the present.

HIST 3340 - Premodern East Asia
3 Credits (3 Contact Hours)
Introduction to histories of China and Japan, from antiquity to approximately 1850. Political, religious, artistic, and other aspects of premodern society are examined and compared in order to gain significant insights regarding the premodern antecedents of these two dynamic and important nations.

HIST 3350 - History of South Asia 1500-Present
3 Credits (3 Contact Hours)
Examination of the major socio-cultural changes, political traditions, and institutions of South Asia or the Indian subcontinent from 1500 to the present. Topics include South Asia's historic role in the global economy, the Mughal empire and its place in the wider Islamic world, and British colonialism and decolonization.

HIST 3370 - History of South Africa
3 Credits (3 Contact Hours)
Examines the important trends in the history of South Africa from earliest times to the present. Topics include nature of precolonial society, European immigration, rise of industrial capitalism, advent of Apartheid, and the liberation struggle.

HIST 3380 - African History to 1875
3 Credits (3 Contact Hours)
Study of sub-Saharan Africa from antiquity to European colonial rule, exploring the development of Stone Age cultures; agricultural and pastoral societies; ancient civilizations; political, economic, and social systems; gradual shift of initiative from the interior to the coast; and various slave trades.

HIST 3390 - Modern Africa, 1875 to the Present
3 Credits (3 Contact Hours)
Study of sub-Saharan Africa from 1875 to the present, with focus on the development and decline of European imperialism, dilemmas of African independence, and ethnic struggles in Southern Africa.

HIST 3400 - Latin America: From Conquest to Independence
3 Credits (3 Contact Hours)
Examination of the encounters, collaborations, and clashes that characterized the conquest period and beyond in Latin America. Readings are assigned regarding the spiritual, biological, social, and political consequences of the meeting of Indians, Africans, and Europeans. Historical sources include images, artwork, letters, and memoirs.

HIST 3410 - Modern Mexico
3 Credits (3 Contact Hours)
Introduction to the geography of the region; origins and progress of the Independence movements; political, economic, and social developments after 1825; and current domestic and international problems.
HIST 3420 - South America Since 1800
3 Credits (3 Contact Hours)
Introduction to the geography of the region; origins and progress of the Independence movements; political, economic, and social developments after 1825; and current domestic and international problems.

HIST (REL) 3510 - Ancient Near East
3 Credits (3 Contact Hours)
History of the peoples and civilizations of the Near East from the Sumerians to the establishment of Roman power in this region. Includes geography, mythology, religious, and economic currents as well as the methods and discoveries of archaeology. May also be offered as REL 3510.

HIST 3520 - Egypt in the Days of the Pharaohs
3 Credits (3 Contact Hours)
Egyptian civilization from its beginning until the period of Roman conquest. Includes a survey of political history but also deals with daily life, making much use of archaeological evidence.

HIST 3530 - Women in Antiquity
3 Credits (3 Contact Hours)
Focuses on women in the ancient period in Mesopotamia, Israel, Egypt, Greece, Rome, and in the early Christian Church. Formation of gender roles and issues related to ancient sexuality also receive attention.

HIST 3540 - The Greek World
3 Credits (3 Contact Hours)
Study of Greek civilization from its beginning until the time of the Roman conquest, concentrating on the social institutions of the Greek city-states.

HIST 3550 - The Roman World
3 Credits (3 Contact Hours)
Considers the rise of Rome to world empire and the international civilization it dominated. Concentrates on the nature of the political change from Republic to monarchy with particular emphasis on city life and the causes of its decline.

HIST 3610 - History of Britain to 1688
3 Credits (3 Contact Hours)
Study of historical developments in the British Isles through the 17th century. Focus is on political institutions, warfare, social and economic trends, and cultural and legal developments.

HIST 3630 - Britain Since 1688
3 Credits (3 Contact Hours)
Study of political, cultural, social, economic, and imperial issues in the history of the British Isles from the late 17th century to the present. Includes Honors sections.

HIST 3650 - British Cultural History
3 Credits (3 Contact Hours)
Examination of topics in British cultural history from the 17th century to the present. Emphasizes the 19th and 20th centuries.

HIST 3670 - Modern Irish History
3 Credits (3 Contact Hours)
Examines Irish history over the past four centuries, with particular attention to the 19th and 20th centuries. Irish political, social, economic, and cultural history, Anglo-Irish relations, and the Irish diaspora are considered.

HIST 3700 - Medieval History
3 Credits (3 Contact Hours)
Survey of the period from the eclipse of Rome to the advent of the Renaissance, emphasizing human migrations, feudalism, rise of towns, and cultural life.

HIST 3720 - The Renaissance
3 Credits (3 Contact Hours)
Examination of the transitional period of European civilization (ca. 1300-1500) emphasizing institutional, cultural, and intellectual developments.

HIST (REL) 3730 - Age of the Protestant Reformation
3 Credits (3 Contact Hours)
Evolution of Modern Europe (ca. 1500-1660), as affected by the Reformation, wars of religion, and growth of nation-states. Study includes intellectual advances and the beginnings of European expansion overseas. May also be offered as REL 3730.

HIST 3740 - Europe in the Age of Reason
3 Credits (3 Contact Hours)
Study of the quest for order and the consolidation of the European state system between 1660 and 1789 with emphasis on the idea of absolutism, the question of French hegemony, and the synthesis of the 18th-century Enlightenment.

HIST 3750 - Revolutionary Europe
3 Credits (3 Contact Hours)
History of Europe from the outbreak of the French Revolution through the Revolutions of 1848 emphasizing the conflict between the forces of change and those of conservatism, within the states and in Europe in general.

HIST 3770 - Europe 1914 to 1945
3 Credits (3 Contact Hours)
Focuses on Europe during two major wars and the peacetime adjustments Europeans made, or failed to make, during the twenty-year interim between those wars.

HIST 3780 - Europe Since 1945
3 Credits (3 Contact Hours)
Focuses on how World War II completed the destruction of European global hegemony, creating a bipolar continent with the west dominated by the United States and the east by Soviet Russia, and how Europe adjusted to this situation.

HIST 3800 - Imperial Germany
3 Credits (3 Contact Hours)
German history from the beginning of the German Empire, 1870-1871, through World War I. Emphasizes the influence of militarism, nationalism, anti-Semitism, and xenophobia on the German culture and political process.

HIST 3810 - Germany 1918 to 1945
3 Credits (3 Contact Hours)
German history from the time of Germany's defeat in World War I, through the Nazi period and World War II. Special focus is on the complex history of Weimar and Nazi Germany. Preq: Sophomore standing.

HIST 3820 - Germany 1945 to the Present
3 Credits (3 Contact Hours)
German history from the time of Germany's defeat in World War II, through the Cold War and reunited Germany. Special focus is on the cultural-intellectual history of West and East Germany and of Germany since the fall of the Berlin Wall. Preq: Sophomore standing.

HIST 3840 - History of Modern France
3 Credits (3 Contact Hours)
French history from mid-19th century to the present with particular emphasis on France since 1900.

HIST 3850 - History of Imperial Russia
3 Credits (3 Contact Hours)
Survey of the formative years of the Russian Empire from the time of accession of Peter the Great to the time of the Russian Revolution. Social, political, diplomatic, and intellectual developments are given equal treatment.

HIST 3860 - History of the Soviet Union
3 Credits (3 Contact Hours)
Soviet history from the revolution to 1991. Surveys the creation and subsequent development of the communist political and social system, with attention given to culture and diplomacy.

HIST 3870 - The Russian Revolution
3 Credits (3 Contact Hours)
History of one of the most formative series of events of the 20th century. Follows the crisis of Imperial Russia, its downfall during World War I, and subsequent revolutionary upheaval leading to the formation of the USSR.

HIST 3890 - Creative Inquiry in History
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of nine credits. Preq: Consent of faculty member/mentor.
HIST 3900 - Modern Military History
3 Credits (3 Contact Hours)
Survey of the development of modern warfare and the influence of technological change on warfare. Particular attention is given to the major conflicts of the 20th and 21st centuries.

HIST 3910 - Post World War II World
3 Credits (3 Contact Hours)
Examines the world in the age of the Cold War; the breakdown of the colonial empires; and racial, religious, ethnic, national, and social tensions. The United States provides the central core to the class.

HIST 3920 - History of the Environment of the United States
3 Credits (3 Contact Hours)
Examination of the historical development of the attitudes, institutions, laws, people, and consequences that have affected the environment of the United States from pre-Columbian days until the present. Emphasizes the interaction of human beings within and with the environment.

HIST 3930 - Sports in the Modern World
3 Credits (3 Contact Hours)
Analysis of the global evolution and diffusion of sports in the industrial age emphasizing the linkage of sports structure and performance to the larger social context.

HIST 3940 - Non-Western History
3 Credits (3 Contact Hours)
Examines the important trends in world history since 1500, including capitalism, industrialization, nationalism, migration, and imperialism, with a focus on non-Western regions. Preq: HIST 1730.

HIST 3950 - Civil Rights History
3 Credits (3 Contact Hours)
Examines the development of American civil rights from the creation of the Constitution through the present. Emphasis is on the legal struggle of African Americans for civil rights, but how other groups fought for rights in the courts is also considered.

HIST 3960 - The Middle East to 1800
3 Credits (3 Contact Hours)
Examines the histories, cultures, and societies of the Middle East from the rise of Islam in the seventh century to the eve of European colonial penetration.

HIST 3970 - Modern Middle East
3 Credits (3 Contact Hours)
Examines the histories, cultures, and societies of the Middle East from the 18th century to the present day with particular emphasis on contemporary issues.

HIST 3980 - American Military History
3 Credits (3 Contact Hours)
Survey of American military experience and the development of American military institutions from 1763 to the present.

HIST 4000 - Studies in United States History
3 Credits (3 Contact Hours)
Topics and problems in the history of the United States from the Colonial era to the present. May be repeated once for credit with departmental consent. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4090 - Kennedy Assassination and Watergate
3 Credits (3 Contact Hours)
Journey into the underbelly that examines the diverse elements of national security, divisive politics, the Cold War and Cuba, FBI, CIA, the mob, fanaticism, anomie, and threats to the stability of the republic that seem to have come together in Dallas in 1963 and in Watergate. Preq: Junior standing.

HIST 4140 - Introduction to the Study of History Museums
3 Credits (3 Contact Hours)
An Introduction to the field of museology, covering the history, philosophy, and ethics of the profession; various types of museums, and
different aspects of museum work; the museum's role in the community; and the effects of philanthropy and government on museums.

Preq: Any 3000-level history course.

**HIST 4150 - Introduction to Digital Methods for History**
3 Credits (3 Contact Hours)
Introduces students to the philosophy and practice of digital methods for historical research and communication. Includes the use of new media by public historians to enhance their archival/museum/center's visibility with the general public. Preq: Any 3000-level history course.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HIST 4170 - History and Tourism**
3 Credits (3 Contact Hours)
Introduces students to important scholarship in the heritage tourism field. Examines the origins and objectives of heritage tourism, and case studies of how professionals employ heritage tourism. Preq: Any 3000-level history course.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HIST 4180 - Oral History and Local History**
3 Credits (3 Contact Hours)
Introduces students to the most recent work in oral history and methodology with a focus on the history of the Upstate and Appalachia from the colonial era to the present. Students engage in their own local oral history project and produce a research paper based on their findings. Preq: Any 3000-level history course.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HIST 4200 - History and Film**
3 Credits (2 Contact Hours)
Analyzes the role of the cinema in the construction and dissemination of history. May be repeated once for credit with departmental consent. Coreq: HIST 4201.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HIST 4201 - History and Film Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany HIST 4200. Coreq: HIST 4200.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HIST 4240 - Topics in History of Medicine and Health**
3 Credits (3 Contact Hours)
Selected topics in the development of medicine and health care including public attitudes towards health and medicine. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HIST 4360 - The Vietnam Wars**
3 Credits (3 Contact Hours)
Wars in Vietnam are seen in two phases. The First Indochina War, 1946-1954, is covered briefly. Main body of the course covers the Second Indochina War, which began as a guerrilla conflict in 1959-1960 and ended as a mostly conventional war in the Communist victory of 1975.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HIST 4380 - Problems in African Historiography and Methodology**
3 Credits (3 Contact Hours)
Concentrates on major issues in the field of African history with an additional focus on methodological concerns. May be repeated once for credit with departmental consent.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HIST 4400 - Studies in Latin American History**
3 Credits (3 Contact Hours)
Consideration of selected and varied topics in Latin American history through readings, discussions, and individual or group projects. Special attention is given to the use of an inquiry or problem-solving method of historical analysis and to the cultivation of a comparative
HIST 4500 - Studies in Ancient History
3 Credits (3 Contact Hours)
Selected topics in ancient history ranging from pre-Biblical times to the fall of the Roman Empire. May be repeated once for credit with departmental consent.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4510 - Alexander the Great
3 Credits (3 Contact Hours)
Focuses on the career of Alexander the Great and deals with the history and archaeology of ancient Macedonia.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST (REL) 4520 - History of Early Christianity
3 Credits (3 Contact Hours)
Study of the history, social and doctrinal, of early Christianity up to 600 A.D. May also be offered as REL 4520.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4600 - Studies in British History
3 Credits (3 Contact Hours)
Examination of selected themes, topics, or periods in British history from Anglo-Saxon times to the present. May be repeated once for credit with departmental consent. Includes Honors sections.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4700 - Studies in Early European History
3 Credits (3 Contact Hours)
Study of selected topics or themes in European history from the fall of the Roman Empire to the age of industrialization. May be repeated once for credit with departmental consent.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4710 - Studies in Modern European History
3 Credits (3 Contact Hours)
Study of selected topics or problems in European history from the end of the Old Regime to the present. May be repeated once for credit with departmental consent. Includes Honors sections.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4720 - Medieval Conquests and Crusades
3 Credits (3 Contact Hours)
Focuses on medieval conquests with particular emphasis on the era of the crusades. Investigates the origins and historical significance of the crusades from both Christian and Muslim perspectives, and examines crusader societies at home and abroad. Explores other medieval colonization movements and religious justifications for warfare outside the Holy Land.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4800 - Museum Practicum
3 Credits (3 Contact Hours)
Introduces critical issues and museum theoretical perspectives affecting museum curators and other museum professionals. Students will integrate theory with practical experience in public history realm as they work with museum professionals. Preq: HIST 4140.

HIST 4870 - World War II and the World
3 Credits (3 Contact Hours)
World War II was a cataclysm of the twentieth century that touched every part of the globe and ushered in the atomic age. This course examines the war from its origins in the aftermath of World War I to the war crimes trials and the dawn of the Cold War.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
HIST 4880 - Studies in Middle East History
3 Credits (3 Contact Hours)
Examination of selected themes and topics in the history of the Middle East. May be repeated for a maximum of six credits with departmental consent.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4900 - Senior Seminar
3 Credits (3 Contact Hours)
Seminar in current research themes in history. Students conduct directed research on a particular topic and learn research, writing, and oral presentation techniques. Seminar topics vary from section to section and from semester to semester. Preq: History major and Senior standing and HIST 2990 with a C or better.

HIST 4910 - Studies in the History of Science and Technology
3 Credits (3 Contact Hours)
Selected topics in the development of science and technology emphasizing their social, political, and economic effects. May be repeated once for credit with departmental consent. Includes Honors sections.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4920 - Studies in Diplomatic History
3 Credits (3 Contact Hours)
Selected topics and problems in international conflict and conflict resolution among nations. Concentration is usually in 20th century history. May be repeated once for credit with departmental consent.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4930 - Studies in Social History
3 Credits (3 Contact Hours)
Studies in the ways people have earned their livings and lived their lives, individually and as communities, in the confines of different societies. May be repeated once for credit with departmental consent.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4940 - Studies in Comparative History
3 Credits (3 Contact Hours)
Selected topics in comparative history, contrasting and comparing similar historic developments in different nations, geographic areas, or civilizations. May be repeated once for credit with departmental consent.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4950 - Studies in the History of Ideas
3 Credits (3 Contact Hours)
Selected topics and themes in the development of ideas that have had an impact on the behavior of individuals and civilizations. May be repeated once for credit with departmental consent.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4960 - Studies in Legal History
3 Credits (3 Contact Hours)
Study of selected problems in the development of law and the system of criminal and civil justice. May be repeated once for credit with departmental consent.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HIST 4970 - Senior Honors Research
3 Credits (3 Contact Hours)
Research for the preparation of senior honors thesis. Preq: Senior standing, completion of a 400-level history course, approval of the History Department. May be repeated once for credit with departmental consent.

HIST 4980 - Senior Honors Thesis
3 Credits (3 Contact Hours)
Writing of the senior honors thesis. May be repeated once for credit with departmental consent. Preq: HIST 4970.

**HIST 4990 - Independent Study**
1-3 Credits (1-3 Contact Hours)
Study of selected problems in history under the direction of a faculty member chosen by the student. Student and faculty member develop a course of study designed for the individual student and approved by the department chair prior to registration. May be repeated once for credit with departmental consent. Preq: Consent of department chair.

**Honors**

**HON 1900 - Freshman Colloquium: Arts and Humanities (Literature) (Honors)**
3 Credits (3 Contact Hours)
Intellectually intensive seminar that engages freshman honors students in dialogue about the "idea of the University." Explores key literary works that enhance understanding of historical eras, intellectual and artistic movements, or cultures. Topics vary. Preq: Membership in Calhoun Honors College.

**HON 1910 - Freshman Colloquium: Arts and Humanities (Non-Literature) (Honors)**
3 Credits (3 Contact Hours)
Intellectually intensive seminar that engages freshman honors students in dialogue about the "idea of the University." Explores historical eras, intellectual and artistic movements, or cultures emphasizing multiple tools of analysis, including literature, art, music, and film. Topics vary. Preq: Membership in Calhoun Honors College.

**HON 1920 - Freshman Colloquium: Social Science (Honors)**
3 Credits (3 Contact Hours)
Intellectually intensive seminar that engages freshman honors students in dialogue about the "idea of the University." Explores foundations and consequences of human thought and behavior at the individual and societal levels, with emphasis on concepts and tools that organize scholarly inquiry across the social and behavioral sciences. Topics vary. Preq: Membership in Calhoun Honors College.

**HON 1930 - Freshman Colloquium: Cross-Cultural Awareness (Honors)**
3 Credits (3 Contact Hours)
Intellectually intensive seminar that engages freshman honors students in dialogue about the "idea of the University." Explores traditions, customs, and value systems of peoples and cultures. Examines concepts and tools that organize scholarly inquiry into world cultures emphasizing non-Western societies. Topics vary. Preq: Membership in Calhoun Honors College.

**HON 1940 - Freshman Colloquium: Science and Technology in Society (Honors)**
3 Credits (3 Contact Hours)
Intellectually intensive seminar that engages honors students in dialogue about the "idea of the University." Explores interactions of the sciences and technology with society. Examines how science and technology are social enterprises and the impact of science and technology on attitudes, behaviors, and choices. Topics vary. Preq: Membership in Calhoun Honors College.

**HON 2010 - Structures and Society (Honors)**
3 Credits (3 Contact Hours)
Interdisciplinary honors seminar that examines selected structures regarded as monuments to artistic creativity and technological genius and the ways that structures affect and are affected by the societies that produce them. Preq: Membership in Calhoun Honors College.

**HON 2020 - Science, Culture, and Human Values (Honors)**
3 Credits (3 Contact Hours)
Interdisciplinary honors seminar that unifies natural scientific, social scientific, and humanistic disciplines into a holistic view of the modern world and its future. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.

**HON 2030 - Society, Art, and Humanities (Honors)**
3 Credits (3 Contact Hours)
Combines readings and methodologies from the social sciences, arts, and humanities to study the interrelationships among the disciplines and their societal effects. Subjects vary. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.

**HON 2040 - Honors Study/Travel**
HON 2050 - Current Issues
1-3 Credits (1-3 Contact Hours)
Examination of a current issue or set of issues from a variety of academic perspectives. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.

HON 2060 - Controversies in Science and Technology (Honors)
3 Credits (3 Contact Hours)
Interdisciplinary honors seminar that examines social issues related to science and technology, using perspectives from science, the social sciences, and humanities. May be repeated for a maximum six credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.

HON 2070 - Reasoning, Critical Thinking, and Problem Solving (Honors)
3 Credits (3 Contact Hours)
Interdisciplinary honors seminar that teaches a particular set of tools for thinking and analysis, showing how these tools can be applied to different kinds of problems in different disciplines. May be repeated for a maximum six credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.

HON 2090 - Border Crossings: Experiences in World Cultures (Honors)
1-3 Credits (1-3 Contact Hours)
Readings and studies that heighten understanding of world cultures and societies. Taken in conjunction with international educational experiences approved by Calhoun Honors College. May be repeated for a maximum of six credits, with a maximum of three credit hours per study abroad experience. Preq: Membership in Calhoun Honors College.

HON 2100 - Experiencing the Arts
3 Credits (2 Contact Hours)
Interdisciplinary exploration of the arts through seminar discussions and attendance at performing and visual arts events on campus. Exploration of arts and aesthetics leading to performance previews, reviews, and experiences of Brooks Center and Lee Gallery events. May be repeated for a maximum of nine credits. Preq: Membership in Calhoun Honors College. Coreq: HON 2101.

HON 2101 - Experiencing the Arts (Honors) Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany HON 2100. Coreq: HON 2100.

HON 2200 - Studies in Social Science (Honors)
3 Credits (3 Contact Hours)
Discipline specific social science seminar including a disciplinary introduction (anthropology, economics, history, political science, psychology or sociology) and a detailed examination of specific theories and methods within that discipline. May be repeated for a maximum of six credits, but only if different disciplines are covered. Preq: Membership in Calhoun Honors College.

HON 2210 - Studies in Literature (Honors)
3 Credits (3 Contact Hours)
Introduction to selected authors and literary works focused around a specific topic. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.

HON 2220 - Studies in Arts and Humanities (Honors)
3 Credits (3 Contact Hours)
Exploration of music, literature, film, philosophy or another area in humanities by examining a discipline specific topic. Focus may be on a particular scholar, era or culture idea or concept specific to a particular arts/humanities discipline. May be repeated for a maximum of six credits, but only if different disciplines are covered. Preq: Membership in Calhoun Honors College.

HON 2230 - Studies in Communications (Honors)
3 Credits (3 Contact Hours)
Explores various topics in communications. Focus may be on a particular type of communication, medium or theory. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.

HON 2240 - Global Issues
3 Credits (3 Contact Hours)
Exploration of various global issues across time and space. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Membership in Calhoun Honors College.
HON 3510 - Honors London Internship
1-6 Credits (3-18 Contact Hours)
Internship must be with an approved corporate, government, non-profit or other appropriate organization or setting in connection with the Honors College's Semester Study Abroad Program in London, UK. Preq: Junior standing; and consent of instructor; and membership in the Calhoun Honors College.

HON 4000 - Honors Contract
0 Credits (0 Contact Hours)
Advanced study and research taken in conjunction with any 3000- or 4000-level course. Contract requires prior approval by instructor and Honors Director. To be taken Pass/No Pass only. May be repeated once, but only if in conjunction with a different course. Preq: Membership in Calhoun Honors College.

HON 4010 - Interdisciplinary Honors Independent Study
1 Credits (1 Contact Hours)
Independent study taken in conjunction with another undergraduate course as part of the student's approved interdisciplinary honors program. Preq: Membership in Calhoun Honors College.

HON 4990 - Honors Research
1-12 Credits (1-12 Contact Hours)
Honors directed research in an academic discipline. Topics include, but are not limited to, literature review, research design and execution, and reporting of results. May be repeated for a maximum of 12 credits. Preq: Membership in Calhoun Honors College.

Horticulture

HORT 1010 - Horticulture
3 Credits (3 Contact Hours)
Environmental factors and horticultural practices affecting optimum production of floral, fruit, ornamental, and vegetable crops. Includes a survey of the various areas of horticulture and their importance to society.

HORT 1020 - Experience Horticulture
1 Credits (2 Contact Hours)
Students experience the art, science, business, and diversity of horticulture through visits to greenhouses, nurseries, botanical gardens, athletic fields, golf courses, orchards, farms, and research fields and laboratories. Students learn about horticulture from a cross section of professionals sharing their work experiences. Preq: Freshman or sophomore standing in Horticulture or Turfgrass.

HORT 2020 - Selected Topics
1-3 Credits (1-3 Contact Hours)
Introduction to developing trends, concepts or technologies in horticulture and/or turfgrass. May be repeated for a maximum of three credits, but only if different topics are covered. Preq: Consent of instructor.

HORT 2080 - Landscape Appreciation
3 Credits (3 Contact Hours)
Deepens students' appreciation of natural and built environments through a study of landscape elements, styles, and professions. Landscapes ranging in scale from residential to regional are critiqued, and design principles and landscape ethics are discussed.

HORT 2100 - Growing Garden Plants in the Fall
3 Credits (2 Contact Hours)
Focuses on growing techniques for the production of ornamental and edible horticultural crops during the fall growing season. Lectures focus on scheduling, fertilization, irrigation, integrated pest management and marketing. Labs focus on providing hands-on opportunities to identify and grow flowering crops and vegetables in greenhouses and the field. Preq: HORT 1010. Coreq: HORT 2101.

HORT 2101 - Growing Garden Plants in the Fall Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany HORT 2100. Coreq: HORT 2100.

HORT 2110 - Growing Garden Plants in the Spring
3 Credits (2 Contact Hours)
Focuses on growing techniques for the production of ornamental and edible horticultural crops during the spring growing season. Includes scheduling, manipulation of vegetative growth and flowering, nutritional management and plant growth regulation. Labs focus on
providing hands-on opportunities to grow flowering crops and vegetables in the greenhouse and field. Preq: HORT 2100. Coreq: HORT 2111.

**HORT 2111 - Growing Garden Plants in the Spring Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany HORT 2110. Coreq: HORT 2110.

**HORT 2120 - Introduction to Turfgrass Culture**
3 Credits (3 Contact Hours)
Studies of the introductory principles associated with the art and science of turfgrass culture. Develops an understanding of the history and evolution of turfgrasses and turfgrass culture. Explores career potentials in turfgrass management. Explains the basic scientific principles and techniques associated with the propagation and establishment of fine turfgrasses. Preq: BIOL 1030 and BIOL 1040.

**HORT 2130 - Turfgrass Culture Laboratory**
1 Credits (2 Contact Hours)
Provides hands-on activities and understanding of basic principles and techniques in turfgrass culture. Students learn all phases of turfgrass management including identification, turfgrass culture, common turfgrass pest identification and control. Preq or concurrent enrollment: HORT 2120.

**HORT 2710 - Internship**
1-6 Credits (1-6 Contact Hours)
Preplanned, practical, supervised work experience to give beginning students on-the-job learning opportunities that support classroom experience. Students submit monthly reports and present a departmental internship seminar. Undergraduates may accumulate a maximum of six credits for participation in HORT 2710 and/or 4710. Preq: Consent of instructor.

**HORT 3030 - Landscape Plants**
3 Credits (2 Contact Hours)
Woody, ornamental plants and their aesthetic and functional uses in landscape developments. Study covers habit of growth, ultimate size, texture effect, period of bloom, color, and cultural requirements. Coreq: HORT 3031.

**HORT 3031 - Landscape Plants Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany HORT 3030. Coreq: HORT 3030.

**HORT 3040 - Annuals and Perennials**
3 Credits (2 Contact Hours)
Annual and perennial flowers' aesthetic appeal and functional uses and needs. Color, texture, bloom time, form, size, and growth requirements as they relate to designing, planting, and maintaining colorful landscapes. Preq: HORT 2080 and HORT 3030. Coreq: HORT 3041.

**HORT 3041 - Annuals and Perennials Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany HORT 3040. Coreq: HORT 3040.

**HORT 3080 - Sustainable Landscape Design, Installation and Maintenance**
3 Credits (3 Contact Hours)
Landscape planning of gardens using environmentally sensitive design, construction, and maintenance practices. Survey skills to obtain user perception and preference and environmental measurement skills are introduced. Offered fall semester only. Preq: HORT 1010.

**HORT 3090 - Sustainable Landscape Garden Design Laboratory**
1 Credits (3 Contact Hours)
Landscape garden design using sustainable environmentally sensitive concepts and practices. Techniques of sustainable landscape garden design including hand drawing, site assessment, client interview, user perception survey, plant selection, and professional presentation. Plant selection encourages establishing healthy ecosystems. Emphasis on interactions between design, installation, and maintenance phases. Preq or concurrent enrollment: HORT 3080.

**HORT 3100 - Growing Landscape Plants**
3 Credits (2 Contact Hours)

**HORT 3101 - Growing Landscape Plants Laboratory**
HORT 4000 - Selected Topics
1-6 Credits (1-6 Contact Hours)
Advanced study of any aspect of horticulture and/or turfgrass not addressed in other courses. May be repeated for a maximum of six credits, but only if different topics are covered.

HORT 4040 - Plant Propagation
3 Credits (3 Contact Hours)
Practices of plant propagation from seeds, bulbs, divisions, layers, cuttings, grafting, and plant tissue culture are introduced. Physiological principles of pollination and seed biology, plant growth, regulators, source sink relations, life cycles and developmental phase transitions explain the practices. Environmental and economic contexts frame the preferred practices. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HORT 4050 - Plant Propagation Techniques Laboratory
1 Credits (3 Contact Hours)
Techniques of plant propagation, including sexual methods: germination, scarification, and stratification. Asexual methods, including grafting, budding, cuttings, layering, tissue culture divisions, and separations. Students visit local nurseries. Preq or concurrent enrollment: HORT 4040. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HORT 4080 - Horticulture Discovery and Inquiry
1-3 Credits (1-3 Contact Hours)
Students learn about horticulture through research, service learning, and/or creative inquiry projects. They explore a topic of interest with faculty, organize a quality proposal, complete the project, and report results to appropriate professional audiences. May be repeated for a maximum of nine credits.

HORT 4090 - Senior Capstone Course
3 Credits (3 Contact Hours)
Student cognitive, affective and psychomotor learning (skills) in the field of environmental horticulture is assessed using real world professional situations requiring the command, analysis and synthesis of knowledge and skills acquired during the undergraduate experience. Preq: Senior standing in Horticulture.

HORT 4120 - Advanced Turfgrass Management
3 Credits (2 Contact Hours)
Advanced principles and practices associated with turfgrass management for golf courses, sports fields, sod production, and commercial lawn care. Topics include turfgrass physiology, plant growth and development, construction, turfgrass nutrition, irrigation, drainage, pesticide use and fate, and development of effective management systems. Preq: HORT 2120 or PES 2020. Coreq: HORT 4121. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HORT 4121 - Advanced Turfgrass Management Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany HORT 4120. Coreq: HORT 4120. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HORT 4200 - Applied Turfgrass Physiology
3 Credits (3 Contact Hours)
Advanced course in turfgrass science and management. Provides the current status and development of turfgrass stress physiology and research. Main topics include temperature, drought, traffic, edaphic stresses, new developments in the turf industry and environmental stewardship. Preq: HORT 2120, and HORT 2130. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

HORT (FOR) 4270 - Urban Tree Care
3 Credits (3 Contact Hours)
Principles, practices, and problems of protecting and maintaining trees in urban and recreational areas. Examines environmental and biological factors affecting trees in high-use areas, their management and cultural requirements, and the practices necessary for their protection and care as valuable assets in the landscape. May also be offered as FOR 4270. Preq: FOR 2050 or HORT 3030.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HORT (PES) 4330 - Landscape and Turf Weed Management**
3 Credits (2 Contact Hours)
Weed management strategies that include cultural, biological, and chemical methods are studied for landscape and turfgrass areas. Problem-solving skills and herbicide characteristics are emphasized. Coreq: HORT 4331. May also be offered as PES 4330. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HORT (PES) 4331 - Landscape and Turf Weed Management Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany HORT 4330. Coreq: HORT 4330. May also be offered as PES 4331. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HORT 4550 - Just Fruits**
3 Credits (3 Contact Hours)
Students explore the origins, biology, culture, and production of major temperate zone fruits: apples, berries, and cherries to pawpaws, peaches, and pomegranates, the familiar to the forbidden. They discover principles, practices, and technologies employed to grow, protect, and harvest the fruits that feed us from commercial orchards, organic farms, and backyards. Preq: HORT 1010. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HORT 4560 - Vegetable Crops**
3 Credits (3 Contact Hours)
Introduction to vegetable production, value-added products and nutrition using a farm-to-table approach. Provides an overview of vegetable production (small to large scale), the links between agriculture and human health, and the concept of value addition. Attention is given to the nutritious, whole-food benefits of vegetables and how they are used to reduce global protein-, calorie- and micronutrient-malnutrition. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HORT 4610 - Advanced Landscape Garden Design**
4 Credits (3 Contact Hours)
Garden design for urban or other highly visible locations. A specific specialty garden with environmental education potential will be designed. Finished plans include detailed planting, installation and maintenance, and communication. Emphasis is on establishing healthy plant communities, habitat linkages, and healthy water and soil. Includes Honors sections. Preq: HORT 3080 and HORT 3090. Coreq: HORT 4611. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HORT 4611 - Advanced Landscape Garden Design Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany HORT 4610. Coreq: HORT 4610. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HORT 4650 - Plant Molecular Biology**
3 Credits (3 Contact Hours)
Study of fundamental plant processes at both the cellular and molecular levels. Topics include genome structure and organization (both nuclear and organellar); regulation of gene expression and its role in cellular and whole-plant processes; transposable genetic elements; applications for biotechnology. Preq: Junior standing; and GEN 3020; and either BIOL 3040 or BIOL 3050. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HORT 4710 - Advanced Internship**
1-6 Credits (1-6 Contact Hours)
Preplanned work experience under competent supervision in approved agency dealing with horticultural endeavors. Gives advanced students on-the-job learning opportunities to apply acquired knowledge and skills. Monthly reports and final departmental seminar required. Undergraduates may accumulate a maximum of six credits for participation in HORT 2710 and/or 4710. Preq: Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**HORT 4720 - Landscapes + Health**
3 Credits (3 Contact Hours)
Explores the role of landscapes in human health and wellness. Historical healing places and contemporary urban environments are examined for evidence of psychological and physiological impacts. Readings include interdisciplinary research. Preq: Senior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**Humanities**

**HUM 3010 - Humanities**
3 Credits (3 Contact Hours)
Introduction to humanistic studies focusing on relationships among disciplines - painting, sculpture, architecture, music, literature, philosophy, and drama - beginning with prehistory and continuing to the Renaissance.

**HUM 3020 - Humanities**
3 Credits (3 Contact Hours)
Introduction to humanistic studies focusing on relationships among disciplines - painting, sculpture, architecture, music, literature, philosophy, and drama - beginning with the 17th century and continuing to the present.

**HUM 3060 - Creative Genius in Western Culture**
3 Credits (3 Contact Hours)
Investigation of creativity through study of great innovators in art, literature, music, and ideas. May be repeated once for credit.

**HUM 3090 - Studies in Humanities**
3 Credits (3 Contact Hours)
Interdisciplinary approach to the humanities. Special subject matter varies according to the instructor and as approved by the chair of the English Department. May be repeated once for credit.

**HUM (ENGL) 4560 - Literature and Arts of the Holocaust**
3 Credits (3 Contact Hours)
Addresses the Holocaust through literature, art, architecture, music, and film. Beginning with historical, political, and economic forces that contributed to the Holocaust, course then focuses on highly diverse creative responses to this event - responses that often reflect the difficulties and politics of these commemorative gestures. May also be offered as ENGL 4560. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**Industrial Engineering**

**IE 2000 - Sophomore Seminar in Industrial Engineering**
1 Credit (1 Contact Hours)
Addresses the industrial engineering program, best student practices, and career paths. Invited lecturers, as needed, and faculty provide lectures and demonstrations.

**IE 2100 - Design and Analysis of Work Systems**
3 Credits (2 Contact Hours)
Introduction to the tools and techniques used to design and analyze work systems for human use, including process improvement, workplace design and an introduction to the field of human factors and ergonomics. Preq: CE 2010 with a C or higher or ME 2010 with a C or higher; and ENGL 1020 with a C or higher or ENGL 1030 with a C or higher. Coreq: IE 2101.

**IE 2101 - Design and Analysis of Work Systems Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany IE 2100. Coreq: IE 2100.

**IE 2680 - Creative Inquiry Seminar in Industrial Engineering**
1 Credit (1 Contact Hours)
Students are introduced to creative inquiry methods, resources, and current activities in a seminar format. To be taken Pass/No Pass only. Includes Honors sections.

**IE 2800 - Deterministic Operations Research**
IE 3000 - Junior Honors Seminar
1 Credit (1 Contact Hours)
Acquaints students enrolled in the Departmental Honors Program with current research issues in the profession. This assists students in preparing a research proposal for the senior thesis. Preq: Junior standing and admission to Departmental Honors Program.

IE 3010 - Systems Design I
4 Credits (3 Contact Hours)
Introduction to the design of industrial engineering systems. Design methodologies are introduced in the context of a design process that includes identifying user needs; developing a design specification; generating, evaluating, refining, and selecting design concepts; detail design; constructing, testing, and refining prototypes; and delivering the product to the customer. Preq: ENGR 1020 or ENGR 1060 with a C or better; and ENGL 1020 or ENGL 1030 with a C or better. Coreq: IE 3011.

IE 3011 - Systems Design I Laboratory
0 Credit (3 Contact Hours)
Non-credit laboratory to accompany IE 3010. Coreq: IE 3010.

IE 3140 - Seminar in Industrial Engineering
1 Credit (1 Contact Hours)
Seminar to orient students to issues of professional development and professional practice of industrial engineering.

IE 3600 - Industrial Applications of Probability and Statistics I
3 Credits (3 Contact Hours)
Introduces central concept that overall system performance can be improved by taking uncertainty into account, especially through the reduction of variability. Specific industrial applications, such as decision analysis, reliability and probabilistic inventory models, are emphasized. Preq: MATH 2060 with a C or higher.

IE 3610 - Industrial Applications of Probability and Statistics II
3 Credits (3 Contact Hours)
Introduces central concept that apparent conflict between productivity and quality can be resolved through improvements in processes by introducing statistical thinking. Specific industrial applications, such as (static) simulation, quality control and reliability models, are emphasized. Preq: IE 3600.

IE 3680 - Professional Practice in Industrial Engineering
1 Credit (1 Contact Hours)
Seminar to orient students to issues of professional development and professional practice of industrial engineering.

IE 3800 - Deterministic Operations Research
3 Credits (3 Contact Hours)
Introduction to operations research models, including linear programming, integer linear programming, transportation and assignment problems, and network flows. Preq: MATH 3110 with a C or better.

IE 3810 - Probabilistic Operations Research
3 Credits (3 Contact Hours)
Probabilistic modeling of engineering systems. Topics include calculus-based probability, Markov processes, Poisson processes, queueing, and other selected topics. Preq: MATH 3110 with a C or higher and IE 3600.

IE 3840 - Engineering Economic Analysis
3 Credits (3 Contact Hours)
Basic principles and techniques of economic analysis of engineering projects. Consideration of time, value of money, short- and long-term investments, replacement analysis, depreciation methods, cost allocation, and measures of cost effectiveness. Preq: MATH 1080 with a C or better.

IE 3860 - Production Planning and Control
3 Credits (3 Contact Hours)
Fundamentals of forecasting demand, scheduling production, and controlling the movement and storage of material associated with production are studied. State-of-the-art manufacturing techniques are discussed. Preq: IE 2800 or MATH 4400.

IE 4000 - Honors Thesis
Individual or joint research project performed with a faculty mentor or committee of faculty. May be repeated for a maximum of six credits. Preq: IE 2680 and consent of mentor.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4040 - Creative Inquiry Research**
1-6 Credits (1-6 Contact Hours)
Research experience promoting reasoning, critical thinking, ethical judgment communication skills, and an understanding of the scientific method and engineering design. These applied/basic research experiences are usually undertaken with a team under the mentorship of a faculty member or advanced graduate student. May be repeated for a maximum of six credits.

**IE 4300 - Human Factors Engineering in Healthcare**
3 Credits (3 Contact Hours)
Focuses on how industrial engineers help improve the quality and safety of patient care. Students learn how healthcare is different from traditional industrial engineering sectors. A substantial part of the course is focused on learning how to apply industrial engineering tools, specifically those grounded in human factors, to healthcare problems. Preq: IE 2100 or IE 4880 or PSYC 3640 or PSYC 3680 or PSYC 4350.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4400 - Decision Support Systems in Industrial Engineering**
3 Credits (2 Contact Hours)
Study of design of decision support systems for production and service systems based on operations research models. Includes use of spreadsheets, databases, and integrated software development environments to implement decision support systems. Preq: ENGR 1090 with a C or better or ENGR 1410 with a C or better, or both CHE 1300 with a C or better and one of CPSC 1010 with a C or better or CPSC 1110 with a C or better or CPSC 1610 with a C or better. Coreq: IE 4401.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4401 - Decision Support Systems in Industrial Engineering Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany IE 4400. Coreq: IE 4400.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE (MGT) 4440 - International Perspectives in Industrial Management**
1-6 Credits (1-6 Contact Hours)
Provides an international perspective to industrial management via organized plant visits to businesses in a foreign country and lectures by and discussions with senior operations managers. Cultural visits and lectures are also organized to provide a holistic perspective to cover cultural and economic environment of the host country. Students are responsible for travel costs. May be repeated for a maximum of six credits. May also be offered as MGT 4440. Preq: Consent of instructor.

**IE 4460 - Modeling and Analysis of Manufacturing Systems**
3 Credits (3 Contact Hours)
Promotes competence in developing and applying quantitative models to improve the design and operation of manufacturing and assembly systems. Emphasis is placed on the underlying principles and analytical models for guiding how resources (humans, machines, tools, information) should be utilized to facilitate the flow of production jobs through a facility. Preq: IE 2800 and IE 3810 and IE 4400.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4520 - Reliability Engineering**
3 Credits (3 Contact Hours)
Probabilistic approach to assessing system reliability. Methods for analyzing serial, parallel, and complex systems. Reliability life testing and its acceleration are covered. Essential elements of maintainability are identified and related to system availability. Preq: IE 3610; or MATH 3020 and MATH 4000.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4560 - Supply Chain Design and Control**
3 Credits (3 Contact Hours)
Industrial engineering aspects of supply chains, including design and control of material and information systems. Preq: IE 3610 and IE 3860.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4570 - Transportation and Logistics Engineering**  
3 Credits (3 Contact Hours)  
Introduces transportation and logistics systems analysis from both analytical and practical perspectives. Covers methods for identifying level-of-service metrics and measuring system performance. Discusses key aspects of modeling, simulation, and other techniques for economic and quantitative analysis of transportation and logistics planning issues. Preq: Senior standing in an engineering, science, or management program; and MATH 1020 or MATH 1060 or MATH 1070.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4600 - Quality Improvement Methods**  
3 Credits (3 Contact Hours)  
Study of modern quality improvement techniques presented in an integrated, comprehensive context. Preq: MATH 1020 or MATH 1060 or MATH 1070; and junior standing.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4610 - Quality Engineering**  
3 Credits (3 Contact Hours)  
Design aspects of quality and the engineer's role in problems of quality in production systems. Preq: IE 3610.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4620 - Six Sigma Quality**  
3 Credits (3 Contact Hours)  
Study of DMAIC (Define, Measure, Analyze, Improve, and Control) elements of Six Sigma, project management, process analysis, quality function deployment, hypothesis testing, gage R&R, data analysis, multivari-analysis, design of experiments, statistical process control, and process capability analysis. Preq: One of STAT 3010 or STAT 4110 or IE 3600 or MATH 3010 or MATH 3020 or MATH 3090 or CHE 3070.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4630 - Quality in the Capital Projects Industry**  
3 Credits (3 Contact Hours)  
Covers topics in quality and lean principles relevant to the capital projects industry. Provides a broad overview on quality concepts and philosophies, quality management and inspection tools applicable to capital projects, Six Sigma Approach, lean concepts and value stream mapping. Preq: MATH 1020 or MATH 1060 or MATH 1070; and junior standing.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4650 - Facilities Planning and Design**  
3 Credits (3 Contact Hours)  
Study of the principles and techniques of facility planning and design. Discusses economic selection of materials handling equipment and integration of this equipment into the layout plan to provide effective product flow in production, distribution, and service contexts. Includes quantitative techniques for evaluation of facility design. Preq: IE 2100 and IE 2800 and IE 3810.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4670 - Systems Design II**  
4 Credits (2 Contact Hours)  
Provides students with the challenge of integrating and synthesizing general engineering knowledge into creatively solving real-world, open-ended problems. This includes developing the problem statement, objectives, and criteria; data collection; technical analysis; developing and integrating recommendations; and presenting results. Preq: All of the following Industrial Engineering courses: IE 2100, 2800, 3010, 3600, 3610, 3810, 3840, 4400, 4610, 4650, and 4820. Coreq: IE 4671.

**IE 4671 - Systems Design II Laboratory**  
0 Credits (4 Contact Hours)  
Non-credit laboratory to accompany IE 4670. Coreq: IE 4670.

**IE 4690 - Creative Inquiry Symposium in Industrial Engineering**  
1 Credits (1 Contact Hours)  
Provides a forum for exchange of results and ideas in creative inquiry student projects. To be taken Pass/No Pass only. Preq: IE 3680.
IE 4810 - Applications of Probability Models in Industrial Engineering
3 Credits (3 Contact Hours)
This second probabilistic operations research course provides a broader, more applied range of topics than the first (IE 3810 or IE 8030). Potential topics include decision making; utility theory; portfolio risk; optimization and hedging; inventory models for perishable products; revenue management; risk analysis; and static simulation. Preq: IE 2800 and IE 3600 and IE 3610 and IE 3840. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

IE 4820 - Systems Modeling
4 Credits (4 Contact Hours)
The purpose, theory, and techniques of modeling systems with dynamic events. Students learn a powerful analytical process to use in the analysis and improvement of systems in several industries, including transportation, logistics, manufacturing and service systems. Incorporates professional simulation software as a tool in evaluating the system performance. Preq: IE 3610 and 3810; or MATH 4400 and MATH 4410 and MATH 3020. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

IE 4840 - Applied Engineering Economics
3 Credits (3 Contact Hours)
Application of principles and techniques required to perform economic analysis of engineering projects in various sectors, such as manufacturing, public sector or the service sector. Topics include replacement analysis, project selection and selecting an analysis technique. Preq: One of CE 3520 or IE 3840; and one of IE 2800 or MATH 4400; and one of IE 3600 or MATH 4000; and one of IE 3610 or MATH 3020. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

IE 4850 - Survey of Optimization Methods and Applications
3 Credits (3 Contact Hours)
Survey of deterministic and stochastic optimization methods, theory and algorithms. Modeling, analysis and applications of optimization to modern industrial engineering problems. Preq: One of IE 2800 or MATH 4400; and one of IE 3810 or MATH 4410. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

IE 4860 - Scheduling
3 Credits (3 Contact Hours)
Introduction to the development and application of operations research approaches for sequencing and scheduling problems. Emphasis is placed on heuristic- and optimization-based solution methods and how they relate to practical approaches for scheduling and sequencing. Prior programming experience in any structured language or environment is required (e.g., C/C++, VBA, Matlab, etc.) Preq: One of IE 3860 or MGT 3900; and one of CPSC 1010 or CPSC 1110 or IE 4400 or MATH 3600 or MATH 3650. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

IE 4870 - Industrial Safety
3 Credits (3 Contact Hours)
Recognition and prevention of hazards; recognition and control of hazardous materials; developing and managing a safety program; designing inherently safe equipment and workplaces. Preq: MATH 1020 or MATH 1060 or MATH 1070; and junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

IE 4880 - Human Factors Engineering
3 Credits (3 Contact Hours)
Introduction to human performance and limitations in the design of effective and efficient systems. Covers issues related to changes in technology, impact of design on society, ethical issues in design of systems, and the cost benefits from designing systems and environments that often challenge perceived notions of benefits. Preq: Junior standing; and MATH 1020 or MATH 1060 or MATH 1070. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

IE 4890 - Industrial Ergonomics and Automation
3 Credits (2 Contact Hours)
Physical ergonomics and ergonomics in industrial settings, including work physiology, the physical environment, automated systems, and hybrid work systems. Preq: IE 2100. Coreq: IE 4891. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
**IE 4891 - Industrial Ergonomics and Automation Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany IE 4890. Coreq: IE 4890.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**IE 4910 - Selected Topics in Industrial Engineering**
3 Credits (3 Contact Hours)
Comprehensive study of any timely or special topic in industrial engineering not included in other courses. May be repeated for a maximum of 12 credits. Includes Honors sections.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

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**Innovation**

**INNO 1990 - Cross-Disciplinary Creative Inquiry**
1-4 Credits (1-4 Contact Hours)
Cross-disciplinary teams engage in projects with the goal of developing each student's ability to investigate issues; think critically; collect, analyze and interpret data; and communicate results relative to real-world applications. Arrangements with mentors must be established before registration. May be repeated for a maximum of nine credits.

**INNO 2990 - Cross-Disciplinary Creative Inquiry**
1-4 Credits (1-4 Contact Hours)
Cross-disciplinary teams engage in projects with the goal of developing each student's ability to investigate issues; think critically; collect, analyze and interpret data; and communicate results relative to real-world applications. Arrangements with mentors must be established before registration. May be repeated for a maximum of nine credits.

**INNO 3990 - Cross-Disciplinary Creative Inquiry**
1-4 Credits (1-4 Contact Hours)
Cross-disciplinary teams engage in projects with the goal of developing each student's ability to investigate issues; think critically; collect, analyze and interpret data; and communicate results relative to real-world applications. Arrangements with mentors must be established before registration. May be repeated for a maximum of nine credits.

**INNO 4990 - Cross-Disciplinary Creative Inquiry**
1-4 Credits (1-4 Contact Hours)
Cross-disciplinary teams engage in projects with the goal of developing each student's ability to investigate issues; think critically; collect, analyze and interpret data; and communicate results relative to real-world applications. Arrangements with mentors must be established before registration. May be repeated for a maximum of nine credits.

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**Integrated Pest Management**

**IPM 4010 - Principles of Integrated Pest Management**
3 Credits (3 Contact Hours)
Origins, theory, and practice of integrated pest management. Relationships among crop production and protection practices are explored. Economics of various control strategies are considered. Integrated pest management field projects are studied. Conventional and integrated pest management approaches are compared. Multidisciplinary plant problem analysis is introduced. Preq: ENT 3010 or PES 4070 or PLPA 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

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**International Studies**

**IS 1010 - Cross-Cultural Awareness International Experience**
0 Credits (0 Contact Hours)
Study of cross-cultural awareness as part of an international/study abroad experience. Minimum duration of the study abroad experience is four weeks. May be repeated. To be taken Pass/No Pass only.
IS 2100 - Selected Topics in International Studies
3 Credits (3 Contact Hours)
Topics in cross-cultural awareness and intercultural communications are studied in situ as part of a study abroad program. Addresses the impact of culture on behavior in intercultural contact in professional and personal contexts. May be repeated for a maximum of six credits, but only if different topics are covered.

Italian

ITAL 1010 - Elementary Italian
4 Credits (3 Contact Hours)
Introductory course stressing grammar, pronunciation, oral practice, and reading skills. Attention is given to practical everyday living as well as cultural considerations. Coreq: ITAL 1011.

ITAL 1011 - Elementary Italian Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany ITAL 1010. Coreq: ITAL 1010.

ITAL 1020 - Elementary Italian
4 Credits (3 Contact Hours)
Continuation of ITAL 1010. Preq: ITAL 1010. Coreq: ITAL 1021.

ITAL 1021 - Elementary Italian Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany ITAL 1020. Coreq: ITAL 1020.

ITAL 2010 - Intermediate Italian
3 Credits (3 Contact Hours)

ITAL 2011 - Intermediate Italian Laboratory
0 Credits (1 Contact Hours)

ITAL 2020 - Intermediate Italian
3 Credits (3 Contact Hours)

ITAL 2021 - Intermediate Italian Laboratory
0 Credits (1 Contact Hours)

ITAL 2970 - Creative Inquiry in Italian
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Arrangements with faculty members must be established prior to registration. Preq: Consent of faculty member.

ITAL 3010 - Introduction to Italian Literature
3 Credits (3 Contact Hours)
Study of selected texts of Italian literature in their artistic, cultural, and social context. May include theme and genre studies. Preq: ITAL 2020.

ITAL 3020 - Modern Italian Literature
3 Credits (0 Contact Hours)
Study of selected works from major 19th- and 20th-century Italian authors, including Manzoni, Verga, Svevo, Moravia, Ginzburg. Preq: ITAL 2020.
ITAL 3050 - Intermediate Italian Conversation and Composition
3 Credits (3 Contact Hours)
Practice in the written and spoken language with emphasis on vocabulary, pronunciation, and comprehension. Preq: ITAL 2020.

ITAL 3070 - Italian Civilization and Culture
3 Credits (3 Contact Hours)
Study of the significant aspects of Italian civilization and culture through analysis of literary texts, paintings, films, and magazine articles. Preq: ITAL 2020.

ITAL 3600 - Italian Literature to 1600
3 Credits (3 Contact Hours)
Examines selected topics in Italian literature from the Middle Ages to 1600. Readings include works by Dante, Boccaccio, Petrarca, Franco, Castiglione and Machiavelli. Preq or concurrent enrollment: ITAL 3020 or ITAL 3050.

ITAL 3970 - Creative Inquiry in Italian
1-4 Credits (1-4 Contact Hours)
Students focus on a special research area under the guidance of a faculty member. After acquiring the requisite background, students formulate hypotheses for a group project, develop a critical framework, and initiate research on a specific topic.

ITAL 3980 - Directed Reading
1-3 Credits (1-3 Contact Hours)
Directed study of selected topics in Italian literature, language, and culture. May be repeated for a maximum of six credits. Preq: Consent of department chair.

ITAL 4000 - Image of an Italian City
3 Credits (3 Contact Hours)

ITAL 4050 - Advanced Italian
3 Credits (3 Contact Hours)
Advanced language study emphasizing fluency in oral and written expression through discussion and analysis of contemporary Italian media. Preq: One 3000-level Italian course.

ITAL 4550 - Italian Film
3 Credits (2 Contact Hours)
Overview of Italian cinema. Topics may include history, genres, and major directors. Preq: ITAL 3050. Coreq: ITAL 4551.

ITAL 4551 - Italian Film Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ITAL 4550. Coreq: ITAL 4550.

ITAL 4750 - Advanced Italian Seminar
3 Credits (3 Contact Hours)
Concentrated research and discussion on advanced topics in Italian literature, film, art, or drama. May be repeated for a maximum of six credits. Preq: One 4000-level Italian course.

ITAL 4970 - Creative Inquiry in Italian
1-4 Credits (1-4 Contact Hours)
Continuation of research initiated in ITAL 3970. Students complete their project and disseminate their research results. Preq: ITAL 3970.

ITAL 4980 - Selected Topics
3 Credits (3 Contact Hours)
Study of selected topics in Italian literature, language, and culture. Taught in Italian. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Consent of department chair.

Japanese

JAPN 1010 - Elementary Japanese
4 Credits (3 Contact Hours)
Course for beginners in which fundamentals are taught and a foundation is provided for further study and the eventual ability to read and speak the language. The Japanese writing system is introduced. Students learn how to recognize and write the two alphabets Hiragana and Katakana. Three hours a week of classroom instruction and one hour a week in the language laboratory. Coreq: JAPN 1011.

JAPN 1011 - Elementary Japanese Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany JAPN 1010. Coreq: JAPN 1010.

JAPN 1020 - Elementary Japanese
4 Credits (3 Contact Hours)

JAPN 1021 - Elementary Japanese Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany JAPN 1020. Coreq: JAPN 1020.

JAPN 2010 - Intermediate Japanese
3 Credits (3 Contact Hours)

JAPN 2011 - Intermediate Japanese Laboratory
0 Credits (1 Contact Hours)

JAPN 2020 - Intermediate Japanese
3 Credits (3 Contact Hours)

JAPN 2021 - Intermediate Japanese Laboratory
0 Credits (1 Contact Hours)

JAPN 2970 - Creative Inquiry in Japanese
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Arrangements with faculty members must be established prior to registration. Preq: Consent of faculty member.

JAPN 3030 - Intensive Conversation and Composition in Japan
3 Credits (3 Contact Hours)

JAPN 3050 - Japanese Conversation and Composition
3 Credits (3 Contact Hours)
Practice in the spoken language with emphasis on vocabulary, Kanji, pronunciation, and comprehension; learning practical language skills and intercultural communication through various topics. Preq: JAPN 3050.

JAPN 3060 - Japanese Conversation and Composition
3 Credits (3 Contact Hours)
Continuation of JAPN 3050. More practice in the spoken language emphasizing vocabulary, Kanji, pronunciation, and comprehension. Learning practical language skills and intercultural communication through various topics. Preq: JAPN 3050.

JAPN 3070 - Japanese Civilization I
3 Credits (3 Contact Hours)

JAPN 3080 - Japanese Civilization II
3 Credits (3 Contact Hours)
JAPN 3160 - Japanese for International Trade I
3 Credits (3 Contact Hours)

JAPN 3970 - Creative Inquiry in Japanese
1-4 Credits (1-4 Contact Hours)
Students focus on a special research area under the guidance of a faculty member. After acquiring the requisite background, students formulate hypotheses for a group project, develop a critical framework, and initiate research on a specific topic.

JAPN 3980 - Directed Reading
1-3 Credits (1-3 Contact Hours)
Directed study of selected topics in Japanese literature, language, and culture. May be repeated for a maximum of six credits. Preq: Consent of department chair.

JAPN 4010 - Japanese Literature in Translation
3 Credits (3 Contact Hours)
Introduction to Japanese literature from 712 AD to the present. Cultivates an appreciation for Japanese literature and culture. All readings and discussions are in English. May not be used to satisfy general modern language requirements.

JAPN 4030 - Internship in Japan
3 Credits (3 Contact Hours)
Minimum of one month of full-time work experience in Japan. All work activities with host companies are conducted in Japanese. May be repeated for a maximum of six credits. Preq: JAPN 2020.

JAPN 4040 - Cultural Studies in Japan
3 Credits (3 Contact Hours)
Study of Japanese cultural topics on site in Japan through lectures, field trips, small student group reconnaissance excursions, and reporting sessions. All activities are conducted in Japanese. May be repeated for a maximum of six credits. Preq: JAPN 2020.

JAPN 4060 - Introduction to Japanese Literature
3 Credits (3 Contact Hours)
Students read contemporary Japanese narrative fiction, poetry, and drama in their historical and social context. Preq: 3000-level Japanese course.

JAPN 4110 - Studies in the Japanese Language I
3 Credits (3 Contact Hours)
Advanced training in the spoken and written language with emphasis on formal expressions. Preq: JAPN 3060.

JAPN 4120 - Studies in the Japanese Language II
3 Credits (3 Contact Hours)
In-depth study of Kanji characters. Preq: JAPN 4110.

JAPN 4160 - Japanese for International Trade II
3 Credits (3 Contact Hours)
Study of language and cultural environment of the Japanese-speaking market, including the linguistic and cultural idioms that support global marketing in general and the international marketing of textiles, agricultural products, and tourism in particular. Preq: JAPN 3160.

JAPN (ANTH) 4170 - Japanese Culture and Society
3 Credits (3 Contact Hours)
Focuses on basic themes in Japanese culture found in social interaction and ritual behavior. Japanese social organization, including marriage and family patterns, neighborhood and community organization, and gender roles receive extensive attention. All readings and discussions are in English. May not be used to satisfy general modern language requirements. May also be offered as ANTH 4170.

JAPN 4900 - Classical Japanese
3 Credits (3 Contact Hours)
Examination and analysis of premodern Japanese texts. Special emphasis is on the grammar and syntax of the classical language, its divergence from and influence upon the modern idiom. All coursework is conducted in Japanese. Preq: JAPN 3060.

JAPN 4910 - Senior Seminar in Japanese Literature
3 Credits (3 Contact Hours)
Close readings of various works of premodern and modern Japanese literature. Includes study of important authors and their representative works in prose and poetry. Familiarizes students with the cultural and linguistic nuances of literature in the original language. All readings and activities are in Japanese. Preq: JAPN 3060.

**JAPN 4970 - Creative Inquiry in Japanese**
1-4 Credits (1-4 Contact Hours)
Continuation of research initiated in JAPN 3970. Students complete their project and disseminate their research results. Preq: JAPN 3970.

**JAPN 4990 - Selected Topics in Japanese Culture**
3 Credits (3 Contact Hours)
Topic-generated examination of fundamental cultural themes in premodern and modern Japan, including, but not limited to, such topics as Japanese drama, poetry, prose, religious traditions, cinema, and folklore/mythology. May be repeated for a maximum of six credits, but only if different topics are covered. Readings and discussions are in English. May not be used to satisfy general modern language requirements.

**Justice Studies**

**JUST 2880 - The Criminal Justice System**
3 Credits (3 Contact Hours)
Social systems analysis of criminal justice agencies. Primary focus is on law enforcement and corrections and their interagency relationship with courts and prosecution. May also be offered as SOC 2880.

**JUST 2890 - Criminology**
3 Credits (3 Contact Hours)
Study of nature and causes of criminal behavior; societal attempts to control crime; social responses to crime, criminals, and the criminal justice system. May also be offered as SOC 2890.

**JUST 3980 - Computer Crime**
3 Credits (3 Contact Hours)
Traces the history of technological crime and evaluates forensic practices in light of legislation with an analysis of emerging case law. Addresses guidelines for the development of forensic laboratories, the creation of computer crime task forces, search/seizure of electronic equipment, and the evaluation of criminal subcultures. Preq: JUST 2880 or JUST 2890 or SOC 2880 or SOC 2890.

**JUST 4280 - Criminal Law**
3 Credits (3 Contact Hours)
Comprehensive exploration of substantive criminal laws at both the state and federal levels. Topics include affirmative defenses, elements of individual crimes, and judicially created legal doctrines, such as the Exclusionary Rule and the expectation of privacy. Constitutional principles and the application of the Bill of Rights are also examined. Preq: JUST 2880 or JUST 2890 or POSC 1010 or SOC 2010 or SOC 2880 or SOC 2890.

**JUST 4290 - Justice Administration**
3 Credits (3 Contact Hours)
Comprehensive evaluation of the administration of criminal justice. The course seeks to develop an understanding of how criminal justice components operate, interact with one another, and administer justice, and explores key theoretical approaches and organizational principles, models and typologies. Preq: JUST 2880 or JUST 2890 or POSC 1010 or SOC 2010 or SOC 2880 or SOC 2890.

**JUST 4680 - Criminal Evidence**
3 Credits (3 Contact Hours)
Introduction to the types of evidence, collection of evidence, chain of custody, and procedures relating to the introduction of evidence into judicial proceedings. Attention is given to Fourth Amendment constitutional issues, the development of law within American boundaries, and the cross-cultural development of law. Preq: JUST 2880 or JUST 2890 or POSC 1010 or SOC 2010 or SOC 2880 or SOC 2890.

**JUST 4860 - Creative Inquiry in Criminal Justice**
1-3 Credits (1-3 Contact Hours)
Faculty and students select criminal justice topics to investigate. Goals, research and outcomes vary from semester to semester and project to project. May be repeated for a maximum of 12 credits.

**JUST 4910 - Policing**
3 Credits (3 Contact Hours)
Introduction to the major issues of contemporary policing in the U. S. from a sociological perspective. Topics include the changing
functions and structure of policing, the police subculture, and the role of the police in a liberal democracy. Preq: ANTH 2010 or JUST 2880 or JUST 2890 or SOC 2010 or SOC 2880 or SOC 2890.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**JUST 4920 - Justice Leadership Practicum**
3 Credits (9 Contact Hours)
Students participate in selected field placements under supervision for eight hours weekly and in a weekly one-hour seminar. May be repeated once for a maximum of six credits. Preq: SOC 3880 and Junior standing and consent of instructor.

**JUST 4930 - Corrections**
3 Credits (3 Contact Hours)
Analysis of correctional alternatives. Topics include sentencing strategies and their impact, prison populations (male, female, and juvenile), inmate social structures, treatment and custody issues, community-based alternatives (probation, parole, electronic monitoring, and work release), and correctional management issues. Preq: ANTH 2010 or JUST 2880 or JUST 2890 or SOC 2010 or SOC 2880 or SOC 2890.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**JUST 4940 - Organized Crime**
3 Credits (3 Contact Hours)
Examines the multifarious aspects of criminal organizations, namely their structure, methods, and networks. Specific topics may include white-collar crime and traditional, nontraditional, and transnational organized crime. Preq: JUST 2880 or JUST 2890 or POSC 1020 or SOC 2010 or SOC 2880 or SOC 2890.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**JUST 4970 - Criminal Justice Senior Capstone**
2 Credits (2 Contact Hours)
Prepares students for career opportunities and the employment process, through the integration of theory, practical application, research design, and policy assessment in the criminal justice field. Students are presented with both learning assessments and tools for professional development. Preq: SOC 3880.

**JUST 4980 - Independent Study**
1-3 Credits (1-3 Contact Hours)
Guided independent study allows students to progress further in an area of study, theory, topic or medium not otherwise available through the curriculum, or to explore criminal justice topics in more depth. An approved proposal is required prior to registration. May be repeated for a maximum of six credits. Preq: Consent of instructor.

**JUST 4990 - Selected Topics in Criminal Justice**
3 Credits (3 Contact Hours)
Areas of current interest in criminal justice are explored. May be repeated for a maximum of six credits by special arrangement.

**Landscape Architecture**

**LARC 1150 - Introduction to Landscape Architecture**
3 Credits (3 Contact Hours)
Introduction to the foundations and contemporary sources of landscape architecture. The course surveys the relationship between landscape architecture and sustainability, medicine, engineering, art, the natural sciences, planning and development, psychology, recreation and tourism, architecture, preservation, and technology.

**LARC 1160 - History of Landscape Architecture**
3 Credits (3 Contact Hours)
History of design on the land from prehistory to the present. Overview of the interface of aesthetics, science, technology, and natural features that influence cultures in shaping places.

**LARC 1280 - Technical Graphics**
3 Credits (2 Contact Hours)
Introduction to rendering techniques, plan graphics, 3-D projection drawings, drafting skills, perspective drawing, and overview of computer graphics. Preq: Landscape Architecture major. Coreq: LARC 1281.

**LARC 1281 - Technical Graphics Laboratory**
LARC 1510 - Basic Design I
3 Credits (6 Contact Hours)
Studio introduction to design fundamentals through 2-D and 3-D application of basic systems and development of attitudes essential to the creative design process. Preq: Landscape Architecture major.

LARC 1520 - Basic Design II
6 Credits (12 Contact Hours)
Further investigations into design fundamentals through 2-D and 3-D application of basic systems and development of attitudes essential to the creative design process. Preq: LARC 1510.

LARC 1990 - Creative Inquiry in Landscape Architecture I
3 Credits (3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. Preq: Consent of faculty member/mentor.

LARC 2510 - Landscape Architecture Design Fundamentals
6 Credits (1 Contact Hours)
Compositional skills introduced in LARC 1510 and 1520 are applied to design in the landscape. Through research, design assignments and discussions, students derive and apply design principles to place, study the processes of design and develop an understanding of how design principles, plant materials and structures are used in the landscape. Preq: LARC 1520. Coreq: LARC 2511.

LARC 2511 - Landscape Architecture Design Fundamentals Laboratory
0 Credits (10 Contact Hours)
Non-credit laboratory to accompany LARC 2510. Coreq: LARC 2510.

LARC 2520 - Site Design in Landscape Architecture
6 Credits (1 Contact Hours)
Students apply lessons from LARC 2510 to site designs considering planting design, responsible land management strategies and appropriate use of materials. Also included are participatory and social behavioral aspects of design. Readings and seminar discussions are emphasized as integral to the design and decision making process. Preq: LARC 2510. Coreq: LARC 2521.

LARC 2521 - Site Design in Landscape Architecture Laboratory
0 Credits (10 Contact Hours)
Non-credit laboratory to accompany LARC 2520. Coreq: LARC 2520.

LARC 2550 - Community Design Studio
6 Credits (1 Contact Hours)
Studio focused on the study and design of communities and public spaces. Students explore multicultural, historical and ecological layers of community, as well as the role of landscape management and the creative design process to add new dimensions of meaning to these places. Preq: Sophomore standing. Coreq: LARC 2551.

LARC 2551 - Community Design Studio Laboratory
0 Credits (10 Contact Hours)
Non-credit laboratory to accompany LARC 2550. Coreq: LARC 2550.

LARC 2620 - Design Implementation I
3 Credits (1 Contact Hours)
Basics of landscape architecture construction methods and construction documents, including site information gathering and analysis, basic site grading and drainage, cut and fill, principles of stormwater management, and sustainable land management related to implementation. Includes explorations in hand and computer graphic techniques used in construction drawings. Preq: Consent of instructor. Coreq: LARC 2621.

LARC 2621 - Design Implementation I Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany LARC 2620. Coreq: LARC 2620.

LARC 2930 - Field Studies Internship
1-3 Credits (1-3 Contact Hours)
Skill-based practical work experience to give beginning students on-the-job learning opportunities. Requires a minimum of five weeks of
uninterrupted, supervised, practical experience with a preapproved commercial firm or public agency dealing with landscape architectural site issues. May be repeated for a maximum of six credits. To be taken Pass/No Pass only. Preq: Consent of instructor.

LARC 2990 - Creative Inquiry in Landscape Architecture II
3 Credits (3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. Preq: LARC 1990 and consent of faculty member/mentor.

LARC 3190 - Off-Campus Field Study
3 Credits (3 Contact Hours)
Intensive study of place in an off-campus setting as context for design. Numerous class trips to significant sites in the area of the off-campus programs. Bus trips to distant sites are also planned. Preq: LARC 2550.

LARC 3210 - Landscape Architectural Seminar
3 Credits (3 Contact Hours)
Lectures and seminars dealing with pertinent topics related to environmental, technological, and theoretical issues in landscape architecture, land planning, and urban design. May be repeated for a maximum of six credits. Preq: Junior standing.

LARC 3510 - Regional Design and Ecology
6 Credits (1 Contact Hours)
Study and analysis of natural and cultural landscapes at the regional scale. Introduction of landscape ecology as an informant to design. Basic overview of geographic information systems. Regional and ecological issues are applied in a final site design. Also includes relevant reading, discussion, and writing. Preq: Senior standing. Coreq: LARC 3511.

LARC 3511 - Regional Design and Ecology Laboratory
0 Credits (10 Contact Hours)
Non-credit laboratory to accompany LARC 3510. Coreq: LARC 3510.

LARC 3550 - Off-Campus Studio
6 Credits (1 Contact Hours)

LARC 3551 - Off-Campus Studio Laboratory
0 Credits (10 Contact Hours)
Non-credit laboratory to accompany LARC 3550. Coreq: LARC 3550.

LARC 3620 - Design Implementation II
3 Credits (1 Contact Hours)
Advanced landscape architecture construction methods and construction documents, including site information gathering, analysis, site grading and drainage, cut and fill, principles of stormwater management, sustainable land management related to implementation, materials research and use, sustainable planting strategies, site demolition and construction management. Includes explorations in appropriate graphic communication techniques. Preq: Consent of instructor. Coreq: LARC 3621.

LARC 3621 - Design Implementation II Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany LARC 3620. Coreq: LARC 3620.

LARC 3990 - Creative Inquiry in Landscape Architecture III
3 Credits (3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. Preq: LARC 2990 and consent of faculty member/mentor.

LARC 4050 - Urban Genesis and Form
3 Credits (3 Contact Hours)
Exploration of urban forms and developments within their historical context through off-campus, on-site lectures and exposure to historic cities and sites. Students visit historic and contemporary cities and analyze those places through readings and direct observations. Offered in the summer only. Preq: LARC 2520. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

LARC 4180 - Off-Campus Study Seminar
Students study various cultural and environmental factors to inform and enhance their off-campus experiences in Istanbul, Barcelona, Genoa, or Charleston. Preq: Landscape Architecture major.

**LARC 4230 - Environmental Issues in Landscape Architecture**
3 Credits (3 Contact Hours)
Overview of environmental and ecological issues and their relationship to landscape architecture practice and design. Preq: LARC 3550. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**LARC 4280 - Landscape Architecture Computer-Aided Design**
3 Credits (2 Contact Hours)
Introduces students to the use of computer technology in the landscape architectural design process. Covers the basics of computer applications used in the industry for conceptualizing, drafting, modeling, and graphic communications. Preq: Landscape Architecture major. Coreq: LARC 4281.

**LARC 4281 - Landscape Architecture Computer-Aided Design Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany LARC 4280. Coreq: LARC 4280.

**LARC 4330 - Historic Preservation in Landscape Architecture**
3 Credits (3 Contact Hours)
Study of historic landscape preservation in a number of contexts, including gardens, vernacular landscapes, parks, cemeteries, and battlefields. Preq: LARC 3550. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**LARC 4380 - Advanced Computer-Aided Design**
3 Credits (2 Contact Hours)
Advanced study in computer-aided design for students wishing to develop their skills beyond LARC 4280. Students develop advanced skills in illustrative drawings, construction drawings, desktop publishing, and other computer-based applications. Preq: LARC 4280. Coreq: 4381.

**LARC 4381 - Advanced Computer-Aided Design Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany LARC 4380. Coreq: LARC 4380.

**LARC 4430 - Community Issues in Landscape Architecture**
3 Credits (3 Contact Hours)
In-depth study of issues relevant to community design. Overview of physical design and related social issues. Preq: LARC 3550. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**LARC 4521 - Off-Campus Studio Laboratory**
0 Credits (10 Contact Hours)
Non-credit laboratory to accompany LARC 4520.

**LARC 4530 - Key Issues in Landscape Architecture**
3 Credits (3 Contact Hours)
Overview of research in landscape architecture and study of relevant research methods. Students write proposals for their own projects positioned within the larger context of research in the profession. Preq: Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**LARC 4540 - Urban Design Studio**
6 Credits (1 Contact Hours)
Landscape architectural design in the urban context. Students study urban issues and offer design solutions for urban areas. The course includes a reading and theory component, as well as an opportunity to collaborate with architecture students. Students attend an international field trip during Spring Break. Preq: Senior standing. Coreq: LARC 4541.

**LARC 4541 - Urban Design Studio Laboratory**
0 Credits (10 Contact Hours)
Non-credit laboratory to accompany LARC 4540. Coreq: LARC 4540.
LARC 4550 - Landscape Architecture Exit Project
6 Credits (12 Contact Hours)
Students select and produce professional level work. This capstone project may be a design-build project or a substantive research project. Exit studio synthesizes and builds upon skills developed throughout the landscape architecture program. Preq: Senior standing.

LARC 4620 - Design Implementation III
3 Credits (2 Contact Hours)
Advanced overview of construction materials and methods used in project implementation. Study characteristics, strengths, nominal sizes and uses of materials (asphalt, brick, concrete, stone, wood). Field trips, exercises, and preparation of construction documents develop understanding of how design ideas are realized in built form. Preq: Junior standing. Coreq: LARC 4621.

LARC 4621 - Design Implementation III Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany LARC 4620. Coreq: LARC 4620.

LARC 4710 - Chinese and Japanese Garden Traditions
3 Credits (3 Contact Hours)
This course examines Chinese and Japanese classical garden traditions within the context of the classical arts. Emphasis is placed on understanding garden design principles that deal with scenery manipulation and visualization, as well as an in-depth study of the Chinese classical design language, grammar and vocabulary. Preq: Junior standing.

LARC 4720 - South Carolina's Landscapes: Then and Now
3 Credits (3 Contact Hours)
This course investigates South Carolina's designed and cultural landscapes. It addresses the human impacts and settlement patterns, the state's natural and physical environments, and focuses on South Carolina's landscape legacy of the built environment. Preq: Junior standing.

LARC 4810 - Landscape Architecture Professional Practice
3 Credits (3 Contact Hours)
Lectures pertaining to the general considerations of landscape architecture office procedures. Topics include the professional relationship between the landscape architect and client, including ethical, legal and business issues, as well as portfolio development. Preq: Junior standing.

LARC 4900 - Directed Studies and Projects in Landscape Architecture
1-5 Credits (1-5 Contact Hours)
Comprehensive studies and/or research of special topics not covered in other landscape architecture courses. May be repeated for a maximum of ten credits. Preq: Consent of instructor.

LARC 4910 - Honors Research Methods for Landscape Architecture
1-3 Credits (1-3 Contact Hours)
Students investigate various research methodologies in landscape architectural design or related areas and apply to student generated project(s). Students generate a proposal for Landscape Architecture Honors Research. Preq: Junior standing and membership in Calhoun Honors College and consent of Department Honors Program Advisor.

LARC 4930 - Professional Office Internship
1-3 Credits (1-3 Contact Hours)
Office experience for advanced students. On-the-job learning requires a minimum of five uninterrupted sequential weeks of employment under the direct supervision of a preapproved registered landscape architect, architect, urban planner, or civil engineer. May be repeated for a maximum of six credits. To be taken Pass/Fail only. Preq: LARC 3620 and LARC 4540 and consent of instructor.

LARC 4940 - Landscape Architecture Honors Research
2-3 Credits (2-3 Contact Hours)
Independent, student-generated research on a preapproved topic conducted under the supervision and weekly guidance of a faculty member. Second in a sequence of three required courses for students enrolled in Departmental Honors Program. Written interim report and presentation to faculty and honors students are required before the end of the semester. May be repeated for a maximum of six credits. Preq: LARC 4910 and membership in Calhoun Honors College.

LARC 4950 - Landscape Architecture Honors Thesis
2-3 Credits (2-3 Contact Hours)
Continuation of independent research, conducted under the supervision and weekly guidance of a faculty member. Third in a sequence of three required courses for students enrolled in Departmental Honors Program. Written thesis is submitted and presented before the end of the semester to qualify for Departmental Honors. Preq: LARC 4940.
LARC 4970 - Selected Topics in Landscape Architecture
1-3 Credits (1-3 Contact Hours)
Study of selected topics in landscape architecture. May be repeated for a maximum of nine credits, but only if different topics are covered. Preq: Landscape architecture major.

LARC 4980 - Selected Topics in Landscape Architecture Studio
1-6 Credits (1-12 Contact Hours)
Study of selected topics in landscape architecture. May be repeated for a maximum of 12 credits, but only if different topics are covered. Preq: Landscape architecture major.

LARC 4990 - Creative Inquiry in Landscape Architecture IV
3 Credits (3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. Preq: LARC 3990 and consent of faculty member/mentor.

LARC 5030 - Landscape Architecture Portfolio
3 Credits (3 Contact Hours)
Presentation of the concepts of conventional portfolios, as well as electronic portfolios, both of which are designed to record and communicate students' academic experiences and achievements. The role of a portfolio within the landscape architecture profession is emphasized through lectures, demonstrations and presentations.

LARC 5510 - Landscape Architecture Design V
6 Credits (1 Contact Hours)
Studio work and adjunct lectures featuring complex problem-solving projects involving regional design analysis and planning, city planning and urban design, complex building relationships and intense site utilization in an urban setting. Studio may be taken in Charleston, Genoa, or Barcelona. Preq: LARC 4520. Coreq: LARC 5511.

LARC 5511 - Landscape Architecture Design V Laboratory
0 Credits (10 Contact Hours)
Non-credit laboratory to accompany LARC 5510. Coreq: LARC 5510.

LARC 5520 - Landscape Architecture Exit Project
6 Credits (12 Contact Hours)
Studio work on student-selected professional level exit project including design-build project or substantive research project. Exit studio synthesizes and builds on skills developed throughout the Landscape Architecture program. Also provides opportunities for students to inquire into areas of interest not otherwise covered. Preq: LARC 4520.

LARC 5620 - Landscape Architectural Technology IV
2 Credits (4 Contact Hours)
Studio course for the integration of design and technology. Preq: LARC 4620, and professional standing. Preq or concurrent enrollment: LARC 5520.

LARC 5810 - Landscape Architectural Professional Practice
3 Credits (3 Contact Hours)
Lectures dealing with general consideration of landscape architectural office procedures. Study of the professional relationships of the landscape architect to client and contractor, including problems of ethics, law, business, and portfolio development. Preq: Senior standing.

Language

LANG 2500 - Introduction to World Languages
3 Credits (3 Contact Hours)
Introduction to fundamental questions concerning the nature and use of human language throughout the world. Emphasizes the definition, genesis and theoretical characterization of language, as well as its role in social and political discourses. All readings and discussions are in English.

LANG 2540 - Introduction to World Cinemas
3 Credits (2 Contact Hours)
Introduction to the development of cinemas outside the United States through an examination of representative works, genres and movements in their cultural contexts. Conducted in English. All films are subtitled. Coreq: LANG 2541.
LANG 2541 - Introduction to World Cinemas Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany LANG 2540. Coreq: LANG 2540.

LANG 2970 - Creative Inquiry in Language
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Arrangements with faculty members must be established prior to registration.

LANG 3000 - Introduction to Linguistics and Foreign Language Learning
3 Credits (3 Contact Hours)
Introduction to the field of linguistics, including the study of phonetics, phonology, morphology, syntax, and semantics. Includes discussion of issues pertaining to foreign language acquisition.

LANG 3030 - Study Abroad Transfer
3-6 Credits (3-6 Contact Hours)
Course for credit transfer of any course taken abroad during a department-approved study. Requires a minimum of two contact hours per week for at least 15 weeks or equivalent. Students may take a course outside their concentration. May be repeated for a maximum of six credits. To be taken Pass/No Pass only. Preq: Consent of department chair.

LANG 3400 - Cosmopolis: The Myth of the City
3 Credits (3 Contact Hours)
Cross-cultural inquiry into the idea of the city through literary, political, and philosophical texts as well as film and architecture. Preq: Junior standing.

LANG 3420 - Sacred and Profane Bodies
3 Credits (3 Contact Hours)
Cross-cultural inquiry into the ambivalence surrounding female sexuality implicit in images of women and, in particular, the division of women into "earthly" and "divine" categories. Preq: Junior standing.

LANG 3560 - Faces of Evil
3 Credits (3 Contact Hours)
Cross-cultural inquiry into evil as an ineradicable challenge to representation disclosed by notions of the monstrous, the enemy, the infinite, and death in literature, cultural theory, and the arts. Preq: Junior standing.

LANG (ANTH) 3710 - Language and Culture
3 Credits (3 Contact Hours)
Surveys key topics, theories, and methodological approaches in linguistic anthropology. Examines the complex relationships among language, culture, and communicative behavior and provides students with conceptual tools that inform the study of language in its cultural contexts. May also be offered as ANTH 3710.

LANG 3910 - Medical Anthropology
3 Credits (3 Contact Hours)
Offers an introduction to medical anthropology, emphasizing the interdisciplinary and cross-cultural perspective in studying health, illness and medicine; provides a survey of major theoretical frames, concepts and methods in the field; and attends to application of anthropology in medicine, nursing and public health in the emerging global context. May also be offered as ANTH 3910. Preq: Junior standing.

LANG 3970 - Creative Inquiry in Language
1-4 Credits (1-4 Contact Hours)
Students focus on a special research area under the guidance of a faculty member. After acquiring the requisite background, students formulate hypotheses for a group project, develop a critical framework, and initiate research on a specific topic.

LANG 4000 - Phonetics
3 Credits (3 Contact Hours)
Study of basic phonetic concepts used in the study of sounds in language. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

LANG 4200 - France and the Francophone World
3 Credits (3 Contact Hours)
Selected masterpieces of French and Francophone Culture are considered within their historical and cultural context. All readings and
instruction are in English. No knowledge of the foreign language is required. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Sophomore standing.

**LANG 4500 - Risk and Danger**
3 Credits (3 Contact Hours)
Cross-cultural inquiry into the meanings of risk and danger as they are articulated in various literary and philosophical texts and films about gambling, duels, stunts, bullfights, wilderness adventure, and smoking. Preq: Junior standing.

**LANG (ENGL) 4540 - Selected Topics in International Film**
3 Credits (2 Contact Hours)
Presents subtitled films of specific world cultures and basic film theory and discourse applicable to the selected areas. Taught in English. May be repeated for a maximum of six credits with consent of department chair. May also be offered as ENGL 4540. Coreq: LANG 4541.

**LANG (ENGL) 4541 - Selected Topics in International Film Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany LANG 4540. May also be offered as ENGL 4541. Coreq: LANG 4540.

**LANG 4550 - Hispanic Film: Documentary and Feature**
3 Credits (3 Contact Hours)
Overview of theory and discourse on Hispanic film. Through lectures, discussions, and films, students become acquainted with film as a vehicle for understanding the Hispanic World. Taught in English. Films are in Spanish with English subtitles. Preq: Sophomore standing.

**LANG 4600 - Propaganda and the Totalitarian Recreation of the World**
3 Credits (3 Contact Hours)
Cross-cultural inquiry into the various languages (philosophical, political, literary, and filmic, among others) that form a crucial weapon in the striving for hegemony over desire that marks the modern totalitarian project. Preq: Junior standing.

**LANG 4620 - Borders**
3 Credits (3 Contact Hours)
Cross-cultural inquiry into representations of physical and non-physical borders. Provides a theoretical framework in which various forms of borders, limits, and boundaries can be studied through literature and other artistic media. Preq: Junior standing.

**LANG (POSC) 4850 - Global Affairs and Governments**
3 Credits (3 Contact Hours)
Designed for teachers and education students who wish to learn how to incorporate global affairs more fully into high school curricula. Overview of major topics involving foreign policies and world politics is provided. May also be offered as POSC 4850.

**LANG 4970 - Creative Inquiry in Language**
1-4 Credits (1-4 Contact Hours)
Continuation of research initiated in LANG 3970. Students complete their project and disseminate their research results. Preq: LANG 3970.

**LANG 4990 - Language Portfolio**
2 Credits (2 Contact Hours)
Students create a digital portfolio to demonstrate competencies in reasoning, critical thinking, problem solving skills, cross-cultural awareness, ethical judgment, and to document a study abroad or internship experience. Course also serves as a resource for academic and professional development. To be taken Pass/No Pass only.

**Language and International Health**

**LIH 1270 - Introduction to Language and International Health**
1 Credit (1 Contact Hour)
Survey of international health and related career opportunities, focusing on the two distinct emphasis areas of the major: community development and health administration. To be taken Pass/No Pass only.

**LIH 2970 - Creative Inquiry in Language and International Health**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Arrangements with faculty members must be established prior to registration.

**LIH 3970 - Creative Inquiry in Language and International Health**
LIH 4000 - Internship Abroad
3 Credits (3 Contact Hours)
One semester or summer, full-time internship in a health care or a health administration setting abroad. To be taken Pass/No Pass only. Preq: Second semester Junior standing.

LIH 4970 - Creative Inquiry in Language and International Health
1-4 Credits (1-4 Contact Hours)
Continuation of research initiated in LIH 3970. Students complete their project and disseminate their research results. Preq: LIH 3970.

Language and International Trade

LIT 1270 - Introduction to Language and International Trade
1 Credit (1 Contact Hours)
Survey of the nature of international trade and related career opportunities. Information and applications of specific relevance to tourism, agriculture, and textile industries are offered. To be taken Pass/No Pass only.

LIT 2970 - Creative Inquiry in Language and International Trade
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Arrangements with faculty members must be established prior to registration. Preq: Consent of faculty member.

LIT 3970 - Creative Inquiry in Language and International Trade
1-4 Credits (1-4 Contact Hours)
Students focus on a special research area under the guidance of a faculty member. After acquiring the requisite background, students formulate hypotheses for a group project, develop a critical framework, and initiate research on a specific topic.

LIT 4000 - Language and International Trade Internship
1-3 Credits (1-3 Contact Hours)
Mandatory internship with an international company in the U.S. or abroad. May be part-time or full-time during the summer or academic semester for a minimum of 1400 hours. After completing the internship, students register for three credits of LIT 4000 and write a research paper in the target language. To be taken Pass/No Pass only. Preq: CHIN 3160 or FR 3160 or GER 3160 or JAP 3160 or SPAN 3160; and twelve credit hours in a Language and International Trade technical option.

LIT 4020 - Language and International Trade Directed Study
3 Credits (0 Contact Hours)
Directed study of an individual project in language and international trade. To be taken Pass/No Pass only.

LIT 4970 - Creative Inquiry in Language and International Trade
1-4 Credits (1-4 Contact Hours)
Continuation of research initiated in LIT 3970. Students complete their project and disseminate their research results. Preq: LIT 3970.

Latin

LATN 1010 - Elementary Latin
4 Credits (4 Contact Hours)
Course for beginners designed principally to teach the reading of the language.

LATN 1020 - Elementary Latin
4 Credits (4 Contact Hours)
Continuation of LATN 1010.

LATN 2010 - Intermediate Latin
3 Credits (3 Contact Hours)
Review of the fundamental principles of grammar in conjunction with readings from the Classical period. Preq: LATN 1020.
LATN 2020 - Intermediate Latin
3 Credits (3 Contact Hours)
Continuation of LATN 2010 with the introduction of writings from the late Latin and Medieval periods. Preq: LATN 2010.

Law

LAW 3220 - Legal Environment of Business
3 Credits (3 Contact Hours)
Examination of both state and national regulation of business. Attention is given to the constitution and limitations of power, specific areas in which governments have acted, and the regulations that have been imposed in these areas. Includes Honors sections. Preq: Junior standing.

LAW 3330 - Real Estate Law
3 Credits (3 Contact Hours)
The nature of real property and means of acquiring rights therein: conveyance of ownership, creation and execution of deeds, mortgages, etc., landlord and tenant relationships, shared concepts, and government regulation.

LAW 3990 - Internship in Legal Studies
1-3 Credits (1-3 Contact Hours)
Faculty-supervised legal internship to give students learning opportunities that support their classroom experiences. Requires a minimum of six full-time weeks. Course enrollment and internship must occur in the same semester. Simultaneous credit cannot be received for another internship offering. May be repeated for a maximum of three credits. To be taken Pass/No Pass only. Preq: Junior standing.

LAW 4050 - Construction Law
3 Credits (3 Contact Hours)
Provides a practical knowledge of legal principles applied to the construction process and legal problems likely to be encountered by practicing construction professionals. Topics include construction contracting, liability, claims and warranties, documentation, and responsibility and authority of contracting parties. Preq: LAW 3220 or LAW 3330. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

LAW 4060 - Sports Law
3 Credits (3 Contact Hours)
Provides awareness of sport-related legal issues. Topics include contracts, torts, arbitration, mediation, criminal liability, intellectual property, gender equity, disabilities, drug testing, and professional and amateur organizations. Preq: LAW 3220 and Senior standing.

LAW 4200 - International Business Law
3 Credits (3 Contact Hours)
Intensive examination of the historical background of modern public and private international law; selected issues of public international law, such as human rights, law of war, United Nations system, and international litigation; selected issues of private international law, such as international sales, international trade, and formation and operation of multinational businesses. Preq: LAW 3220. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

LAW 4990 - Selected Topics
1-3 Credits (1-3 Contact Hours)
In-depth examination of timely topics in legal studies. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Senior standing and consent of instructor.

Leisure Skills

LS 1000 - Selected Topics
1 Credits (3 Contact Hours)
Presentation of leisure skills not covered in other courses. May be repeated for a maximum of three credits, but only if different topics are covered.

LS 1010 - Challenge Recreation Activities
Encourages students to broaden their leisure skills and improve self-image through challenge activities. Classroom instruction stresses how to get started safely in flying, scuba, canoeing, skiing, windsurfing, mountaineering, hang-gliding, ballooning, and other challenge activities.

**LS 1110 - Lapidary Arts**  
1 Credits (3 Contact Hours)  
Students learn the techniques used to transform raw materials such as gemstones, minerals, gold, and silver into objects of art, primarily jewelry.

**LS 1130 - Wood Carving**  
1 Credits (3 Contact Hours)  
Introduction to the art of wood carving. Students learn about types of wood, tools, carving, and shop safety.

**LS 1250 - Budget Travel**  
1 Credits (3 Contact Hours)  
Teaches the necessary skills to travel internationally on a budget. Students learn how to get the best airfares, research destinations, and build an itinerary. Packing, security, local transportation, and culture/reverse-culture shock are also discussed.

**LS 1260 - Group Initiatives**  
1 Credits (2 Contact Hours)  
Students learn to lead people in group initiatives, also called team building exercises, with the goal of developing trust, cooperation, risk-taking, and leadership among participants. Students learn specific initiatives to lead, as well as how to bring groups to their intended goals.

**LS 1330 - Women's Shotgun Shooting**  
1 Credits (3 Contact Hours)  
Introduces basic shotgun shooting skills and firearm safety. Topics include gun fitting, skeet and trap shooting, and gun and range safety. Course is designed to provide women a comfortable environment in which to learn the necessary skills to participate in shotgun shooting.

**LS 1340 - Women's Hunting Traditions**  
1 Credits (3 Contact Hours)  
Students receive hands-on instruction in shooting sports and the sport of hunting. Students are introduced to the safe and responsible use of firearms and archery, and learn how to participate safely in hunting.

**LS 1350 - Women's Riflery**  
1 Credits (3 Contact Hours)  
Introduces students to the basics of rifle shooting and safety. Students learn basic shooting skills and are exposed to more advanced topics, such as reloading, external ballistics and long range shooting. This course is designed to give women a comfortable environment to learn the skills necessary to participate in the sport of riflery.

**LS 1410 - Top Rope Climbing**  
1 Credits (3 Contact Hours)  
Basic rock climbing skills, including philosophy, safety, knots, climbing techniques, site and supplies selection, and nature/conservation issues are covered.

**LS 1430 - Mountain Biking**  
1 Credits (3 Contact Hours)  
Introduces the sport of mountain biking; guides students on techniques and procedures to plan and undertake rides. Covers both on-trail and off-trail bike mechanics used to keep bikes in proper working order.

**LS 1440 - Performance Cycling**  
1 Credits (3 Contact Hours)  
Provides aspiring cyclists with all the information necessary to be safe and successful cyclists. Students learn how to ride safely on open roadways, group riding skills, bike maintenance, and bike mechanics.

**LS 1450 - Camping and Backpacking**  
1 Credits (3 Contact Hours)  
Basic camping and backpacking skills including map and compass reading, outdoor cooking, camping hazards and safety, site selections, and trip planning.

**LS 1470 - Alpine Skiing**  
1 Credits (3 Contact Hours)  
Basic downhill snow skiing instruction including equipment selection, safety, and maintenance; parallel turns; edging; carved and linked
turns; wedeling; and safety and etiquette. There is an additional fee for this course. Taught during Christmas recess. (Contact the Department of Parks, Recreation and Tourism Management in October.)

**LS 1490 - Snowboarding**  
1 Credit (3 Contact Hours)  
Basic snowboarding instruction including equipment selection; safety; conditioning; and skills such as stopping, techniques for turning, and riding lifts. There is an additional fee for this course. Taught during Christmas recess. (Contact the Department of Parks, Recreation and Tourism Management in October.) May not be taken concurrently with LS 1470 or 3470.

**LS 1560 - Riflery**  
1 Credit (3 Contact Hours)  
Introduces the basics of rifle shooting and firearm safety. Students progress from beginning rifle shooting to more advanced topics such as reloading, external ballistics, and long-range shooting.

**LS 1570 - Shotgun Shooting**  
1 Credit (3 Contact Hours)  
Introduces students to basic shotgun shooting skills and firearm safety. Topics include gun fitting, chokes, gauges, ammunition, and different shotgun disciplines such as skeet, trap shooting, and sporting clays.

**LS 1580 - Archery**  
1 Credit (3 Contact Hours)  
Introduces students to the basic principles and skills of archery and helps them develop proper shooting form and marksmanship.

**LS 1590 - Hunting Traditions**  
1 Credit (3 Contact Hours)  
Basic, hands-on instruction in the shooting sports (shotgun, rifle, and archery) and the sport of hunting. Designed to introduce students to the safe and responsible use of firearms and archery equipment and safe hunting practices. Students are required to complete the South Carolina Department of Natural Resources Hunter Education certification.

**LS 1610 - Turkey Hunting**  
1 Credit (3 Contact Hours)  
Exposes students to the skills, techniques, and history of turkey hunting. Students learn gun and hunting safety; shotgun, muzzleloading, and archery hunting techniques; tracking; and basic calling techniques.

**LS 1640 - Whitewater Kayaking**  
1 Credit (3 Contact Hours)  
Flat-water and whitewater skills, techniques, safety, rescue, equipment selection and maintenance, and selection of routes/trips to participate in basic white-water kayaking. Students must possess basic swimming skills to enroll in this course.

**LS 1650 - Inland Kayak Touring**  
1 Credit (3 Contact Hours)  
Introduction to basic skills necessary for safe enjoyment of flatwater (non-tidal waters: lakes, slow moving rivers) kayak touring. Students learn equipment selection, strokes, safety, and rescue techniques. Students must demonstrate swimming competence to enroll in this course.

**LS 1670 - Canoeing**  
1 Credit (3 Contact Hours)  
Basic instruction in the nomenclature, strokes, and safety techniques in canoeing. Students must possess basic swimming skills to enroll in this course.

**LS 1690 - Sailing**  
1 Credit (3 Contact Hours)  
Basic instruction in the nomenclature, safety and rescue techniques, and skills required to skipper sailing craft. Students must possess basic swimming skills to enroll in this course.

**LS 1710 - Windsurfing**  
1 Credit (3 Contact Hours)  
Basic windsurfing instruction including rigging, launching, tacking, jibbing, rig and foot steering, safety, maintenance, equipment selection, rules-of-the-road, and racing techniques are covered. Offered Fall Break and first summer session. There is an extra fee for this course. Students must have the ability to swim 3000 yards and tread water for five minutes to enroll in this course.

**LS 1730 - Bass Fishing**  
1 Credit (3 Contact Hours)  
Provides basic knowledge and skills necessary to participate successfully in bass fishing.
LS 1750 - Fly Fishing
1 Credits (3 Contact Hours)
Introductory course in the techniques of fly-fishing. Students learn casting, fly-tying, and equipment selection.

LS 1760 - Beginning Fly Tying
1 Credits (3 Contact Hours)
The art of fly tying. Students learn basic fly tying techniques and gain a knowledge of materials and tools used in fly tying.

LS 1770 - Saltwater Fly Tying
1 Credits (3 Contact Hours)
Introduction to tying flies for saltwater applications of fly fishing.

LS 1790 - Scuba I
1 Credits (3 Contact Hours)
Teaches basic open water diving techniques; prepares students to complete requirements for the open water diving certification. Certifications are granted by an internationally recognized and accepted certifying agency. Students are required to pass a swim test required by certifying agency.

LS 1830 - Introduction to Rugby
1 Credits (3 Contact Hours)
Introduces students to the sport of Rugby. Covers history of the game, rules, and skills such as passing, kicking, and decision making.

LS 1850 - Bowling
1 Credits (3 Contact Hours)
Basic instructional program on techniques of bowling.

LS 1870 - Frisbee Sports
1 Credits (3 Contact Hours)
Focuses on the rules, history, and skills necessary for participating in various frisbee sports. Heavy emphasis is placed on Ultimate Frisbee and Frisbee Golf.

LS 1880 - Disc Golf
1 Credits (3 Contact Hours)
Introduces students to basic disc golf skills and knowledge. Topics include development of basic throwing skills, rules of the game, game strategy and disc golf etiquette.

LS 1890 - Tennis
1 Credits (3 Contact Hours)
Fundamental course stressing rules, strokes, and strategy, with ample opportunity for practice.

LS 1940 - Racquetball
1 Credits (3 Contact Hours)
Basic skills, knowledge of rules, strategy, and basic strokes.

LS 1950 - Intermediate Racquetball
1 Credits (3 Contact Hours)
Builds on knowledge gained in LS 1940. Students learn advanced swing mechanics, game strategy, and other advanced skills. Preq: LS 1940. Students who have not taken LS 1940 may demonstrate that they possess equivalent skill and obtain a registration override.

LS 1960 - Introduction to Billiards
1 Credits (3 Contact Hours)
Introductory course in the history, rules, and skills necessary to participate in billiards. Students learn different types of games, proper shot techniques, and equipment selection.

LS 1980 - Golf
1 Credits (3 Contact Hours)
Fundamental course stressing rules, strategy, and basic strokes.

LS 1990 - Intermediate Golf
Builds on the knowledge gained in LS 1980. Students learn to apply rules to common golf situations, improve ball striking, and course management. The skills and strategies taught are designed to improve existing golf scores.

**LS 2000 - Traditional Sports**
1 Credits (3 Contact Hours)
Introductory course in the history, rules, and skills necessary to participate in traditional sports. Students learn about and participate in basketball, volleyball, football, and softball.

**LS 2020 - Field Hockey**
1 Credits (3 Contact Hours)
Introduces the fundamental skills, history, and rules of field hockey.

**LS 2030 - Lacrosse**
1 Credits (3 Contact Hours)
Introduces the fundamental skills, history, and rules of men's and women's lacrosse.

**LS 2040 - Soccer**
1 Credits (3 Contact Hours)
Introduces the history, rules, and fundamental skills of soccer.

**LS 2100 - Learn to Dance**
1 Credits (2 Contact Hours)
Students develop an understanding of the qualities of dance, recognize the importance of dance as a leisure pursuit, and learn to dance different types of music. Dances include shag, waltz, cha-cha, foxtrot, as well as current dance trends.

**LS 2110 - Introduction to Belly Dance**
1 Credits (2 Contact Hours)
Introduces students to the Middle Eastern belly dance. In addition to learning choreography and belly dance skills, students are introduced to the traditions and origins of Middle Eastern belly dance.

**LS 2120 - Belly Dance II**
1 Credits (2 Contact Hours)
Designed to build on the dance and musicality skills developed during Introduction to Belly Dance, this course also introduces students to choreography, additional dance styles, improvisation, and the use of finger cymbals when they participate as a member of a percussion section. Preq: LS 2110.

**LS 2130 - Middle Eastern Dance**
1 Credits (2 Contact Hours)
Explores the various dance styles associated with middle eastern countries. Students learn dances, rhythms and traditions from Egypt, Libya, Morocco, Saudi Arabia, Lebanon and Turkey.

**LS 2140 - Modern Dance**
1 Credits (3 Contact Hours)
Introduction to modern dance techniques with emphasis on developing the style of movement and understanding the dance art form.

**LS 2150 - Contra Dance**
1 Credits (2 Contact Hours)
Introduces students to the social dance of Contra. Students learn the origin and history of Contra along with the basic dance steps and styles.

**LS 2160 - Ballroom Dance**
1 Credits (2 Contact Hours)
Students develop an understanding of advanced dance methods, learn about dance at social and competitive levels, and increase knowledge of a variety of both smooth and Latin steps. Dances include tango, cha-cha, waltz, foxtrot, and swing.

**LS 2190 - Country Western Dance**
1 Credits (2 Contact Hours)
Introduces traditional country western dance. Students learn traditional couples dances, line dances, and barn dances.

**LS 2200 - Shag**
1 Credits (2 Contact Hours)
Develops an understanding of the South Carolina state dance, its history and impact on the state. Students learn more advanced steps in shag, including bellyroll, sugarfoot, slide step, tiptoe up the ladder, pivot, and the thirteen steps.

**LS 2210 - Intermediate Shag Dance**
1 Credits (2 Contact Hours)
Builds on skills learned in LS 2200. Students improve their ability to improvise, add style, and add many different moves to their dance vocabulary. Preq: LS 2200.

**LS 2220 - Advanced Shag**
1 Credits (2 Contact Hours)
Exposes students to a competition level of shag. Students learn to break down a dance routine and to choreograph short routines. Preq: LS 2210.

**LS 2270 - Introduction to Swing Dance**
1 Credits (2 Contact Hours)
Introduction to vintage swing dance created in the 1920s-1950s, including Charleston, Lindy Hop, Jitterbug, and optional acrobatic moves used in performance and competition.

**LS 2280 - Intermediate Swing Dance**
1 Credits (2 Contact Hours)
Builds on skills learned in LS 2270 by improving students' ability to improvise, add style, musicality, and many additional moves to add to their dance vocabulary. Preq: LS 2270.

**LS 2290 - Advanced Swing Dance**
1 Credits (2 Contact Hours)
Focuses on competition level and style of swing dance. Students learn to break down and teach a routine to beginners. Students also learn the skills necessary to create and choreograph a short routine. Preq: LS 2280.

**LS 2310 - Bosu**
1 Credits (3 Contact Hours)
Introduces the group aerobic style of Bosu, which concentrates on physical stability, core strength, and general fitness.

**LS 2320 - Core Stability Training**
1 Credits (3 Contact Hours)
Teaches fundamentals of core training. Students learn basic anatomy, proper strength training, and how to design a program to fit their fitness goals.

**LS 2330 - Aerobic Dance**
1 Credits (3 Contact Hours)
Instruction in the development of skills for the safe improvement and maintenance of cardiovascular fitness, flexibility, and muscle tone utilizing dance movements and techniques.

**LS 2350 - Basic Yoga**
1 Credits (3 Contact Hours)
Develops flexibility, strength, sensitivity, energy, and a sense of relaxation through the study of basic yoga postures, conscious breathing, and meditation techniques.

**LS 2360 - Power/Ashtanga Yoga**
1 Credits (3 Contact Hours)
Power/Ashtanga Yoga is a comprehensive workout based on the Eastern philosophy of K. Pattabhi. Students learn the eight limbs of this philosophy and the rigorous series of postures that produce a high power, athletic workout with the purpose of detoxifying impurities in the body.

**LS 2370 - Kripalu Yoga**
1 Credits (3 Contact Hours)
Great emphasis is placed on learning breath work techniques to combine directly with the various kripalu yoga postures. The goal is to teach individuals the physiological reactions produced by this type of yoga in developing and restoring health.

**LS 2380 - Vinyasa Flow Yoga**
1 Credits (3 Contact Hours)
Explores the energetic, fluid movement of Yoga postures in sync with conscious breathing. Students study creative sequences using classical as well as innovative and advanced Yoga postures.
**LS 2420 - Meditation and Relaxation**  
1 Credits (2 Contact Hours)  
Exposes students to the benefits of relaxation and meditation techniques. Students learn different techniques used to relieve stress and promote relaxation.

**LS 2450 - Pilates**  
1 Credits (3 Contact Hours)  
Study of the history, philosophy, and fundamental movement concepts of Pilates.

**LS 2460 - Intermediate Pilates**  
1 Credits (3 Contact Hours)  
Course is designed to expand students' knowledge and practice of the principles, techniques and exercises learned in the basic Pilates course. Preq: LS 2450.

**LS 2500 - Marathon Training**  
1 Credits (3 Contact Hours)  
Provides students with the resources and knowledge to train for and successfully complete a marathon.

**LS 2510 - Running and Jogging**  
1 Credits (3 Contact Hours)  
Introduces the various components important to improving overall fitness level through a running or jogging activity. Topics include proper stretching exercises, nutrition, workout program design, and proper running techniques.

**LS 2580 - Self Defense**  
1 Credits (3 Contact Hours)  
Basic physical defense that incorporates risk avoidance and awareness techniques with basic physical defense options.

**LS 2640 - Aikido**  
1 Credits (3 Contact Hours)  
Introduces the modern Japanese martial art of Aikido.

**LS 2660 - Hapkido**  
1 Credits (3 Contact Hours)  
Introduces the fundamental skills and techniques of the self-defense based Korean martial art of Hapkido.

**LS 2700 - Sports Officiating**  
1 Credits (3 Contact Hours)  
Practical study of officiating for various sports. Includes studies and practical application of officiating rules and mechanics. Sports studied include football, basketball, softball, soccer, and introductions to a variety of other team sports.

**LS 2750 - Red Cross First Aid/CPR**  
1 Credits (3 Contact Hours)  
Gives students the knowledge and skills necessary to prevent, recognize, and provide basic care for infants, children, and adults with injuries and sudden illness.

**LS 2760 - First Aid/CPR for the Professional**  
1 Credits (2 Contact Hours)  
This American Red Cross CPRAED for the Professional Rescuer course teaches those with a duty to act the skills needed to respond appropriately to breathing cardiac emergencies, including the use of an Automated External Defibrillator (AED) to care for a victim of cardiac arrest.

**LS 2770 - Lifeguarding**  
1 Credits (3 Contact Hours)  
Students gain the knowledge and skills to prevent, recognize and respond to emergencies and to provide care for injuries and sudden illness. Upon course completion, students receive a lifeguarding certification from the American Red Cross.

**LS 2780 - Wilderness First Aid**  
1 Credits (2 Contact Hours)  
This American Red Cross Wilderness First Aid with Adult CPR course provides individuals involved with wilderness activities with the knowledge and skills to prevent, recognize and provide basic care for injuries and sudden illness when more advanced help is not immediately available.
**LS 2910 - Outdoor Leadership**  
1 Credits (3 Contact Hours)  
Introduces the skills necessary to lead others in a backcountry environment. Focus is on wilderness travel skills, minimum impact, group dynamics, leadership skills and decision making. Course also includes certification in Wilderness First Aid.

**LS 3470 - Advanced Alpine Skiing**  
1 Credits (3 Contact Hours)  
Advanced downhill snow skiing instruction in such techniques as mogul skiing, check turns, free-style, and racing. There is an additional fee for course. Taught over Christmas break. Credit is awarded for spring semester. (Contact Department of Parks, Recreation and Tourism Management in October.) Preq: LS 1470.

**LS 3560 - Riflery II**  
1 Credits (2 Contact Hours)  
Students build upon skills previously learned in the basic riflery course, and learn advanced skills, such as using ballistic software and chronographs, precision long range shooting and advanced reloading.

**LS 3580 - Advanced Shotgun Skeet**  
1 Credits (2 Contact Hours)  
Introduces students who have taken the basic shotgun course to the shotgun game of Skeet. Students learn the rules and techniques necessary to competitively participate in Skeet.

**LS 3890 - Intermediate Tennis**  
1 Credits (3 Contact Hours)  
Develops skills necessary to play at a competitive level of tennis. Students learn mechanically sound tennis skills, court positioning, court movement, proper shot selection, and strategic insight into the game. Preq: LS 1890.

**Library**

**LIB 1990 - Creative Inquiry in The Libraries**  
1-4 Credits (1-4 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

**LIB 2990 - Creative Inquiry in The Libraries**  
1-4 Credits (1-4 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

**LIB 3010 - Introduction to Patent Searching**  
1 Credits (1 Contact Hours)  
Introduction to patents with an emphasis on how patents fit into the research process. Students develop skills in creating effective patent search strategies, and evaluating and presenting their search results.

**LIB 3990 - Creative Inquiry in The Libraries**  
1-4 Credits (1-4 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

**LIB 4990 - Creative Inquiry in The Libraries**  
1-4 Credits (1-4 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

**Literacy**
EDLT 1030 - Learning Strategies
2 Credits (3 Contact Hours)
Students learn strategies of active learning and critical thinking skills, which become an integral part of their natural thinking processes. Students learn how to generalize and apply newly acquired strategies to a variety of settings and situations.

EDLT 4580 - Early Literacy: From Birth to Kindergarten
3 Credits (3 Contact Hours)
Provides Early Childhood Education majors with theory and research-based, developmentally appropriate instructional practices related to literacy development from birth to kindergarten. Factors related to assessment and communication within and between the family, school, and teacher are addressed. Designed to meet Read to Succeed state teacher certification requirements. Preq: Admission to the professional level.

EDLT 4590 - Teaching Reading in the Early Grades: K-3
3 Credits (3 Contact Hours)
Provides Early Childhood Education majors an understanding of teaching reading in the elementary school setting in kindergarten through third grade. Students investigate general principles of language and literacy development and learn methods for teaching and assessing children's literacy. Meets Read to Succeed state teacher certification requirements. Preq: Admission to the professional level. Coreq: EDEC 4000.

EDLT 4600 - Teaching Reading in the Elementary Grades: 2-6
3 Credits (3 Contact Hours)
Provides preservice teachers with an understanding of teaching reading in the elementary setting in grades 2-6. Students investigate general principles of language and literacy development and learn methods for teaching and assessing children's literacy. Preq: EDF 3010 and EDF 3020 and EDF 3340 and admission to the professional level.

EDLT 4610 - Content Area Reading: Grades 2-6
3 Credits (2 Contact Hours)
Provides preservice teachers with an understanding of teaching content area literacy in grades 2-6. Students learn methods and strategies for teaching children to learn with and make use of expository texts. Comprehension, the role of expository texts, and vocabulary learning in content areas are presented. Preq: EDLT 4600 and admission to the professional level. Coreq: EDLT 4611.

EDLT 4611 - Content Area Reading: Grades 2-6 Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany EDLT 4610. Coreq: EDLT 4610.

EDLT 4620 - Reading and Responding to Children's Literature in the Elementary Classroom
3 Credits (3 Contact Hours)
Introduces children's literature across genres. Participants examine strategies for responding to children's literature through various modes and explore cultural issues and controversies related to children's literature. Preq: EDLT 4600 and admission to the professional level. Coreq: EDEL 4520.

EDLT 4630 - Teaching Reading and Writing to English Language Learners
3 Credits (3 Contact Hours)
Within a framework of the dimensions of cross-cultural knowledge and knowledge of theories and principles related to second language acquisition, participants develop understanding of the reading and writing processes and instructional models, strategies and tools that offer supportive learning for English language learners. Preq: EDLT 4600 and admission to the professional level. Coreq: EDLT 4670.

EDLT 4670 - Principles and Strategies for Teaching English to Speakers of Other Languages in Elementary Schools
3 Credits (3 Contact Hours)
Introduces preservice teachers to theories and principles related to second language acquisition as applied in culturally and linguistically responsive classrooms. Presents instructional models and strategies for teaching the language acquisition process within a context of academics supportive of English language learners (ELLs) and their needs. Preq: Admission to the professional level. Coreq: EDEL 4050 and EDLT 4630.

EDLT 4800 - Foundations in Adolescent Literacy
3 Credits (3 Contact Hours)
Provides key theoretical and evidence-based foundations for instruction in adolescent literacy. Investigates historical and current theories of literacy by exploring how adolescents use literacy, including digital literacies, to construct, communicate and critique knowledge. This course meets Read to Succeed South Carolina state requirements. Preq: Secondary Education major.

EDLT 4980 - Secondary Content Area Reading
EDLT 4981 - Secondary Content Area Reading Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany EDLT 4980. Coreq: EDLT 4980.

Management

MGT 2010 - Principles of Management
3 Credits (3 Contact Hours)
Management's role as a factor of economic production. Functions of management, principles of organization, and behavior in organizations. Includes Honors sections.

MGT 2180 - Management Personal Computer Applications
3 Credits (6 Contact Hours)
Personal computer applications that support managers. Students learn from hands-on work rather than lecture.

MGT 2970 - Creative Inquiry Management
1-3 Credits (1-3 Contact Hours)
Students plan, develop, and execute a research project related to the field of management and present their findings. The development of the project includes lectures about research design, conduct, and data analysis. May be repeated for a maximum of six credits. Includes Honors sections.

MGT 3050 - Economics of Transportation
3 Credits (3 Contact Hours)
Topics include history and structure of transportation systems in the United States, the nature of transportation costs and rates, transportation systems as factors in industrial location, transportation policy, and the role of transportation in national security. Preq: Junior standing.

MGT (ECON) 3060 - Managerial Economics
3 Credits (3 Contact Hours)
Uses tools of economic analysis in classifying problems in organizing and evaluating information, and in comparing alternative courses of action. Bridges the gap between economic theory and managerial practices. May not be used to satisfy requirements for a degree in Economics. May also be offered as ECON 3060. Preq: ECON 2110.

MGT 3070 - Human Resource Management
3 Credits (3 Contact Hours)
Principles, concepts, and techniques concerned with effective and efficient utilization of personnel. Emphasizes motivation, leadership, and human behavior related to employer-employee relations. Topics include personnel recruitment, classification, selection, training, development, and performance evaluation. Includes Honors sections. Preq: STAT 3090 or equivalent (IE 3610 or MATH 3020 or PSYC 3090).

MGT 3100 - Intermediate Business Statistics
3 Credits (3 Contact Hours)
Quantitative methods of the management scientist with applications to business and industrial problems. Topics include regression analysis, correlation analysis, analysis of variance, sampling, and nonparametric methods. Includes honors sections. Preq: STAT 3090 or equivalent (IE 3610 or MATH 3020 or PSYC 3090); and MGT 2180 or equivalent (CPSC 2200).

MGT 3120 - Decision Models for Management
3 Credits (3 Contact Hours)
Exploration of ways in which management science decision models can help in making sound managerial decisions. Problem solving is Excel-based. Topics include linear programming, project scheduling, and simulation. Includes Honors sections. Preq: STAT 3090 or equivalent (IE 3610 or MATH 3020 or PSYC 3090); and MGT 2180 or equivalent (CPSC 2200).

MGT (ELE) 3150 - New Venture Creation
3 Credits (3 Contact Hours)
Through the development of a business plan, the course focuses on creating an organization capable of effectively exploiting a viable
opportunity. Topics include organization strategy and design, start-up capital, operations and sourcing issues, leadership, team building, and management of rapid growth.

**MGT 3170 - Logistics Management**  
3 Credits (3 Contact Hours)  
Management of physical distribution and supply systems with emphasis on design concepts, cost determinants, and control. Preq: MGT 3120.

**MGT 3180 - Management of Information Systems**  
3 Credits (3 Contact Hours)  
Introduction to information systems concepts and applications in business. Topics include software, hardware, decision support and knowledge based systems, database, information systems design and implementation, and the management of information systems. Preq: MGT 2010.

**MGT 3500 - Introduction to Business Analytics**  
3 Credits (3 Contact Hours)  
Introduces students to the common language, terminology and concepts related to business analytics, as well as to the business analyst profession and ways to manage business problems using business analytics. Students learn foundational technical, business and statistical concepts and skills. Preq: ACCT 3220 or MGT 3180.

**MGT 3510 - Business Modeling, Analytics and Problem Solving**  
3 Credits (3 Contact Hours)  
This course focuses on problem solving using statistics to analyze business data. Case studies are used to address business problems in data management, model fitting, model interpretation, and diagnostics. Model approaches include selected topics from multivariate analysis, exploratory data analysis, and linear models. Preq: MGT 3100.

**MGT 3900 - Operations Management**  
3 Credits (3 Contact Hours)  
Examines the role of operations management in both manufacturing and service organizations. Discusses the concepts, tools, and techniques for managing the operations function. Topics include operations strategy, design, planning, and control. Preq: STAT 3090 or equivalent (IE 3610 or MATH 3020 or PSYC 3090); and MGT 2180 or equivalent (CPSC 2200).

**MGT 3980 - Internship in Management**  
1-3 Credits (1-3 Contact Hours)  
Faculty-supervised management internship to give students learning opportunities that support their classroom experiences. Requires at least 150 hours of internship work per credit hour received. Course enrollment and internship must occur in the same semester. May be repeated for a maximum of three credits. To be taken Pass/No Pass only. Preq: Junior standing and a 2.0 cumulative grade-point average and consent of instructor.

**MGT 4000 - Management of Organizational Behavior**  
3 Credits (3 Contact Hours)  
Provides management students with a framework for understanding how behavior within business organizations is managed. Particular emphasis is on integrating management theory with recent developments in the behavioral sciences with distinct management applications. Theory, research, and business applications are considered. Preq: MGT 2010.

**MGT 4020 - Operations Planning and Control**  
3 Credits (3 Contact Hours)  
Managing, planning, and controlling production and service operations emphasizing demand forecasting, aggregate planning, production scheduling, and inventory management. Includes Honors sections. Preq: MGT 3900.

**MGT 4030 - Special Problems**  
1-3 Credits (1-3 Contact Hours)  
Students plan, develop, and execute a research project related to the field of management and defense studies. May be repeated for a maximum of six credits. Preq: Senior standing in Management.

**MGT 4040 - Advanced Statistical Quality Control**  
3 Credits (3 Contact Hours)  
Statistical quality control techniques as applied to all areas of quality control: process control, process capability, acceptance sampling, and economic aspects of quality decisions. Preq: MGT 3900.

**MGT 4080 - Lean Operations**  
3 Credits (3 Contact Hours)  
Examines the use of scientific methods for the design of operating systems for both manufacturing and services. Special emphasis is on the
development of the Toyota Production System for continuous improvement and the application of the relevant techniques to the design of facilities, jobs, and systems. Preq: MGT 3900.

**MGT 4110 - Project Management**
3 Credits (3 Contact Hours)
Examination and application of the project management body of knowledge. This consists of theory, tools, and techniques to organize, plan, and control individuals, teams, quality, and operations while conducting a project. Preq: STAT 3090 or equivalent (IE 3610 or MATH 3020 or PSYC 3090).

**MGT 4120 - Sourcing and Supplier Management**
3 Credits (3 Contact Hours)
Provides an understanding of the key issues in selecting and developing suppliers. Provides a conceptual framework to understand purchasing's function within the firm and its role in supply chain management. Preq: MGT 3900.

**MGT 4150 - Business Strategy**
3 Credits (3 Contact Hours)
Capstone course for seniors. Various methods are used in analyzing complex business problems, requiring students to integrate their knowledge of all areas of business. Student participation and written and oral communications are stressed. Includes Honors sections. Students must take this course at Clemson University. Preq: FIN 3060 or 3110; and MGT 2010; and MKT 3010; and Senior standing.

**MGT 4160 - Special Topics in Human Resources**
3 Credits (3 Contact Hours)
In-depth examination of advanced topics in Human Resource Management based on the developments in the Human Resource profession and interests of faculty. Emphasizes the strategic formulation and application of these topics to support organizational leadership. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: MGT 3070 and MGT 4000.

**MGT 4220 - Small Business Management**
3 Credits (3 Contact Hours)
Study of management of the small independently owned and operated business. Emphasizes analyzing new business opportunities, planning and establishing a growing concern, and managing the contemporary small business. Field experience in consulting with small businesses enhances students' understanding of the unique opportunities and problems of small business organizations. Preq: MKT 3010.

**MGT 4230 - International Business Management**
3 Credits (3 Contact Hours)
Survey of theoretical and institutional complexities of international business operations. Topics include exporting, importing, foreign investment, multinational corporations, and international payment system. Preq: Junior standing.

**MGT 4240 - Global Supply Chain Management**
3 Credits (3 Contact Hours)
Design, planning, control, and improvement of supply chains for competing effectively in the context of global operations. Topics include supply chain structure and configuration, approaches to intra-organizational and inter-firm integration, and complexities of material, information, and cash flows across international borders. Preq: MGT 3900.

**MGT 4250 - Compensation Management**
3 Credits (3 Contact Hours)
Examination of compensation employees seek in exchange for their efforts and contributions. Topics include government and union influences; job content analysis, description, and evaluation; developing pay structures; measuring and paying for performance; employee benefits; administration of the compensation plan; executive, managerial, professional, and sales. Preq: MGT 3070 and MGT 4000.

**MGT 4270 - Managing Continuous Improvement**
3 Credits (3 Contact Hours)
Examination of issues related to continuous improvement, including a systematic approach to selecting improvement areas, determining how to improve, plan, and manage the improvement process. Topics include selecting performance measurements, using teams to achieve breakthrough change, identifying root causes of problems, and developing and implementing solutions to problems. Preq: MGT 3900.

**MGT 4300 - Senior Seminar in Management**
3 Credits (3 Contact Hours)
In-depth study of current business topics; allows senior Management students to relate their academic studies to real-world problems. Senior paper is required. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Senior standing.

**MGT 4310 - Employee Diversity, Rights, and Responsibilities**
3 Credits (3 Contact Hours)
Focuses on employee and organizational rights and responsibilities. Topics include various types of discrimination (race, sex, religion,
national origin, age, and disability status); drug and alcohol testing; AIDS in the workplace; employee discipline and termination issues; privacy and safety concerns; and union organizing campaigns. Preq: MGT 3070 or MGT 4000.

**MGT 4350 - Personnel Interviewing**
3 Credits (3 Contact Hours)
Helps students understand current interviewing theory, conduct an employment interview, and advise their future employers how to improve interviewing programs. Topics include job analysis, legal issues, types of interviews, and evaluating applicants. Preq: MGT 3070 or MGT 4000.

**MGT 4360 - White-Collar Crime**
3 Credits (3 Contact Hours)
White-collar crime and corruption are examined from a managerial perspective. Topics include financial crimes, crimes against consumers, environmental crimes, acts of institutional corruption, the impact of organized crime on legitimate businesses, and computer crime. Preq: Senior standing. Preq or concurrent enrollment: FIN 3060.

**MGT (IE) 4400 - Negotiations**
3 Credits (3 Contact Hours)
Focuses on principles and practice in business negotiations. Topics include negotiating concepts, strategies, situational applications, and practice in applied techniques. Situations include negotiation in sales, customer relations, global nuances in negotiation situations, employee management, and career development. Preq: Senior standing.

**MGT 4440 - International Perspectives in Industrial Management**
1-6 Credits (1-6 Contact Hours)
Provides an international perspective to industrial management via organized plant visits to businesses in a foreign country and lectures by and discussions with senior operations managers. Cultural visits and lectures are also organized to provide a holistic perspective to cover cultural and economic environment of the host country. Students are responsible for travel costs. May be repeated for a maximum of six credits. May also be offered as IE 4440. Preq: Consent of instructor.

**MGT 4500 - Advanced Business Analytics**
3 Credits (3 Contact Hours)
This course deepens students' understanding of how to manage and analyze business data to gain competitive advantages. Case studies, projects and real-world business problems are utilized to give opportunity for students to apply business and analytics skills and use business analytics software applications. Preq: MGT 3500.

**MGT 4520 - Business Analysis**
3 Credits (3 Contact Hours)
Follows the traditional systems development life cycle (SDLC), although alternative methodologies are also discussed. Focuses on earlier phases of the SDLC, from IS planning through specification of structured requirements and on the methods, techniques, and tools used to determine information requirements and their unambiguous documentation. Preq: MGT 3180; or MGT 2010 and ACCT 3220; or MGT 2010 and CPSC 2150 and CPSC 2310.

**MGT 4540 - Systems Implementation**
3 Credits (3 Contact Hours)
Builds upon skills of programming, database, and systems analysis and design by involving students with the later phases of the systems development life cycle (SDLC). Students design and develop a system using various platforms. Focus is on the logical and physical system design. Preq: MGT 3180.

**MGT 4550 - Emerging Information Technology Trends in Business**
3 Credits (3 Contact Hours)
In-depth study, through case studies, readings, and hands-on experience, of emerging information technologies in and across business organizations. Focuses on understanding, effective deployment, and impact of these technologies on business outcomes. Preq: MGT 3180; or MGT 2010 and ACCT 3220; or MGT 2010 and CPSC 2150 and CPSC 2310.

**MGT 4560 - Business Information Management**
3 Credits (3 Contact Hours)
In-depth study of business related data, information, and knowledge-based systems as well as business intelligence technologies and techniques, through readings, hands-on experience, and case studies. Emphasizes organizational decision-making and the ability to access data, information and knowledge-based assets where and when needed. Preq: MGT 3180; or MGT 2010 and ACCT 3220; or MGT 2010 and CPSC 2150 and CPSC 2310.

**MGT 4680 - International Internship in Management**
3 Credits (3 Contact Hours)
Pre-planned, pre-approved internship in conjunction with a Clemson Study Abroad program. Internships must be no fewer than eight weeks and a minimum of 30 hours a week. Preq: Management major or minor; and consent of instructor.

**MGT 4900 - Selected Topics in Industrial Management**
3 Credits (3 Contact Hours)
In-depth examination of advanced topics in Industrial Management. Topics may vary in keeping with developments in the management profession and interests of faculty. Emphasizes the application of these topics to the production and operations management environment. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: MGT 4020 or 4040 or 4080.

**MGT 4970 - Creative Inquiry Management**
1-3 Credits (1-3 Contact Hours)
Students plan, develop, execute, and direct a research project related to the field of management and present their findings. The project includes lectures about research design, conduct, and data analysis. May be repeated for a maximum of six credits. Includes Honors sections.

**Marketing**

**MKT 2980 - Creative Inquiry in Marketing**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Consent of faculty member/mentor.

**MKT 3010 - Principles of Marketing**
3 Credits (3 Contact Hours)
Principles and concepts involved in planning, pricing, promoting, and distributing of goods and services. Includes Honors sections. Preq: ECON 2000 or ECON 2110 or ECON 2120 or any 2000-level AGRB course; and sophomore standing.

**MKT 3020 - Consumer Behavior**
3 Credits (3 Contact Hours)
Examination of selected individual and group behavioral science concepts and their application to the understanding of consumer decision making. Preq: MKT 3010.

**MKT (ELE) 3140 - New Venture Creation I**
3 Credits (3 Contact Hours)
First in a two-part series that continues with MGT (ELE) 3150 assessing entrepreneurial opportunities. Focuses on creativity, idea generation, market opportunity analysis, strategy, and methods of entry. Opportunity analysis may be developed into a full new venture plan in ELE 3150 or MGT 3150. May also be offered as ELE 3140. Preq: Junior standing.

**MKT 3210 - Sports Marketing**
3 Credits (3 Contact Hours)
Exploration of the essentials of effective sports marketing. Topics include application of marketing principles in the sports area, licensing issues, sponsorships and endorsements, stadium and arena marketing, broadcasting and media considerations, public policy and sports, and unique marketing challenges for sport specific products (football, basketball, baseball, motorsports, etc.) Preq: MKT 3010.

**MKT 3220 - Social Media Marketing**
3 Credits (3 Contact Hours)
Examines how consumers interact with firms in social media spaces, the norms and purposes of these platforms, and the communications strategies available on them. Through class discussion, teamwork and presentations, students learn to formulate effective social media promotions and overall strategy. Preq: MKT 3010.

**MKT 3310 - Marketing Metrics and Analytics**
3 Credits (3 Contact Hours)
Examines the derivation, meaning, use and communication of marketing metrics used to facilitate decision making in various areas, including, but not limited to, online and social media strategy, advertising, pricing, branding and product development. Students are also introduced to database management, including the use of Microsoft Excel. Preq: MKT 3010 and STAT 3090.

**MKT 3900 - Junior Honors Research**
1 Credits (1 Contact Hours)
Students select and complete a research project approved by a faculty advisor, in conjunction with an approved three-credit marketing
course (other than MKT 3010 or 4310). Students are expected to display a command of marketing theory and an ability to apply theory to their research. Preq: MKT 3010 and membership in Calhoun Honors College and consent of faculty member supervising research.

**MKT 3980 - Creative Inquiry in Marketing**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Consent of faculty member/mentor.

**MKT 3990 - Marketing Internship**
3 Credits (3 Contact Hours)
Pre-planned, preapproved, faculty-supervised marketing internships. Credit is only given for internships of at least ten full-time, consecutive weeks with the same internship provider. To be taken Pass/No Pass only. May be taken only once. Preq: MKT 3010 and consent of instructor.

**MKT 4200 - Professional Selling**
3 Credits (3 Contact Hours)
Current theories about the selling of goods and services to organizational buyers in the context of long-term relationships. Role playing, video-taped presentations, and other techniques are generally employed to enhance interpersonal communication skills. Preq: Junior standing and MKT 3010.

**MKT 4210 - Technical Selling**
3 Credits (3 Contact Hours)
Introduces the principles of selling across industry contexts with a focus on the technical selling role. Students learn critical thinking skills in developing selling strategy for technical applications and ideas. This course is intended for students in engineering and closely related science majors. Preq: ENGR 1050 or PKSC 1020.

**MKT 4230 - Promotional Strategy**
3 Credits (3 Contact Hours)
Emphasizes promotion as the communication function of marketing. Attention is given to communication theory and promotion's relation to mass and interpersonal communication. Factors affecting promotional decision-making process are explored, and promotion as a competitive tool is examined. Preq: MKT 3010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MKT 4240 - Sales Management**
3 Credits (3 Contact Hours)
Comprehensive examination of the planning, implementation, and control of professional sales organizations. Preq: MKT 3010 and either MKT 4200 or MKT 4210.

**MKT 4250 - Retail Management**
3 Credits (3 Contact Hours)
Retailing is studied from a decision-making approach. Topics include target market analysis, location analysis, merchandising, human resources, pricing and promotion. Preq: MKT 3010.

**MKT 4260 - Business-to-Business Marketing**
3 Credits (3 Contact Hours)
Study and analysis of the unique aspects of marketing goods and services to organizational buyers rather than household consumers. Emphasis is on developing strategic responses to market opportunities given competitive behavior. Preq: MKT 3010.

**MKT 4270 - International Marketing**
3 Credits (3 Contact Hours)
Study of marketing from the international point of view. Emphasis is on the necessary modification of marketing thinking and practice for foreign markets due to individual environmental differences. Preq: MKT 3010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MKT 4280 - Services Marketing**
3 Credits (3 Contact Hours)
Exploration and study of the nature of service organizations and the principles that guide the marketing of their products. Emphasis is on a marketing mix that is fundamentally different than that found in traditional goods marketing. Preq: MKT 3010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
MKT 4290 - Public and Nonprofit Marketing
3 Credits (3 Contact Hours)
Examines the role and application of marketing in public and nonprofit settings. Focuses on a conceptual understanding of the marketing discipline and marketing processes and shows how basic concepts and principles of marketing are applicable to public and nonprofit organizations. Preq: MKT 3010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MKT 4300 - Marketing Product Management
3 Credits (3 Contact Hours)
Management of the firm's product or service offerings. Topics include new product screening, evaluation, and development; product line and mix analysis, abandonment decisions, brand manager's role, new product development department, and others. Emphasis is on decision making. Preq: MKT 3010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MKT 4310 - Marketing Research
3 Credits (3 Contact Hours)
Research used in marketing decision making. Emphasizes methods and techniques used in planning, collection, processing, and utilizing information. Topics include research design, sources of information, questionnaire design, sampling, data collection, and data analysis. Preq: Marketing major and MKT 3010 and STAT 3090. Preq or concurrent enrollment: MKT 3310.

MKT 4330 - Sport Marketing Strategy
3 Credits (3 Contact Hours)
Provides students with basic knowledge about brand management as it applies to sport. Addresses basic principles and guiding precepts of how sport-based organizations build strong brands. Preq: MKT 3210.

MKT 4340 - Sport Promotion
3 Credits (3 Contact Hours)
Emphasizes the promotional function of sport. Topics include event sponsorship, developing media relationships, endorsements, promotion objective setting and budgeting, media planning and scheduling, and utilizing the tools of promotion within a sport context. Integrated Marketing Communication provides the theoretical and managerial framework for how these factors are utilized optimally. Preq: MKT 3210.

MKT 4350 - Macromarketing
3 Credits (3 Contact Hours)
Examines the relationship between marketing and society, focusing on the social impact of marketing practices. Topics include technology, ethics, materialism, globalization, environmental sustainability, and the political and economic philosophy underlying marketing. Course is multidisciplinary and uses a variety of readings to cover each topic area. Preq: MKT 3010 and junior standing.

MKT 4500 - Strategic Marketing Management
3 Credits (3 Contact Hours)
Application of marketing constructs in analyzing and solving marketing problems. Emphasizes information systems, data analysis, and critical-thinking skills in solving marketing problems in a wide range of managerial decision areas, including, but not limited to, new product development, pricing, advertising, personal selling, channels, and international marketing. Preq: Marketing major and MKT 3010 and six credits of 4000-level marketing courses.

MKT 4900 - Senior Honors Thesis Research
3 Credits (3 Contact Hours)
Students, in consultation with a Marketing faculty member, choose a topic for the honors thesis and produce a research proposal that involves an imaginative approach to the subject, a sufficient literature review, a comprehensive introduction to the research topic, and a detailed research plan. Preq: MKT 3900.

MKT 4910 - Senior Honors Thesis Writing and Presentation
3 Credits (3 Contact Hours)
Students implement their research plans, write up their reports, and present and defend their Senior Honors Theses to an audience of Marketing faculty, Honors students, and invited others. Preq: MKT 4900.

**MKT 4950 - Selected Topics**
3 Credits (3 Contact Hours)
In-depth examination of timely topics in marketing. May be repeated for a maximum of 15 credits, but only if different topics are covered. Preq: MKT 3010.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MKT 4980 - Creative Inquiry in Marketing**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of six credits. Preq: Consent of faculty member/mentor.

**MKT 4990 - Independent Study**
1-3 Credits (1-3 Contact Hours)
Directed readings or independent research in selected marketing areas. Topics must be selected and proposed by student. Proposals must be approved by instructor. May be repeated for a maximum of three credits. Preq: MKT 3010 and consent of instructor.

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**Materials Science and Engineering**

**MSE 2100 - Introduction to Materials Science**
3 Credits (3 Contact Hours)
Introductory course in materials science designed primarily for engineering students. Studies the relation between the electrical, mechanical, and thermal properties of products and the structure and composition of these products. All levels of structure are considered from gross structures easily visible to the eye through electronic structure of atoms. Preq: CH 1010 with a C or better. Preq or concurrent enrollment: MATH 1080.

**MSE 2410 - Metrics Laboratory**
1 Credits (3 Contact Hours)
Provides basic knowledge of statistical techniques and testing procedures used to evaluate materials. Includes sampling procedures, calculation of averages, confidence intervals, Weibull statistics, precision and accuracy to enable quality decision making. Preq or concurrent enrollment: MSE 2100.

**MSE 2500 - Polymer and Fiber Materials I**
3 Credits (3 Contact Hours)
Introduction to the broad fields of textile, fiber, and polymer science and engineering with emphasis on the scientific, technological, and business principles utilized in producing fibers, yarns, and fabrics; enhancing fabric functionality by dyeing, finishing, and printing; and establishing end-use products.

**MSE 3000 - Honors Seminar**
1 Credits (1 Contact Hours)
Acquaints students enrolled in the Departmental Honors Program with current research issues in the profession. This assists students in preparing a research proposal for the Senior Thesis. To be taken Pass/No Pass only. Preq: Junior standing and admission to departmental honors program.

**MSE 3010 - Materials Synthesis and Fabrication Laboratory**
2-6 Credits (2-6 Contact Hours)
Students gain understanding of materials processing, with emphasis on the interrelationships between processing, microstructural development, and resulting properties. Students learn basic lab skills required for the fabrication of polymeric, ceramic, and metal materials. Preq: CH 2280 and MSE 2100.

**MSE 3020 - Materials Characterization Laboratory**
2-6 Credits (2-6 Contact Hours)
Students learn the basic lab skills required for the characterization of polymeric, ceramic, and metal materials, including characterization of the density, porosity, and electronic and mechanical properties. Additional techniques include optical and electron imaging of materials, thermal analysis, and spectroscopy for structural and chemical analysis. Preq: CH 2280 and MSE 2100.
MSE 3100 - Introduction to Metals and Ceramics
3 Credits (3 Contact Hours)
This course covers the fundamentals of atomic structure, defect formation, microstructural development and subsequent impact on physical properties in metallic and ceramic materials. Mechanical, electrical, magnetic, thermal, and optical properties are explored and phase diagrams are used to interpret processing routes and utilization. Preq: MSE 2100.

MSE 3190 - Materials Processing I
3 Credits (3 Contact Hours)
Introduction into the principles underlying the processing/manufacturing of ceramic, polymeric, and metallic materials. Preq or concurrent enrollment: MSE 2100.

MSE 3260 - Thermodynamics of Materials
3 Credits (3 Contact Hours)
Introduction to physical laws that govern the equilibrium products of chemical and thermal reactions. Covers the three laws of thermodynamics, phase equilibria, energy requirements for reactions, material corrosion, and environmental stability. Preq: CH 1020 and MSE 2100 and MATH 1080 and PHYS 2210.

MSE 3270 - Transport Phenomena
3 Credits (3 Contact Hours)
Kinetic aspects of mass, heat, and fluid transport as they relate to the processing and performance of materials. Preq or concurrent enrollment: MSE 2100 and MSE 3260 and MATH 2080.

MSE 3280 - Phase Diagrams for Materials Processing and Applications
3 Credits (3 Contact Hours)
Teaches students to use single component, binary, and ternary phase diagrams to analyze material processing routes and utilization. Considers reaction pathways by which material microstructure evolves and the relationship of reaction pathway to equilibrium phase diagrams. Also considers material interactions/degradation during use. Preq: CH 3310 or MSE 3260.

MSE 3420 - Structure/Property Laboratory
2 Credits (6 Contact Hours)
Provides a basic understanding of how microstructure interrelationships and processes affect the physical properties of materials and how environmental effects modify structure and mechanical behavior of materials. Preq: MSE 2410.

MSE 3610 - Processing of Metals and Their Composites
3 Credits (3 Contact Hours)
Examines the control of microstructure-property relationships in metallic materials and their composites through development and selection of innovative manufacturing methods. Preq: MSE 2100.

MSE 3950 - Honors Research I
3 Credits (9 Contact Hours)
Individual research under the direction of a Ceramic and Materials Engineering faculty member. Preq or concurrent enrollment: MSE 3270.

MSE 4020 - Solid State Materials
3 Credits (3 Contact Hours)
Discussion of the properties of solids as related to structure and bonding with emphasis on electronic materials. Band structure theory, electronic, and optical properties are treated. Preq: CH 3310 or MSE 3260; and MATH 2080; and PHYS 2210. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MSE 4070 - Senior Capstone Design
3 Credits (1 Contact Hours)
Work with industrial partners who have materials-related processes or product problems. Emphasizes interdisciplinary team approach and global perspective of products and problems. Incorporates critical thinking, group effectiveness, and problem solving with materials and processes. Collaborative efforts between industry and student academic teams are employed. Preq: Senior standing in Materials Science and Engineering. Coreq: MSE 4071.

MSE 4071 - Senior Capstone Design Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany MSE 4070. Coreq: MSE 4070.

MSE 4130 - Noncrystalline Materials
Study of the fundamentals of the noncrystalline state. Includes cooling kinetics and effects on formation as well as physical properties of noncrystalline substances in metallic, polymeric, and ceramic systems. Preq: MSE 3260. Preq or concurrent enrollment: MSE 4020. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MSE 4150 - Introduction to Polymer Science and Engineering**
3 Credits (3 Contact Hours)
Chemistry of monomers and polymers and the chemical and physical properties of polymers are discussed emphasizing fiber forming, synthetic polymers. Includes molecular characterization, structure, morphology, and mechanical properties as they relate to the design of polymer systems for end uses in textiles, geotextiles, plastics and fiber-reinforced composite materials. Includes Honors sections. Preq: CH 2010 or CH 2240. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MSE 4160 - Electrical Properties of Materials**
3 Credits (3 Contact Hours)
Covers a range of topics dealing with electrical and magnetic materials, including metal and polymer conductors, insulators, ceramic and polymer materials for dielectric applications, and ferroelectric, piezoelectric, pyroelectric, and electrooptic materials. Metal and ceramic magnetic materials are also discussed. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MSE 4220 - Mechanical Behavior of Materials**
3 Credits (3 Contact Hours)
Covers the microstructural basis of deformation and fracture in ceramic, metallic, and polymeric systems. Preq: CE 2010 and MATH 2080. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MSE 4240 - Optical Materials and Their Applications**
3 Credits (3 Contact Hours)
Introduces the interaction of materials with light. Specific topics include fundamental optical properties, materials synthesis, optical fiber and planar waveguides, and the componentry and systems-level aspects of optical communication systems. Preq: MSE 4020 and MSE 4130. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MSE 4320 - Manufacturing Processes and Systems**
3 Credits (3 Contact Hours)
Plant layout and design for manufacturing of ceramic products. Emphasizes process control and verification of processing results. Includes adaptation of computers in process simulation/robotics and the use of programmable logic controllers and robotics in processing. Preq: MSE 3260.

**MSE 4330 - Combustion Systems and Environmental Emissions**
3 Credits (3 Contact Hours)
Study of the application of burners, burner controls, firing atmospheres, hydrocarbon fuels, and other energy resources to industrial kilns, furnaces, and firing operations. Topics include energy resources, fuel chemistry, combustion analysis, ratio control systems, flow and pressure measurement and control, kiln atmosphere controls, industrial burners, and flames. Preq: MSE 3260.

**MSE 4410 - Manufacturing Laboratory**
1 Credits (3 Contact Hours)
Provides students with the understanding of process optimization. Emphasizes the use of complex experimental design schemes to elucidate the interrelationships between processing, microstructural development, and resulting properties. Preq: MSE 3420.

**MSE 4450 - Practice of Materials Engineering**
1 Credits (1 Contact Hours)
Students working in groups present and discuss practical, ethical, safety, business, and selected technical topics. Invited speakers discuss various aspects of the engineering world. To be taken Pass/No Pass only. Preq: Junior standing in Materials Science and Engineering.

**MSE 4550 - Polymer and Fiber Laboratory**
1 Credits (3 Contact Hours)
High molecular weight polymers are prepared from monomers, and their chemical and physical properties are measured as functions of critical end use parameters using instrumental and physical methods. Preq or concurrent enrollment: MSE 4150.
MSE 4560 - Polymer and Fiber Materials II
3 Credits (2 Contact Hours)
Chemicals used in the preparation of fabric for dyeing and finishing. Oxidizing and reducing agents and their control and effect on various fibers. Colloidal and surface active properties of various compounds and the fundamental factors influencing these properties. Preq: MSE 4150. Coreq: MSE 4561.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MSE 4561 - Polymer and Fiber Science II Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany MSE 4560. Coreq: MSE 4560.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MSE 4570 - Color Science
3 Credits (3 Contact Hours)
Understanding of physical, chemical, and mechanical principles behind the application of colors and finishes to textiles. Requires an appreciation of fiber chemistry and morphology, dye and finish structures and reactivity and mechanical principles behind equipment used to effect transfer of these chemicals onto the textile substrate. Includes Honors sections.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MSE 4580 - Surface Phenomena in Materials Science and Engineering
3 Credits (3 Contact Hours)
Introduction to surface phenomena focusing on fiber science. Fundamentals of interfacial phenomena embrace thermodynamics of surfaces, physics of adhesion, wetting, and finishing emphasizing specific features associated with interactions of liquids and chemicals with fibers and fibrous materials. Preq: Junior standing in engineering or science.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MSE 4590 - Color Science Laboratory
1 Credits (3 Contact Hours)
Introduction to common dyeing and printing methods and to some of the machinery necessary to carry out dyeing operations. Preq or concurrent enrollment: MSE 4570.

MSE 4600 - Surface Phenomena in Materials Science and Engineering Laboratory
1 Credits (3 Contact Hours)
Covers finishing in addition to dyeing operations and their instrumental control. Preq or concurrent enrollment: MSE 4580.

MSE 4610 - Polymer and Fiber Materials III
3 Credits (2 Contact Hours)
Familiarizes students with the physical properties of textile and high performance fibers and how these properties influence process and end-use performance; method of measuring those properties; and how those properties are related to structural features of the fiber. Includes Honors sections. Coreq: MSE 4611.

MSE 4611 - Polymer and Fiber Materials III Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany MSE 4610. Coreq: MSE 4610.

MSE 4810 - Undergraduate Research Fundamentals
1 Credits (1 Contact Hours)
Investigation of skills needed to become a successful, safety conscious and ethical researcher. This course reviews most safety training required by Clemson University, ethical decision making and the important skills, such as writing skills and record keeping, needed to be a successful researcher. Preq or concurrent enrollment: MSE 3260.

MSE 4900 - Selected Topics in Materials Science and Engineering
1-3 Credits (1-3 Contact Hours)
Study of topics not ordinarily covered in other courses. Taught as the need arises. Typical topics could include current research in a specific area or technological advances. May be repeated for a maximum of six credits, but only if different topics are covered. Includes Honors sections.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
MSE 4910 - Undergraduate Research
1-3 Credits (2-6 Contact Hours)
Investigation of a typical materials science and engineering research problem under the direct supervision of a faculty member. After completing the research, students prepare a formal written and oral report. May be repeated for a maximum of three credits. Preq: Consent of instructor.

MSE 4950 - Honors Research II
3 Credits (9 Contact Hours)
Individual research under the direction of a Ceramic and Materials Engineering faculty member. Preq: MSE 3950.

MSE 4970 - Honors Thesis
1 Credit (1 Contact Hours)
Preparation of honors thesis based on research conducted in MSE 3950 and 4950. Preq: MSE 4950.

Mathematical Sciences

MATH 1010 - Essential Mathematics for the Informed Society
3 Credits (3 Contact Hours)
Topics include logic and computers, probability and statistics, and financial mathematics. Specific topics include Boolean algebra, digital data formats, randomness, graphical representation of data, inference and estimation; interest, annuities, and amortization. Not open to students who have received credit for MATH 3010, 3020, 3090, or STAT 3010. Preq: Any MATH or STAT course or a score of 50 or higher on the Clemson Mathematics Placement Test.

MATH 1020 - Business Calculus I
3 Credits (3 Contact Hours)
Intuitive approach to the concepts and applications of calculus. Topics include functions and graphing, differentiation, and integration. Applications from social, biological, and management sciences are presented. Not open to students who have received credit for MATH 1060. Preq: Any MATH or STAT course or a score of 60 or higher on the Clemson Mathematics Placement Test.

MATH 1030 - Elementary Functions
3 Credits (2 Contact Hours)
Gateway course for MATH 1060. Comprehensive treatment of functions and analytic geometry with applications including polynomial, rational, algebraic, exponential, logarithmic, and trigonometric functions. Not open to students who have received credit for MATH 1050. To be taken Pass/No Pass only. Preq: Any MATH or STAT course or a score of 65 or higher on the Clemson Mathematics Placement Test. Coreq: MATH 1031.

MATH 1031 - Elementary Functions Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany MATH 1030. Coreq: MATH 1030.

MATH 1040 - Precalculus and Introductory Differential Calculus
4 Credits (4 Contact Hours)
Relevant precalculus and algebra review, limits, continuity and introduction to differential calculus. The combination of MATH 1040 and MATH 1070 covers the same calculus material as MATH 1060. MATH 1040 alone cannot be substituted for any calculus course. To be taken Pass/No Pass only. Not open to students who have received credit for MATH 1060. Preq: Any MATH or STAT course or a score of 65 or higher on the Clemson Mathematics Placement Test.

MATH 1050 - Precalculus
5 Credits (4 Contact Hours)
Extensive treatment of topics chosen to prepare students for the study of calculus. Special emphasis is given to polynomial, rational, exponential, logarithmic, and trigonometric functions and their graphs, as well as basic and analytic trigonometry. Students who have received credit for any other mathematical sciences course will not be allowed to enroll in or receive credit for MATH 1050. To be taken Pass/No Pass only. Coreq: MATH 1051.

MATH 1051 - Precalculus Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany MATH 1050. Coreq: MATH 1050.

MATH 1060 - Calculus of One Variable I
4 Credits (4 Contact Hours)  
Topics include analytic geometry, introduction to derivatives, computation and application of derivatives, integrals, exponential and logarithm functions. Includes Honors sections. Preq: A score of 80 or better on the Clemson Mathematics Placement Test.

**MATH 1070 - Differential and Integral Calculus**  
4 Credits (4 Contact Hours)  
Continuation of MATH 1040. Successful completion of MATH 1040 and MATH 1070 is equivalent to the completion of MATH 1060.  
Continuation of differential calculus and an introduction to integral calculus. Not open to students who have received credit for MATH 1060. Preq: MATH 1040.

**MATH 1080 - Calculus of One Variable II**  
4 Credits (4 Contact Hours)  
Topics include transcendental functions, applications of integration, integration techniques, indeterminate forms, improper integrals, parametric equations, polar coordinates, and infinite series. Includes Honors sections. Preq: MATH 1060 with a C or better or MATH 1070 with a C or better.

**MATH 1110 - Calculus II for Biologists**  
4 Credits (4 Contact Hours)  
Selected topics from integral calculus, eigenvalues and eigenvectors of matrices and differential equations are used to encourage the use of mathematics, computational tool and biological science in the study of relevant biological models. Credit toward a degree will be given for only one of MATH 1080 and MATH 1110. Preq: MATH 1060 or MATH 1070.

**MATH 1150 - Contemporary Mathematics for Elementary School Teachers I**  
3 Credits (3 Contact Hours)  
Cooperative learning groups, manipulatives, and concrete models are used to demonstrate logical reasoning, problem-solving strategies, sets and their operations, numeration systems, properties and operations of whole numbers, number theory, prime and composite numbers, divisibility, common factors and multiples. Open to Elementary, Early Childhood, and Special Education majors only. Preq: Any MATH or STAT course or a score of 50 or higher on the Clemson Mathematics Placement Test.

**MATH 1160 - Contemporary Mathematics for Elementary School Teachers II**  
3 Credits (3 Contact Hours)  
Continuation of MATH 1150. Manipulatives and concrete models are used for properties, operations, and problem solving for integers, elementary fractions, rational numbers, and real numbers. Selected topics in statistics and probability are introduced with a hands-on approach to learning. Restricted to Elementary, Early Childhood, and Special Education majors. Preq: MATH 1150.

**MATH 1170 - Mathematics for Elementary School Teachers I**  
3 Credits (2 Contact Hours)  
Problem-solving strategies, logic, algebraic thinking, sets, relations, functions, numeration systems, whole numbers, integers, number theory, fractions, decimals, applications of percent, real numbers with their computational algorithms and properties are explored. Content, according to state standards, is taught with appropriate methodology for teaching K-6. Preq: MATH 1010. Coreq: MATH 1171.

**MATH 1171 - Mathematics for Elementary School Teachers I Laboratory**  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany MATH 1170. Coreq: MATH 1170.

**MATH 1180 - Mathematics for Elementary School Teachers II**  
3 Credits (2 Contact Hours)  
Simple probability and descriptive statistics are reviewed. Two- and three-dimensional geometry including polygons, polyhedra and their properties; congruence, similarity, and constructions; coordinate system; standard measurement, area, surface area, volume; and motion geometry are explored. Content, according to State standards, is taught with appropriate methodology for teaching K-6. Preq: MATH 1170. Coreq: MATH 1181.

**MATH 1181 - Mathematics for Elementary School Teachers II Laboratory**  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany MATH 1180. Coreq: MATH 1180.

**MATH 1190 - Introduction to Discrete Methods**  
3 Credits (3 Contact Hours)  
Topics normally include elementary logic and methods of proof; sets, functions, and relations; graphs and trees; combinatorial circuits and Boolean algebra.

**MATH 1290 - Problem Solving in Discrete Mathematics**
Problem-solving approach to learning mathematics is applied to topics in modern discrete mathematics. Typical selection of topics includes logic and proof, sets, relations, functions, mathematical induction, graphs and trees, counting techniques, recurrence equations. For Bachelor of Science and Bachelor of Arts majors in Mathematical Sciences only. Credit may not be received for both MATH 1190 and MATH 1290. Preq: MATH 1060 or MATH 1070. Coreq: MATH 1291.

**MATH 1291 - Problem Solving in Discrete Mathematics Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany MATH 1290. Coreq: MATH 1290.

**MATH 1990 - Problem Solving in Mathematics**
3 Credits (2 Contact Hours)
Functions and graphs, mathematical modeling, and applications. Applications from management and life and social sciences are presented. Specific topics include linear, quadratic, polynomial, exponential, and logarithmic functions with emphasis on problem solving. Students who have received credit for any other mathematical sciences course will not be allowed to enroll in or receive credit for MATH 1990. To be taken Pass/No Pass only. Coreq: MATH 1991.

**MATH 1991 - Problem Solving in Mathematics Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany MATH 1990. Coreq: MATH 1990.

**MATH 2060 - Calculus of Several Variables**
4 Credits (4 Contact Hours)
Topics include real valued functions of several variables, multiple integration, differential calculus of functions of several variables, vector field theory. Includes Honors sections. Preq: MATH 1080 with a C or better or MATH 1110 with a C or better.

**MATH 2070 - Business Calculus II**
3 Credits (3 Contact Hours)
Introduction to the calculus of several variables, differential calculus and optimization of several variables, multiple integrals. Topics from the management sciences are used to illustrate the above concepts. May not be taken by students who have passed MATH 2060. Preq: MATH 1020 with a C or better or MATH 1060 or MATH 1070.

**MATH 2080 - Introduction to Ordinary Differential Equations**
4 Credits (4 Contact Hours)
Introduction to the study of differential equations and their application to physical problems. Topics include exact, series, and numerical solutions; solutions by means of Laplace transforms; and solutions of systems of differential equations. Includes Honors sections. Preq: MATH 2060.

**MATH 2100 - Applied Matrix Algebra**
3 Credits (3 Contact Hours)
Introduction to the basic principles of matrix algebra with applications to the behavioral and managerial sciences. Major areas of application include linear programming, directed graphs, and game theory. Preq: MATH 1020 or MATH 1060 or MATH 1070.

**MATH 2160 - Geometry for Elementary School Teachers**
3 Credits (3 Contact Hours)
Informal treatment of the basic concepts of geometry. Open to Elementary, Early Childhood, and Special Education majors only. Preq: MATH 1160.

**MATH 2190 - Introduction to Cryptography**
3 Credits (3 Contact Hours)
Introduction to mathematical cryptography aimed at first- or second-year students with no background in abstract mathematics. Topics include properties of integers, polynomials and finite fields; basics of algorithms, symmetric and public key cryptosystems; and cryptanalysis. Preq: MATH 1060 and freshman or sophomore standing.

**MATH 2500 - Introduction to Mathematical Sciences**
1 Credits (1 Contact Hours)
Introduction to areas of study, degree options, career choices, and professional development in mathematical sciences. Includes guidelines and requirements for portfolio development and an introduction to ethical issues. Preq: Sophomore standing.

**MATH 2990 - Creative Inquiry in Mathematical Sciences**
1-3 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These
creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of three credits. Preq: Consent of faculty member/mentor.

**MATH 3020 - Statistics for Science and Engineering**  
3 Credits (3 Contact Hours)  
Calculus based statistics course in methodology for collecting, organizing, and interpreting data. Topics include understanding variability, graphical and numerical summarization of data, introductory probability, normal and related distributions, statistical inference, basic experimental design, and simple linear regression. Statistical software is used. Preq: MATH 2060.

**MATH 3080 - College Geometry**  
3 Credits (3 Contact Hours)  
Theorems and concepts more advanced than those of high school geometry. Treatment of the various properties of the triangle, including the notable points, lines, and circles associated with it. Preq: MATH 1060 or MATH 1070.

**MATH 3110 - Linear Algebra**  
3 Credits (3 Contact Hours)  
Introduction to the algebra of matrices, vector spaces, polynomials, and linear transformations. Includes Honors sections. Preq: MATH 1080 or MATH 1110.

**MATH 3150 - Advanced Topics in Mathematics for Elementary Teachers**  
3 Credits (3 Contact Hours)  
Course builds and expands upon content from previous elementary mathematics courses. Covers investigation of two- and three-dimensional shapes; scale and scale factor; ratio and proportional reasoning; relationships between perimeter, area, surface area and volume; relationships between fractions, decimals, and percents. Open to Elementary, Early Childhood, and Special Education majors only. Preq: MATH 2160.

**MATH 3160 - Problem Solving for Mathematics Teachers**  
3 Credits (3 Contact Hours)  
Course emphasizes problem solving and builds and expands upon previous mathematics content courses by examining connections between number and operations; algebra; data analysis and probability; geometry; and measurement. Open to Elementary, Early Childhood, and Special Education majors only. Preq: MATH 2160.

**MATH 3190 - Introduction to Proof**  
3 Credits (3 Contact Hours)  
Introduces mathematical proofs with topics that include proof techniques, elementary logic, induction, sets, functions, and relations. Preq: MATH 1080 or MATH 1110.

**MATH 3600 - Intermediate Mathematics Computing**  
3 Credits (3 Contact Hours)  
Intermediate-level introduction in using computers to solve problems in the mathematical sciences. Fundamental concepts of procedural programming including flow control, modular construction, primitive data structures, recursion, and graphics are applied to problems in applied mathematics, probability, statistics, discrete mathematics, and operations research. Preq: MATH 1080 or MATH 1110.

**MATH 3650 - Numerical Methods for Engineers**  
3 Credits (3 Contact Hours)  
Application of undergraduate mathematics and basic engineering principles with emphasis on numerical methods, computer programming and the use of mathematical software packages in the solution of engineering problems. Preq: ENGR 1090 with a C or better or ENGR 1410 with a C or better; and MATH 2080 with a C or better.

**MATH 3820 - Honors Seminar**  
1 Credits (1 Contact Hours)  
Weekly seminar to prepare students in Departmental Honors Program for independent senior research. At the end of the second semester, each student must have identified a research topic and a faculty advisor. May be repeated for a maximum of two credits. Preq: Junior standing in departmental honors program.

**MATH 3990 - Creative Inquiry in Mathematical Sciences**  
1-3 Credits (1-3 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of three credits. Preq: Consent of faculty member/mentor.

**MATH 4000 - Theory of Probability**
3 Credits (3 Contact Hours)
Principal topics include combinatorial theory, probability axioms, random variables, expected values; special discrete and continuous distributions, jointly distributed random variables, correlation, conditional expectation, law of large numbers, central limit theorem. Includes Honors sections. Preq: MATH 2060.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MATH 4020 - Statistics for Science and Engineering II**
3 Credits (3 Contact Hours)
Principal topics include simple linear regression, multiple regression and correlation analysis, one-way analysis of variance, multiple comparison, multifactor analysis of variance, experimental design. Computation and interpretation of results are facilitated through use of statistical computer packages. Preq: MATH 3020.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MATH 4030 - Introduction to Statistical Theory**
3 Credits (3 Contact Hours)
Principal topics include sampling distributions, point and interval estimation, maximum likelihood estimators, method of moments, least squares estimators, tests of hypotheses, likelihood ratio methods, regression and correlation analysis, introduction to analysis of variance. Includes Honors sections. Preq: MATH 4000.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MATH 4060 - Sampling Theory and Methods**
3 Credits (3 Contact Hours)
Probability-based treatment of sampling methodology. Theory and application of estimation techniques are treated using simple and stratified random sampling, cluster sampling, and systematic sampling. Preq: MATH 4000; and one of MATH 3020 or STAT 2300 or STAT 3090.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MATH 4070 - Regression and Time-Series Analysis**
3 Credits (3 Contact Hours)
Theory and application of the regression and time series. Approaches to empirical model building and data analysis are treated. Computation and interpretation of results are facilitated through the use of interactive statistical packages. Written and oral reports are required for students using this course as part of their capstone. Preq: MATH 3110 and MATH 4000; and one of MATH 3020 or STAT 2300 or STAT 3090.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MATH 4080 - Exploration and Analysis of Secondary Mathematics**
3 Credits (3 Contact Hours)
In-depth exploration and analysis of important underlying ideas in the secondary mathematics curriculum. An emphasis is placed on reasoning and proof as students investigate topics in algebra, geometry, probability, statistics and calculus. Preq: MATH 2060 and MATH 3080.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MATH 4100 - Number Theory**
3 Credits (3 Contact Hours)
Introduction to theory of integers and related number systems. Topics include historical development, principle of mathematical induction, divisibility, primes, congruences, number-theoretic functions, primitive roots, quadratic residues, and diophantine equations. Preq: MATH 3190 with a C or better.

**MATH 4110 - Introduction to Combinatorics**
3 Credits (3 Contact Hours)
Introductory course in combinatorial analysis. Topics include enumeration, graph theory, posets, and extremal combinatorics. Preq: MATH 3110; and either MATH 1190 or MATH 3190.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MATH 4120 - Algebra I**
3 Credits (3 Contact Hours)
Provides a first introduction to algebra with topics including modular arithmetic, ring theory and group theory. Preq: MATH 3110 and
MATH 3190, each with a grade of C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4130 - Algebra II
3 Credits (3 Contact Hours)
A continuation of MATH 4120. Topics may include advanced group theory (including Sylow theorems, some classifications of groups); advanced ring theory; field theory; and Galois theory. Preq: MATH 4120 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4190 - Discrete Mathematical Structures I
3 Credits (3 Contact Hours)
Applies theoretical concepts of sets, functions, binary relations, graphs, Boolean algebras, propositional logic, semigroups, groups, homomorphisms, and permutation groups to computer characteristics and design, words over a finite alphabet and concatenation, binary group codes, and other communication or computer problems. Includes Honors sections. Preq: MATH 3110.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4300 - Actuarial Science Seminar I
1 Credits (1 Contact Hours)
Problem-solving seminar to prepare students for the Society of Actuaries' Exam P or the Casualty Actuarial Society's Exam I (Probability). Preq: MATH 4000.

MATH 4310 - Theory of Interest
3 Credits (3 Contact Hours)
Comprehensive treatment of the theory of interest including from a calculus-based continuous viewpoint. Topics include simple and compound interest and discount, nominal and effective rates, force of interest, basic and general annuities, yield rates, amortization and sinking funds, and applications to bonds, mortgages, and other securities. Preq: MATH 2060.

MATH 4320 - Actuarial Science Seminar II
1 Credits (1 Contact Hours)
Problem-solving seminar to prepare students for the Society of Actuaries' Exam FM or the Casualty Actuarial Society's Exam 2 (Financial Mathematics). Preq: MATH 4310.

MATH 4340 - Advanced Engineering Mathematics
3 Credits (3 Contact Hours)
Fourier series, Laplace and Fourier transform, and numerical methods for solving initial value and boundary-value problems in partial differential equations are developed. Applications to diffusion wave and Dirichelet problems are given. Matrix methods and special functions are utilized. Preq: MATH 2080.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4350 - Complex Variables
3 Credits (3 Contact Hours)
Elementary functions; differentiation and integration of analytic functions; Taylor and Laurent series; contour integration and residue theory; conformal mapping; Schwartz-Christoffel transformation. Includes Honors sections. Preq: MATH 2060.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4400 - Linear Programming
3 Credits (3 Contact Hours)
Introduction to linear programming covering the simplex algorithm, duality, sensitivity analysis, network models, formulation of models, and the use of simplex codes to solve, interpret, and analyze problems. Includes Honors sections. Preq: MATH 2060 and MATH 3110.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4410 - Introduction to Stochastic Models
3 Credits (3 Contact Hours)
Introductory treatment of stochastic processes, finite-state Markov chains, queueing, dynamic programming, Markov decision processes, reliability, decision analysis, and simulation. Both theory and applications are stressed. Includes Honors sections. Preq: MATH 4000.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
MATH 4420 - Advanced Mathematical Programming  
3 Credits (3 Contact Hours)  
Theory, methodology, and applications of integer and nonlinear programming. Topics include model development, computer solutions, branch and bound, unconstrained and constrained optimization algorithms, complexity and convergence analysis. Case studies are included. Preq: MATH 4400.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4500 - Introduction to Mathematical Models  
3 Credits (3 Contact Hours)  
Includes a study of the modeling process and examples of existing models chosen from physical, biological, social, and management sciences, depending on the instructor. Written and oral report is required for at least one of the models studied. May be repeated for a maximum of six credits. Preq: MATH 3600 or MATH 3650; and one of MATH 3020 or STAT 2300 or STAT 3090.

MATH 4530 - Advanced Calculus I  
3 Credits (3 Contact Hours)  
Basic properties of the real number system, sequences and limits, continuous functions, uniform continuity, and differentiation. Includes Honors sections. Preq: MATH 2060 and MATH 3190, each with a grade of C or better.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4540 - Advanced Calculus II  
3 Credits (3 Contact Hours)  
Continuation of MATH 4530. Material includes Riemann integrals and improper integrals, infinite series, sequences and series of functions. Includes Honors sections. Preq: MATH 4530 with a C or better.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4550 - Topics in Geometry  
3 Credits (3 Contact Hours)  
Covers a variety of geometries, such as Euclidean, hyperbolic, projective, and spherical. The intrinsic properties of these spaces, such as their geodesics and isometries, are studied. Other topics include differential geometry of curves and surfaces, Gaussian curvature, and the celebrated Gauss-Bonnet theory linking geometry with topology. Preq: MATH 2060 and MATH 3110; and either MATH 1190 or MATH 3190.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4560 - Topology  
3 Credits (3 Contact Hours)  
Introduction to point-set topology. Topics include metric spaces, topological spaces, Hausdorff spaces, homeomorphisms, continuity, product and quotient spaces, compactness, and connectedness. Additional topics, such as homotopy equivalence of paths, the fundamental group, and basic knot theory, are introduced as time permits. Preq: MATH 1190 or MATH 3190.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4600 - Introduction to Numerical Analysis I  
3 Credits (3 Contact Hours)  
Introduction to the problems of numerical analysis emphasizing computational procedures and application. Topics include sources of error and conditioning, matrix methods, systems of linear equations, nonlinear equations, interpolation and approximation by splines, polynomials, and trigonometric functions. Preq: MATH 2060 or MATH 2070; and MATH 3600 or MATH 3650.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4630 - Mathematical Analysis I  
3 Credits (3 Contact Hours)  
Basic properties of the real number system, sequences and limits; continuous functions, uniform continuity and convergence. Integration, differentiation, functions of several real variables, implicit function theory. Includes Honors sections. Preq: MATH 2060.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MATH 4810 - Seminar in Mathematics  
1-3 Credits (1-3 Contact Hours)  
Attention is focused on mathematical areas in which nonroutine problems can be posed with comparative ease. Emphasis is on independent
study and student use of previously acquired mathematical skills. Open to students by invitation only for a maximum of three credits. Preq: Consent of instructor.

**MATH 4820 - Undergraduate Research**
3 Credits (3 Contact Hours)
Independent research conducted under the supervision and guidance of a faculty member. May be repeated for a maximum of six credits. Includes Honors sections.

**MATH 4910 - Independent Study**
3 Credits (3 Contact Hours)
Independent study or internship in mathematical sciences under faculty supervision. A written report and oral poster presentation of the results of the independent study or internship are required. May be repeated for a maximum of six credits.

**MATH 4920 - Professional Development**
1 Credits (1 Contact Hours)
Issues in professional development in the Mathematical Sciences. Individual portfolios are evaluated and critiqued for continued career use. To be taken Pass/No Pass only.

**MATH 4990 - Creative Inquiry in Mathematical Sciences**
1-3 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of three credits. Preq: Consent of faculty member/mentor.

**Mechanical Engineering**

**ME 2000 - Sophomore Seminar**
1 Credits (1 Contact Hours)
Seminars address the Mechanical Engineering program, the profession, best student practices, and career paths. Invited presenters and faculty provide lectures and demonstrations. Preq or concurrent enrollment: ME 2010 with a C or better.

**ME 2010 - Statics and Dynamics for Mechanical Engineers**
5 Credits (3 Contact Hours)
Vector analysis of the effects of forces, couples, and force-systems on rigid bodies. Conditions of static equilibrium for simple structures, including pulleys, trusses, beams, frames. Kinematics and kinetics of general rigid body motion in 2-D. Applications of Newton's laws, energy methods, and impulse momentum methods to simple machine elements. Preq: MATH1060 or MATH 1070, with a C or better; and MATH 1080 and PHYS 1220, each with a C or better; and both ENGR 1070 and ENGR 1080, or ENGR 1410, with a C or better. Preq or concurrent enrollment: ENGR 1090 and ENGR 2080 and PHYS 1240 and MATH 2060, each with a C or better. Coreq: ME 2011.

**ME 2011 - Statics and Dynamics for Mechanical Engineers Laboratory**
0 Credits (4 Contact Hours)

**ME 2030 - Foundations of Thermal and Fluid Systems**
3 Credits (3 Contact Hours)
Introduction to control volumes, conservation laws of mass, momentum, and energy. Concepts of work and heat are introduced, including rate forms. Properties of pure substances. Preq: MATH 2060 and PHYS 2210, each with a C or better. Preq or concurrent enrollment: ME 2220 with a C or better.

**ME 2040 - Mechanics of Materials**
3 Credits (3 Contact Hours)
Relationships between external loads on solid bodies or members and the resulting internal effects and dimension changes, including the derivation of rational formulas for stresses and deformations and the identification and use of important mechanical properties of engineering materials. Includes Honors sections. Preq: MATH 2060 and ME 2010, each with a C or better. Preq or concurrent enrollment: MATH 2080 and ME 2220 and MSE 2100, each with a C or better.

**ME 2220 - Mechanical Engineering Laboratory I**
2 Credits (6 Contact Hours)
Discovery of mechanical engineering principles and phenomena. Introduction to laboratory safety practices, instrumentation, calibration techniques, data analysis, and report writing. Introduction to basic manufacturing processes. Preq: PHYS 1220 and PHYS 1240 and MATH 1080, each with a C or better.
ME 2900 - Creative Inquiry in Mechanical Engineering I
1-3 Credits (1-3 Contact Hours)
Students work in extended teams (including sophomores, juniors, seniors, and graduate students) addressing research and development problems under the supervision of a faculty lead. Engineering principles and best practices will be employed. Team work, professionalism, and communication skills are emphasized. May be repeated for a maximum of nine credits. Preq: consent of instructor.

ME 3000 - Junior Honors Seminar
0 Credits (0 Contact Hours)
Acquaints students enrolled in Departmental Honors Program with current research activities in the Department of Mechanical Engineering. Faculty provide seminars in which research interests are summarized. These seminars are planned to prepare students in choosing a research topic for the senior thesis. Preq: Junior standing in departmental honors program.

ME 3030 - Thermodynamics
3 Credits (3 Contact Hours)
Study of the second law and entropy. Includes applications to fixed mass systems and control volumes; vapor and gas power cycles; mixtures of gases; vapor psychrometrics; combustion and the third law. Thermochemical equilibrium. Preq: ME 2030 with a C or better.

ME 3040 - Heat Transfer
3 Credits (3 Contact Hours)
Study of steady and transient heat conduction, free and forced convection, radiation, and multi-mode heat transfer. Emphasizes analytical and numerical solutions to engineering heat transfer problems with a design orientation. Preq: MATH 2080 and ME 3080 each with a C or better. Preq or concurrent enrollment: MATH 3650 with a C or better.

ME 3050 - Modeling and Analysis of Dynamic Systems
3 Credits (3 Contact Hours)
Presents techniques for developing and analyzing models of mechanical, electrical, electromechanical, fluid and thermal systems. Transient, steady-state and frequency response are determined using analytical and numerical methods. Covers tools for stability analysis and state-space representation. Covers linear free- and forced-vibrations in single- and multi-degree-of-freedom systems with lumped-parameters representation, methods of vibration absorption and isolations. Preq: ECE 2070 and ECE 2080 and MATH 2080 and MATH 3650, each with a C or better. Preq or concurrent enrollment: ME 3070 with a C or better.

ME 3060 - Fundamentals of Machine Design
3 Credits (3 Contact Hours)
Introduction to failure theory and fatigue analysis. Integration of these topics with selected portions of mechanics of materials and application of them to the design and analysis of machine elements. Preq: ME 2040 and ME 3070, each with a C or better. Preq or concurrent enrollment: MATH 3650 with a C or better.

ME 3070 - Foundations of Mechanical Systems
3 Credits (3 Contact Hours)
Introduction to physical elements and mechanisms that define basic mechanical engineering systems. Application of kinematic and kinetic analysis to mechanisms and the role of design in mechanisms. Preq: ME 2010 with a C or better. Preq or concurrent enrollment: ME 2040 with a C or better.

ME 3080 - Fluid Mechanics
3 Credits (3 Contact Hours)
Behavior of fluids at rest or in motion, including the study of fluid properties. Emphasizes a rational, analytical approach from which are developed basic principles of broad applicability to all fields of engineering. Includes Honors sections. Preq: ME 2010 and ME 2030, each with a C or better. Preq or concurrent enrollment: MATH 2080 with a C or better.

ME 3100 - Thermodynamics and Heat Transfer
3 Credits (3 Contact Hours)
Introduction to thermodynamics and heat transfer for nonmajors: properties of liquids and gases, first and second law analysis, introduction to cycles for power and refrigeration, heat flow by conduction and radiation, and convective heat flow and heat exchangers. Preq: MATH 2060 and PHYS 2210, each with a C or better; and enrollment in an engineering curriculum other than Mechanical Engineering.

ME 3120 - Manufacturing Processes and Their Application
3 Credits (3 Contact Hours)
Fundamental principles associated with production processes and their application to the manufacture of products from metals, polymers, ceramics, and composites. Emphasizes the physical and quantitative aspects of processing, the selection of processes to create products, and the identification processes used to manufacture existing products. Preq or concurrent enrollment: ME 3040 and ME 3060 and ME 3330, each with a C or better.
ME 3330 - Mechanical Engineering Laboratory II  
2 Credits (6 Contact Hours)  
Mechanical engineering principles and phenomena are reinforced through student conducted experiments. Presentation of fundamentals of instrumentation, calibration techniques, data analysis, and report writing in the context of laboratory experiments. Preq: MATH 2080 and ME 2030 and ME 2220, each with a C or better.

ME 3900 - Creative Inquiry in Mechanical Engineering II  
1-3 Credits (1-3 Contact Hours)  
Students work in extended teams (including sophomores, juniors, seniors, and graduate students) addressing research and development problems under the supervision of a faculty lead. Engineering principles and best practices will be employed. Team work, professionalism, and communication skills are emphasized. May be repeated for a maximum of nine credits. Preq: Consent of instructor.

ME 4000 - Senior Seminar  
1 Credits (1 Contact Hours)  
Seminars address the problems encountered by engineering graduates in professional practice. Invited lecturers as well as faculty provide the lectures and demonstrations. Preq or concurrent enrollment: ME 4010 with a C or better.

ME 4010 - Mechanical Engineering Design  
3 Credits (3 Contact Hours)  
Project-oriented course in mechanical engineering emphasizing the role of analysis, synthesis, and evaluation in design and on written reporting of design solutions. Influence of economics and optimization, concurrent development, integration of design and manufacturing, and system creation are utilized for engineering design decisions. Preq: ENGL 3140 and ME 3030 and ME 3040 and ME 3050 and ME 3060, each with a C or better (concurrent enrollment in one of the preceding ME courses is permitted, but student must request a prerequisite override from the undergraduate coordinator). Preq or concurrent enrollment: ME 3120 with a C or better.

ME 4020 - Internship in Engineering Design  
3 Credits (1 Contact Hours)  
Creative application of general engineering knowledge in solving an open-ended design problem provided by a sponsor typically external to the University. Progress is evaluated by a faculty jury. Students present results to the jury and sponsor through written reports and oral presentations addressing University written/oral competency goals. Students must have completed all required 3000-level ME courses before enrolling in this course. Preq: ME 4010 with a C or better. Coreq: ME 4021.

ME 4021 - Internship in Engineering Design Laboratory  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany ME 4020. Coreq: ME 4020.

ME 4030 - Control and Integration of Multidomain Dynamic Systems  
3 Credits (3 Contact Hours)  
Introduction of control theory with sensor, actuator, and dynamic plant integration to develop, model, control, and analyze mathematical models of dynamics systems, including mechanical, electrical, electromechanical, hydraulic and pneumatic systems. Transient dynamics are determined using analytical and numerical methods with feedback control systems. Strong emphasis is placed on system design using computer simulation tools. Preq: ME 3050 with a C or better.

ME 4150 - Undergraduate Research  
1-3 Credits (1-3 Contact Hours)  
Individual research projects conducted under the direct supervision and guidance of a faculty member. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Consent of instructor.

ME 4170 - Mechatronics System Design  
3 Credits (2 Contact Hours)  
Mechatronics integrates control, sensors, actuators, and computers to create a variety of electromechanical products. Includes concepts of design, appropriate dynamic system modeling, analysis, sensors, actuating devices, and real time microprocessor interfacing and control. Laboratory experiments, simulation, and design projects are used to exemplify the course concepts. Preq: ME 3050 with a C or better. Coreq: ME 4171. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4171 - Mechatronics System Design Laboratory  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany ME 4170. Coreq: ME 4170. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
ME 4180 - Finite Element Analysis in Mechanical Engineering Design
3 Credits (2 Contact Hours)
Introduction to the finite element method and solid modeling, finite element modeling and analysis using commercial codes; analysis strategies using finite elements; applications to heat transfer, fluid flow, and structures. Preq: ME 2040 and ME 3040 and ME 3080, each with a C or better. Coreq: ME 4181.

ME 4181 - Finite Element Analysis in Mechanical Engineering Design Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany ME 4180. Coreq: ME 4180.

ME 4200 - Energy Sources and Their Utilization
3 Credits (3 Contact Hours)
Covers availability and use of energy sources such as fossil fuels, solar (direct and indirect), and nuclear; addresses energy density and constraints to use (technical and economic) for each source. Preq: ME 3030 and ME 3040, each with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4210 - Introduction to Compressible Flow
3 Credits (3 Contact Hours)
Introductory concepts to compressible flow; methods of treating one-dimensional gas dynamics including flow in nozzles and diffusers, normal shocks, moving and oblique shocks, Prandtl-Meyer Flow, Fanno Flow, Rayleigh Flow, and reaction propulsion systems. Preq: ME 3030 and ME 3080, each with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4220 - Design of Gas Turbines
3 Credits (3 Contact Hours)
Guiding principles in gas turbine cycles are reviewed. Turbine and compressor design procedures and performance prediction for both axial and radial flow machines are presented. Methods of design of rotary heat-exchangers and retrofitting gas turbine for regenerative operation are presented. Design projects are used to illustrate the procedures. Preq: ME 3080 with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4230 - Introduction to Aerodynamics
3 Credits (3 Contact Hours)
Basic theories of aerodynamics are presented for the purpose of accurately predicting the aerodynamic forces and moments which act on a vehicle in flight. Preq: ME 3080 with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4240 - Aircraft Conceptual Design
3 Credits (3 Contact Hours)
This course develops the aspects involved in the conceptual design of an aircraft. Focus is on the interplay between goals and constraints in the process of the design of a subsonic aircraft. Preq: ME 3080.

ME 4250 - Nuclear Energy
3 Credits (3 Contact Hours)
Engineering methods and science principles are considered for the design of components to nuclear power stations. A systems level understanding is emphasized. Includes nuclear fuel cycle and regulatory considerations. Preq: CE 3410; or CHE 3210; or EES 3100; or both ME 3030 and ME 3040; or ME 3100; or MSE 3270; or PHYS 3220; each with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4280 - Thermal-Hydraulics of Nuclear Reactors
3 Credits (3 Contact Hours)
Provides the mechanical engineer with the basic concepts required to understand the thermal-hydraulic behavior of nuclear reactors in normal operating conditions. Preq: ME 3040 with a C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4290 - Thermal Environmental Control
3 Credits (3 Contact Hours)
Mechanical vapor compression refrigeration cycles, refrigerants, thermoelectrical cooling systems, cryogenics, thermodynamic properties of air, psychometric charts, heating and cooling coils, solar radiation, heating and cooling loads, insulation systems. Preq: ME 3030 and ME 3080, each with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4300 - Mechanics of Composite Materials
3 Credits (3 Contact Hours)
Develops fundamental relationships for predicting the mechanical and thermal response of multi-layered materials and structures. Develops micromechanical and macromechanical relationships for laminated materials emphasizing continuous filament composites. Discusses the unique nature of composites and the advantages of designing with composites. Preq: ME 2040 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4310 - Applied Fluids Engineering
3 Credits (3 Contact Hours)
Applications-oriented course in industrial fluids engineering, primarily directed toward the analysis and design of piping systems and components for liquid and gas flow. Topics include friction factors, head loss, flow capacities, piping networks, flow measurement, pumps, control valves, and hydraulic and pneumatic components. Preq: ME 3080 and ME 3330, each with a C or better.

ME 4320 - Advanced Strength of Materials
3 Credits (3 Contact Hours)
Topics in strength of materials not covered in ME 3020. Three-dimensional stress and strain transformations, theories of failure, shear center, unsymmetrical bending, curved beams, and energy methods. Other topics such as stress concentrations and fatigue concepts are treated as time permits. Preq: ME 2040 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4400 - Materials for Aggressive Environments
3 Credits (3 Contact Hours)
Emphasizes the engineering aspects of selecting materials for applications in aggressive environments. Various types of materials degradation are discussed as are methods for wastage prevention, including especially engineering design and materials selection approaches. Structural metallic alloys are emphasized; however, technically important ceramics and polymers are also discussed. Preq: ME 3060 with a C or better.

ME 4440 - Mechanical Engineering Laboratory III
2 Credits (6 Contact Hours)
Continuation of ME 3330. Mechanical engineering principles and phenomena are reinforced through student-conducted experiments. Presentation of fundamentals of instrumentation, calibration techniques, data analysis, and report writing in the context of laboratory experiments. Preq: ME 3330; and MATH 3020 or STAT 4110, each with a C or better. Preq or concurrent enrollment: ME 3060 with a C or better.

ME 4530 - Dynamic Performance of Vehicles
3 Credits (3 Contact Hours)
Introduces techniques for analyzing the dynamic behavior of vehicles. Types of vehicles to be considered are chosen from aircraft, surface ships, automobiles and trucks, railway vehicles, and magnetically levitated vehicles. Preq: ME 3050 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4540 - Design of Machine Elements
3 Credits (3 Contact Hours)
Design of common machine elements including clutches, brakes, bearings, springs, and gears. Optimization techniques and numerical methods are employed as appropriate. Preq: ME 3060 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4550 - Design for Manufacturing
3 Credits (3 Contact Hours)
Concepts of product and process design for automated manufacturing are considered. Topics include product design for automated manufacturing, inspection and assembly, using automation, industrial robots, knowledge-based systems and concepts of flexible product manufacture. Preq: ME 3060 with a C or better. Preq or concurrent enrollment: ME 3120 with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
ME (ECE) 4570 - Fundamentals of Wind Power
3 Credits (3 Contact Hours)
Introduces wind turbine systems, including wind energy potential and application to power generation. Topics include wind energy principles, wind site assessment, wind turbine components, power generation machinery control systems, connection to the electric grid, and maintenance. May also be offered as ECE 4570. Preq: ECE 2070 or ECE 3200, with a C or better.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4710 - Computer-Aided Engineering Analysis and Design
3 Credits (2 Contact Hours)
Students are exposed to geometric and solid modeling, finite elements, optimization, and rapid-prototyping. Students design an artifact, represent it on the computer, analyze it using FEA, then optimize before prototyping it. Emphasizes the use of computer-based tools for engineering design. Preq: ENGR 1090 and ME 3070, each with a C or better. Coreq: ME 4711.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4711 - Computer-Aided Engineering Analysis and Design Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ME 4710. Coreq: ME 4710.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

ME 4900 - Creative Inquiry in Mechanical Engineering III
1-3 Credits (1-3 Contact Hours)
Students work in extended teams (including sophomores, juniors, seniors, and graduate students) addressing research and development problems under the supervision of a faculty lead. Engineering principles and best practices will be employed. Team work, professionalism, and communication skills are emphasized. May be repeated for a maximum of nine credits. Preq: Consent of instructor.

ME 4930 - Selected Topics in Mechanical Engineering
1-6 Credits (1-6 Contact Hours)
Study of topics not found in other courses. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

Microbiology

MICR 1010 - Microbes and Human Affairs
1 Credit (1 Contact Hour)
Introduces Microbiology majors to University career and library services, evaluation of computer program proficiency, Web page development, Microbiology emphasis areas, and Microbiology faculty. Students initiate their own Web-based student portfolios, which showcase their skills and experiences (e.g., resumes, accomplishments, and work samples) during their undergraduate programs. Preq or concurrent enrollment: BIOL 1030 and BIOL 1050; or BIOL 1100.

MICR 2050 - Introductory Microbiology
4 Credits (3 Contact Hours)
Basic concepts of microbiology, introduced through classroom and laboratory experiences. Emphasizes practical applications in various areas of importance to man. Recommended for students not majoring in a biological science. Not open to Microbiology majors. Preq: CH 1010; and one of the following combinations: BIOL 1030 and BIOL 1050, or BIOL 1100; and CH 1010. Coreq: MICR 2051.

MICR 2051 - Introductory Microbiology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany MICR 2050. Coreq: MICR 2050.

MICR 3000 - Essential Skills in Microbiology
3 Credits (3 Contact Hours)
Equips students with skills needed to achieve success in a variety of scientific fields, with emphasis on microbiology. The course focuses on career-building skills, scientific ethics, and scientific written communication. Preq: ENGL 1030.

MICR 3050 - General Microbiology
4 Credits (3 Contact Hours)
Morphology, physiology, classification, distribution, and cultivation of microorganisms. Preq: CH 1010 and CH 1020; and one of the following combinations: BIOL 1030 and BIOL 1050, or BIOL 1100; and BIOL 1040 and BIOL 1060, or BIOL 1110; and CH 1010; and sophomore standing. Coreq: MICR 3051.

**MICR 3051 - General Microbiology Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany MICR 3050. Coreq: MICR 3050.

**MICR 3940 - Selected Topics in Creative Inquiry I**
1-3 Credits (1-3 Contact Hours)
Disciplinary and multidisciplinary group research projects with the goal of developing the students' ability to discover, analyze, and evaluate data. May be repeated for a maximum of 24 credits. Honors students must take at least six credits over a two-semester period with the same research advisor and write an honors thesis. These credits may include MICR 3940, MICR 4940 or both. Includes Honors sections. Preq: Consent of instructor.

**MICR 3941 - Selected Topics in Creative Inquiry I Laboratory**
0 Credits (3-6 Contact Hours)
Non-credit laboratory to accompany MICR 3940.

**MICR 4000 - Public Health Microbiology**
3 Credits (3 Contact Hours)
Epidemiology of transmissible diseases including pathogenic characteristics of the infectious organism, modes of transmission, mechanism of infection, diagnostic aids, effective treatments, immunizing procedures, and methods of preventing infection. Includes Honors sections. Preq: MICR 3050. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4010 - Microbial Diversity and Ecology**
3 Credits (3 Contact Hours)
In-depth survey of microbial morphology, ecology, and diversity. Study of the interaction and adaptation of microbes in a wide range of environmental conditions, including consideration of their metabolism, nutrition, growth and the use of microbiological assays. Includes Honors sections. Preq: CH 2010 and CH 2020; or CH 2230 and CH 2270; and MICR 3050. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4020 - Environmental Microbiology**
3 Credits (3 Contact Hours)
Discussion of microorganisms in air, terrestrial, and aquatic environments and how they are used for environmental restoration activities. Topics include the nature of biofilms, interactions of microbes with inorganic and organic constituents, processes to implement bioremediation in surface/subsurface environments, and treatment of solid, liquid, and gaseous waste streams. Preq: MICR 3050 and MICR 4010; and either CH 2010; or both CH 2230 and CH 2270. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4030 - Marine Microbiology**
3 Credits (3 Contact Hours)
Discussion of the microbes that inhabit the marine environment, their peculiar physiological traits, and contributions to the ecology of oceans. Preq: MICR 3050; and either CH 2010; or both CH 2230 and CH 2270. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4050 - Advanced Microbial Ecology of Humans**
3 Credits (3 Contact Hours)
Investigation of the complex ecological relationships between microbes and their human hosts, including investigation of the normal microbial community in various body systems, factors that change the microbiota, and the role of the microbiota in normal development, health and disease of the host. Preq: MICR 4010 with a grade of C or better. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4070 - Food and Dairy Microbiology**
4 Credits (3 Contact Hours)
Physical-chemical factors limiting survival and growth of microorganisms during processing and manufacturing of food and dairy products. Standard methods for enumerating and identifying indicator bacteria, yeasts, molds, and microbes producing food and food-borne
illness. Starter cultures, fungal toxins, microbial cell injury and standards for food and dairy products. Includes Honors sections. Preq: MICR 3050; and one of BCHM 3050 or CH 2100 or CH 2230. Coreq: MICR 4071.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4071 - Food and Dairy Microbiology Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany MICR 4070. Coreq: MICR 4070.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4100 - Soil Microbiology**
3 Credits (3 Contact Hours)
Role of microorganisms in the decomposition of organic substances, transformation of nitrogen and mineral substances in the soil; interrelationships between higher plants and microorganisms; importance of microorganisms in soil fertility. Includes Honors sections. Preq: MICR 3050; and MICR 4010 or PES 4900.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4110 - Pathogenic Bacteriology**
3 Credits (3 Contact Hours)
Study of pathogenic bacteria and their virulence mechanisms. Emphasizes host-microbe interactions, responses to infection and treatment, and research strategies for various topics of bacterial pathogenesis. Includes Honors sections. Preq: MICR 3050 and MICR 4120 and MICR 4140.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4120 - Bacterial Physiology**
3 Credits (3 Contact Hours)
Consideration of the cytology, physiology, metabolism, and genetics of bacteria. Includes studies of growth and death, reproduction and mutation, nutrition and metabolic pathways, regulatory mechanisms, and effects of environment. Includes Honors sections. Preq: CH 2240 and MICR 3050; and either BCHM 3010 or BCHM 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4130 - Industrial Microbiology**
3 Credits (2 Contact Hours)
Microbial aspects of large-scale processes for the production of foods, antibiotics, enzymes, fine chemicals, and beverages. Topics include strain selection, culture maintenance, biosynthetic pathways, continuous cultivation and production of single cell protein. Includes Honors sections. Coreq: MICR 4131.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4131 - Industrial Microbiology Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany MICR 4130. Coreq: MICR 4130.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR (AVS, BIOL) 4140 - Basic Immunology**
3 Credits (3 Contact Hours)
Introduction to the immune system of vertebrate animals, with an emphasis on structure, function, regulation, and cellular and molecular mechanisms of immune responses. Includes honors sections. May also be offered as AVS 4140 or BIOL 4140. Preq: BIOL 4610 and MICR 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MICR 4150 - Microbial Genetics**
3 Credits (3 Contact Hours)
Investigates the molecular basis of microbial lives. Topics include essential genes involved in DNA, RNA and protein metabolism; mutations and genome evolution; global gene regulation; and genetic analysis, using both forward and reverse genetics. Includes Honors sections. Preq: MICR 4120; and BCHM 3010 or BCHM 3050. Non-Microbiology majors do not have to have taken MICR 4120, but must request a registration override from the instructor to enroll in this course.
MICR 4160 - Introductory Virology
3 Credits (3 Contact Hours)
Introduction to the field of virology, including animal, bacterial, and plant viruses. Topics include nomenclature and classification, biochemical and biophysical characteristics, mechanisms of replication, chemotherapy, and techniques for isolation, assay, and purification. Includes Honors sections. Preq: MICR 3050; and either BCHM 3010 or BCHM 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MICR 4170 - Cancer and Aging
3 Credits (3 Contact Hours)
Discusses alterations that occur at molecular, cellular and tissue levels during cell transformation and aging. Topics include the cell division cycle, signal transduction pathways, oncogenes and tumor suppressors, cell death and cell aging. Includes Honors sections. Preq: MICR 3050 and BIOL 4610; and either BCHM 3010 or 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MICR 4190 - Selected Topics in Molecular Medicine
3 Credits (3 Contact Hours)
Introduction to various areas of molecular medicine. Examines the latest research and developments in molecular medicine. Designed for students interested in medicine and biomedical research. Graduate students may repeat for a maximum of six credits. Preq: BCHM 3010 or BCHM 3050 or MICR 3050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MICR 4210 - Pathogenic Bacteriology Laboratory
1 Credits (3 Contact Hours)
Complements the pathogenesis research topics covered in the pathogenic bacteriology lecture. These topics are important at practical levels for prevention and treatment of bacterial diseases. Laboratory is used to teach pathogen handling, basic identification techniques, and modern molecular protocols for pathogen identification. Preq: MICR 4140. Preq or concurrent enrollment: MICR 4110.

MICR 4220 - Bacterial Physiology Laboratory
1 Credits (3 Contact Hours)
Laboratory topics corresponding to MICR 4120 lecture. The course will train students in the proper handling of bacteria and will teach techniques for growing and maintaining bacterial cultures while avoiding contamination. Preq or concurrent enrollment: MICR 4120.

MIC (AVS, BIOL) 4240 - Immunology Laboratory
1 Credits (3 Contact Hours)
This course is designed to apply the knowledge gained in MICR 4140, Immunology lecture, in an applied setting. The experiments in this beginning immunology laboratory are designed to study both the innate and acquired immune systems. Experimentation into the formation, function and detection of antibodies provides students with skills in basic immunologic techniques. May also be offered as AVS 4240 or BIOL 4240. Preq or concurrent enrollment: MICR 4140.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MICR 4250 - Microbial Genetics Laboratory
1 Credits (3 Contact Hours)
Complements the genetics topics covered in the Microbial Genetics lecture. These topics are important at practical levels for molecular and genetics studies. The laboratory is used to teach basic cloning techniques, the basis of blue/white screening, isolation of mutants, calculation of mutation rate, as well as gene regulation. Preq or concurrent enrollment: MICR 4150.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MICR 4270 - Cancer and Aging Laboratory
1 Credits (3 Contact Hours)
The laboratory is used to teach the basic molecular protocols for cancer and aging research, and will help students to understand the mechanisms of cancer and aging discussed in lecture. Preq or concurrent enrollment: MICR 4170.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MICR 4300 - Soil Microbiology Laboratory
MICR 4310 - Microbial Diversity and Ecology Laboratory
1 Credits (3 Contact Hours)
Provides a laboratory experience to complement topics covered in the Microbial Diversity and Ecology lecture. These topics are important at practical levels to better understand the diversity of microbes in various ecosystems. The laboratory is used to learn sampling techniques, preparation of microbial media, basic identification techniques, and modern molecular protocols for microbe identification, such as PCR and 16S rDNA gene sequencing. Preq or concurrent enrollment: MICR 4100.

MICR 4500 - Advanced Microbiology Laboratory I
2 Credits (1 Contact Hours)
Application of knowledge and techniques learned in the Introductory Microbiology Lab with new topics on microbial ecology, diversity and physiology. Experiments in soil, marine and environmental microbiology will be conducted. Preq: MICR 4010. Coreq: MICR 4501.

MICR 4501 - Advanced Microbiology Laboratory I Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany MICR 4500. Coreq: MICR 4500.

MICR 4510 - Advanced Microbiology Laboratory II
2 Credits (1 Contact Hours)
Application of knowledge and techniques learned in the Advanced Microbiology Lab I with new topics in microbial cell biology and microbial genetics. Preq: MICR 4120 and MICR 4500. Coreq: MICR 4511.

MICR 4511 - Advanced Microbiology Laboratory II Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany MICR 4510. Coreq: MICR 4510.

MICR 4520 - Advanced Microbiology Laboratory III
2 Credits (1 Contact Hours)
Application of knowledge and techniques learned in the Advanced Microbiology Labs I and II with new topics on pathogenic bacteriology, parasitology, virology and immunology. Preq: MICRO 4510. Coreq: MICR 4521.

MICR 4521 - Advanced Microbiology Laboratory III Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany MICR 4520. Coreq: MICR 4520.

MICR (BIOL) 4560 - Medical and Veterinary Parasitology
3 Credits (3 Contact Hours)
Introduction to parasitism in the animal kingdom. Emphasizes basic and applied principles related to economically and medically important diseases. Classical and experimental approaches to the study of parasitism are examined in reference to protozoa, helminths, and arthropods. Includes Honors sections. May also be offered as BIOL 4560. Preq: BIOL 1040 and BIOL 1060: or BIOL 1110. Coreq: MICR 4570.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MICR (BIOL) 4570 - Medical and Veterinary Parasitology Laboratory
2 Credits (1 Contact Hours)
Laboratory to reinforce material presented in BIOL 4560. Introduces students to both live and preserved human/animal parasites. Also introduces techniques used in collection, preservation, and examination of animal parasites. Includes Honors sections. May also be offered as BIOL 4570. Coreq: MICR 4560 and MICR 4571.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

MICR (BIOL) 4571 - Medical and Veterinary Parasitology Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany MICR 4570. May also be offered as BIOL 4571. Coreq: MICR 4570.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
**MICR 4910 - Undergraduate Research in Microbiology**  
1-4 Credits (3-12 Contact Hours)  
Individually mentored research problems in various areas of microbiology that introduce undergraduate students to the planning and execution of research experimentation and the presentation of research findings. May be repeated for a maximum of eight credits with consent of instructor. Honors students must take at least six hours under a single research advisor over two semesters. Honors thesis is required. Includes Honors sections. Preq: Consent of instructor.

**MICR 4920 - Internship in Microbiology**  
0-4 Credits (3-12 Contact Hours)  
Preplanned internship at an advisor-approved facility to give students learning opportunities beyond their classroom experiences. Students submit a Student Internship Contract and a two-page study plan before the internship and a comprehensive report within one week of the end of the internship. May be repeated for a maximum of six credits. To be taken Pass/No Pass only. Preq: Consent of instructor.

**MICR 4930 - Senior Seminar**  
2 Credits (2 Contact Hours)  
Capstone course engaging students in analysis and discussion of publications from the technical and non-technical literature in biological sciences and from current topics of biology appearing in other media. Emphasis is placed on ethical issues that arise as a result of biological research. Preq: Senior standing and COMM 1500 or COMM 2500 or ENGL 3150.

**MICR (BIOL) 4940 - Selected Topics in Creative Inquiry II**  
2-3 Credits (1 Contact Hours)  
Disciplinary and multidisciplinary group research projects with the goal of developing the students' ability to discover, analyze, and evaluate data. May be repeated for a maximum of six credits. Honors students must take at least six credits over a two-semester period with the same research advisor and write an honors thesis. These credits may include BIOL 3940, BIOL 4940 or both. Includes Honors sections. May also be offered as BIOL 4940. Preq: Consent of instructor. Coreq: MICR 4941.

**MICR (BIOL) 4941 - Selected Topics in Creative Inquiry II Laboratory**  
0 Credits (3-6 Contact Hours)  
Non-credit laboratory to accompany MICR 4940. May also be offered as BIOL 4941. Coreq: MICR 4940.

**MICR 4950 - Service Learning in Biology**  
2-4 Credits (1 Contact Hours)  
Combines service and academic learning while helping pre-college or college students learn about the fundamental aspects of science. Provides lecture and laboratory experiences as students learn to prepare and participate in supervised laboratory teaching for pre-college or college students. May be repeated for a maximum of six credits. Preq: Consent of instructor. Coreq: MICR 4951.

**MICR 4951 - Service Learning in Biology Laboratory**  
0 Credits (3-9 Contact Hours)  
Non-credit laboratory to accompany MICR 4950. Coreq: MICR 4950.

**Military Leadership**

**ML 1010 - Leadership Fundamentals I**  
2 Credits (2 Contact Hours)  
Study of leadership focused at the individual level. Students learn effective communicating skills, ethical decision making, small group management, and mental and physical conditioning. Skills are applied in a variety of challenging training events during laboratory, including rappelling, water survival, land navigation, and team athletics. Coreq: ML 1011.

**ML 1011 - Leadership Fundamentals I Laboratory**  
0 Credits (1 Contact Hours)  
Non-credit laboratory to accompany ML 1010. Coreq: ML 1010.

**ML 1020 - Leadership Fundamentals II**  
2 Credits (2 Contact Hours)  
Continued study of leadership focused at the individual and team levels. Topics include problem solving, critical thinking, leadership styles, and group cohesion. Leadership laboratory training includes small tactics and weapons firing. Coreq: ML 1021.

**ML 1021 - Leadership Fundamentals II Laboratory**  
0 Credits (1 Contact Hours)  
Non-credit laboratory to accompany ML 1020. Coreq: ML 1020.
ML 2010 - Leadership Development I
3 Credits (2 Contact Hours)
Study of leadership focused at the team level. Students develop leadership skills through public speaking, managing small groups, and mentoring first-year students. Skills are applied in a variety of challenging training events during leadership laboratory, including rappelling, water survival, land navigation, and team-building exercises. Coreq: ML 2011.

ML 2011 - Leadership Development I Laboratory
0 Credits (2 Contact Hours)

ML 2020 - Leadership Development II
3 Credits (2 Contact Hours)
Continued study of leadership at the team and small group levels. Focuses on moral leadership, officership, and the Army as a profession. Leadership laboratory training includes small unit tactics, airmobile operations, and weapons firing. Students lead teams throughout the semester. Coreq: ML 2021.

ML 2021 - Leadership Development II Laboratory
0 Credits (2 Contact Hours)

ML 2100 - Leaders' Training Course
4 Credits (8 Contact Hours)
Five-week leadership camp conducted on an Army post. Students' pay and expenses are provided by the U.S. Army. Environment is rigorous and focused on leadership development. No military obligation is incurred. Completion of this course qualifies students for entry into the Army ROTC Advanced Course.

ML 3010 - Advanced Leadership I
4 Credits (2 Contact Hours)
Study of leadership focused on decision making, planning, communicating, and executing. Addresses motivational techniques, the role of a leader, and performance assessment. Provides students with leadership management tools and methodology. Students are responsible for training, developing, and mentoring Basic Course students. Students apply learned techniques in leadership laboratory. Preq: ML 2020 or ML 2100. Coreq: ML 3011.

ML 3011 - Advanced Leadership I Laboratory
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany ML 3010. Coreq: ML 3010.

ML 3020 - Advanced Leadership II
4 Credits (2 Contact Hours)
Continuation of leadership study focusing on collective skills training, tactics, and small group instruction. Synthesizes various components of training, leadership, and team-building learned during the Basic Course and ML 3010. Final step in students' progression prior to the Leader's Development and Assessment Course. Preq: ML 3010. Coreq: ML 3021.

ML 3021 - Advanced Leadership II Laboratory
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany ML 3020. Coreq: ML 3020.

ML 3900 - American Army Military Experience
3 Credits (3 Contact Hours)
Covers the purpose of the American military experience from its Colonial origins to today's War on Terrorism. Topics include the evolution of U.S. joint forces and coalition operations, effects of United States society on its military, and how leaders utilize the military decision making process. How historical leaders developed critical thinking skills about the human dimensions of war is also discussed. Preq: Enrollment in Army ROTC program.

ML 4010 - Organizational Leadership I
4 Credits (2 Contact Hours)
Culmination of leadership study in preparation for commissioning as Army officers. Students continue exercising leadership and management skills as senior cadet leaders. Leadership instruction focuses on coordinating activities with staffs, communicating effectively, counseling and mentoring subordinates, training management and ethics. Preq: ML 3020. Coreq: ML 4011.

ML 4011 - Organizational Leadership I Laboratory
ML 4020 - Organizational Leadership II
4 Credits (2 Contact Hours)
Continuation of ML 4010. Focuses on the continued study of moral, ethical, and legal issues faced by leaders. Includes instruction in administrative and logistical management. Requires students to apply their knowledge individually and collectively to solve problems and improve the organization. Preq: ML 4010. Coreq: ML 4021.

ML 4021 - Organizational Leadership II Laboratory
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany ML 4020. Coreq: ML 4020.

ML 4510 - Organizational Leadership III
3 Credits (2 Contact Hours)
Transitional leadership development and training for completion cadets and others designed to enhance practical experiences in managing organizational training programs, develop leadership skills by serving in cadet staff positions, develop small group decision making and conflict management skills, and reinforce physical fitness and lifestyle skills required of leaders. May be repeated for a maximum of six credits. Preq: ML 3020. Coreq: ML 4511.

ML 4511 - Organizational Leadership III Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany ML 4510. Coreq: ML 4510.

Music

MUSC 1010 - Beginning Class Piano
1 Credits (2 Contact Hours)
Thorough introduction to basic keyboard skills including solo and ensemble repertoire, technique, applied keyboard theory, and performance. Applied music fee is assessed.

MUSC 1020 - Intermediate Class Piano
1 Credits (2 Contact Hours)
Continued work on keyboard skills, applied keyboard theory, solo and ensemble repertoire, and performance. Applied music fee is assessed. Preq: MUSC 1010.

MUSC 1110 - Beginning Class Guitar
1 Credits (2 Contact Hours)
Introduction to basic guitar skills, including finger-style technique, strumming, and song accompaniment. Students develop skills and appreciation of the discipline through teacher-led drills, ensemble playing, and the exploration of guitar history, style, and the impact of various players and composers on the medium. Applied music fee is assessed.

MUSC 1120 - Intermediate Class Guitar
1 Credits (2 Contact Hours)
Continued work on guitar skills, including finger-style, strumming, pick playing, ensemble playing, and soloing. Also includes music theory for guitarists such as keys, scales, and chord building, as well as discussions of the impact of various players and composers on the medium. Applied music fee is assessed. Preq: MUSC 1110.

MUSC 1210 - Beginning Class Voice
1 Credits (2 Contact Hours)
Introduction to basic vocal skills, including breathing, tone production, diction, intonation, and interpretation. Includes solo and ensemble repertoire. In-class group and individual performances are required. Applied music fee is assessed.

MUSC 1420 - Music Theory I
3 Credits (3 Contact Hours)
Introduces the materials of music theory, including notation, scales, keys, intervals, basic rhythms and meter, triads and seventh chords, and chord progressions. Coreq: MUSC 1430.

MUSC 1430 - Aural Skills I
1 Credits (2 Contact Hours)
Beginning aural skills, which include Solfege, singing and identifying intervals and scales, identifying triads and seventh chords, sight singing simple melodies in major and minor keys, and taking dictation of simple melodies in major and minor keys. Coreq: MUSC 1420.

**MUSC 1440 - Music Theory II**
3 Credits (3 Contact Hours)
Continuation of MUSC 1420 with added emphasis on part writing, phrase structures, non-chord tones, and seventh chords. Preq: MUSC 1420. Coreq: MUSC 1450.

**MUSC 1450 - Aural Skills II**
1 Credits (2 Contact Hours)
Continuation of MUSC 1430 with added emphasis on sight singing and taking dictation with more complex intervals and in various modes. Preq: MUSC 1430. Coreq: MUSC 1440.

**MUSC 1510 - Applied Music**
1 Credits (1 Contact Hours)
Individual study in performance medium (piano, voice, strings, woodwinds, brass, percussion, guitar, organ, or carillon). One 30-minute lesson each week, for which a minimum of four hours practice is required. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. Preq: Consent of instructor, based upon a qualifying audition.

**MUSC 1520 - Applied Music**
1 Credits (1 Contact Hours)
Continuation of MUSC 1510. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. Preq: MUSC 1510 and consent of instructor.

**MUSC 1530 - Applied Music for Majors**
1 Credits (1 Contact Hours)
Individual study in vocal or instrumental performance (voice, woodwinds, brass, strings, percussion or keyboards). One 45-minute lesson each week. Jury required. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. Preq: Performing Arts major (Music Concentration) and consent of instructor, based upon qualifying audition.

**MUSC 1540 - Applied Music for Majors**
1 Credits (1 Contact Hours)
Continuation of MUSC 1530. Jury and performance on a recital are required. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. Preq: MUSC 1530 and consent of instructor.

**MUSC 1800 - Introduction to Music Technology**
3 Credits (2 Contact Hours)

**MUSC 1801 - Introduction to Music Technology Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany MUSC 1800. Coreq: MUSC 1800.

**MUSC 1950 - Creative Inquiry in Music I**
1–4 Credits (1–4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

**MUSC 2100 - Music Appreciation: Music in the Western World**
3 Credits (3 Contact Hours)
Deepens students' appreciation of their musical heritage through study of the elements of the musical language and its development in Western culture. Includes Honors sections.

**MUSC 2420 - Music Theory III**
3 Credits (3 Contact Hours)
Continuation of MUSC 1440, focusing on secondary functions, modulation, and larger formal structures. Preq: MUSC 1440. Coreq: MUSC 2430.

**MUSC 2430 - Aural Skills III**
Continuation of MUSC 1450, with the addition of harmonic dictation in inversions, melodic/harmonic dictation, and the identification of formal structures through listening. Preq: MUSC 1450. Coreq: MUSC 2420.

**MUSC 2440 - Music Theory IV**
3 Credits (3 Contact Hours)
Continuation of MUSC 2420, focusing on 19th-chromaticism, as well as 20th- and early 21st-century compositional techniques. Preq: MUSC 2420.

**MUSC 2510 - Applied Music**
1 Credits (1 Contact Hours)
Continuation of MUSC 1520. Applied music fee is assessed. Preq: MUSC 1520 and consent of instructor.

**MUSC 2520 - Applied Music**
1 Credits (1 Contact Hours)
Continuation of MUSC 2510. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. Preq: MUSC 2510 and consent of instructor.

**MUSC 2530 - Applied Music for Majors**
1 Credits (1 Contact Hours)
Continuation of MUSC 1540. May be repeated for credit on other performance media with departmental approval. Jury is required. Applied music fee is assessed. Preq: MUSC 1540 and consent of instructor.

**MUSC 2540 - Applied Music for Majors**
1 Credits (1 Contact Hours)
Continuation of MUSC 2530. May be repeated on other performance media with departmental approval. Jury and performance on a recital are required. Applied music fee is assessed. Preq: MUSC 2530 and consent of instructor.

**MUSC 2950 - Creative Inquiry in Music II**
1-4 Credits (4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits.

**MUSC (THEA) 3080 - Survey of Broadway Musicals I**
3 Credits (3 Contact Hours)
Introduction to Broadway musical repertoire from the Golden Age of Broadway: 1943-1964. Emphasizes the music with attention to production detail, historical perspective, and social milieu. May also be offered as THEA 3080.

**MUSC (THEA) 3090 - Survey of Broadway Musicals II**
3 Credits (3 Contact Hours)
Survey of Broadway musical repertoire from new conceptual shows from 1965 to the present day. Emphasizes the music with attention to production detail, historical perspective, and social milieu. May also be offered as THEA 3090.

**MUSC 3110 - History of American Music**
3 Credits (3 Contact Hours)
Music in America from 1620 to the present. Indigenous and borrowed influences are examined.

**MUSC 3120 - History of Jazz**
3 Credits (3 Contact Hours)
Comprehensive survey of jazz elements and styles. A historical perspective from Dixieland to bebop to jazz/rock is included.

**MUSC 3130 - History of Rock and Roll**
3 Credits (3 Contact Hours)
Comprehensive survey of rock elements, styles, and artists. Emphasizes the evolution of rock and roll including a broad examination of musical influences. Course content examines how rock and roll both reflected and influenced social issues.

**MUSC 3140 - World Music**
3 Credits (3 Contact Hours)
Introduction to ethnomusicology and music of the world's peoples. Emphasis is placed on music through culture.

**MUSC 3170 - History of Country Music**
3 Credits (3 Contact Hours)
Chronological study of country music origins, styles, and artists. Emphasizes the evolution of country music from a cultural expression of the South to a commercial art form of worldwide appeal.

**MUSC 3180 - History of Audio Technology**
3 Credits (3 Contact Hours)
Surveys the historical development of audio technology and its social impacts and consequences. Technologies include automatic instruments, recording devices, radio, amplification, consumer listening devices, and distribution formats.

**MUSC 3230 - Piano Accompanying I**
1 Credits (3 Contact Hours)
Group study in piano accompanying. Focuses on sight-reading and choral, vocal, and instrumental accompanying. Students take group lessons and accompany choral groups and/or applied music students.

**MUSC 3250 - CU Carillonneurs**
1 Credits (2 Contact Hours)
Group study in playing the 47-bell University carillon. One two-hour meeting each week for which a minimum of two hours of individual practice is required. Participation in a recital is required. Students are expected to have musical keyboard experience.

**MUSC (THEA) 3290 - Musical Theatre Vocal Performance**
3 Credits (2 Contact Hours)
Trains singer-actors in musical theatre repertoire. A study of repertoire via master classes, individual instruction, research of the historical context of Broadway music, studio performance, observation, and peer evaluation, culminating in a public showcase performance. May also be offered as THEA 3290. Coreq: MUSC 3291.

**MUSC (THEA) 3291 - Musical Theatre Vocal Performance Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany MUSC 3290. May also be offered as THEA 3291. Coreq: MUSC3290.

**MUSC 3300 - Small Ensemble**
1 Credits (3 Contact Hours)
Ensembles: devoted to the musical training of instrumental, vocal ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. Enrollment in simultaneous sections is allowed.

**MUSC 3310 - Pep Band**
1 Credits (3 Contact Hours)
Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given in addition to the minimum rehearsal time. Simultaneous enrollment in multiple sections is allowed. Audition required.

**MUSC 3320 - Woodwind Quintet**
1 Credits (3 Contact Hours)
Ensembles: advanced study of woodwind chamber music media. One one-hour class meeting each week, for which a minimum of two hours of ensemble practice is required. Audition required. Preq or concurrent enrollment: MUSC 3620.

**MUSC 3330 - String Quartet**
1 Credits (3 Contact Hours)
Ensembles: advanced study of string quartet repertoire. Two 90-minute meetings each week for which a minimum of two hours of practice is required. Audition required. Preq or concurrent enrollment: MUSC 3690.

**MUSC 3340 - Flute Choir**
1 Credits (3 Contact Hours)
Ensembles: study of flute ensemble literature. One 60-minute meeting each week for which a minimum of two hours of practice is required. Audition required.

**MUSC 3360 - Percussion Ensemble**
1 Credits (2 Contact Hours)
Ensembles: study and performance of percussion ensemble literature. One two-hour class meeting each week, for which a minimum of two hours of individual practice is required. Audition required. Preq or concurrent enrollment: MUSC 3310 or MUSC 3620 or MUSC 3630 or MUSC 3640 or MUSC 3690.

**MUSC 3370 - Steel Drum Band**
1 Credits (2 Contact Hours)
Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances
are given in addition to the minimum rehearsal time. Rehearsals also include discussions of steel band history and performance practice. Audition required.

**MUSC 3410 - Men's Breakout Ensemble**  
1 Credits (2 Contact Hours)  
Small ensembles: study of male a cappella/popular music on an advanced level. Audition required. Preq or concurrent enrollment: MUSC 3700 or MUSC 3720.

**MUSC 3420 - Women's Breakout Ensemble**  
1 Credits (2 Contact Hours)  
Small ensembles: study of women's a cappella/popular vocal music on an advanced level. Audition required. This course may be repeated for credit with a maximum of 16 hours ensemble credit allowable toward a degree. Preq or concurrent enrollment: MUSC 3700 or MUSC 3710.

**MUSC 3430 - Men's Small Ensemble**  
1 Credit (2 Contact Hours)  
Small ensembles: study of male a cappella/popular, barbershop, and nostalgic music on an advanced level.

**MUSC 3440 - Vocal Jazz Ensemble**  
1 Credit (3 Contact Hours)  
Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time.

**MUSC 3450 - Chamber Choir**  
1-3 Credits (1-3 Contact Hours)  
Ensemble devoted to music training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. An audition is required. Preq: MUSC 3700 or MUSC 3710 or MUSC 3720.

**MUSC 3510 - Applied Music**  
1 Credits (1 Contact Hours)  
Continuation of MUSC 2520. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. Preq: MUSC 2520 and consent of instructor.

**MUSC 3520 - Applied Music**  
1 Credits (1 Contact Hours)  
Continuation of MUSC 3510. Students are required to perform an appropriate solo in a student recital. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. Preq: MUSC 3510 and consent of instructor.

**MUSC 3530 - Applied Music for Majors**  
1 Credits (1 Contact Hours)  
Continuation of MUSC 2540. May be repeated on other performance media with departmental approval. Jury is required. Applied music fee is assessed. Preq: MUSC 2540 and consent of instructor.

**MUSC 3540 - Applied Music for Majors**  
1 Credits (1 Contact Hours)  
Continuation of MUSC 3530. May be repeated on other performance media with departmental approval. Juried half-recital performance is required. Applied music fee is assessed. Preq: MUSC 3530 and consent of instructor.

**MUSC 3610 - Marching Band**  
1 Credits (3 Contact Hours)  
Ensembles: devoted to musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. Offered fall semester only. This course may be repeated for credit with a maximum of 16 hours ensemble credit allowable toward a degree.

**MUSC 3620 - Symphonic Band**  
1 Credits (3 Contact Hours)  
Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. Audition required. This course may be repeated for credit with a maximum of 16 hours ensemble credit allowable toward a degree.

**MUSC 3630 - Jazz Ensemble**  
1 Credits (3 Contact Hours)  
Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances
are given periodically in addition to the minimum rehearsal time. Audition required. This course may be repeated for credit with a maximum of 16 hours ensemble credit allowable toward a degree.

**MUSC 3640 - Concert Band**
1 Credits (2 Contact Hours)
Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. This course may be repeated for credit with a maximum of 16 hours ensemble credit allowable toward a degree.

**MUSC 3690 - Symphony Orchestra**
1 Credits (3 Contact Hours)
College-community orchestra devoted to performing works from the standard repertoire. Public performances are given periodically in addition to the minimum rehearsal time. Audition required. This course may be repeated for credit with a maximum of 16 hours ensemble credit allowable toward a degree.

**MUSC 3700 - Clemson University Singers**
1 Credits (3 Contact Hours)
Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given periodically in addition to the minimum rehearsal time. Audition required. This course may be repeated for credit with a maximum of 16 hours ensemble credit allowable toward a degree.

**MUSC 3710 - Women's Chorus**
1 Credits (3 Contact Hours)
Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given in addition to the minimum rehearsal time. This course may be repeated for credit with a maximum of 16 hours ensemble credit allowable toward a degree.

**MUSC 3720 - Men's Chorus**
1 Credits (3 Contact Hours)
Ensembles: devoted to the musical training of ensemble members through reading and rehearsal of appropriate music. Public performances are given in addition to the minimum rehearsal time. This course may be repeated for credit with a maximum of 16 hours ensemble credit allowable toward a degree.

**MUSC 3950 - Creative Inquiry in Music III**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

**MUSC 3980 - Special Topics in Music**
3 Credits (3 Contact Hours)
Consideration of select areas of study in music not addressed by other music courses. May be repeated once for credit.

**MUSC 4000 - Music in the Elementary Classroom**
3 Credits (3 Contact Hours)
Familiarizes teachers in the elementary classroom with traditional, Kodaly, Orff, and Kindermusik approaches in correlating music with language arts, mathematics, and social studies. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**MUSC 4050 - Instrumental and Vocal Arranging**
3 Credits (2 Contact Hours)
Advanced study of the properties of instruments and voices and their combination in various small and large ensembles. Emphasis is placed on applying this knowledge to the creation of instrumental and vocal arrangements. Preq: MUSC 1800 and MUSC 1420. Coreq: MUSC 4051.

**MUSC 4051 - Instrumental and Vocal Arranging Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany MUSC 4050. Coreq: MUSC 4050.

**MUSC 4150 - Music History to 1750**
3 Credits (3 Contact Hours)
Development of Western music from antiquity to 1750, emphasizing representative literature from various styles and periods. Music ensemble and/or lesson experience is recommended.

**MUSC 4160 - Music History Since 1750**
3 Credits (3 Contact Hours)
Development of Western music from 1750 to the present, emphasizing representative literature from various styles and periods. Music ensemble and/or lesson experience is recommended.

**MUSC 4300 - Conducting**
3 Credits (3 Contact Hours)
Study of choral and instrumental conducting. Emphasis is on manual conducting techniques, attitudes, philosophies, and responsibilities necessary for the preparation, planning, and execution of artistic conducting. Preq: MUSC 1420.

**MUSC 4510 - Applied Music**
1 Credits (1 Contact Hours)
Continuation of MUSC 3520, guiding students in interpretation of advanced solo and ensemble literature. Students are required to perform an appropriate solo in a student recital. May be repeated for credit with departmental approval of differing performance media. Applied music fee is assessed. Preq: MUSC 3520 and consent of instructor.

**MUSC 4520 - Applied Music**
1 Credits (1 Contact Hours)
Continuation of MUSC 4510. Students are required to perform an appropriate solo in a student recital. Applied music fee is assessed. Preq: MUSC 4510 and consent of instructor.

**MUSC 4530 - Applied Music for Majors**
1 Credits (1 Contact Hours)
Continuation of MUSC 3540. May be repeated on other performance media with departmental approval. Jury is required. Applied music fee is assessed. Preq: MUSC 3540 and consent of instructor.

**MUSC 4540 - Applied Music for Majors**
1 Credits (1 Contact Hours)
Continuation of MUSC 4530. May be repeated on other performance media with departmental approval. Juried full recital performance is required. Applied music fee is assessed. Preq: MUSC 4530 and consent of instructor.

**MUSC 4950 - Creative Inquiry in Music IV**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

**MUSC 4990 - Independent Studies**
1-3 Credits (1-3 Contact Hours)
Tutorial work for students with special interests in music study outside the scope of existing courses. May be repeated for a maximum of six credits. Preq: Consent of department chair.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

### Nonprofit Leadership

**NPL 3000 - Foundations in Nonprofit Leadership**
3 Credits (3 Contact Hours)
Course provides foundational knowledge and understanding of non-profit organizations, their development, governance, maintenance and operations within modern society. NPL courses may not substitute for courses in Accounting, Economics, Executive Leadership & Entrepreneurship, Finance, Management, or Marketing curricula.

**NPL 3010 - Understanding Stakeholders for Non-Profit Organizations**
3 Credits (3 Contact Hours)
Comprehensive review of identifying and reaching stakeholders in non-profit organizations. Material covers basic promotion of non-profit services, including use of media through advertising, public service announcements, events and partnerships, as well as approaches to copy
writing, public speaking and working with local and regional governments. NPL courses may not substitute for courses in Accounting, Economics, Executive Leadership & Entrepreneurship, Finance, Management, or Marketing curricula. Preq: NPL 3000.

**NPL 3020 - Funding and Accountability in Non-Profit Organizations**
3 Credits (3 Contact Hours)
This course prepares students to understand and participate in the fiscal management of non-profit organizations. Course focuses on understanding, producing, interpreting, and communicating financial information to staff, board members, volunteers and other stakeholders. NPL courses may not substitute for courses in Accounting, Economics, Executive Leadership & Entrepreneurship, Finance, Management, or Marketing curricula. Preq: NPL 3000.

**NPL 3030 - Personnel Leadership in Non-Profit Organizations**
3 Credits (3 Contact Hours)
Introduces students to the principles of personnel leadership as related to paid, un-paid and seasonal employees of non-profit organizations. Recruitment, selection/hiring, retention and motivation, and evaluation as it pertains to the non-profit sector and its unique blend of paid and un-paid workers is discussed. NPL courses may not substitute for courses in Accounting, Economics, Executive Leadership & Entrepreneurship, Finance, Management, or Marketing curricula. Preq: NPL 3000.

**NPL 3040 - Risk Management of Non-Profit Organizations**
3 Credits (3 Contact Hours)
Conceptual and practical aspects of risk management and legal issues associated with non-profit organizations are covered. Foundational knowledge of the non-profit organization as a legal entity, including risk identification, management, transfer and financing, liability, and ethics. NPL courses may not substitute for courses in Accounting, Economics, Executive Leadership & Entrepreneurship, Finance, Management, or Marketing curricula. Preq: NPL 3000.

**NPL 3900 - Practicum I**
1 Credits (3 Contact Hours)
Under agency supervision, students spend 60 hours observing and implementing activities, events, and programs in a nonprofit, faith-based, grassroots, or organization approved by instructor. To be taken Pass/No Pass only. Preq: NPL 3000.

**NPL 4900 - Non-Profit Leadership Preceptorship**
3 Credits (9 Contact Hours)
Provides students with the opportunity to gain practical experience in an environment where learning about non-profit operations and management is the chief objective. Under the guidance of a qualified professional supervisor, students apply theories, concepts, philosophies and techniques acquired in the classroom. To maximize the student's professional development, the practicum is to encompass as many operation and management aspects of the cooperating agency as possible. To be taken Pass/No Pass only. NPL courses may not substitute for courses in Accounting, Economics, Executive Leadership & Entrepreneurship, Finance, Management, or Marketing curricula. Preq: NPL 3000.

**Nursing**

**NURS 1020 - Nursing Success Skills**
2 Credits (2 Contact Hours)
Introduction to a variety of topics critical to a student's success as a Nursing major and future professional. Topics include time management, goal setting, test taking, campus and nursing department resources and policies, critical thinking, and diversity. Students have the opportunity to discover and practice many procedures, techniques, and tips, as well as apply principles learned to their future career in nursing. Preq: Nursing major.

**NURS 1400 - Computer Applications in Nursing**
3 Credits (3 Contact Hours)
Introduces students to nursing and the application of computer technology in the delivery of health care. Covers existing computer health-care applications, emerging trends and forecast future needs. Social and ethical issues related to technology are discussed. Preq: Acceptance into the Nursing program.

**NURS 1980 - Creative Inquiry in Nursing**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

**NURS 2980 - Creative Inquiry in Nursing**
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

**NURS 3000 - Seminar in Health Care Topics**
1-4 Credits (1-4 Contact Hours)
Individualized in-depth study in a selected health care area; may have a clinical component and/or special projects. Open to non-Nursing majors. May be repeated for a maximum of six credits. Preq: Consent of instructor.

**NURS 3030 - Medical-Surgical II: Nursing of Adults**
7 Credits (3 Contact Hours)
Incorporates theoretical and empirical knowledge from physical and social sciences. Uses critical thinking to provide holistic, safe, individualized nursing care to adults, including health promotion, maintenance, restoration, and health teaching. Preq: NURS 3040 and NURS 3100 and NURS 3120 and NURS 3400, each with a C or better. Coreq: NURS 3031 and NURS 3050.

**NURS 3031 - Medical-Surgical II: Nursing of Adults Laboratory**
0 Credits (12 Contact Hours)
Non-credit laboratory to accompany NURS 3030. Coreq: NURS 3030.

**NURS 3040 - Pathophysiology for Health Care Professionals**
3 Credits (3 Contact Hours)
Focuses on disease mechanisms and recognition of the manifestations of these mechanisms in body systems. Discussion also includes pharmacologic and mechanical interventions commonly associated with specific disease processes and application to patient-care situations. Preq: BIOL 2230 with a C or better and junior standing in Nursing.

**NURS 3050 - Psychosocial Nursing**
3 Credits (3 Contact Hours)
Lifespan approach to examine psychosocial, developmental, family, and cultural factors that influence individuals from diverse populations and their families in the promotion, maintenance, and restoration of health. The use of the nursing process, critical thinking, therapeutic communication, and psychosocial nursing interventions is explored. Coreq: NURS 3030.

**NURS 3070 - Family Nursing in the Community**
4 Credits (3 Contact Hours)
Bridge course for registered nurse students that focuses on nursing care of families across the lifespan in the context of the community. Major emphasis is on practice activities to assist individuals in achieving or maintaining wellness in the family, home, and community environments. Coreq: NURS 3071 and NURS 4250.

**NURS 3071 - Family Nursing in the Community Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany NURS 3070. Coreq: NURS 3070.

**NURS 3100 - Health Assessment**
3 Credits (2 Contact Hours)
Introduces concepts of health, wellness, and illness. Focuses on physical, psychosocial, and cultural assessment for the well adult client with variations across the lifespan. Includes interviewing techniques. Preq: BIOL 2220 with a C or better. Coreq: NURS 3101 and NURS 3120 and NURS 3400.

**NURS 3101 - Health Assessment Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany NURS 3100. Coreq: NURS 3100.

**NURS 3110 - Health Promotion Across the Lifespan**
2 Credits (2 Contact Hours)
Focuses on health promotion and illness prevention activities across the lifespan for individuals and families in the community. Major emphasis is on nursing's role in the acquisition and maintenance of health as well as the identification and modification of health risk factors. Preq: NURS 3100 and NURS 3120 and NURS 3200.

**NURS 3120 - Medical-Surgical I: Foundations of Nursing**
4 Credits (2 Contact Hours)
Focuses on therapeutic nursing interventions, including selected psychomotor skills, communication skills, and teaching/learning. Coreq: NURS 3100 and NURS 3121 and NURS 3400.
NURS 3121 - Medical-Surgical I: Foundations of Nursing Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany NURS 3120. Coreq: NURS 3120.

NURS 3180 - Multidisciplinary Approach to End-of-Life Care
3 Credits (3 Contact Hours)
Integrates principles of care to increase comfort at the end of life, presented within a framework that encompasses the physical, psychosocial, and spiritual dimensions of an individual. Coursework also includes ethical and legal issues related to advance directives, reimbursement, and regulatory topics. Preq: PSYC 2010 or SOC 2010.

NURS 3190 - Health Assessment for RNs
3 Credits (3 Contact Hours)
Expands knowledge of health assessment techniques utilized with well or ill adult clients. Emphasizes data collection as a basis for critical thinking in professional nursing practice. Preq: Admission to RN/BS program.

NURS 3200 - Professionalism in Nursing
3 Credits (3 Contact Hours)
Application of critical thinking skills is the core of professional nursing roles in multidisciplinary approaches to health care. Analysis of the historical development of modern nursing. Examination of issues of providing nursing care to diverse populations within the context of professional standards. Includes medical nomenclature. Preq: BIOL 2220 with a C or better.

NURS 3230 - Gerontology Nursing
2 Credits (2 Contact Hours)
Introduction of theories of aging. Focuses on complex health care issues of aging and chronic care, including promotion, maintenance, and restoration of health of the elderly. Scientific concepts address physiological, psychological, and sociological issues of aging and chronic illness. Preq: NURS 3100 and NURS 3120.

NURS 3280 - Honors Seminar I
2 Credits (2 Contact Hours)
Serves as the foundation for senior honors projects. Students identify a topic of interest, a faculty mentor, and team members for their honors project and begin to review the literature in their areas of interest. Preq: Admission to Nursing Department Honors program.

NURS 3300 - Research in Nursing
3 Credits (3 Contact Hours)
Introduction to conceptual frameworks, models, and theories related to nursing. Analysis of reported research in nursing and related disciplines. Ethical, moral, and legal issues are discussed in relation to nursing research. Includes Honors sections. Preq: NURS 3100 and NURS 3120 and NURS 3200; or admission to the RN/BS or accelerated Nursing program.

NURS (HCG) 3330 - Health Care Genetics
3 Credits (3 Contact Hours)
Focuses on the new genetics and the implications for health care professionals. Discussion includes applications of the evolving genetics technology and services to changing life stages. Issues of ethics relevant to various genetic disorders is also addressed. May also be offered as HCH 3330. Preq: BIOL 2220 with a C or better.

NURS 3340 - Integrative Healing: Complementary/Alternative Healthcare
3 Credits (3 Contact Hours)
Introduction to healing practices that are complementary with/and alternative (C/A) for conventional Western medicine. Includes exploration of research, principles, techniques, and methods of C/A used in health and healing.

NURS 3400 - Pharmacotherapeutic Nursing Interventions
3 Credits (3 Contact Hours)
Focuses on the integration of nursing process with pharmacotherapeutics, administration, monitoring, and related client education. Includes major drug classifications, indications for use, side effects, interactions, routes of administration, usual dosages and contraindications. Preq: Junior standing in Nursing. Coreq: NURS 3100 and NURS 3120.

NURS 3510 - Contemporary Health Care Ethics
3 Credits (3 Contact Hours)
Students from diverse disciplines use knowledge of ethical theories/principles to critically reflect on current health care issues and policies. Students also examine methods of ethical decision making to conduct policy analysis. Current trends in the political, economic and legal arenas of health care are examined using the Socratic Method. Nursing majors are given registration priority.

NURS 3600 - Social Determinants of Health in Low Resource Countries
3 Credits (3 Contact Hours)
Examines the historic roots of global health and the impact of social determinants of health with specific focus on low resource countries. Topics include diseases common to impoverished populations, childhood and maternal morbidity, violence, occupational injuries, and malnutrition. Preq: Nursing, Public Health Sciences, Nutrition, Preprofessional Health Studies, Preoccupational Therapy, Prepharmacy, Prephysical Therapy, or Prephysician Assistant major.

**NURS 3610 - Leadership and Collaboration in Global Health**
3 Credits (3 Contact Hours)
Provides the foundation for leadership skills and collaboration for the delivery of global health care in low resource countries. Development of communication skills needed to work in collective, partnership-based agencies and communities as part of an inter-professional team is emphasized. Preq: NURS 3600 with a C or better; and Nursing, Public Health Sciences, Nutrition, Preprofessional Health Studies, Preoccupational Therapy, Prepharmacy, or Prephysician Assistant major.

**NURS 3620 - Low Resource Country Field Experience**
3 Credits (9 Contact Hours)
In this study abroad course, students focus on language acquisition while working and living in a low resource country. Students participate in service-learning projects with community partnerships. Emphasis is placed on recognition of the social, economic and cultural contexts of the host country. Preq: NURS 3600 and NURS 3610, each with a C or better; and Nursing, Public Health Sciences, Nutrition, Preprofessional Health Studies, Preoccupational Therapy, Prepharmacy, Prephysical Therapy, or Prephysician Assistant major.

**NURS 3980 - Creative Inquiry in Nursing**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

**NURS 4010 - Mental Health Nursing**
5 Credits (3 Contact Hours)
Application of theories and the nursing process to identify, implement, and evaluate nursing interventions for the care of clients with psychiatric disorders. Preq: NURS 3030 and NURS 3050 and NURS 3110 and NURS 3230 and NURS 3300, each with a C or better. Coreq: NURS 4011 and NURS 4110 and NURS 4120.

**NURS 4011 - Mental Health Nursing Laboratory**
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany NURS 4010. Coreq: NURS 4010.

**NURS 4030 - Medical-Surgical III: Complex Nursing of Adults**
5 Credits (3 Contact Hours)
Focuses on the biological, psychological, philosophical, and sociocultural influences on complex health problems related to acute and traumatic conditions. Emphasizes the concepts of circulation, oxygenation, homeostasis, and compensation in acutely ill adults. Preq: NURS 4010 and NURS 4110 and NURS 4120, each with a C or better. Coreq: NURS 4031 and NURS 4100 and NURS 4150.

**NURS 4031 - Medical-Surgical III: Complex Nursing of Adults Laboratory**
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany NURS 4030. Coreq: NURS 4030.

**NURS 4050 - Leadership and Management in Nursing**
3 Credits (2 Contact Hours)
Focuses on the role of the professional nurse in managing nursing care. Theories and research related to leadership, power, management, organizations, regulation, and ethics are discussed. Directed laboratory experiences are provided. Preq: Admission to RN/BS program. Coreq: NURS 4051.

**NURS 4051 - Leadership and Management in Nursing Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany NURS 4050. Coreq: NURS 4050.

**NURS 4060 - Issues in Professionalism**
3 Credits (3 Contact Hours)
Analysis of the development of professional nursing. Consideration of educational issues, legal and economic issues, health policy, leadership, cultural variations, and the influence of values in ethical decisions and nursing practice. Preq: Admission to RN/BS program.

**NURS 4100 - Leadership Management and Nursing Care Practicum**
6 Credits (3 Contact Hours)
Focuses on the role of the professional nurse in practicing and managing nursing care. Theories and research related to clinical practice, leadership, power, management, organizations, regulation, ethics, and licensure preparation are discussed. Directed lab experiences are provided under preceptor supervision. Coreq: NURS 4030 and NURS 4101 and NURS 4150.

NURS 4101 - Leadership Management and Nursing Care Practicum Laboratory
0 Credits (9 Contact Hours)
Non-credit laboratory to accompany NURS 4100. Coreq: NURS 4100.

NURS 4110 - Nursing Care of Children
5 Credits (3 Contact Hours)
Focuses on child health problems and health maintenance. Emphasizes biological, pathophysiological, psychological, and sociocultural concepts related to nursing care of children with acute, critical, and chronic illnesses. Includes strategies for alleviation of illnesses, restoration of wellness, promotion and maintenance of health, growth, and development. Preq: NURS 3030 and NURS 3050 and NURS 3110 and NURS 3230 and NURS 3300, each with a C or better. Coreq: NURS 4010 and NURS 4111 and NURS 4120.

NURS 4111 - Nursing Care of Children Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany NURS 4110. Coreq: NURS 4110.

NURS 4120 - Nursing Care of Women and Their Families
5 Credits (3 Contact Hours)
Focuses on community health nursing of families and community groups, including community assessment, screening, health promotion and health education, with emphasis on the health of clients and population groups in homes, schools, industries and other community agencies and organizations. Preq: NURS 4010 and NURS 4110 and NURS 4120, each with a C or better; and admission to the accelerated Nursing program. Coreq: NURS 4141.

NURS 4121 - Nursing Care of Women and Their Families Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany NURS 4120. Coreq: NURS 4120.

NURS 4140 - Community Health Nursing and Health Promotion
5 Credits (3 Contact Hours)
Consideration of health promotion activities for family and community groups with emphasis on community assessment, screening, and health teaching/counseling. Practice activities are related to health promotion in population groups and nursing care of homebound clients. Laboratory settings include homes, schools, industries, and other community organizations. Preq: NURS 4010 and NURS 4110 and NURS 4120, each with a C or better. Coreq: NURS 4030 and NURS 4100 and NURS 4151.

NURS 4150 - Community Health Nursing Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany NURS 4150. Coreq: NURS 4150.

NURS 4160 - Concepts in Transcultural Nursing
3 Credits (3 Contact Hours)
Focuses on transcultural nursing concepts, theory and practices in order to provide culturally congruent nursing care. Culture care beliefs, values and practices of specific cultures are analyzed based on Leininger's Culture Care Theory, using the ethnonursing method and research findings.

NURS 4200 - Senior Honors I
2 Credits (2 Contact Hours)
Students develop a proposal for a major thesis, directed study project, or research project under the guidance of a faculty preceptor. Preq: Honors section of NURS 3300 with a C or better.
NURS 4250 - Community Nursing
4 Credits (3 Contact Hours)
Consideration of health promotion activities for groups within the community with emphasis on community assessment, screening, and health teaching/counseling. Practice activities are related to health promotion in population groups and nursing care of homebound clients. Laboratory settings include homes, schools, industries, public health department, and other community agencies. Preq: Admission to RN/BS program. Coreq: NURS 3070 and NURS 4251.

NURS 4251 - Community Nursing Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany NURS 4250. Coreq: NURS 4250.

NURS 4280 - Senior Honors II
2 Credits (2 Contact Hours)
Students implement a proposal for a major directed study project or research thesis under the guidance of a faculty preceptor. Preq: NURS 4200 with a C or better.

NURS 4500 - Adult Critical Care
3 Credits (6 Contact Hours)
Focuses on the biological, psychological, philosophical and sociocultural influences on complex health problems related to acute, critical and traumatic health conditions. Applications of the concepts in ventilator management, hemodynamic monitoring and implementation of practice alerts in the critical care population in an acute and critical care setting. Preq: Admission to RN/BS program.

NURS 4980 - Creative Inquiry in Nursing
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

NURS 4990 - Independent Study
1-4 Credits (1-4 Contact Hours)
In-depth study in an area of special interest in Nursing. Students develop specific objectives with a faculty member with expertise in the area of interest. May be repeated for a maximum of six credits. Preq: Consent of instructor.

Nutrition

NUTR 2030 - Introduction to Principles of Human Nutrition
3 Credits (3 Contact Hours)
Study of nutrient functions and requirements, food choices, dietary adequacy, and role of nutrition in physical fitness. Deals with social and scientific issues; evaluation and interpretation of nutrition sources from government, private, academic, and the health care sectors.

NUTR 2040 - Nutrition Across the Life Cycle
3 Credits (3 Contact Hours)
Using current evidence, course examines nutrition issues and requirements across the life cycle, including pre-conception, pregnancy, lactation, infancy, childhood, adolescence, adulthood, and aging. Methods of nutritional assessment for each stage of life are explored. Preq: NUTR 2030.

NUTR 2050 - Nutrition for Nursing Professionals
3 Credits (3 Contact Hours)
Investigation of targeted general and clinical nutrition topics, including principles of nutrition, life-cycle nutrition, relationship of diet to health and disease, and the role of nursing professionals and nutrition. Preq: Nursing major. Preq or concurrent enrollment: BIOL 2220.

NUTR 2100 - Nutrition and Physical Activity
3 Credits (3 Contact Hours)
Topics include role of carbohydrates, fats, and proteins on energy utilization during exercise; altering body composition and improving fitness with diet and physical activity; importance of fluid intake on performance; effectiveness of dietary supplements and ergogenic aids; and choosing a diet appropriate for individual physical activity levels. Preq: BIOL 1200; and one of BIOL 1210 or BIOL 1220 or BIOL 1230 or BIOL 1240.

NUTR 2160 - Evidence-Based Nutrition
2 Credits (2 Contact Hours)
Introduction to research methods, ethics in research, and evidence-based nutrition guidelines within the profession of nutrition and dietetics. Preq: Food Science and Human Nutrition major.

**NUTR 4010 - Fundamentals of Nutrition**
3 Credits (3 Contact Hours)
Biochemical and physiological fundamentals of nutrition applicable to man and domestic animals. Considers digestive processes and absorption and metabolism of carbohydrates, lipids, proteins, water, minerals, and vitamins. Discusses energy metabolism and comparative anatomy and physiology of digestive systems. Offered fall semester only. Includes Honors sections. Preq: BCHM 3050 or CH 2230. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**NUTR 4180 - Professional Development in Dietetics**
1 Credits (1 Contact Hours)
Provides the steps for dietetic internship application process; career development in the dietetics field; and concepts of professional standards. Preq: Food Science and Human Nutrition major and Junior standing.

**NUTR 4190 - Professional Development in Nutrition**
1 Credits (1 Contact Hours)
Career development strategies to assist students pursuing professional or graduate degrees. The focus is on standards used for admission, application preparation, and what to do when admitted. Preq: Food Science and Human Nutrition major and Junior standing.

**NUTR 4200 - Selected Topics in Nutrition**
1-3 Credits (1-3 Contact Hours)
Comprehensive study of special topics in nutrition not covered in detail or contained in other courses. Current developments in each area are stressed. May be repeated for a maximum of three credits, but only if different topics are covered. Preq: Food Science and Human Nutrition major and Senior standing.

**NUTR 4210 - Special Problems in Nutrition**
1-4 Credits (1-4 Contact Hours)
Independent research investigation in nutrition. Special emphasis is on developing a research proposal, conducting the research, and reporting the findings. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Food Science and Human Nutrition major and Senior standing.

**NUTR 4240 - Medical Nutrition Therapy I**
4 Credits (3 Contact Hours)
Principles of nutritional assessment, education, and counseling skills; development of medical nutrition therapy for individuals with obesity and eating disorders, gastrointestinal disorders, metabolic and renal disorders. Includes Honors sections. Preq: Food Science and Human Nutrition major or Food Science minor; and BIOL 2220 and BIOL 2230 and NUTR 4510. Coreq: NUTR 4241. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**NUTR 4241 - Medical Nutrition Therapy I Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany NUTR 4240. Coreq: NUTR 4240. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**NUTR 4250 - Medical Nutrition Therapy II**
4 Credits (3 Contact Hours)
Development of medical nutrition therapy for individuals with various disease states, including cardiovascular, hepatic, musculoskeletal, and neoplastic disorders. Also considers sociocultural and ethnic aspects of food consumption and alternative nutrition therapies. Includes Honors sections. Preq: Food Science and Human Nutrition major or Food Science minor; and BIOL 2220 and BIOL 2230 and NUTR 4240. Coreq: NUTR 4251. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**NUTR 4251 - Medical Nutrition Therapy II Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany NUTR 4250. Coreq: NUTR 4250. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
NUTR 4260 - Community Nutrition
3 Credits (3 Contact Hours)
Study of fundamentals of nutrition care delivery in community programs beginning with assessment and problem identification and continuing through the development, implementation, and evaluation of nutrition intervention programs. Preq: Food Science and Human Nutrition major or Food Science minor and NUTR 4510.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

NUTR 4270 - Nutrition Counseling
1 Credit (1 Contact Hours)
Examination and application of nutrition counseling methods, theories and strategies needed to promote nutrition behavior change. Assessment and interpretation of client information, development of client goals, and evaluation of interventions are discussed. Preq: NUTR 4240.

NUTR 4510 - Human Nutrition and Metabolism I
3 Credits (3 Contact Hours)
Concepts of metabolism fundamental to understanding human nutrition are examined. Bioenergetics and the metabolism of carbohydrates, lipids and amino acids are discussed. Includes Honors sections. Preq: Food Science and Human Nutrition major or Food Science minor; and NUTR 2030; and one of BCHM 3050 or BCHM 4060 or BCHM 4230.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

NUTR 4550 - Human Nutrition and Metabolism II
3 Credits (3 Contact Hours)
Concepts of metabolism fundamental to understanding human nutrition are examined. Bioenergetics related to the metabolism of vitamins and minerals, physical activity, and hormonal responses are discussed. Preq: BIOL 2220 and NUTR 4510. Preq or concurrent enrollment: BIOL 2230.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

NUTR 4950 - Senior Honors Research in Nutrition
3 Credits (1 Contact Hours)
With professor supervision, students select a well-defined research question, plan the experimental design, perform data collection and results analysis, and prepare a project summary. Preq: Membership in Calhoun Honors College. Coreq: NUTR 4951.

NUTR 4951 - Senior Honors Research in Nutrition Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany NUTR 4950. Coreq: NUTR 4950.

NUTR 4960 - Senior Honors Research in Nutrition
3 Credits (1 Contact Hours)
Continuation of NUTR 4950. Students complete an advanced, mentored, two-semester research project under a single research advisor, culminating in an advisor approved honors thesis, in-depth written report or portfolio of work. An oral project summary presentation is required. Preq: Membership in Calhoun Honors College. Coreq: NUTR 4961.

NUTR 4961 - Senior Honors Research in Nutrition Laboratory
0 Credits (6 Contact Hours)

Packaging Science
PKSC 1010 - Packaging Orientation
1 Credit (1 Contact Hours)
Overview of the various principles and practices in packaging science, historical development, packaging as a career.

PKSC 1020 - Introduction to Packaging Science
2 Credits (2 Contact Hours)
Considers functions of a package; materials, processes, and technology used in package development; and the relationship of packaging to the corporation, consumer, and society as a whole.
PKSC 2010 - Packaging Perishable Products  
3 Credits (3 Contact Hours)  
Covers fundamental characteristics and applications of various materials and systems used to package perishable products such as foods and pharmaceuticals. Discusses packaging issues regarding food, pharmaceutical, and medical packaging. Includes product/package interactions and packaging requirements to address basic theory in food and pharmaceutical protection. Preq or concurrent enrollment: CH 2010 and PKSC 1020 and PKSC 2020 and PKSC 2021.

PKSC 2020 - Packaging Materials and Manufacturing  
4 Credits (3 Contact Hours)  

PKSC 2021 - Packaging Materials and Manufacturing Laboratory  
0 Credits (3 Contact Hours)  

PKSC 2030 - Packaging Research Fundamentals  
2 Credits (2 Contact Hours)  
Principles, methods, and resources for organizing, researching, and reporting technical work in packaging science. Preq: PKSC 1020 and PKSC 1030 and ENGL 1030 and Packaging Science major.

PKSC 2040 - Container Systems (Rigid and Flexible)  
3 Credits (3 Contact Hours)  
Examination of all the packages and containers used to develop systems to distribute products. Compatibility of product and package, structural design, costs, and merchandising considerations are stressed. Preq: PKSC 1020 and PKSC 2020. Coreq: PKSC 2060.

PKSC 2060 - Container Systems Laboratory  
1 Credits (3 Contact Hours)  

PKSC 2200 - Product/Package Design and Prototyping  
4 Credits (2 Contact Hours)  

PKSC 2201 - Product/Package Design and Prototyping Laboratory  
0 Credits (6 Contact Hours)  
Non-credit laboratory to accompany PKSC 2200. Coreq: PKSC 2200.

PKSC 3200 - Packaging Design Theory  
3 Credits (2 Contact Hours)  
Study of human factors psychology as it relates to product and package development. Lecture topics center on advanced color theory, space, shape, texture, pattern, typography, branding, marketing, consumer studies, ergonomics, sustainability and applied packaging. Laboratory focuses on developing retail packaging through applying course theory, group development and peer critique. Preq: PKSC 1020 and PKSC 2200. Coreq: PKSC 3201.

PKSC 3201 - Packaging Design Theory Laboratory  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany PKSC 3200. Coreq: PKSC 3200.

PKSC 3680 - Packaging and Society  
3 Credits (3 Contact Hours)  
Study of the role of packaging in society as it specifically relates to the responsibilities of the packaging scientist in protecting people and the environment. Includes study of packaging and environmental regulations and guidelines currently in place to achieve these goals. Ability to make informed decisions and ethical judgments is an encompassing goal. Includes Honors sections.

PKSC 4010 - Packaging Machinery  
3 Credits (3 Contact Hours)  
Systematic study of types of machinery used to form, fill, seal, and handle various packaging, products, and packaging materials. Emphasizes basic mechanical, electrical, pneumatic, and hydraulic components of packaging machinery along with packaging machinery
terminology. Discusses methods for machine line optimization and layout. Preq: Packaging Science major or minor or Food Science major or minor; and FDSC 2140 or PKSC 2040. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PKSC 4030 - Packaging Career Preparation
1 Credits (1 Contact Hours)
Preparation for a successful career in Packaging Science by completing the professional e-portfolio, and finalizing a resume and career e-portfolio. Refines career skills through role playing. Topics include presentations, interviewing, effective collaboration and communication, business and foreign travel etiquette. Preq: Packaging Science major or minor. Coreq: PKSC 4200.

PKSC 4040 - Mechanical Properties of Packages and Principles of Protective Packaging
3 Credits (3 Contact Hours)
Study of the mechanical properties of products and packages and standard methods of determining these properties. Focuses on the functional properties of packages related to shock and vibration isolation and compression. Includes Honors sections. Preq: Packaging Science major or minor and junior standing; and MATH 1060 and PKSC 1020 and PKSC 2040; and one of PHYS 1220 or PHYS 2070. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PKSC (FDSC) 4090 - Total Quality Management for the Food and Packaging Industries
3 Credits (3 Contact Hours)
Introduction to the principles of modern quality management emphasizing quality standards and issues and the practices necessary for food processing and packaging companies to survive in a customer-driven marketplace. May also be offered as FDSC 4090. Preq: STAT 2300.

PKSC 4160 - Application of Polymers in Packaging
4 Credits (3 Contact Hours)
Detailed study of polymer science and engineering as applied to packaging science. Includes polymer morphology, rheology, physical properties, processing methods, and polymerization. Emphasizes relationships among processing, structure, and properties. Preq: Packaging Science major or minor; and PKSC 1020 and PKSC 2040 and PKSC 2060; and one of PHYS 1220 or PHYS 2070; and one of CH 2010 or CH 2230. Coreq: PKSC 4161.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PKSC 4161 - Application of Polymers in Packaging Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PKSC 4160. Coreq: PKSC 4160.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PKSC 4200 - Package Design and Development
3 Credits (2 Contact Hours)
Study of the principles and methods practiced in designing and developing packages and packaging systems and of methods used to coordinate and analyze package development activities including interfacing with product development, manufacturing, marketing, purchasing, and accounting. Preq: Packaging Science major or minor and second semester Senior standing; and PKSC 1020 and PKSC 3200 and PKSC 3680 and PKSC 4400. Preq or concurrent enrollment: PKSC 4010 and PKSC 4040 and PKSC 4160 and PKSC 4300 and PKSC 4540 and PKSC 4640. Coreq: PKSC 4030 and PKSC 4201.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PKSC 4201 - Package Design and Development Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PKSC 4200. Coreq: PKSC 4200.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PKSC 4210 - Special Problems in Packaging Science
1-4 Credits (1-4 Contact Hours)
Independent research investigations in packaging science related to packaging materials, machinery, design, and applications. Special emphasis is placed on organizing a research proposal, conducting research, and reporting results. May be repeated for a maximum of 15 credits. Preq: Consent of instructor.

PKSC 4220 - Selected Topics in Packaging Science
1-3 Credits (1-3 Contact Hours)
Comprehensive study of selected topics in packaging science not covered in detail or contained in other courses. Contemporary
developments in each area are stressed. May be repeated for a maximum of 15 credits, but only if different topics are covered. Preq: Consent of instructor.

**PKSC 4230 - 3D Parametric Design Online**
3 Credits (3 Contact Hours)
Provides an overview of the techniques used in designing 3D parametrics solid parts for packaging science applications. The course begins with a basic overview of design software and progresses to cover advanced applications, including simulation, surfacing, tooling, photorealizing and sustainability. Additionally, this course prepares students for a professional certification exam. Recommended for students who have experience with design software.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PKSC 4240 - Structural Packaging Design Online**
3 Credits (3 Contact Hours)
Provides a comprehensive overview of how to design structural packaging for paperboard and corrugated mediums. This course begins with a basic overview and transitions into covering advanced applications. Access to design software (vector-based 2D CAD software, such as Illustrator or ArtiosCAD) is required. Recommended for students with design software experience.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PKSC 4300 - Converting for Flexible Packaging**
3 Credits (1 Contact Hours)
Study of materials, methods, processes, and equipment used in converting web materials for flexible packaging. Laboratory provides hands-on experience preparing and operating pilot-scale converting equipment. Preq: Packaging Science major or minor; and PKSC 1020 and PKSC 2040. Coreq: 4301.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PKSC 4301 - Converting for Flexible Packaging Laboratory**
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany PKSC 4300. Coreq: PKSC 4300.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PKSC 4400 - Packaging for Distribution**
3 Credits (3 Contact Hours)
Packages are exposed to various shipping methods and numerous hazards during distribution. To ensure adequate product protection, packaging professionals need to understand the fundamental principles of distribution packaging design. Topics include ASTM and ISTA packaging test methods, packaging design guidelines for distribution, terminology, transport modes, distribution hazards, and protective packaging materials. Preq: Packaging Science major or minor; and PKSC 1020 and PKSC 4040.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PKSC 4540 - Product and Package Evaluation Laboratory**
1 Credits (3 Contact Hours)
Laboratory experiments to determine properties of packaging materials and to evaluate the response of packages and products to shock, vibration, and compression. Students operate standard testing equipment and become familiar with industry recognized test methods and standards. Preq: Packaging Science major or minor; and PKSC 1020. Preq or concurrent enrollment: PKSC 4040.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PKSC 4640 - Food and Health Care Packaging Systems**
4 Credits (3 Contact Hours)
Characteristics, engineering properties, and applications of various materials and systems used in the packaging of foods, pharmaceuticals, and medical devices. Packaging systems for specific food and medical applications are considered. Laboratory and field exercises on food and medical packaging operations and packaging materials are included. Emphasis is on evaluation methods. Includes Honors sections. Preq: Packaging Science major or minor or Food Science and Human Nutrition major or Food Science minor; and one of PKSC 2010 or FDSC 2140; and PKSC 1020 and PKSC 2040. Coreq: PKSC 4641.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PKSC 4641 - Food and Health Care Packaging Systems Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PKSC 4640. Coreq: PKSC 4640.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PKSC 4950 - Senior Honors Research in Packaging Science**
3 Credits (1 Contact Hours)
With professor supervision, students select a well-defined research question, plan the experimental design, perform data collection and results analysis, and prepare a project summary. Preq: Membership in Calhoun Honors College. Coreq: PKSC 4951.

**PKSC 4951 - Senior Honors Research in Packaging Science Laboratory**
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany PKSC 4950. Coreq: PKSC 4950.

**PKSC 4960 - Senior Honors Research in Packaging Science**
3 Credits (1 Contact Hours)
Continuation of PKSC 4950. Students complete an advanced, mentored, two-semester research project under a single research advisor, culminating in an advisor approved honors thesis, in-depth written report or portfolio of work. An oral project summary presentation is required. Preq: Membership in Calhoun Honors College. Coreq: PKSC 4961.

**PKSC 4961 - Senior Honors Research in Packaging Science Laboratory**
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany PKSC 4960. Professor supervised research experience. Preq: Membership in Calhoun Honors College. Coreq: PKSC 4960.

**PKSC 4980 - Creative Inquiry Laboratory**
1-3 Credits (3-9 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams based on laboratory experimentation. Projects may be interdisciplinary in nature. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits, but the combined credits earned from PKSC 4980 and 4990 may not exceed eight.

**PKSC 4990 - Creative Inquiry in Packaging Science**
1-3 Credits (1-3 Contact Hours)
Students engage in creative inquiry projects such as surveys or literature research that do not require a laboratory component. Projects may be interdisciplinary in nature. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits, but the combined credits earned from PKSC 4980 and 4990 may not exceed eight.

**Pan African Studies**

**PAS 1010 - Africa and the Atlantic World**
3 Credits (3 Contact Hours)
Study of Africa and its impact on the culture and life of peoples in the New World. Traces the impact Africans have had on shaping the music, language, dress, art, religion, and culture of the Western world.

**PAS 3010 - Introduction to Pan African Studies**
3 Credits (3 Contact Hours)
Study of African American experience from an Afrocentric perspective from colonial America to the present.

**PAS 4000 - Studies in Pan African Studies**
3 Credits (3 Contact Hours)
Study of selected topics or themes in Pan African Studies. Allows for individualized study of specific topics related to Pan African Studies such as music, dance, religion, colonization, slavery, or economic development. May be repeated for a maximum of six credits, but only if different topics are covered.

**PAS 4100 - Studies in Africana Experience**
3 Credits (3 Contact Hours)
Looks at the impact of Africans or African Americans on U.S. society. Interdisciplinary course that allows for the study of Africans and their descendants from a variety of perspectives. Focuses primarily on the United States. May be repeated for a maximum of six credits, but only if different topics are covered.

**PAS 4300 - Hip-Hop and African American Contemporary Culture**
3 Credits (3 Contact Hours)
Examines the controversial history and legacy of Hip-Hop culture, and explores how the artistic expression of the American underclass has evolved into worldwide cultural expression. Combines scholarship and theory with considerable audio and video exposure to various Hip-Hop songs and artists. Preq: Sophomore standing.

**PAS 4680 - Comparative Racism and Discrimination in the Atlantic World**
3 Credits (3 Contact Hours)

**PAS 4710 - Directed Studies on the Black Experience in Education**
1-3 Credits (1-3 Contact Hours)
Students conduct research and produce scholarship on academic, social, and historical issues that impact the Black experience in educational settings. Students may also participate in service learning activities to broaden their understanding and apply their knowledge in the community. May be repeated for a maximum of nine credits.

**PAS 4980 - Seminar on Pan African Studies**
3 Credits (3 Contact Hours)
Research/writing seminar on the African American experience. Selected topics and themes from 1900 to present. Preq: PAS 3010; and one of HIS 3110 or HIST 3120 or HIST 3390.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

### Parks, Recreation and Tourism Management

**PRTM 1010 - Concepts of Leisure**
3 Credits (3 Contact Hours)
Introduces recreation professions and organizations: government, voluntary, and commercial; overviews professional preparation; outlines development of man's uses of leisure and evolution of recreation, city parks, natural resources conservation, and preservation movements as philosophical forces affecting leisure services. Restricted to Parks, Recreation and Tourism Management majors.

**PRTM 1950 - Professional Golf Management Seminar I**
1 Credit (1 Contact Hours)
Covers career planning and professional development training needed in the golf industry with special emphasis on topics covered in the PGA/PGM Level I Training Program. Preq: Enrollment in Professional Golf Management concentration.

**PRTM 1980 - Creative Inquiry in Parks, Recreation and Tourism Management I**
1-4 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. To be taken Pass/No Pass only. Preq: Consent of faculty member/mentor. Coreq: PRTM 1981.

**PRTM 1981 - Creative Inquiry in Parks, Recreation and Tourism Management I Laboratory**
0 Credits (1-12 Contact Hours)

**PRTM 2000 - The Profession and Practice in Parks Recreation, and Tourism Management**
1 Credit (1 Contact Hours)
Introduces students to the Parks, Recreation and Tourism Management field. Covers the history and development of the PRTM profession, including professional organizations, current issues and trends, ethical principles and professionalism, and professional competencies and development. To be taken Pass/No Pass only.

**PRTM 2010 - The Recreation/Leisure Environment**
3 Credits (3 Contact Hours)
Discusses the development characteristics of built and natural environmental resource settings for recreation, tourism development, and community expression. Examines human/environment interactions during leisure, including the impact of the recreation environment on people and the impact of people on the recreation environment. Surveys public agencies and private interests in these settings.

**PRTM 2050 - Program and Event Planning**
3 Credits (2 Contact Hours)
Principles and methods of program development. Time and facility utilization for sports activities, social functions, arts and crafts, outdoor activities, hobbies or special-interest groups, and activities in the cultural and performing arts are pursued.
PRTM 2051 - Program and Event Planning Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany PRTM 2050.

PRTM 2060 - Practicum I
1 Credit (3 Contact Hours)
Students conduct a recreation program in a supervised setting. A minimum of 90 hours with a leisure agency approved by the University is required. To be taken Pass/No Pass only. Preq: PRTM 2270.

PRTM 2070 - Practicum II
1 Credit (3 Contact Hours)
Continuation of PRTM 2060. Experience in a leisure situation different from the PRTM 2060 exposure. A minimum of 90 hours with a leisure agency approved by the University is required. To be taken Pass/No Pass only. Preq: PRTM 2270.

PRTM 2100 - Serving Diverse Populations in Parks, Recreation and Tourism Management
3 Credits (3 Contact Hours)
Introduces students to the leisure patterns and constraints of diverse constituents, including members of ethnic and racial minorities, people of diverse socioeconomic status, women, older adults, people with disabilities, and people with alternative lifestyles.

PRTM 2110 - Impacts of Technology and Science in the Context of Play, Recreation and Tourism
3 Credits (3 Contact Hours)
Examines the relationship among society, technology, and tourism and recreation. Introduces theories of play, recreation and tourism as they relate to social concerns. Students learn how science and technology have impacted how people play, recreate and travel.

PRTM 2200 - Conceptual Foundations of Parks, Recreation and Tourism
3 Credits (3 Contact Hours)
Introduces students to the background, nature and scope of the profession, including its history, philosophy, and social and behavioral science underpinnings.

PRTM 2210 - Delivery Systems for Parks, Recreation and Tourism
2 Credits (2 Contact Hours)
Introduces students to the various roles, interrelationships, and importance of leisure service delivery systems in designing and operating programs and facilities to serve diverse populations. Also includes discussion of the role and impact of leisure services and community and economic development.

PRTM 2220 - Program and Event Planning in Parks, Recreation and Tourism
3 Credits (2 Contact Hours)
Introduces concepts, principles, and skills necessary to plan, implement, and evaluate leisure and recreation programs and events. Topics include assessing needs, developing goals and objectives, selecting programs, events, and resources, marketing, venues, implementation, evaluation, group dynamics and leadership techniques. Preq: PRTM 2000. Coreq: PRTM 2221.

PRTM 2221 - Program and Event Planning in Parks, Recreation and Tourism Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany PRTM 2220. Coreq: PRTM 2220.

PRTM 2230 - Administration/Management in Parks, Recreation and Tourism
4 Credits (3 Contact Hours)
Covers the concepts, principles, and skills of administration/management as they relate to leisure and recreation services. Topics include the fundamental principles of research and data analysis, management, human resources management, supervisory leadership, budgeting and financial management, marketing, professional communication, technology, and facility planning and operations.

PRTM 2231 - Administration/Management in Parks, Recreation and Tourism Laboratory
0 Credits (0 Contact Hours)
Non-credit laboratory to accompany PRTM 2230.

PRTM 2240 - Legal Aspects of Parks, Recreation and Tourism
2 Credits (2 Contact Hours)
Introduces legal foundations and legislative processes, contracts and tort law, regulatory agents and methods of compliance, safety, emergency, and risk management as they relate to recreation, park resources, and leisure services. Preq: PRTM 2000.
PRTM 2260 - Foundations of Management and Administration in Parks, Recreation and Tourism Management
6 Credits (5 Contact Hours)
Course covers the learning outcomes related to the management and administration of leisure services required for program accreditation by National Recreation and Parks Association. Topics include basic management history and functions, personnel and labor law, marketing, finance, and strategic management as they relate to the Parks, Recreation and Tourism Management field. Coreq: PRTM 2261 and PRTM 2270 and PRTM 2290.

PRTM 2261 - Foundations of Management and Administration in Parks, Recreation and Tourism Management Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany PRTM 2260. Coreq: PRTM 2260.

PRTM 2270 - Provision of Leisure Service Experiences
5 Credits (4 Contact Hours)
Course covers the learning outcomes related to the provision of leisure service experiences required for program accreditation by National Recreation and Parks Association. Topics include program design, facilitation, and evaluation as they relate to the Parks, Recreation and Tourism Management field. Coreq: PRTM 2260 and PRTM 2271 and PRTM 2290.

PRTM 2271 - Provision of Leisure Service Experiences Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany PRTM 2270. Coreq: PRTM 2270.

PRTM 2290 - Distributed Competency Integration in Parks, Recreation and Tourism Management
3 Credits (3 Contact Hours)
Covers and reinforces critical and creative thinking processes, ethical judgment, oral communication skills, and written communication skills as applied to the Parks, Recreation and Tourism Management field. In addition, students are given refresher/enhancement seminars on spreadsheets, presentation software and word processing software. Coreq: PRTM 2260 and PRTM 2270.

PRTM 2410 - Introduction to Community Recreation, Sport and Camp Management
3 Credits (3 Contact Hours)
Conceptual examination of community recreation, including the history and structure of public and private nonprofit recreation agencies with an emphasis on programs and services, career opportunities, funding mechanisms, the role of government, and current trends and issues impacting delivery of services.

PRTM 2540 - Introduction to Sport Management
3 Credits (3 Contact Hours)
Development of a conceptual understanding of sport management, career opportunities in sport management, and the necessary competencies for the different career fields.

PRTM 2600 - Foundations of Recreational Therapy
3 Credits (3 Contact Hours)
Examines the history, philosophy, concepts, roles and functions involved in recreational therapy services. Topics include service-delivery models, ethics, standards of practice, credentialing, use of the clinical process in various treatment settings, collaborative interdisciplinary practice and professional behavior specific to therapeutic relationships and practitioner/client interactions. Students must have a 2.0 cumulative grade-point average to enroll in this course.

PRTM 2650 - Terminology in Recreational Therapy Practice
1 Credit (1 Contact Hours)
Provides students with the opportunity to learn about the language of health care, including basic term components, medical terms and health care records, and terms associated with body systems. Students must have a 2.0 cumulative grade-point average to enroll in this course.

PRTM 2700 - Introduction to Recreation Resources Management
3 Credits (3 Contact Hours)
Fundamentals of recreation resources management are presented to include the framework of management, management of specific resources, management of visitors, and management of services. Includes Honors sections.

PRTM 2810 - Introduction to Golf Management
3 Credits (2 Contact Hours)
Development of a conceptual understanding of the golf industry, career opportunities in professional golf management, and specific introductory competencies utilized within the field. Preq: PRTM 1950. Coreq: PRTM 2811.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits (Contact Hours)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRTM 2811</td>
<td>Introduction to Golf Management Laboratory</td>
<td>0 (3)</td>
<td>Non-credit laboratory to accompany PRTM 2810.</td>
</tr>
<tr>
<td>PRTM 2820</td>
<td>Principles of Golfer Development</td>
<td>3 (3)</td>
<td>Introduction to golf instruction. Provides knowledge and skills necessary to develop successful golf programs. Preq: PRTM 1950.</td>
</tr>
<tr>
<td>PRTM 2830</td>
<td>Advanced Methods of Teaching Golf</td>
<td>3 (3)</td>
<td>Provides students with the knowledge and skills necessary to succeed as golf instructors. Particular emphasis is on golf swing mechanics, learning styles and motivation theory, the business of teaching golf, and the use of advanced technology in golf instructions. Preq: PRTM 2810 and PRTM 2820 and PRTM 2950.</td>
</tr>
<tr>
<td>PRTM 2950</td>
<td>Professional Golf Management Seminar II</td>
<td>1 (1)</td>
<td>Introduction to the golf industry, professionalism, and current issues of interest in the industry with special emphasis on topics covered in the PGA/PGM Training Program Level I. Preq: PRTM 1950.</td>
</tr>
<tr>
<td>PRTM 2980</td>
<td>Creative Inquiry in Parks, Recreation and Tourism Management II</td>
<td>1 (3-12)</td>
<td>In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor. Coreq: PRTM 2980.</td>
</tr>
<tr>
<td>PRTM 2981</td>
<td>Creative Inquiry in Parks, Recreation and Tourism Management II Laboratory</td>
<td>0 (1-12)</td>
<td>Non-credit laboratory to accompany PRTM 2980. Coreq: PRTM 2980.</td>
</tr>
<tr>
<td>PRTM 3010</td>
<td>Recreation and Society</td>
<td>3 (3)</td>
<td>Investigation of the role of recreation in a technological and work-oriented society. Particular emphasis is on recreation behavior, resources, and programming in public and private organizations that serve the public wants. Not open to Parks, Recreation and Tourism Management majors; may not be substituted or otherwise used to meet Parks, Recreation and Tourism Management area requirements. Students must have a 2.0 cumulative grade-point average to enroll in this course.</td>
</tr>
<tr>
<td>PRTM 3040</td>
<td>Challenge Course Facilitation</td>
<td>3 (2)</td>
<td>Develops knowledge and skill in planning, directing, and evaluating group performance in an adventure challenge course environment; emphasis is placed on low and high ropes elements, processing, assessment, safety, and course management. Students must have a 2.0 cumulative grade-point average to enroll in this course. Coreq: PRTM 3041.</td>
</tr>
<tr>
<td>PRTM 3041</td>
<td>Challenge Course Facilitation Laboratory</td>
<td>0 (2)</td>
<td>Non-credit laboratory to accompany PRTM 3040. Coreq: PRTM 3040.</td>
</tr>
<tr>
<td>PRTM 3050</td>
<td>Safety and Risk Management in Parks, Recreation and Tourism Management</td>
<td>3 (3)</td>
<td>Provisions of safe services, facilities, and activities in the parks, recreation, and tourism domain are studied through the application of germane concepts from the areas of safety, risk management, and liability. Students must have a 2.0 cumulative grade-point average to enroll in this course.</td>
</tr>
<tr>
<td>PRTM 3070</td>
<td>Facility Planning and Operations</td>
<td>3 (3)</td>
<td>Introduction to recreation facility planning and operations processes. Design, planning, financing, construction, budgeting, personnel, operating policies and procedures, maintenance, and equipment considerations are covered. Students must have a 2.0 cumulative grade-point average to enroll in this course.</td>
</tr>
</tbody>
</table>
| PRTM 3080  | Leadership and Group Processes in Recreation                                | 3 (3)                   | Leadership is analyzed through experience-based learning. Examines various styles of leadership and communication and their probable...
considers techniques for planning large and small group meetings. Examines literature in the field of leadership and group processes. Includes Honors sections. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 3090 - Behavioral Concepts in Parks, Recreation and Tourism**  
3 Credits (3 Contact Hours)  
Studies social psychological concepts concerning leisure behavior in various park, recreation, and tourism settings. Students learn to apply those theories and behavioral concepts required to understand and manage leisure activities and environments. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 3100 - Seminar in Therapeutic Recreation**  
1 Credit (1 Contact Hours)  
Examination and discussion related to evidence-based practice in therapeutic recreation settings.

**PRTM 3110 - Therapeutic Recreation**  
3 Credits (3 Contact Hours)  
Examination of the profession of therapeutic recreation by analyzing the history, philosophy, concepts, roles, and functions involved in the therapeutic recreation services. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 3170 - Group Initiatives**  
3 Credits (2 Contact Hours)  
Examination and development of initiative modalities used by therapeutic recreators to teach teamwork, problem-solving communication, goal setting, leadership and personal interaction to diverse populations in a variety of settings. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 3171 - Group Initiatives Laboratory**  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany PRTM 3170.

**PRTM 3180 - Leisure Lifestyle Management**  
3 Credits (3 Contact Hours)  
Examines principles and techniques applicable to guiding disabled as well as nondisabled individuals in an exploration of leisure needs, barriers, consequences, and accessibility. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 3200 - Recreation Policymaking**  
3 Credits (3 Contact Hours)  
Structures and processes for public park and/or recreation policy formation in the United States. Includes Honors sections. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 3210 - Recreation Administration**  
3 Credits (3 Contact Hours)  
Analysis of the internal organization of a recreation department dealing with finances and accounting, records and reports, publicity and public relations, state and federal legislation, staff organization, coordination of community resources. Includes Honors sections. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 3220 - Facilitation Techniques in Recreational Therapy**  
3 Credits (3 Contact Hours)  
Covers basic concepts, methods and techniques associated with the selection and implementation of therapeutic facilitation techniques and interventions for use in recreational therapy practice. Preq: PRTM 2600 with a C or better. Coreq: PRTM 3240.

**PRTM 3230 - Professional Preparation for Recreational Therapy Practice**  
3 Credits (3 Contact Hours)  
Course is designed to prepare students for their recreational therapy field placement experience, as well as assist them in their preparation for job-seeking, job-attainment, and career development following graduation. This course provides the academic preparation necessary to ensure entry level skills and determine the preferred placement based on identification of recreational therapy students' career goals. Preq: PRTM-Recreational Therapy major and PRTM 2600 and PRTM 2650, each with a C or better. Preq or concurrent enrollment: PRTM 3240 with a C or better.

**PRTM 3240 - Assessment and Planning in Recreational Therapy**  
4 Credits (4 Contact Hours)  
Provides the information and tools for the first two steps of the recreational therapy process: assessment and planning. Through this course, students develop the necessary skills to complete a comprehensive assessment of clients in a therapeutic environment, and develop an appropriate, evidence-based treatment plan. Preq: PRTM 2600 with a grade of C or better. Coreq: PRTM 3220.
PRTM 3250 - Global Perspectives in Leisure, Recreation and Tourism
3 Credits (3 Contact Hours)
Advanced topics in serving diverse populations in Parks, Recreation and Tourism Management, including lifespan, cultural and global perspectives, as well as other dimensions of diversity.

PRTM 3260 - Recreational Therapy Implementation and Evaluation: Physical Health Conditions
3 Credits (3 Contact Hours)
Examines the various health conditions and the role of recreational therapy in treatment settings for individuals with physical health conditions. In addition, students apply current recreational therapy implementation techniques and evaluation methods across physical health diagnoses and treatment settings. Preq: PRTM 3220 and PRTM 3240, each with a grade of C or better. Coreq: PRTM 3270.

PRTM 3270 - Recreational Therapy Implementation and Evaluation: Mental Health Conditions
3 Credits (3 Contact Hours)
Examines the various health conditions and the role of recreational therapy in treatment settings for individuals with mental health conditions. In addition, students apply current recreational therapy implementation techniques and evaluation methods across mental health diagnoses and settings. Preq: PRTM 3220 and PRTM 3240, each with a grade of C or better. Coreq: PRTM 3260.

PRTM 3280 - Preceptorship in Recreational Therapy
2 Credits (4 Contact Hours)
Course facilitates experiential learning opportunities for recreational therapy students consisting of preceptor-supervised clinical experiences in health care and community-based agencies. Preq: PRTM-Recreational Therapy major and PRTM 3220 and PRTM 3240, each with a grade of C or better. Preq or concurrent enrollment: PRTM 3260 and PRTM 3270, each with a grade of C or better.

PRTM 3300 - Visitor Services and Interpretation
3 Credits (3 Contact Hours)
Introduces the philosophy and principles of the art of environmental interpretation. Comprehensive survey of interpretive theory as it applies to the recreation and parks practitioner and the varying settings within the profession. Includes Honors sections. Students must have a 2.0 cumulative grade-point average to enroll in this course.

PRTM 3420 - Introduction to Tourism
3 Credits (3 Contact Hours)
Survey of travel and tourism in the United States with focus on terminology, demographics, financial significance, and trends. Includes Honors sections. Students must have a 2.0 cumulative grade-point ratio to enroll in this course.

PRTM 3430 - Spatial Aspects of Tourist Behavior
3 Credits (3 Contact Hours)
Spatial patterns of national and international leisure travel destinations are explored and analyzed regarding their tourism attractiveness. Students must have a 2.0 cumulative grade-point average to enroll in this course.

PRTM 3440 - Tourism Markets and Supply
3 Credits (3 Contact Hours)
Acquaints students with the principles of matching tourism markets and supply. Students examine the strategies used in developing markets. Students must have a 2.0 cumulative grade-point average to enroll in this course.

PRTM 3450 - Tourism Management
3 Credits (3 Contact Hours)
Examines the management issues associated with offering tourism products and experiences to travelers by the private and public sectors for the purpose of enhancing visitor opportunities, making a profit and affecting change in a destination.

PRTM 3460 - Heritage Tourism
3 Credits (3 Contact Hours)
Heritage is an important part of tourism and can be the focal point of many journeys. Students are introduced to key concepts and issues in heritage tourism, including management of heritage tourism resources, politics of heritage tourism and the relationship between heritage tourism and authenticity.

PRTM 3470 - Sport Tourism
3 Credits (3 Contact Hours)
Sport tourism is one of the largest and most important segments of the travel and tourism industry. With a focus on the global sports environment, course introduces students to the fundamentals of sport tourism, including the creation, impacts and future trends of sport tourism development.

PRTM 3480 - Parks, Recreation and Tourism Management Travel Immersion Experience
PRTM 3490 - Survey of Tourism Sites
1 Credit (3 Contact Hours)
On-site study of various exemplary components of the travel and tourism industry in the Southeast. There are additional costs to students to cover travel. To be taken Pass/No Pass only. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 3420 and Junior standing in Parks, Recreation and Tourism Management and consent of instructor.

PRTM 3510 - Risk Management and Certifications in Parks, Recreation and Tourism Management
3 Credits (2 Contact Hours)
Reviews basics of risk management relative to the administration of recreation programs. Certifies students in Red Cross Wilderness First Aid, First Aid for Sports, and CPR for the Professional Rescuer. Coreq: PRTM 3511.

PRTM 3511 - Risk Management and Certifications in Parks, Recreation and Tourism Management Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany PRTM 3510. Coreq: PRTM 3510.

PRTM 3520 - Camp Organization and Administration
3 Credits (3 Contact Hours)
Surveys the development and trends of camping in America. Considers programming for the operations of agency and private camps. Enables students to master the techniques of group living. Laboratory offers practical experience in camp craft including trips and outdoor cooking. Students must have a 2.0 cumulative grade-point average to enroll in this course.

PRTM 3530 - Foundations of Camp Counseling
3 Credits (3 Contact Hours)
Introduces concepts, principles and skills essential to personnel working within a camp context. Topics include supervising campers, interacting with campers, understanding the developmental needs of campers, and dealing with camper behavior. Group dynamics, leadership techniques and issues such as abuse are also discussed.

PRTM 3540 - Youth Development in Camp
3 Credits (3 Contact Hours)
Provides camp professionals with an understanding of concepts and theories in youth development relative to camp settings. Topics include the developmental needs of campers through various ages and stages, activity planning and structure, programming for individuals with disabilities or special medical needs, and creating positive youth development outcomes.

PRTM 3550 - Trends and Issues in Camp Management
3 Credits (3 Contact Hours)
Advanced course designed for students to examine the most current principles and practices in the organized camp profession. Topics include evaluation of programs, professional development, fund development, social media and research within a camp context.

PRTM 3600 - Recreation and Amateur Sport Management
3 Credits (3 Contact Hours)
Explores the theoretical foundations and basic skills, methods and techniques necessary for the effective design and delivery of recreational sport programs offered in public, not-for-profit, collegiate, and private agencies and organizations.

PRTM 3610 - Recreational Sport Facility and Venue Management
3 Credits (3 Contact Hours)
An overview of the management of recreational sport facilities and venues. Topics include in depth discussion and application of planning models, project management principles, financing capital projects, risk management and legal liability, and current issues and trends in facility and venue management.

PRTM 3620 - Programming and Trends in Community Sport
3 Credits (3 Contact Hours)
An overview of program development and issues and trends in community sport. This course outlines the development and evolution of community recreational sport programming to serve youth and adults.

PRTM 3630 - Programming and Trends in Campus Recreation
3 Credits (3 Contact Hours)
An overview of program development and issues and trends in campus recreation. This course outlines the development and evolution of
PRTM 3640 - Programming and Trends in Intercollegiate Athletics
3 Credits (3 Contact Hours)
Current trends in intercollegiate athletics in the United States and abroad are identified and examined. Topics include programs, programming, organizational structure, education, policies, funding, governance and communication as they relate to intercollegiate athletics.

PRTM 3650 - Community Sport Practicum
3 Credits (6 Contact Hours)
Students gain practical experience in community-based recreational sport management to aid in discovery and application of PRTM core and recreational sport management course content within a municipal/community-based recreation agency or equivalent setting. To be taken Pass/No Pass only. Preq: PRTM 3600 and PRTM 3610 and PRTM 3620.

PRTM 3660 - Campus Recreation Practicum
3 Credits (6 Contact Hours)
Students gain practical experience in an area or areas of a campus recreation program to aid in discovery and application of PRTM core and recreational sport management course content. To be taken Pass/No Pass only. Preq: PRTM 3600 and PRTM 3610 and PRTM 3630.

PRTM 3670 - Intercollegiate Athletics Practicum
3 Credits (6 Contact Hours)
Students gain practical experience in an area of intercollegiate athletics, and apply knowledge gained in PRTM core courses and other recreation sport management courses in the field. Preq: PRTM 3600 and PRTM 3610 and PRTM 3640.

PRTM 3800 - Community Recreation in South Carolina
3 Credits (1 Contact Hours)
Students study indoor and outdoor recreation facilities, governmental jurisdiction, funding, programming, management, and staffing at community recreation agencies throughout South Carolina during a hands-on five-day field trip. Students must have a 2.0 cumulative grade-point average to enroll in this course. Coreq: PRTM 3801.

PRTM 3801 - Community Recreation in South Carolina Laboratory
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany PRTM 3800. Coreq: PRTM 3800.

PRTM 3830 - Golf Shop Operations
3 Credits (3 Contact Hours)
Provides students with the knowledge and skills necessary to succeed as managers of golf shops. Particular emphasis is on fundamental business planning, development of policies and procedures, merchandising, inventory control, pricing, and customer service. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 2810 and PRTM 2820 and PRTM 2950.

PRTM 3900 - Independent Study in Parks, Recreation and Tourism Management
1-6 Credits (1-6 Contact Hours)
Comprehensive studies and investigation of special topics not covered in other courses. Emphasizes field studies, community service, and independent readings. May be repeated for a maximum of six credits. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: Junior standing and consent of instructor.

PRTM 3910 - Selected Topics in Parks, Recreation and Tourism Management
2-3 Credits (2-3 Contact Hours)
In-depth examination of developing trends in parks, recreation, and tourism that warrant timely study. May be repeated twice for a maximum of six credits, but only if different topics are covered. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: Junior standing.

PRTM 3920 - Special Event Management
3 Credits (3 Contact Hours)
Students acquire an in-depth knowledge about the field of special event management. Planning techniques, strategies, and requirements for planning, implementing, and evaluating community events are included. Emphasizes ordinances, planning, funding, and marketing. Students must have a 2.0 cumulative grade-point average to enroll in this course.

PRTM 3950 - Professional Golf Management Seminar III
2 Credits (2 Contact Hours)
Covers advanced teaching methods, golf club fitting, and player development programs. This course is designed to assist students in
gaining the knowledge and skills necessary to successfully complete the PGA/PGM Training Program Level II. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 2830 and PRTM 3830.

PRTM 3980 - Creative Inquiry in Parks, Recreation and Tourism Management III
1-4 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Coreq: PRTM 3981.

PRTM 3981 - Creative Inquiry in Parks, Recreation and Tourism Management III Laboratory
0 Credits (1-12 Contact Hours)
Non-credit laboratory to accompany PRTM 3980. Coreq: PRTM 3980.

PRTM 3990 - Introduction to Field Training and Research (Honors)
1 Credit (1 Contact Hours)
For students pursuing departmental honors, provides an initial orientation to the internship and research requirements including identification of a faculty mentor to supervise these activities. Preq: PRTM 2070 and consent of instructor.

PRTM 4020 - Professional Golf Management Alternative Internship
3 Credits (3 Contact Hours)
Under the guidance of a qualified professional supervisor, students gain practical experience and apply knowledge acquired in the classroom to the workplace.

PRTM 4030 - Elements of Recreation and Park Planning
3 Credits (3 Contact Hours)
Basic recreation and park planning principles, processes, and trends in area and facility development combine to form the basis for formulation of a relevant knowledge of planning. Students must have a 2.0 cumulative grade-point ratio to enroll in this course. Preq: Senior standing.

PRTM 4040 - Field Training I
1 Credit (1 Contact Hours)
Preparation for field training experience, including topics such as résumé development, interviewing techniques, internship agency selections, and responsibilities of the student, department, and agency. To be taken Pass/No Pass only. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 2060 and consent of instructor. Preq or concurrent enrollment: PRTM 2070.

PRTM 4050 - Field Training II
6 Credits (18 Contact Hours)
Minimum ten weeks (400 hours) of uninterrupted, supervised work in a park, recreation or tourism management agency. Under agency supervision, students observe, organize, and implement activities, events, and programs. To be taken Pass/No Pass only. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 2060 and PRTM 2070 and PRTM 4040; and Senior standing in Parks, Recreation and Tourism Management; and consent of instructor.

PRTM 4070 - Personnel Administration in Parks, Recreation and Tourism Management
3 Credits (3 Contact Hours)
Study of personnel administration practices in recreation agencies, including employee selection, training, motivation, rewards, evaluation, and legal issues related to personnel and supervision. Students must have a 2.0 cumulative grade-point average to enroll in this course.

PRTM 4080 - Honors Internship
6 Credits (18 Contact Hours)
Minimum of 400 hours of uninterrupted, supervised work in a park, recreation or tourism setting. Written report on observations, special project or research is required in compliance with a contract between student and course instructor. Preq: PRTM 3990 and consent of instructor.

PRTM 4090 - Methods of Recreation Research I
3 Credits (3 Contact Hours)
Analysis of the principal methods of recreation research, the application of descriptive statistics to recreation research, and the development of a research proposal. Includes Honors sections. Students must have a 2.0 cumulative grade-point ratio to enroll in this course. Preq: PRTM 1980.

PRTM 4100 - Methods of Recreation Research II
3 Credits (3 Contact Hours)
Continuation of PRTM 4090; includes supervised execution and reporting of results of research proposal developed in PRTM 4090 and the
application of inferential statistics to research. Includes Honors sections. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 4090 and consent of instructor.

**PRTM 4120 - Therapeutic Recreation and Mental Health**

3 Credits (3 Contact Hours)

Therapeutic recreation services in mental health clinics, institutions, and outdoor settings. Review of disorders and current modes of treatment as they relate to therapeutic recreation. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 4160 - Leisure and Aging**

3 Credits (3 Contact Hours)

Examines the role of leisure services in later life, the needs of community-based and institutionalized elderly, and the development of service-delivery systems to meet those needs. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 4170 - Therapeutic Recreation Processes I**

4 Credits (3 Contact Hours)

Examination of models, principles, and procedures applicable to comprehensive program planning, specific program plans, individualized care plans, activity analysis, documentation, and evaluation. Students must have a 2.0 cumulative grade-point average and have completed three credit hours of human anatomy and physiology to enroll in this course.

**PRTM 4171 - Therapeutic Recreation Processes I Laboratory**

0 Credits (2 Contact Hours)

Non-credit laboratory to accompany PRTM 4170.

**PRTM 4180 - Therapeutic Recreation Processes II**

4 Credits (3 Contact Hours)

Examination of theories and concepts that guide therapeutic recreation interventions, including knowledge and use of communication skills, therapeutic relationships, counseling theories, and group processing techniques. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 4181 - Therapeutic Recreation Processes II Laboratory**

0 Credits (2 Contact Hours)

Non-credit laboratory to accompany PRTM 4180.

**PRTM 4190 - Therapeutic Recreation and Aspects of Disability Across the Lifespan**

3 Credits (3 Contact Hours)

Examination of characteristics and diagnoses of individuals with various disabilities (cognitive, affective, and/or psychomotor domains) across the lifespan. Application of theories and concepts that guide therapeutic recreation interventions as well as examination of disability theory and concepts. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 4200 - Therapeutic Recreation Trends and Issues**

3 Credits (3 Contact Hours)

Advanced principles and practices of therapeutic recreation, including philosophy, ethics, professional development, standards of practice, certification, recreation inclusion, and marketing services. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 4210 - Recreation Financial Resources Management**

3 Credits (3 Contact Hours)

Analysis of recreation financial resources management. Deals with revenue sources and their allocation. Includes Honors sections. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 2410. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PRTM 4220 - Management of Recreational Therapy Services**

3 Credits (3 Contact Hours)

Presents the foundation for understanding the contemporary health care system, as well as developing systematic program design, implementation and management of recreational therapy services. Students achieve a comprehensive understanding of the insurance and reimbursement systems; relevant guidelines and standards related to health care organizations; the process of program development; and program management principles. Preq: PRTM 3260 and PRTM 3270, each with a grade of C or better.

**PRTM 4260 - Trends and Issues in Recreational Therapy**

3 Credits (3 Contact Hours)

Capstone course provides insight into the contemporary issues in the recreational therapy profession. The course requires students to synthesize previous course content and experiential learning and appraise personal and professional philosophies to elucidate their role as an entry-level practitioner. Preq: PRTM 3260 and PRTM 3270, each with a C or better.
PRTM (GEOG) 4300 - World Geography of Parks and Equivalent Reserves
3 Credits (3 Contact Hours)
Major international patterns in the provision and use of urban and rural parks and recreation are examined. May also be offered as GEOG 4300. Preq: 2.0 cumulative grade-point average.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PRTM 4310 - Methods of Environmental Interpretation
3 Credits (2 Contact Hours)
Practice and instruction in the use of equipment and methods available to the interpreter in public contact work. Coaching in presentation and evaluation of live programs and in design, execution, and evaluation of mediated programs is the major emphasis. Programs are delivered to public audiences in the Clemson area. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 3300 and Senior standing in Parks, Recreation and Tourism Management and consent of instructor. Coreq: PRTM 4311.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PRTM 4311 - Methods of Environmental Interpretation Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PRTM 4310. Coreq: PRTM 4310.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PRTM 4410 - Commercial Recreation
3 Credits (3 Contact Hours)
Components of offering leisure services and products to the public by individuals, partnerships, and corporations for the purpose of making a profit. Students must have a 2.0 cumulative grade-point average to enroll in this course.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PRTM 4440 - Tour Planning and Operations
3 Credits (3 Contact Hours)
Provides the opportunity to understand the psychology of touring, with emphasis on packaged and group tours and how tours of different types and scale are planned, organized, marketed, and operated. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 3420 and consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PRTM 4450 - Conference/Convention Planning and Management
3 Credits (3 Contact Hours)
Provides the opportunity to understand the problems of and solutions to conference and convention planning and management from both the sponsoring organization's and facility manager's perspectives. Students must have a 2.0 cumulative grade-point average to enroll in this course.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PRTM 4460 - Community Tourism Development
3 Credits (3 Contact Hours)
Provides a community-based perspective of organizational, planning, development, and operational needs for a successful tourism economy at the local level. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 3420 and consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PRTM 4470 - Perspectives on International Travel
3 Credits (3 Contact Hours)
Using the United States as a destination, international travel patterns and major attractions are presented. Factors which restrain foreign travel to the United States are analyzed. Students must have a 2.0 cumulative grade-point average to enroll in this course.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PRTM 4510 - Seminar in Community Recreation, Sport and Camp Management
3 Credits (3 Contact Hours)
Capstone course of case studies applied to management issues focused on community recreation, sport and camp management. Preq: PRTM 2060 and PRTM 2070 and PRTM 4050.

**PRTM 4520 - Campus Recreation**
3 Credits (3 Contact Hours)
Study of the basic components required for administration of successful college union and intramural-recreation sport programs. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 4530 - Sports Information and Event Management**
3 Credits (3 Contact Hours)
Introduction to basic techniques, tools, and procedures associated with sports information and event management activities. Focuses on the application of sports information and event management activities building upon knowledge from personal interviews, selected readings, event management brochures and field experience. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 4540 - Trends in Sport Management**
3 Credits (3 Contact Hours)
Examination of trends in the sport management area that allows PRTM majors to obtain an updated knowledge base of the field. Students are able to relate their academic studies to the current trends, problems, and management strategies confronting and being used within the sport management industry. Students must have a 2.0 cumulative grade-point ratio to enroll in this course.

**PRTM 4550 - Advanced Program Planning**
3 Credits (3 Contact Hours)
Advanced recreation programming techniques with an emphasis on funding, outcome measurement, customer service, program development, marketing, specialized populations, and current trends and issues impacting the delivery of recreation programs. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 2410.

**PRTM 4600 - Leisure Across the Lifespan**
3 Credits (3 Contact Hours)
Introduces students to ways in which leisure affects human development and human development affects leisure behavior. Students must have a 2.0 cumulative grade-point average to enroll in this course.

**PRTM 4740 - Advanced Recreation Resources Management**
3 Credits (3 Contact Hours)
Advanced topics in recreation resource management focusing on management strategies and techniques for addressing common resource and social problems in recreation resource management. Case studies and problem analysis are emphasized. Includes Honors sections. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 2700 and Senior standing.

**PRTM 4830 - Golf Club Management and Operations**
3 Credits (9 Contact Hours)
Focuses on activities related to merchandising, purchasing and selling, inventory management, vendor selection, pricing strategies, strategies for monitoring sales and inventory related to financial control and customer service. Students are exposed to the responsibilities of a golf professional at a full-service golf club facility. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 2830 and PRTM 3830.

**PRTM 4900 - Senior Independent Study**
1-6 Credits (1-6 Contact Hours)
In cooperation with and under supervision of a faculty member, students develop and execute a field study or community project. May be repeated for a maximum of six credits. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: Senior standing and consent of instructor.

**PRTM 4950 - Professional Golf Management Seminar IV**
1 Credits (1 Contact Hours)
Covers golf shop merchandising and inventory management and supervising and delegating. Emphasizes topics covered in the PGA/PGM Training Program Level III checkpoint. Students must have a 2.0 cumulative grade-point average to enroll in this course. Preq: PRTM 2830 and PRTM 3830.

**PRTM 4980 - Creative Inquiry in Parks, Recreation and Tourism Management IV**
1-4 Credits (1-3 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor. Coreq: PRTM 4981.
PRTM 4981 - Creative Inquiry in Parks, Recreation and Tourism Management IV Laboratory
0 Credits (1-12 Contact Hours)
Non-credit laboratory to accompany PRTM 4980. Coreq: PRTM 4980.

PRTM 4990 - Presentation of Honors Projects
1 Credit (1 Contact Hours)
Under direction of a faculty supervisor, students prepare and deliver oral presentations on projects that were carried out in honors sections of PRTM 4090 or 4100. Preq: PRTM 4090 or 4100; and consent of instructor.

Pearce Center for Professional Communication

PCPC 4990 - Pearce Center Internship
1-3 Credits (1-3 Contact Hours)
Students work in the Class of 1941 Studio for Student Communication on projects involving multimodal communications, public relations, graphic design, and publishing. Students edit copy, pitch stories, research and write articles for print, web, and/or video publication, create ePubs, develop and execute social media strategies, design marketing material, develop public relations strategies, design websites, and other related tasks. Preq: Consent of instructor.

Performing Arts

PA 1010 - Introduction to Performing Arts
3 Credits (3 Contact Hours)
Overview of performing arts, including performance, careers, technology, production, management, community outreach, safety, sales, and marketing. Preq: Production Studies in Performing Arts major.

PA 1030 - Portfolio I
1 Credit (3 Contact Hours)
Students develop discipline-specific portfolios that display creative design and contain samples of work that demonstrate integrated learning.

PA 1950 - Creative Inquiry in Performing Arts
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

PA 2010 - Career Planning and Professional Development
3 Credits (2 Contact Hours)
Study of selected performing arts topics. Includes seminars and masterclasses with faculty and visiting artists and concert and theatre attendance and evaluation. Emphasis is placed on written communication skills. Preq: PA 1010 and Sophomore standing. Coreq: PA 2011.

PA 2011 - Career Planning and Professional Development Laboratory
0 Credits (3 Contact Hours)

PA 2790 - Performing Arts Practicum I
1 Credit (3 Contact Hours)
Practical work on performing arts presentations including backstage technical work, multimedia support, and arts management.

PA 2800 - Performing Arts Practicum II
1 Credit (3 Contact Hours)
Continuation of practical work on performing arts presentations, with more specialized opportunities for backstage technical work, multimedia support, and arts management training. Preq: PA 2790.

PA 2950 - Creative Inquiry in Performing Arts
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These
creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

**PA 3010 - Principles of Arts Administration**  
3 Credits (2 Contact Hours)  
Continuation of PA 2010 with added focus on critical and ethical analysis of performing arts. Emphasis is placed on oral communication skills. Preq: PA 2010 and Junior standing. Coreq: PA 3011.

**PA 3011 - Principles of Arts Administration Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany PA 3010. Coreq: PA 3010.

**PA 3950 - Creative Inquiry in Performing Arts**  
1-4 Credits (1-4 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

**PA 3980 - Special Topics in Performing Arts**  
1-3 Credits (1-3 Contact Hours)  
Select areas of study in performing arts not addressed by other performing arts course offerings. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: PA 1010 and consent of instructor.

**PA 3990 - Internship**  
1-3 Credits (1-3 Contact Hours)  
Provides performing Arts majors an opportunity to apply technical, managerial, and artistic concepts in a performing arts environment through preplanned, preapproved, faculty-supervised internships. Minimum of 45 hours of work per credit hour. May be repeated for a maximum of six credits. To be taken Pass/No Pass only. Preq: PA 2790 and consent of instructor.

**PA 4010 - Capstone Project**  
3 Credits (3 Contact Hours)  
Capstone course for Performing Arts majors. Students research, prepare, execute and assess a substantial project for the community as approved by a faculty committee. Students, with faculty guidance, manage all aspects of the project. Preq: PA 3010. Coreq: PA 4011.

**PA 4011 - Capstone Project Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany PA 4010. Coreq: PA 4010.

**PA 4030 - Portfolio II**  
1 Credit (3 Contact Hours)  
Students revise discipline-specific portfolios through use of current technologies. Further demonstration of integrated learning is provided with the incorporation of capstone project research content from PA 4010.

**PA 4910 - Performing Arts Honors Research**  
3 Credits (3 Contact Hours)  
Research for the preparation of an honors project. Preq: PA 3010 and consent of department chair.

**PA 4920 - Performing Arts Honors Project**  
3 Credits (3 Contact Hours)  
Preparation and presentation of an honors project. Preq: PA 4910 and consent of department chair.

**PA 4950 - Creative Inquiry in Performing Arts**  
1-4 Credits (1-4 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

**PA 4990 - Independent Studies**  
1-3 Credits (1-3 Contact Hours)  
Supervised study for students with special interests in performing arts outside the scope of existing courses. May be repeated for a maximum of six credits. Preq: Consent of department chair.
**Philosophy**

**PHIL 1010 - Introduction to Philosphic Problems**
3 Credits (3 Contact Hours)
Discussion of representative philosophical questions that arise from human thought and action. Characteristic topics are values, knowledge, human nature, and society. Includes Honors sections.

**PHIL 1020 - Introduction to Logic**
3 Credits (3 Contact Hours)
Introduction to methods of evaluating arguments. Gives simple valid argument forms, which can be joined together to produce the logical form of virtually any argument. Informal fallacies may also be considered. Includes Honors sections.

**PHIL 1030 - Introduction to Ethics**
3 Credits (3 Contact Hours)
Philosophical consideration of the nature of ethics, basic ethical issues, and problems and modes of ethical reasoning. Includes Honors sections.

**PHIL 1050 - Introductory Seminar in the Big Questions**
3 Credits (3 Contact Hours)
Introductory seminar dealing with a single important philosophical question such as "Who are we?" "What is the meaning of life?" or "Are we free or determined?" The question is pursued throughout the semester with active student involvement. Questions may vary from semester to semester.

**PHIL 1240 - Technology and Its Discontents**
3 Credits (3 Contact Hours)
Philosophical introduction to issues arising from the development of technologies, their implementation, and their integration into society. Considers theoretical questions regarding the nature of technology and its evaluation, as well as issues related to specific technologies.

**PHIL 2100 - Evolution and Creation**
3 Credits (3 Contact Hours)
A critical comparison of evolution and creationism. Students examine the scientific, philosophical, and theological issues this clash brings to light, develop their ability to think through the various claims and counter claims critically, and then articulate a coherent position for themselves. Credit toward a degree will be given for only one of PHIL 2100 or BIOL 2100.

**PHIL 3030 - Philosophy of Religion**
3 Credits (3 Contact Hours)
Critical consideration of the meaning and justification of religious beliefs. Representative topics are the nature and existence of God, religious knowledge, religious language, the problem of evil.

**PHIL 3040 - Moral Philosophy**
3 Credits (3 Contact Hours)
Study of moral problems, their origin in conflicts between duty and desire, and alternative solutions proposed by classical and contemporary writers.

**PHIL 3050 - Existentialism**
3 Credits (3 Contact Hours)
Inquiry into the core themes of existentialism: freedom, meaningfulness or meaninglessness of life, the existence of God, etc. Representative thinkers from the existentialist tradition, such as Dostoyevsky, Kierkegaard, Sartre, and de Beauvoir, are studied.

**PHIL (CHIN) 3120 - Philosophy in Ancient China**
3 Credits (3 Contact Hours)
Study of the history of Chinese philosophy from fifth century BCE, including Confucianism, Daoism, Moism, legalism, Buddhism, Neo-Daoism, and Neo-Confucianism. Examination of Chinese philosophers' views and arguments on questions of life and death, history and society, education and personal cultivation. May not be used to satisfy general modern language requirements. May also be offered as CHIN 3120.

**PHIL (CHIN) 3130 - Philosophy in Modern China**
3 Credits (3 Contact Hours)
Study of the history of Chinese philosophy from the 19th century BCE, including Confucianism, Daoism, Moism, legalism, Buddhism, Neo-Daoism, and Neo-Confucianism. Examination of Chinese philosophers' views and arguments on questions of life and death, history and society, education and personal cultivation. May not be used to satisfy general modern language requirements. May also be offered as CHIN 3130.
PHIL 3140 - Comparative Topics in Eastern and Western Philosophy
3 Credits (3 Contact Hours)
Study of issues and areas of overlapping concern to Eastern and Western philosophical traditions (e.g., ontology, ethics) with emphasis on both contrasts and convergences in philosophical approaches. Topics may vary.

PHIL 3150 - Ancient Philosophy
3 Credits (3 Contact Hours)
Origins and development of rationality as found in the thought of selected philosophers such as Socrates, Plato, and Aristotle.

PHIL 3160 - Modern Philosophy
3 Credits (3 Contact Hours)
Development of the modern view as seen in major Western philosophers of the 16th, 17th, and 18th centuries. Thought of Berkeley, Descartes, Hume, Leibniz, Locke, and Spinoza may be considered to illustrate the development of rationalism and empiricism.

PHIL 3170 - Nineteenth-Century Philosophy
3 Credits (3 Contact Hours)
Development of 19th-century philosophy emphasizing selected works of philosophers such as Kant, Hegel, Marx, Nietzsche, and Kierkegaard.

PHIL 3180 - Twentieth-Century Philosophy
3 Credits (3 Contact Hours)
Historical overview of selected significant movements in 20th-century Western philosophy such as Continental and/or analytic philosophy.

PHIL 3200 - Social and Political Philosophy
3 Credits (3 Contact Hours)
Critical consideration of the views of some major philosophers on the nature of the individual's relation to society and the state in the context of their wider philosophical (logical, epistemological, metaphysical, and ethical) doctrines. Philosophers may include Plato, Aristotle, Augustine, Hobbes, Rousseau, Mill, Marx, Hegel, Rawls, and Nozick.

PHIL 3210 - Crime and Punishment
3 Credits (3 Contact Hours)
Investigates what sorts of conduct should be criminalized and what society should do with those who engage in criminal activity. Specific topics may include the enforcement of morals, euthanasia, hate crimes, deterrence, retribution, and restitution.

PHIL 3230 - Theory of Knowledge
3 Credits (3 Contact Hours)
Examination of concepts, criteria, and decision procedures underlying rational belief and the justification of knowledge claims. Representative answers to the problem of skepticism are considered, with special attention to some leading theories of knowledge.

PHIL 3240 - Philosophy of Technology
3 Credits (3 Contact Hours)
Examines technology and representative philosophical assessments of it with a focus on understanding its impact on the human condition.

PHIL 3250 - Philosophy of Science
3 Credits (3 Contact Hours)
Philosophical study of problems generated by science, but that are not themselves scientific, such as what comprises a scientific theory; how scientists formulate theories and acquire knowledge; what, if anything, differentiates science from other ways of knowing; what role concepts play in scientific knowledge; whether scientific progress is rational.

PHIL 3260 - Science and Values
3 Credits (3 Contact Hours)
Examination of several features of the relation between science and values. Topics may include ethical and social obligations of scientists, role of value judgements in scientific practice, and influence of social and political values on science and scientists.

PHIL 3270 - Philosophy of Social Science
3 Credits (3 Contact Hours)
Inquiry into the philosophical foundations of social science, in particular questions of objectivity, explanatory structure, causality, agency, normativism and naturalism, and social determination of knowledge.

PHIL 3280 - Philosophy and Technology of the Body
3 Credits (3 Contact Hours)
Examines the interrelation of human bodies and emerging technologies in light of philosophical notions of human nature, personal identity,
and the ethical dignity of the human. Emphasizes the influence of social values on scientific and technological developments and the reciprocal impact of these developments on understandings of the body.

**PHIL 3300 - Contemporary Issues in Philosophy**  
3 Credits (3 Contact Hours)  
Examination of a variety of issues of broad concern to philosophers today. Issues may vary. May be repeated once for credit with departmental consent.

**PHIL 3330 - Metaphysics**  
3 Credits (3 Contact Hours)  
Examination of issues and problems concerning the ultimate nature of reality. Topics may include the appearance/reality distinction, the nature of existence, freedom and determinism, personal identity, idealism, and realism.

**PHIL 3400 - Technology, Environment, and Sustainability**  
3 Credits (3 Contact Hours)  
Philosophical examination of how technology contributes to significant environmental change. Considers role of science in justifying claims about (for example) global climate change, role of technology in responding to these changes, how technology affects relations between humans and the extra-human world, and ethical implications of various kinds of technology.

**PHIL 3430 - Philosophy of Law**  
3 Credits (3 Contact Hours)  
Explanation of the nature of legal theory and the law through a critical examination of the basic concepts and principles of these fields.

**PHIL 3440 - Business Ethics**  
3 Credits (3 Contact Hours)  
Study of ethical issues created by business activities, relating them to fundamental questions of ethics generally. Representative topics may include hiring, firing, promotions, business and minorities, organizational influence in private lives, consumer interests, economic justice, and reindustrialization.

**PHIL 3450 - Environmental Ethics**  
3 Credits (3 Contact Hours)  
Study of ethical problems in our dealings with the rest of nature and of how they relate to ethics in general. Representative topics include the basis of ethics, nature and intrinsic value, duties to future generations, economics and the environment, rare species, animal rights, ethics and agriculture, energy doctrine.

**PHIL 3460 - Biomedical Ethics**  
3 Credits (3 Contact Hours)  
Examines ethical dilemmas facing modern medicine and biomedical science. Topics may include controversies surrounding death, reproductive technologies, abortion, allocation of resources, the concept of disease, the doctor-patient relationship, and medical research.

**PHIL 3470 - Ethics in Architecture**  
3 Credits (3 Contact Hours)  
Interdisciplinary course focused on the architectural profession and the practices of design, building, and other processes in a social and business context. Consideration is given to both general moral principles and particular case studies.

**PHIL 3480 - Philosophies of Art**  
3 Credits (3 Contact Hours)  
Examines some of the predominant attempts to understand art in ancient and modern philosophy and also considers a variety of contemporary views and controversies about the nature, meaning, value, and future of art.

**PHIL (WS) 3490 - Theories of Gender and Sexuality**  
3 Credits (3 Contact Hours)  
Examines the philosophical dimensions of contemporary debates about the relation of sex, gender, and sexuality. May also be offered as WS 3490.

**PHIL 3510 - Philosophy of Emotion**  
3 Credits (3 Contact Hours)  
Considers a range of classic and contemporary readings on the nature and function of emotion. Topics include cognitive, physiological, and constructionist approaches to understanding emotion, emotion and reason, emotion and morality, and select individual emotions.

**PHIL 3550 - Philosophy of Mind and Cognitive Science**  
3 Credits (3 Contact Hours)  
Critical examination of philosophical and scientific theories of mental phenomena and of the relationship between mental and material
phenomena. Theories of Mind-Body Dualism, Monism, Functionalism, Eliminative and Reductive Materialism, Connectionism, and the status of folk psychology versus cognitive neuroscience are studied.

**PHIL 3600 - Symbolic Logic**  
3 Credits (3 Contact Hours)  
Introduction to the basic concepts of modern symbolic logic, including the symbolization of statements and arguments and the techniques of formal proof.

**PHIL 3700 - Philosophy of War**  
3 Credits (3 Contact Hours)  
Examines war from both ethical and strategic perspectives: the nature of a just war, the aims of war, and the kinds of general strategies appropriate for achieving those aims.

**PHIL 3750 - Minds and Machines**  
3 Credits (3 Contact Hours)  
Examines controversial questions in artificial intelligence and the Computational Theory of Mind. Topics may include: "Can machines think?" "What's involved in being able to think?" "Can machines reason, understand, be conscious, be self-aware, learn, be creative, have emotions, and use natural language?" Focus is on manmade computers and the mind as computer.

**PHIL 3990 - Philosophy Portfolio**  
2 Credits (2 Contact Hours)  
Creation of a digital portfolio to demonstrate competence in reasoning, critical thinking, and problem solving skills as well as ethical judgment. Course also serves as a resource for academic and professional development. Preq: Junior standing in Philosophy.

**PHIL 4010 - Studies in the History of Philosophy**  
3 Credits (3 Contact Hours)  
In-depth study of a selected philosopher, philosophical school, or movement. Topics vary. With departmental consent, may be repeated once for credit. Current topics and course descriptions are available in the department's course offering brochure. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PHIL 4020 - Topics in Philosophy**  
3 Credits (3 Contact Hours)  
Thorough examination of a particular philosophical topic, issue, or problem. Topics vary. May be repeated once for credit with departmental consent. Current topics and course descriptions are available in the department's course offering brochure. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PHIL 4140 - Philosophy in Medieval China**  
3 Credits (3 Contact Hours)  
Study of the history of Chinese philosophy from the 2nd century B.C.E. to the 18th century C.E., including the formation of Confucianism as national ideology, Neo-Daoism, Chinese Buddhism, and Neo-Confucianism. All readings and discussions are conducted in English. May not be used to satisfy general foreign language requirement. Includes Honors sections. May also be offered as CHIN 4140. Preq: CHIN 3120 or CHIN 3130 or PHIL 3120 or PHIL 3130 or PHIL 3140 or REL 3140.

**PHIL 4220 - Anarchism**  
3 Credits (3 Contact Hours)  
Philosophical study of the roots of anarchist thought and its current articulations.

**PHIL 4750 - Philosophy of Film**  
3 Credits (3 Contact Hours)  
Pursues several issues at the center of recent debate in the philosophy of film. Questions investigated include whether film has an essence that distinguishes it from other art forms, whether films ought to be thought of as having authors or narrators, and whether films can themselves philosophize.

**PHIL 4900 - Law, Liberty and Justice Prelaw Internship**  
1-3 Credits (1-3 Contact Hours)  
Faculty-supervised internship designed for students in the Law, Liberty and Justice emphasis area of the Philosophy major. Interns are placed with law offices or with institutions and agencies in fields related to law and social policy. May be repeated for a maximum of six credits. To be taken Pass/No Pass only. Preq: Philosophy major and Junior standing and consent of internship coordinator.

**PHIL 4920 - Creative Inquiry in Philosophy**
1-4 Credits (1-4 Contact Hours)
Small group work on particular issues with emphasis on involving students in research. Content varies. May be repeated for a maximum of nine credits. Preq: Consent of instructor.

**PHIL 4970 - Philosophy Honors Research**
3 Credits (3 Contact Hours)
Students conduct research, clearly define the topic, and complete an annotated bibliography under the supervision of the thesis advisor. Preq: Consent of department chair and thesis advisor.

**PHIL 4980 - Philosophy Honors Thesis**
3 Credits (3 Contact Hours)
In consultation with the thesis advisor and committee, students write, revise, defend, and complete the thesis. Preq: PHIL 4970 and consent of department chair and thesis advisor.

**PHIL 4990 - Independent Study**
1-3 Credits (1-3 Contact Hours)
Course of study designed by the student in consultation with a faculty member who agrees to provide guidance, discussion, and evaluation of the project. Student must confer with the faculty member prior to registration. May be repeated for a maximum of six credits. Preq: Consent of instructor. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**Physical Science**

**PHSC 1070 - Introduction to Earth Science**
4 Credits (3 Contact Hours)
Survey of topics in geology, meteorology, astronomy, and oceanography, emphasizing comprehension and practical application of earth science concepts to experiments. Credit toward a degree will be given for only one of PHSC 1070 or 1170. Coreq: PHSC 1071.

**PHSC 1071 - Introduction to Earth Science Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PHSC 1070. Coreq: PHSC 1070.

**PHSC 1080 - Introduction to Physical Science**
4 Credits (3 Contact Hours)
Survey of topics in chemistry and physics emphasizing comprehension and practical application of physical science concepts to experiments. Credit toward a degree will be given for only one of PHSC 1080 or 1180. Coreq: PHSC 1081.

**PHSC 1081 - Introduction to Physical Science Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PHSC 1080. Coreq: PHSC 1080.

**PHSC 1170 - Introduction to Chemistry and Earth Science for Elementary Education Majors**
4 Credits (3 Contact Hours)
Integrates topics in chemistry, earth science and environmental science. It emphasizes the interconnections among the various science disciplines and the practical application to experiments and activities appropriate for the elementary classroom. Credit toward a degree will be given for only one of PHSC 1070 or 1170. Preq: Elementary Education major. Coreq: PHSC 1171.

**PHSC 1171 - Introduction to Chemistry and Earth Science for Elementary Education Majors Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PHSC 1170. Coreq: PHSC 1170.

**PHSC 1180 - Introduction to Physics, Astronomy, and Earth Science for Elementary Education Majors**
4 Credits (3 Contact Hours)
Integrates topics in physics, astronomy, and earth science. It emphasizes the interconnections among the various science disciplines and the practical application to experiments and activities appropriate for the elementary classroom. Credit toward a degree will be given for only one of PHSC 1080 or 1180. Preq: PHSC 1170. Coreq: PHSC 1181.
PHSC 1181 - Introduction to Physics, Astronomy, and Earth Science for Elementary Education
Majors Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PHSC 1180. Coreq: PHSC 1180.

Physics

PHYS 1010 - Current Topics in Modern Physics
1 Credits (0 Contact Hours)
Demonstrations and lectures serving as an introduction to different areas of physics and astronomy are presented by various members of the staff. May include such topics as astrophysics, energy, relativity, and weather, as well as visits to the planetarium.

PHYS 1220 - Physics with Calculus I
3 Credits (3 Contact Hours)
First of three courses in a calculus-based physics sequence. Topics include vectors, laws of motion, conservation principles, rotational motion, oscillations, and gravitation. Credit for a degree will be given for only one of PHYS 1220, 2000, or 2070. Includes Honors sections. Preq or concurrent enrollment: MATH 1060 or MATH 1070.

PHYS 1240 - Physics Laboratory I
1 Credits (3 Contact Hours)
Introduction to physical experimentation with emphasis on mechanical systems, including oscillatory motion and resonance. Computers are used in the experimental measurements and in the statistical treatment of data. Credit for a degree will be given for only one of PHYS 1240 or 2090. Preq or concurrent enrollment: PHYS 1220.

PHYS 1990 - Creative Inquiry in Physics and Astronomy
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

PHYS 2000 - Introductory Physics
4 Credits (3 Contact Hours)
Introduction to classical physics. Includes elements of mechanics, heat, electricity, and light. May not be substituted for PHYS 1220, but may be substituted for PHYS 2070 with the approval of the student's program of study department. Credit for a degree will be given for only one of PHYS 1220, 2000, or 2070. Preq or concurrent enrollment: MATH 1020. Coreq: PHYS 2001.

PHYS 2001 - Introductory Physics Laboratory
0 Credits (2 Contact Hours)

PHYS 2070 - General Physics I
3 Credits (3 Contact Hours)
Introductory course for students who are not majoring in physical science or engineering. Covers such topics as mechanics, waves, fluids, and thermal physics. Credit for a degree will be given for only one of PHYS 1220, 2000, or 2070. Preq: MATH 1020 or MATH 1040 or MATH 1050 or MATH 1060 or MATH 1070 or score of 60 or higher on the CMPT.

PHYS 2080 - General Physics II
3 Credits (3 Contact Hours)
Continuation of PHYS 2070. Covers such topics as electricity, magnetism, electromagnetic waves, optics, and modern physics. Credit for a degree will be given for only one of PHYS 2080 or 2210. Preq: PHYS 2070.

PHYS 2090 - General Physics I Laboratory
1 Credits (2 Contact Hours)
Introductory laboratory course for students who are not majoring in physical science or engineering. Covers such topics as mechanics, waves, fluids, and heat. Credit for a degree will be given for only one of PHYS 1240 or 2090. Preq or concurrent enrollment: PHYS 2070.

PHYS 2100 - General Physics II Laboratory
1 Credits (2 Contact Hours)
Covers such topics as electricity, magnetism, electromagnetic waves, optics, and modern physics. Credit for a degree will be given for only one of PHYS 2230 or 2100. Preq: PHYS 2070, 2090. Preq or concurrent enrollment: PHYS 2080.
PHYS 2210 - Physics with Calculus II
3 Credits (3 Contact Hours)
Continuation of PHYS 1220. Topics include thermodynamics, kinetic theory of gases, electric and magnetic fields, electric currents and circuits, and motions of charged particles in fields. Credit for a degree will be given for only one of PHYS 2080 or 2210. Includes Honors sections. Preq or concurrent enrollment: MATH 1080 or MATH 1110.

PHYS 2220 - Physics with Calculus III
3 Credits (3 Contact Hours)
Continuation of PHYS 2210. Topics include wave motion, electromagnetic waves, interference and diffraction, relativity, atomic particles, and atomic and nuclear structure. Includes Honors sections. Preq: PHYS 2210.

PHYS 2230 - Physics Laboratory II
1 Credits (3 Contact Hours)
Experiments in heat and thermodynamics, electrostatics, circuits, and magnetism. Computers are used in statistical treatment of data. Credit for a degree will be given for only one of PHYS 2230 or 2100. Preq or concurrent enrollment: MATH 1080 or MATH 1110.

PHYS 2240 - Physics Laboratory III
1 Credits (3 Contact Hours)
Experiments involve atomic, molecular, and nuclear systems. Wave particle dualism of light and matter is emphasized. Calculators and computers are used in statistical treatment of data. Preq or concurrent enrollment: PHYS 2220.

PHYS 2400 - Physics of the Weather
3 Credits (3 Contact Hours)
Descriptive introduction to meteorology. Includes atmospheric thermodynamics, solar radiation, heat budget, atmospheric circulation, force laws governing air motion, fronts, precipitation, synoptic prediction. Special topics of current interest, such as the effect of environmental pollution on weather and the effect of weather on health, are included.

PHYS 2450 - Physics of Global Climate Change
3 Credits (3 Contact Hours)
Descriptive study of the heating and cooling balance of the Earth's atmosphere and surface and feedback mechanisms that regulate our climate. Past and future temperature trends, atmospheric greenhouse gas inventories, and solar radiative forcing. Evaluation of claims and news about climate change, and their interaction with public opinion.

PHYS 2800 - Physics and Reality
3 Credits (3 Contact Hours)
Non-technical study of the content and meaning of modern physics. Begins with first-principles of physics. Evaluates concepts of substance, matter, locomotion, atomization, fields, space, time, and randomness. Includes quantum mechanics, Bells Theorem, theory of relativity, and Godels Theorem. Intended for a broad audience, including specialists and non-specialists.

PHYS 2900 - Physics Research
1-3 Credits (1-3 Contact Hours)
Individual research project in any area of experimental or theoretical physics or astronomy supervised by a physics or astronomy faculty member. Project need not be original but must add to students' ability to carry out research. May be repeated for a maximum of six credits. Students must have a 3.0 minimum grade-point average to enroll in this course. Preq: Consent of instructor.

PHYS 2990 - Creative Inquiry in Physics and Astronomy
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. To be taken Pass/No Pass only. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

PHYS 3000 - Introduction to Research
2 Credits (2 Contact Hours)
Acquaints students with current research in physics. Seminars are provided where research activities in various areas of physics and astronomy are summarized. Provides a basis for students to choose a suitable topic for a senior thesis. Includes Honors sections. Preq: PHYS 2210.

PHYS 3110 - Introduction to the Methods of Theoretical Physics
3 Credits (3 Contact Hours)
PHYS 3120 - Methods of Theoretical Physics II  
3 Credits (3 Contact Hours)  
Continuation of PHYS 3110 focused on introducing various mathematical notions widely used in upper level physics courses, such as differential equations, special functions and complex numbers, and complex functions. Preq: PHYS 3110.

PHYS 3150 - Introduction to Computational Physics  
3 Credits (3 Contact Hours)  
Basic numerical methods important for data interpretation and modeling in physics, such as interpolation, derivatives, integration, solving differential and matrix equations, and Monte Carlo simulation. Methods are applied to physics problems, including realistic projectile motion, harmonic oscillators, chaotic pendulum, nonlinear systems, and Ising model. Preq: PHYS 2220.

PHYS 3210 - Mechanics I  
3 Credits (3 Contact Hours)  
Statics, motions of particles and rigid bodies, vibratory motion, gravitation, properties of matter, flow of fluids. Includes Honors sections. Preq: PHYS 2210.

PHYS 3220 - Mechanics II  
3 Credits (3 Contact Hours)  
Dynamics of particles and rigid bodies, Lagrangian and Hamiltonian formulations, vibrations of strings, wave propagation. Includes Honors sections. Preq: PHYS 3210.

PHYS 3250 - Experimental Physics I  
3 Credits (1 Contact Hours)  
Introduction to experimental modern physics, measurement of fundamental constants, repetition of crucial experiments of modern physics (Stern-Gerlach, Zeeman effect, photoelectric effect, etc.). Includes Honors sections. Preq or concurrent enrollment: PHYS 2220. Coreq: PHYS 3251.

PHYS 3251 - Experimental Physics I Laboratory  
0 Credits (4 Contact Hours)  
Non-credit laboratory to accompany PHYS 3250. Coreq: PHYS 3250.

PHYS 3260 - Experimental Physics II  
3 Credits (1 Contact Hours)  
Continuation of PHYS 3250. Includes Honors sections. Coreq: PHYS 3261.

PHYS 3261 - Experimental Physics II Laboratory  
0 Credits (4 Contact Hours)  
Non-credit laboratory to accompany PHYS 3260. Coreq: PHYS 3260.

PHYS 3550 - Modern Physics  
3 Credits (3 Contact Hours)  
Study of the topics of modern physics, including relativity, atomic physics, quantum mechanics, condensed-matter physics, nuclear physics, and elementary particles. Includes Honors sections. Preq: PHYS 2220 and MATH 2060.

PHYS 3560 - Modern Physics Overview  
1 Credits (1 Contact Hours)  

PHYS 3990 - Creative Inquiry in Physics and Astronomy  
1-4 Credits (1-4 Contact Hours)  
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. To be taken Pass/No Pass only. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

PHYS 4010 - Senior Thesis  
1-3 Credits (1-3 Contact Hours)  
Semi-original theoretical, experimental, or computational research project performed under the direction of a faculty member. Fields available include astronomy, astrophysics, atmospheric physics, biophysics, high energy physics, relativity, solid state physics, and statistical mechanics. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Nine credits of physics at the 3000 or 4000 level.
PHYS 4170 - Introduction to Biophysics I
3 Credits (3 Contact Hours)
Introduction to the application of physics to biological problems. Topics include review of elementary chemical and biological principles, physics of biological molecules, and fundamentals of radiation biophysics. Includes Honors sections. Preq: MATH 2060 and PHYS 2210. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PHYS 4200 - Atmospheric Physics
3 Credits (3 Contact Hours)
Study of physical processes governing atmospheric phenomena. Topics include thermodynamics of dry and moist air, solar and terrestrial radiative processes, convection and cloud physics, precipitation processes, hydrodynamic equations of motion and large-scale motion of the atmosphere, numerical weather prediction, atmospheric electricity. Preq: MATH 1080; and PHYS 2080 or PHYS 2210. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PHYS 4320 - Optics
3 Credits (3 Contact Hours)
Covers a selection of topics, depending on the interest of the student. Topics may include the formation of images by lenses and mirrors, design of optical instruments, electromagnetic wave propagation, interference, diffraction, optical activity, lasers, and holography. Includes Honors sections. Preq: PHYS 2210. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PHYS 4410 - Electromagnetics I
3 Credits (3 Contact Hours)
Study of the foundations of electromagnetic theory. Topics include electric fields, electric potential, dielectrics, electric circuits, solution of electrostatic boundary-value problems, magnetic fields, and magnetostatics. Includes Honors sections. Preq: PHYS 2210 and MATH 2080. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PHYS 4420 - Electromagnetics II
3 Credits (3 Contact Hours)
Continuation of PHYS 4410. Study of foundations of electromagnetic theory. Topics include magnetic properties of matter, microscopic theory of magnetization, electromagnetic induction, magnetic energy, AC circuits, Maxwell's equations, and propagation of electromagnetic waves. Other topics may include waves in bounded media, antennas, electrodynamics, special theory of relativity, and plasma physics. Includes Honors sections. Preq: PHYS 4410. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PHYS 4450 - Solid State Physics I
3 Credits (3 Contact Hours)
Topics include an overview of crystal structures, chemical and atomic bonding, and periodicity in relation to solid materials. Covers electronic, thermal, and magnetic properties of materials, electrical conduction in metals and semiconductors. Overview of the role of electrons and phonons and their interactions is presented. Includes Honors sections. Preq: PHYS 2210. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PHYS 4460 - Solid State Physics II
3 Credits (3 Contact Hours)
Continuation of PHYS 4450, including selected topics in solid-state physics such as optical properties, superconductivity, non-crystalline solids, dielectrics, ferroelectrics, and nanomaterials. Plasmons, polarons, and excitons are discussed. Brief introduction into methods of solid-state synthesis and characterization tools is presented. Includes Honors sections. Preq: PHYS 4450. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PHYS 4520 - Nuclear and Particle Physics
3 Credits (3 Contact Hours)
Study of our present knowledge concerning subatomic matter. Experimental results are stressed. Topics include particle spectra, detection techniques, Regge pole analysis, quark models, proton structure, nuclear structure, scattering and reactions. Includes Honors sections. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PHYS 4550 - Quantum Physics I
PHYS 4560 - Quantum Physics II
3 Credits (3 Contact Hours)
Continuation of PHYS 4550. Application of principles of quantum mechanics as developed in PHYS 4550 to atomic, molecular, solid state, and nuclear systems. Includes Honors sections. Preq: PHYS 4550.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PHYS 4650 - Thermodynamics and Statistical Mechanics
3 Credits (3 Contact Hours)
Study of temperature development of the laws of thermodynamics and their application to thermodynamic systems. Introduction to low temperature physics is given. Includes Honors sections. Preq: PHYS 3210.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PHYS 4750 - Selected Topics
1-3 Credits (1-3 Contact Hours)
Comprehensive study of a topic of current interest in the field of physics. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PHYS 4810 - Physics of Surfaces
3 Credits (3 Contact Hours)
Introduction for advanced undergraduates to the physics and chemical physics of solid surfaces and to the interaction of atoms and molecules with those surfaces. Preq: PHYS 3120 and PHYS 3220 and PHYS 3250 and PHYS 3260 and PHYS 4410.

PHYS 4820 - Surface Experiments
3 Credits (2 Contact Hours)

PHYS 4821 - Surface Experiments Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PHYS 4820. Coreq: PHYS 4820.

PHYS 4990 - Creative Inquiry in Physics and Astronomy
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. To be taken Pass/No Pass only. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

Plant and Environmental Sciences

PES 1040 - Introduction to Plant Sciences
3 Credits (3 Contact Hours)
Fundamental course in plant sciences, including agronomic and horticultural crops of the major agricultural areas of the world and emphasizing the crops of South Carolina. Includes Honors sections.

PES 2010 - Selected Topics in Plant and Environmental Sciences
1-4 Credits (1-4 Contact Hours)
Specialized selected topics in plant and environmental sciences not covered in other courses. May be repeated for a maximum of eight credits, but only if different topics are covered.

PES 2020 - Soils
4 Credits (3 Contact Hours)
Introduces world land resources, soil formation, classification, and mineralogy. Emphasizes basic chemical and physical properties of soil. Also discusses soil microorganisms, plant nutrients, and fertilization. Soil properties are related to growth. Preq: CH 1010 or CH 1020 or GEOL 1010. Coreq: PES 2021.

PES 2021 - Soils Laboratory
0 Credits (2 Contact Hours)

PES (ENSP) 3150 - Environment and Agriculture
3 Credits (3 Contact Hours)
Survey of the interrelationships of the environment and current agriculture and agricultural practices to include both the environmental impacts of agriculture and the role of agriculture in conservation and improving the environment. Includes Honors sections. May also be offered as ENSP 3150. Preq: Sophomore standing and one of the following combinations: BIOL 1040 and BIOL 1060; or BIOL 1100 and BIOL 1110; or CH 1010 and CH 1020; or CH 1050 and CH 1060.

PES 3350 - Agricultural Biotechnology
3 Credits (2 Contact Hours)
Strategies for the best use of biotechnology and genetic resources to alleviate constraints in global hunger, environmental sustainability, and health. Includes genetic enhancement and chromosome engineering of plant, animal, and microbial systems; issues related to commercial implementation; the impact on developing countries, environmental impact, and governmental policies. Preq: GEN 3000. Coreq: PES 3351.

PES 3351 - Agricultural Biotechnology Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany PES 3350. Coreq: PES 3350.

PES (BIOL) 3400 - Medical Botany
3 Credits (3 Contact Hours)
Study of use of compounds of plant and fungal origin as poisons, hallucinogens, and pharmaceuticals. May also be offered as BIOL 3400. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110; and CH 1020.

PES 3500 - Practicum
1-6 Credits (1-6 Contact Hours)
Preplanned practical or research experience related to student-selected Plant and Environmental Sciences concentration. Practicum is undertaken with an approved advisor or agency. May be repeated for a maximum of six credits. Preq: Plant and Environmental Sciences major.

PES 4010 - Academic and Professional Development
1 Credits (1 Contact Hours)
Students work with Career Center staff and the instructor to develop interview skills, resumes and professional goals, as well as identify skills necessary to be competitive. The importance of ethics in science careers is discussed.

PES 4030 - Soil Genesis and Classification
2 Credits (1 Contact Hours)
Study of soil morphology and characterization, pedogenic processes, soil-forming factors, and classification of soils. Offered fall semester only. Preq: PES 2020. Coreq: PES 4031. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PES 4031 - Soil Genesis and Classification Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PES 4030. Coreq: PES 4030. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PES 4050 - Plant Breeding
3 Credits (3 Contact Hours)
Application of genetic principles to the development of improved crop plants. Principal topics include the genetic and cytogenetic basis of plant breeding, mode of reproduction, techniques in selfing and crossing, methods of breeding, inheritance in the major crops, and biometrical methods. Offered spring semester only. Preq: GEN 3000. Coreq: PES 4051. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
PES 4051 - Plant Breeding Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany PES 4050. Coreq: PES 4050.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PES 4060 - Special Problems
1-3 Credits (1-3 Contact Hours)
Acquaints students with the scientific method. Literature investigation, planning, and execution of an experiment are integral parts of the course. Not open to students who have taken or are taking PES 4910 and PES 4920. May be repeated for a maximum of six credits. Preq: Senior standing.

PES (BE) 4080 - Land Treatment of Wastewater and Sludges
3 Credits (3 Contact Hours)
Principles for designing environmentally acceptable land application systems using municipal and industrial wastewater and sludges are presented. Topics include land-limiting constituent analysis; soil-plant interactions; system equipment and design; system operation and management; public acceptance, social, and regulatory issues. Case studies and field trips are planned. Preq: Senior standing. May also be offered as BE 4080.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PES 4090 - Biology of Invasive Plants
3 Credits (3 Contact Hours)
Introductory course covering mechanisms of plant invasions. Emphasizes unique traits that confer invasiveness and/or weediness to plants, and how these plant traits interact with the environment to facilitate invasion of agricultural lands, forests, rangelands and less-managed landscapes. Covers various cultural, chemical and biological control aspects. Preq: BIOL 1040 and BIOL 1060; or BIOL 3040.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PES 4210 - Principles of Field Crop Production
3 Credits (3 Contact Hours)
Principles for production of field crops. Topics include botany and physiology, tillage, harvesting, storage, and crop quality. Principles are illustrated using examples from various crops. Preq: PES 1040 and PES 2020.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PES 4220 - Major World Crops
3 Credits (3 Contact Hours)
Examines the distribution, adaptation, production, and utilization of major agronomic crops of the world. Emphasizes crops important to U.S. agriculture. Specific crops discussed in more detail include corn, wheat, rice, sorghum, soybeans, cotton, tobacco, and peanuts. Preq: PES 1040 and PES 2020.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PES 4230 - Field Crops: Forages
3 Credits (3 Contact Hours)
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PES (AGRB) 4260 - Cropping Systems Analysis
3 Credits (2 Contact Hours)
Application of agronomic and economic principles in solving problems related to the production and marketing of agronomic crops. Major part of the course is a case study in which detailed analysis of a farm, agribusiness, or environmental situation is made with students making formal written and oral presentations of results. Preq: PES 1040; and Junior standing; and AGRB 2020 or ECON 2000 or ECON 2110. Coreq: PES 4261. May also be offered as AGRB 4260.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PES (AGRB) 4261 - Cropping Systems Analysis Laboratory
Non-credit laboratory to accompany PES 4260. Coreq: PES 4260. May also be offered as AGRB 4261. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PES (HORT) 4330 - Landscape and Turf Weed Management**
3 Credits (2 Contact Hours)
Weed management strategies that include cultural, biological, and chemical methods are studied for landscape and turfgrass areas. Problem-solving skills and herbicide characteristics are emphasized. Coreq: PES 4331. May also be offered as HORT 4330. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PES (HORT) 4331 - Landscape and Turf Weed Management Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany PES 4330. Coreq: PES 4330. May also be offered as HORT 4331. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PES 4450 - Regulatory Issues and Policies**
3 Credits (3 Contact Hours)
Introduction to regulations of plant agriculture. Emphasizes risk assessment, patenting biotechnology inventions, and ethical issues. Includes survey of state and governmental agencies with responsibilities to avoid risk to humans, non-target organisms, and preservation of food safety, agricultural resources, and natural ecosystems. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PES 4460 - Soil Management**
3 Credits (3 Contact Hours)
Basic soil properties are related to compaction, water and solute movement, and root growth. Considers practical management problems and develops solutions based on basic soil characteristics. Problems include erosion, no-tillage, compaction, irrigation, leaching, waste application, golf green management, and orchard establishment. Preq: PES 2020. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PES 4510 - Agricultural Biotechnology and Global Society**
1 Credit (1 Contact Hours)
In-depth discussion of recent articles on agricultural biotechnology and related global issues. Includes independent and comprehensive literature survey and critical discussions on implementation of biotechnology products in the context of world agricultural production systems and economics. Discusses the role of international agencies and social and ethical issues. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PES 4520 - Soil Fertility and Management**
3 Credits (3 Contact Hours)
Study of soil properties, climatic factors, and management systems in relation to soil fertility maintenance for crop production. Considers plant nutrition and growth in relation to crop fertilization and management. Preq: PES 2020. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PES 4530 - Soil Fertility Laboratory**
1 Credits (3 Contact Hours)
Evaluation and interpretation of soil fertility production. Includes Honors sections. Preq: PES 2020. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PES 4550 - Seminar**
1 Credit (1 Contact Hours)
Presentation of interdisciplinary topics and original research in agronomy, entomology, plant pathology, soils, and related sciences.

**PES 4760 - Sustainable Food Systems Towards Global Food Security**
3 Credits (3 Contact Hours)
Covers the concept of food security linking to different agriculture production systems, human nutrition and food policies. Crop production systems include modern farming systems, small holder farming systems, and organic production systems to increase global nutritious food production. Preq: Junior standing.
PES (GEOL) 4850 - Environmental Soil Chemistry  
3 Credits (3 Contact Hours)  
Study of soil chemical processes (sorption, desorption, ion exchange, precipitation, dissolution, and redox reactions) of nutrients and inorganic and organic contaminants in soils and organic matter. Chemical complex equilibria and adsorption phenomena at the solid (soil, sediment, and mineral) water interface are emphasized. Preq: CH 1020 or PES 2020. May also be offered as ETOX 4850 or GEOL 4850.

PES 4900 - Beneficial Soil Organisms in Plant Growth  
3 Credits (3 Contact Hours)  
Aspects of biological nitrogen fixation, mycorrhizal fungi, microbial-pesticide interactions, bioremediation, nutrient cycles, and biological pest control related to plant growth, soil/environmental quality; and sustainable agriculture are covered. Students who desire laboratory experience in these topics may register for PES 4060 after consultation with instructor. Preq: PES 2020 and either MICR 3050 or PLPA 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PES 4910 - Senior Honors Research  
3 Credits (1 Contact Hours)  
Senior division honors research in an agricultural sciences curriculum. In consultation with and under the direction of a professor, students select a research topic, conduct experiments, record data, and make oral presentations of results to the College Honors Program Committee. Open to approved Honors Program students only. Coreq: PES 4911.

PES 4911 - Senior Honors Research Laboratory  
0 Credits (6 Contact Hours)  
Non-credit laboratory to accompany PES 4910. Coreq: PES 4910.

PES 4920 - Senior Honors Research  
3 Credits (1 Contact Hours)  
Continuation of PES 4910. Senior division honors research in an agricultural sciences curriculum. Upon termination of the research project, students submit formal written reports and make final oral presentations of results to the College Honors Program Committee. Professor-student discussions of additional topics are arranged. Coreq: PES 4921.

PES 4921 - Senior Honors Research Laboratory  
0 Credits (6 Contact Hours)  
Non-credit laboratory to accompany PES 4920. Coreq: PES 4920.

PES (ENT) 4960 - Selected Topics in Creative Inquiry  
1-2 Credits (1-2 Contact Hours)  
Disciplinary and multidisciplinary projects with the goal of developing the student's ability to discover, analyze, evaluate, and present data. Students are required to document their activities in their ePortfolios. May be repeated for a maximum of six credits. Preq: Consent of instructor. May also be offered as ENT 4960.

PES (ENT) 4970 - Selected Topics in Creative Inquiry Laboratory  
1-2 Credits (1-2 Contact Hours)  
Disciplinary and multidisciplinary research project with the goal of developing the student's ability to conduct research along with analysis, evaluation and presentation of results. Students are required to document their research activities in their ePortfolios. May be repeated for a maximum of six credits. Preq: Consent of instructor. May also be offered as ENT 4970.

Plant Pathology

PLPA 2130 - Fungi and Civilization  
3 Credits (3 Contact Hours)  
Overview of how fungi affect the lives of humans, both currently and historically. Addresses the diversity of fungi and the tremendous roles fungi play on the planet with respect to the biological, social and ethical consequences. The general nature of this course makes it beneficial to all students.

PLPA 3020 - Plant Pathology Research  
1-3 Credits (1-3 Contact Hours)  
Research experience in a plant pathology project for undergraduates who understand basic concepts of research. Students develop research objectives, procedures, and collect data. A written report includes interpretation of results. To be taken Pass/No Pass only. Includes Honors sections. Preq: Consent of instructor.
PLPA 3100 - Principles of Plant Pathology
3 Credits (2 Contact Hours)
Introduction to plant diseases caused by biotic agents and abiotic disorders, recognition of symptoms and signs, types of plant pathogens, diagnosis, disease development, economics, disease management, and effects of plant diseases on human welfare and the environment. Preq: BIOL 1110; or BIOL 1040 and BIOL 1060. Coreq: PLPA 3101.

PLPA 3101 - Principles of Plant Pathology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PLPA 3100. Coreq: PLPA 3100.

PLPA (ENT) 4060 - Diseases and Insects of Turfgrasses
2 Credits (2 Contact Hours)
Host-parasite relationships, symptomatology, diagnosis, economics, and control of infectious diseases of turfgrasses and life histories, diagnosis, and control of important insect pests of turfgrasses. May also be offered as ENT 4060. Preq: ENT 3010 and PLPA 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PLPA (ENT) 4080 - Diseases and Insects of Turfgrasses Laboratory
1 Credits (3 Contact Hours)
Laboratory to complement PLPA 4060 or ENT 4060 to learn symptomatology, diagnosis, and control of infectious diseases of turfgrasses and diagnosis of damage caused by important insect pests of turfgrasses. May also be offered as ENT 4080. Preq: PLPA 4060 or ENT 4060. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PLPA 4110 - Plant Disease Diagnosis
3 Credits (2 Contact Hours)
Methods and procedures used in the diagnosis of plant diseases, especially late spring and early summer diseases. Basic techniques of pure culture and identification of plant pathogens and Koch's postulates are taught. Diagnosis of a wide variety of diseases of cultivated and wild plants is carried out. Offered summer session only. Preq: PLPA 3100. Coreq: PLPA 4111. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PLPA 4111 - Plant Disease Diagnosis Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PLPA 4110. Coreq: PLPA 4110. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PLPA (BION) 4250 - Introductory Mycology
3 Credits (3 Contact Hours)
Introduction to the biology of all the groups of fungi and some related organisms, with considerations of the taxonomy, morphology, development, physiology, and ecology of representative forms. May also be offered as BIOL 4250. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PLPA (BIOL) 4260 - Mycology Practicum
2 Credits (1 Contact Hours)
Application of the principles of mycological techniques, microscopic study of fungi. Examples from all major groups of fungi are included. May also be offered as BIOL 4260. Preq or concurrent enrollment: BIOL 4250 or PLPA 4250. Coreq: PLPA 4261. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PLPA (BIOL) 4261 - Mycology Practicum Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany PLPA 4260. May also be offered as BIOL 4261. Coreq: PLPA 4260. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PLPA (BIOL) 4540 - Plant Virology
4 Credits (3 Contact Hours)
Study of plant viruses: their morphology, biochemistry, purification, and transmission; symptoms resulting from virus infection; virus vector relationships. Serological and nucleic acid hybridization procedures. Diagnosis of viral diseases and the identification of causal agents. Replication of plant viruses, the interaction between viral host and plant genome. Control of plant viral diseases. May also be offered as BIOL 4540. Preq: BCHM 3010 or BCHM 3050 or MICR 3050. Coreq: PLPA 4541.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PLPA (BIOL) 4541 - Plant Virology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PLPA 4540. Coreq: PLPA 4540. May also be offered as BIOL 4541.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PLPA 4590 - Plant Nematology
3 Credits (2 Contact Hours)
Introduction to nematodes emphasizing plant parasitic nematodes. Introduces morphology of nematodes as it relates to their taxonomic position and ability to cause diseases. Includes diagnosis and control of nematode diseases, along with use of nematodes in studies of molecular interaction and genetics involvement in developing resistance. Preq: PLPA 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PLPA 4591 - Plant Nematology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany PLPA 4590. Coreq: PLPA 4590.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

PLPA 4700 - Molecular Plant Pathogen Interactions
3 Credits (3 Contact Hours)
Study of the interactions of plants and pathogens at the molecular level. Investigates the molecular and genetic components of plant disease and how these can be used for improvement and understanding of how diseases occur and how these can be used for possible disease management. Preq: PLPA 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

Political Science

POSC 1010 - American National Government
3 Credits (3 Contact Hours)
Introduction to American national government and politics examining topics such as the Constitution, federalism, political institutions, political behavior, and political participation. Includes Honors sections.

POSC 1020 - Introduction to International Relations
3 Credits (3 Contact Hours)
Overview of both theory and practice in contemporary global politics. Topics include the structure of and primary actors in the international system; reasons conflict occurs; and roles of international institutions, law, and policy. Includes Honors sections.

POSC 1030 - Introduction to Political Theory
3 Credits (3 Contact Hours)
Introduction to major themes and thinkers in the Western tradition of political thought. Students examine classic primary texts of the ancient and modern periods, including Plato, Aristotle, Hobbes and Locke, to acquire a working conceptual vocabulary of normative and theoretical terms, political ideologies, and basic patterns of political organization. Includes honors sections.

POSC 1040 - Introduction to Comparative Politics
3 Credits (3 Contact Hours)
Introduction to the study of comparative politics in the post-Cold War era, with emphasis on theories and applications. Topics include democratic and nondemocratic systems; ideology; political culture; party systems; and legislative, executive, and judicial structures. Includes Honors sections.

POSC 1990 - Introduction to Political Science
Introduction to political science as a discipline. Topics include an overview of the subfields within political science, core research methodologies and source materials, and ethical issues related to the study of political science.

**POSC 3020 - State and Local Government**
3 Credits (3 Contact Hours)
Introduction to American state and local governments, including examination of nature and scope of non-national governments and their interaction with the U.S. federal system. Emphasis is on structural features, functions, and policies of non-national governments.

**POSC 3050 - Creative Inquiry in Political Science**
1-3 Credits (1-3 Contact Hours)
Engages students in faculty-led research projects. May be repeated for a maximum of six credits. No more than three hours from POSC 3050, 3100, 3110, 3120, 3130, 4090, 4100 may be applied toward a Political Science major, minor, or a Global Politics minor. Preq: Consent of instructor.

**POSC 3100 - Political Science Internship**
1-3 Credits (1-3 Contact Hours)
Off-campus internship for at least one semester equivalent. May be repeated for a maximum of three credits. No more than three hours from POSC 3050, 3100, 3110, 3120, 3130, 4090, 4100 may be applied toward a Political Science major, minor or a Global Politics minor. No more than six hours from POSC 3100, 3110, 3120, 3130 may be applied toward any other degree. Preq: Consent of instructor.

**POSC 3110 - Model United Nations**
1 Credits (1 Contact Hours)
United Nations simulation exercises. May be repeated for a maximum of six credits. No more than three hours from POSC 3050, 3100, 3110, 3120, 3130, 4090, 4100 may be applied toward a Political Science major, minor, or a Global Politics minor. No more than six hours from POSC 3100, 3110, 3120, 3130 may be applied toward any other degree.

**POSC 3120 - State Student Legislature**
1 Credits (1 Contact Hours)
State student legislature simulation exercises. May be repeated for a maximum of six credits. No more three hours from POSC 3050, 3100, 3110, 3120, 3130, 4090, 4100 may be applied toward a Political Science major, minor, or a Global Politics minor. No more than six hours from POSC 3100, 3110, 3120, 3130 may be applied toward any other degree.

**POSC 3130 - Clemson University Model United Nations Conference**
1 Credits (1 Contact Hours)
Facilitation of annual high school Model United Nations conference held on Clemson campus. No more three hours from POSC 3050, 3100, 3110, 3120, 3130, 4090, 4100 may be applied toward a Political Science major, minor, or a Global Politics minor. No more than six hours from POSC 3100, 3110, 3120, 3130 may be applied toward any other degree. May be repeated for a maximum of three credits.

**POSC 3210 - Public Administration**
3 Credits (3 Contact Hours)
Introduction to public administration, including the elements of organization, personnel and financial management, administrative law, and administrative responsibility. Preq: Sophomore standing.

**POSC 3410 - Quantitative Methods in Political Science**
3 Credits (3 Contact Hours)
Introduction to quantitative research methods in political science. Topics include research design, measurement, data collection, sampling procedures, and applications of statistical techniques to research problems in political science. Also stresses computer use for elementary data analysis.

**POSC 3430 - Mass Media in American Politics**
3 Credits (3 Contact Hours)
Role and impact of the mass media in the American political system, emphasizing the media's role in shaping public opinion and in influencing government and public policy. Preq: POSC 1010.

**POSC 3610 - International Conflict**
3 Credits (3 Contact Hours)
The onset, expansion and consequences of inter-state conflict lie at the heart of international relations. This course examines the causes and consequences of disputes and wars. Includes Honors sections. Preq: Sophomore standing.

**POSC 3620 - International Organizations**
3 Credits (3 Contact Hours)
Examines normative and institutional foundations of civil society. Explains the formal institutions, decision-making processes, and multilateral capacities of international governmental and nongovernmental organizations. Preq: Sophomore standing.

**POSC 3630 - United States Foreign Policy**
3 Credits (3 Contact Hours)
American foreign policy in historical perspective, with particular emphasis on the decision-making process, contemporary American capabilities and challenges, and analysis of key issues. Preq: Sophomore standing.

**POSC 3710 - European Politics**
3 Credits (3 Contact Hours)
Major emphasis on European governments and issues of importance in the European context. Current methods of comparison are studied and applied to the formal and informal functioning of European governments. Preq: Sophomore standing.

**POSC 3720 - Political Culture of East Asia**
3 Credits (3 Contact Hours)
Introduction to political culture that commonly characterizes East Asian countries, with emphasis on political subcultures of different nations, and on the analysis of the mutual influence between politics and culture. Preq: Sophomore standing.

**POSC 3750 - European Integration**
3 Credits (3 Contact Hours)
Survey course analyzing increasing institutional cooperation between European countries with a focus on the European Union. Includes Honors sections. Preq: Sophomore standing.

**POSC 3810 - African American Politics**
3 Credits (3 Contact Hours)
Examination of African American political thought, interests and agenda setting, and dynamics of African Americans' participation in political and governmental decision making. Preq: Sophomore standing.

**POSC 3890 - Selected Topics**
1-3 Credits (1-3 Contact Hours)
Study of a selected area of political science. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Junior standing.

**POSC 3950 - Junior Honors Research Seminar**
1 Credits (1 Contact Hours)
Readings and discussion to prepare for the Junior Research Paper and the Senior Thesis. Preq: Junior standing and membership in Calhoun Honors College.

**POSC 3960 - Junior Honors Research**
1 Credits (1 Contact Hours)
Readings and research in conjunction with an approved political science course at the 3000 or 4000 level. Preq: Junior standing and membership in Calhoun Honors College.

**POSC 4030 - United States Congress**
3 Credits (3 Contact Hours)
Examination of the evolution of Congress, congressional elections, the organization of the legislative branch, congressional rules and procedures, decision making, styles of representation, and policymaking. Preq: Sophomore standing.

**POSC 4050 - The American Presidency**
3 Credits (3 Contact Hours)
Examines the evolution of the presidency, the powers of the chief executive, the public presidency, executive branch organization and staffing, decision making, and political relations with Congress and the federal judiciary. Preq: Sophomore standing.

**POSC 4070 - Religion and American Politics**
3 Credits (3 Contact Hours)
Examines the impact of religion on American politics, including an analysis of the role of religion in politics, political behavior of major religious groups, constitutional issues and voting behavior. Preq: Sophomore standing.

**POSC 4090 - Directed Study in American Politics**
1-3 Credits (1-3 Contact Hours)
Supervised reading/research in selected areas of American politics. May be repeated for a maximum of six credits. No more than three hours from POSC 3050, 3100, 3110, 3120, 3130, 4090, 4100 may be applied toward a Political Science major, minor, or a Global Politics
minor. Preq: Consent of instructor.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**POSC 4100 - Directed Study in International Politics**
1-3 Credits (1-3 Contact Hours)
Supervised reading/research in selected areas of international/comparative politics. May be repeated for a maximum of six credits. No more than three hours from POSC 3050, 3100, 3110, 3120, 3130, 4090, 4100 may be applied toward a Political Science major, minor, or a Global Politics minor. Preq: Consent of instructor.

**POSC 4160 - Interest Groups and Social Movements**
3 Credits (3 Contact Hours)
Empirical and normative examination of the origins, roles, and influence of interest groups and social movements in the United States and of the relationships among interest groups, social movements, and democratic theory. Preq: Sophomore standing.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**POSC 4210 - Public Policy**
3 Credits (3 Contact Hours)
Introduction to the major approaches to public policy making in American government. Topics include theories and models of policy making, the identification of policy problems, agenda setting, the formulation and adoption of policy, implementation, and program evaluation. Preq: Sophomore standing.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**POSC 4230 - Urban Politics**
3 Credits (3 Contact Hours)
Examines the nature and scope of politics in urban communities and offers an analysis of urban governance, especially in the interaction of public authority and private institutions in metropolitan areas. Emphasis is on the structure, processes, and problems challenging governments in urban America. Preq: Sophomore standing.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**POSC 4240 - Federalism and Intergovernmental Relations**
3 Credits (3 Contact Hours)
Introduction to the historical, theoretical, legal, and fiscal aspects of constitutionally divided government. Federal, state, and local division of responsibility for public services is emphasized, along with the emerging devolution of those responsibilities from the federal government to states and localities. Preq: Sophomore standing.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**POSC 4280 - National Security Policy**
3 Credits (3 Contact Hours)
National security threats and policy decision making. Issues covered include weapons of mass destruction, terrorism, organized crime, narcotics, arms control, intelligence, and homeland security. Students deliberate and assess threat priorities and crisis management.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**POSC 4290 - Global Issues**
3 Credits (3 Contact Hours)
Analysis, assessment, and management of the principal threats facing global security today. Topics include rogue nations, regional superpowers, alliances, organized crime, illegal weapons proliferation, and corruption. Emphasis is on the strategies available to the international community for dealing with these threats.

This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**POSC 4300 - Public Policy Evaluation**
3 Credits (3 Contact Hours)
Discussion of the role of policy analysis in government. Applications of analytical and computer tools to substantive policy areas such as transportation, economic/community development, education, poverty, and health. Students focus on assessing a policy from a set of options based on analytic criteria as well as developing policy alternatives. Preq: POSC 3410 or STAT 2300 or STAT 3300.

**POSC 4360 - Law, Courts, and Politics**
3 Credits (3 Contact Hours)
Introduces the principal features of the American legal system. Analyzes how and why legal actors and institutions operate as they do. Explores how the law functions as both a tool and an institution of government, as well as how the court system affects the formation and implementation of public policies. Preq: Sophomore standing.

**POSC 4370 - American Constitutional Law: Rights and Liberties**
3 Credits (3 Contact Hours)
Examination and analysis of Supreme Court decisions and other legal materials in the areas of civil rights and civil liberties, with an emphasis on freedom of speech, freedom of religion, equal protection of the laws, and privacy rights. Preq: Sophomore standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**POSC 4380 - American Constitutional Law: Structures of Government**
3 Credits (3 Contact Hours)
Examination and analysis of Supreme Court decisions and other legal materials in the areas of national power, federalism, the separation of powers, and the role of the judiciary. Preq: Sophomore standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**POSC 4390 - Religious Liberty and the U.S. Constitution**
3 Credits (3 Contact Hours)
Examination and analysis of legal materials relevant to religious liberty in the United States, with a special focus on the United States Supreme Court. Topics include exemptions for religious believers, religious establishment, and the place of religion in public life. Preq: Sophomore standing.

**POSC 4420 - Political Parties and Elections**
3 Credits (3 Contact Hours)
Study of the distinctive features of the American two-party system with emphasis on presidential elections. Parties are examined as formal organizations, coalitions of voters and interest groups, coordinators of nomination and election processes, and managers of policy-making institutions. Preq: Sophomore standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**POSC 4430 - Political Behavior**
3 Credits (3 Contact Hours)
Offers students a comprehensive introduction to how individuals think, act and behave in their engagement in politics. Preq: Sophomore standing.

**POSC 4470 - International Law**
3 Credits (3 Contact Hours)
Study of the inherently political nature of international law and the ways in which international law relates closely to both international and domestic politics. This course examines the use, design and consequences of international law for a wide range of players in world politics. Preq: Sophomore standing.

**POSC 4480 - International Political Economy**
3 Credits (3 Contact Hours)
Provides students with background knowledge and conceptual tools for understanding the politics of contemporary international economic relations. Students are introduced to the major issues of the international political economy and different perspectives approaching these issues. Preq: Sophomore standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**POSC 4490 - Political Theory of Capitalism**
3 Credits (3 Contact Hours)
Examines the ethical foundations of capitalism. Focuses primarily on the major ethical theories that have supported or criticized capitalism throughout history. Topics include justification of private property, role of corporations, the profit motive, and the source of wealth creation. Preq: Sophomore standing.

**POSC 4500 - Special Topics in Political Theory**
3 Credits (3 Contact Hours)
Intensive examination of a selected political philosopher, conceptual area within political theory, or political thought of a particular era. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Sophomore standing.
POSC 4530 - American Political Thought
3 Credits (3 Contact Hours)
American political philosophy from the 17th century to the present with emphasis on political and social developments since the 1770s.
Preq: Sophomore standing.

POSC 4540 - Southern Politics
3 Credits (3 Contact Hours)
Examination of the unique political environment of the American South, with emphasis on the events and social forces that have shaped politics in the region since World War II. Course material is approached from a variety of perspectives, including history, literature, social themes, and political culture. Preq: Sophomore standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

POSC 4550 - Political Thought of the American Founding
3 Credits (3 Contact Hours)
Intensive seminar of the principles and practices of America's founders (e.g., Washington, Adams, Jefferson, Madison, and Hamilton). Examines how American revolutionaries struggled between 1765 and 1788 to develop new ideas about rights, liberty, equality, constitutions, republicanism, separation of powers, representation, federalism, etc. Preq: Sophomore standing.

POSC 4560 - Diplomacy: The Art of Negotiation
3 Credits (3 Contact Hours)
Examines the conduct of foreign policy in the historical and contemporary context. Explores theories and key concepts of international negotiation, offering a comparative look at the behavior and practice of major powers. Preq: Sophomore standing.

POSC 4570 - Political Terrorism
3 Credits (3 Contact Hours)
Examination and analysis of the international phenomenon of terrorism in terms of origins, operations, philosophy, and objectives. Preq: Sophomore standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

POSC 4580 - Political Leadership
3 Credits (3 Contact Hours)
Comparative examination of political leaders, focusing particularly on types, methods, and consequences of leadership and on the relationship between leaders and followers. Preq: Sophomore standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

POSC 4590 - Nationalism and Ethnic Conflict
3 Credits (3 Contact Hours)
Examination of how and why nationalism and nationalist politics emerge, and the consideration of the consequences nationalism has on matters of sovereignty and peace. Emphasis is placed on how ethnicity and identity relate to nationalism and conflict. Preq: Sophomore standing.

POSC 4610 - American Diplomacy and Politics
3 Credits (3 Contact Hours)
Analyzes the process of making and implementing strategies to protect and promote American national interests. Focuses on the role of government agencies and executive-legislative relations, as well as the participation and influence of interest groups and the media.
Includes a five-day seminar in Washington, DC. Preq: Consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

POSC 4660 - African Politics
3 Credits (3 Contact Hours)
Comprehensive survey of major regional blocks, as well as analysis of individual states and thematic concepts. Preq: Sophomore standing.

POSC 4710 - Russian Politics
3 Credits (3 Contact Hours)
Comprehensive examination of the Russian Federation since the fall of the Soviet Union. The successes and failures of democratic transition are analyzed, with topics covering political participation, organized crime and corruption, center-periphery conflict, and ethnic/religious unrest. Preq: Sophomore standing.
POSC 4760 - Middle East Politics
3 Credits (3 Contact Hours)
Comprehensive thematic and empirical analysis of the Middle East region. Issues covered include democratization, political and religious freedom, oil, the role of women, and terrorism. States analyzed include Syria, Jordan, Iran, Iraq, Saudi Arabia, Turkey, and the Gulf States. Preq: Sophomore standing.

POSC 4770 - Chinese Politics
3 Credits (3 Contact Hours)
Concepts and operation of contemporary China's political system; emphasizes institutional innovation and political economy in recent reforms. Preq: Sophomore standing.

POSC 4780 - Latin American Politics
3 Credits (3 Contact Hours)
Survey of prominent trends in Latin American politics, with a focus on major countries in the region and major issues affecting the region. Relations between Latin America and the United States and other prominent countries are also considered. Preq: Sophomore standing.

POSC 4800 - Gender and Politics
3 Credits (3 Contact Hours)
Examination of the role of gender in politics in the United States and in other countries. Particular emphasis on the role of women in electoral politics, issues of gender, women's rights as human rights, and feminist theory. Preq: Sophomore standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

POSC 4820 - Political Novel and Film
3 Credits (3 Contact Hours)
Examination of political novels and films. Emphasizes the development of these media as art forms; the relationship between political novels and films and politics at large; and the role of these media in shaping public opinion. Preq: Sophomore standing.

POSC (LANG) 4850 - Global Affairs and Governments
3 Credits (3 Contact Hours)
Designed for teachers and education students who wish to learn how to incorporate global affairs more fully into high school curricula. Overview of major topics involving foreign policies and world politics is provided. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

POSC 4890 - Selected Topics
1-3 Credits (1-3 Contact Hours)
Intensive examination of a selected area of political science. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

POSC 4900 - Senior Honors Thesis Research
3 Credits (3 Contact Hours)
Reading and research related to the senior honors thesis. Preq: POSC 3960 and Senior standing and membership in Calhoun Honors College.

POSC 4910 - Senior Honors Thesis
3 Credits (3 Contact Hours)
Research and writing of the senior honors thesis. Preq: POSC 4900 and Senior standing and membership in Calhoun Honors College.

POSC 4990 - Professional Development in Political Science
1 Credits (1 Contact Hours)
Allows students to reflect on their experience as political science majors. Topics include understanding of cross-disciplinary issues, current research in political science, career options, and ethical issues related to the study of political science. To be taken Pass/No Pass only. Preq: Senior standing in Political Science.

Portuguese

PORT 1010 - Elementary Portuguese
4 Credits (3 Contact Hours)
Introduction to speaking, listening, and writing. Attention is given to the sound system of Portuguese to develop basic communication skills. Coreq: PORT 1011.

PORT 1011 - Elementary Portuguese Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany PORT 1010. Coreq: PORT 1010.

PORT 1020 - Elementary Portuguese
4 Credits (3 Contact Hours)

PORT 1021 - Elementary Portuguese Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany PORT 1020. Coreq: PORT 1020.

PORT 2010 - Intermediate Portuguese
3 Credits (3 Contact Hours)
Intermediate course with more emphasis on communication skills and structure. Reading and writing practice in and outside the classroom, with special attention to idiomatic usage. Introduction to perspectives through readings and cultural activities. Preq: PORT 1020.

PORT 2020 - Intermediate Portuguese
3 Credits (3 Contact Hours)

Psychology

PSYC 2010 - Introduction to Psychology
3 Credits (3 Contact Hours)
Introduction to the study of behavior. Analysis of the biological bases of behavior, learning, thinking, motivation, perception, human development, social behavior, and the application of basic principles to more complex phenomena such as education, personal adjustment, and interpersonal relations. Includes Honors sections.

PSYC 2020 - Introductory Psychology Laboratory
1 Credits (2 Contact Hours)
Major phenomena and methods of psychology are illustrated and investigated in a series of laboratory modules. Students also explore career and academic development issues.

PSYC 2500 - Pursuing Happiness
3 Credits (3 Contact Hours)
Introduces psychological theories and principles used to study human behavior (methods, cognition, motivation, etc.). The concept of happiness is investigated as a psychological construct across cultures. Offered summer session only.

PSYC 2750 - Applied Psychology and Transportation
3 Credits (3 Contact Hours)
Introduces psychological principles used to study human behavior (methodological, cognitive, perceptual, etc.). These psychological principles, in addition to ethical, legal, and societal perspectives, are applied to transportation issues.

PSYC 2890 - Topics in Basic Psychology
3 Credits (3 Contact Hours)
Various topics in basic psychology are covered. No prior knowledge of psychology is required. May be repeated for a maximum of six credits if different topics are covered.

PSYC 3060 - Human Sexual Behavior
3 Credits (3 Contact Hours)
The subject of sexual behavior is approached from the psychophysiological, behavioral, and cultural points of view. Evolutionary, historical, and cross-cultural perspectives are considered.

PSYC 3090 - Introductory Experimental Psychology
4 Credits (3 Contact Hours)
Introduction to the analysis of data from experimental and correlational research in psychology. Emphasizes the applications and logical

**PSYC 3091 - Introductory Experimental Psychology Laboratory**  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany PSYC 3090. Coreq: PSYC 3090.

**PSYC 3100 - Advanced Experimental Psychology**  
4 Credits (3 Contact Hours)  
Continuation of PSYC 3090. Focus is on techniques of empirical research (experiments, quasi-experiments, non-experimental research, etc.) that are widely used in psychology. Students design and carry out their own empirical research projects normally involving data collected from human participants. Extensive practice in the writing of reports is included. Preq: PSYC 2010 and PSYC 3090. Coreq: PSYC 3101.

**PSYC 3101 - Advanced Experimental Psychology Laboratory**  
0 Credits (2 Contact Hours)  
Non-credit laboratory to accompany PSYC 3100. Coreq: PSYC 3100.

**PSYC 3240 - Physiological Psychology**  
3 Credits (3 Contact Hours)  
Study of human neuroanatomy with emphasis on the function of the nervous and endocrine systems. Discusses the biological basis of behavior in its normal and abnormal dimensions. Preq: PSYC 2010.

**PSYC 3250 - Physiological Psychology Laboratory**  
1 Credits (3 Contact Hours)  
Demonstrations and techniques of selected physiological procedures are presented to explain the principles discussed in PSYC 3240. Preq: PSYC 2010. Preq or concurrent enrollment: PSYC 3240.

**PSYC 3300 - Motivation**  
3 Credits (3 Contact Hours)  
Various aspects of motivation are considered by studying physiological, emotional, and environmental influences on behavior. Orientation is empirical rather than theoretical with emphasis on pertinent research, applications, and measurement of motives. Preq: PSYC 2010.

**PSYC 3310 - Critical Thinking**  
3 Credits (3 Contact Hours)  
People use cause-effect reasoning, which is part of critical thinking, frequently in daily living and at work or school. Examples include political arguments, personal decisions, and science. This course provides a psychological perspective on how people reason causally, the errors they make and how causal thinking can be improved. Preq: PSYC 2010.

**PSYC 3330 - Cognitive Psychology**  
3 Credits (3 Contact Hours)  
Study of higher-order mental processing in humans. Topics include memory, learning of concepts, problem solving, and the psychology of language. Preq: PSYC 2010.

**PSYC 3340 - Laboratory in Cognitive Psychology**  
1 Credits (2 Contact Hours)  
Selected experiments and demonstrations are conducted to reveal phenomena related to human perception, memory, reasoning, problem solving, and high-level mental processes. Preq: PSYC 2010 and PSYC 3090. Preq or concurrent enrollment: PSYC 3330.

**PSYC 3400 - Lifespan Developmental Psychology**  
3 Credits (3 Contact Hours)  
Survey of current theory and research concerned with the psychological aspects of human growth and development across the entire lifespan. Major topics include developmental methods, physical maturation, cognition, socialization, personality, psycholinguistics, intelligence, learning, behavior problems, and exceptionality. Includes Honors sections. Preq: PSYC 2010.

**PSYC 3440 - Psychology of Adolescence**  
3 Credits (3 Contact Hours)  
Study of the psychosocial processes of adolescence. Major emphasis is on personality development, growth of thinking, social and sexual maturation, and variations in adolescence. Preq: PSYC 2010.

**PSYC 3450 - Adulthood and Aging**  
3 Credits (3 Contact Hours)  
Special consideration of the major psychological processes of aging as they relate to individual behavior and adaptation. Includes the
influences of aging on the body, learning and psychomotor skills, thinking and intelligence, employment and productivity, personality, and psychopathology. Opportunity for contact with institutionalized and noninstitutionalized elderly persons is provided. Preq: PSYC 2010.

**PSYC 3520 - Social Psychology**
3 Credits (3 Contact Hours)
Survey course analyzing human social behavior from the perspective of the individual as a participant in social relationships. Major emphasis is on the study of such contemporary social processes as attitude formation and change, interpersonal relations, conformity, conflict resolution, aggression and violence, social communication, and group phenomena. Includes Honors sections. Preq: PSYC 2010.

**PSYC (ELE, SOC) 3560 - Social Science of Entrepreneurship**
3 Credits (3 Contact Hours)
Examines those areas of the social sciences that have direct relevance for entrepreneurs. Topics include processes by which entrepreneurs are shaped by social institutions such as the family and community, public policy implications and influences on entrepreneurship, risk perception, decision making, motivation, leadership, and group dynamics. May also be offered as ELE 3560 or SOC 3560. Preq: SOC 2010 or SOC 2020 or SOC 2350 or CRD 2350 or PSYC 2010 or POSC 1010 or POSC 1020 or POSC 1040.

**PSYC 3640 - Industrial Psychology**
3 Credits (3 Contact Hours)
Reviews perception of work from the pre-industrial revolution to the present. Comparative approaches to motivation, development, maintenance, and attraction of successful work behaviors are discussed. Topics include the organization's responsibilities to the community, implementing a disease- and accident-free workplace, and the effects of consumerism. Preq: PSYC 2010.

**PSYC 3660 - Organizational Psychology**
3 Credits (3 Contact Hours)
Analysis of individual behavior for the purpose of investigating problems in organizations and increasing organization effectiveness. Topics include psychological factors affecting communication, decision making, conflict, leadership, work stress, power, and organizational change. Preq: PSYC 2010.

**PSYC 3690 - Leadership in Organizational Settings**
3 Credits (3 Contact Hours)
Broad survey of theory and research on leadership in formal organizations. A detailed explanation and critical evaluation of major theories (including participative and charismatic leadership) are bridged with helpful remedies and prescriptions for effective leadership in organizations. Preq: PSYC 2010.

**PSYC 3700 - Personality**
3 Credits (3 Contact Hours)
Historical and contemporary views of individual differences in behavior, affect, health, coping, and motivation. Covers topics such as personality development and structure, personality assessment, cross-cultural issues, and applications of personality psychology. Preq: PSYC 2010.

**PSYC 3830 - Abnormal Psychology**
3 Credits (3 Contact Hours)
Introduction to the diagnosis and treatment of mental illnesses. Uses current diagnostic standards for mental disorders as a framework for understanding the symptoms, causes, and treatments of the most commonly observed maladaptive behaviors. Includes Honors sections. Preq: PSYC 2010.

**PSYC 3890 - Topics in Psychology**
3 Credits (3 Contact Hours)
Various topics in psychology are covered. A basic understanding of psychological concepts is required. May be repeated for a maximum of six credits if different topics are covered. Preq: PSYC 2010.

**PSYC 3900 - Honors Seminar in Psychology**
3 Credits (3 Contact Hours)
Variable topic seminar for Honors students from all majors. Topics are announced prior to registration for each semester. May be repeated once for credit, but only if different topics are covered. Preq: PSYC 2010.

**PSYC 4080 - Women and Psychology**
3 Credits (3 Contact Hours)
Explores the wide variety of psychological issues that concern women. Emphasizes empirical research on topics such as motherhood, sex differentiation, motivation, and psychological disorders. Preq: PSYC 2010.

**PSYC 4150 - Systems and Theories of Psychology**
Study of the development of psychology, particularly during the past 1000 years. Emphasis is on giving students a better perspective of present-day psychology. Focus is on the various approaches taken by influential psychologists and the conflicts among these approaches. Preq: PSYC 2010.

**PSYC 4220 - Sensation and Perception**
3 Credits (3 Contact Hours)
Study of psychophysical techniques of measurement and sensory and perceptual processes related to vision, hearing, and the other senses. Includes Honors sections. Preq: PSYC 2010.

**PSYC 4230 - Sensation and Perception Laboratory**
1 Credit (2 Contact Hours)
Selected experiments are conducted to demonstrate the phenomena involved in sensation and perception. Preq: PSYC 3090. Preq or concurrent enrollment: PSYC 4220.

**PSYC 4260 - Advanced Physiological Psychology**
3 Credits (3 Contact Hours)
Advanced studies of the biological basis of behavior with emphasis on functional neuroanatomy and endocrinology. Topics may vary. May not be repeated for credit. Preq: PSYC 3240.

**PSYC 4350 - Human Factors Psychology**
3 Credits (3 Contact Hours)
Analyses of theoretical issues and research methods related to the interaction between people and machines and human performance. Topics include information processing theory, human control systems and displays, task simulation, perceptual and motor factors limiting human performance. Preq: PSYC 2010.

**PSYC 4430 - Infant and Child Development**
3 Credits (3 Contact Hours)
Cognitive, emotional, and social development from conception through childhood (up to age 12). Major theories and research findings are covered. Preq: PSYC 2010 and PSYC 3400.

**PSYC 4470 - Moral Development**
3 Credits (3 Contact Hours)
Explores the development of moral reasoning, judgment, and character from a descriptive psychological point of view. Examines the theoretical and empirical work of Jean Piaget, Lawrence Kohlberg, and Elliot Turiel as well as prosocial, eudaemonistic, and cross-cultural alternatives to these ideas. Preq: PSYC 2010; and one of PSYC 3400 or PSYC 3440 or PSYC 3450.

**PSYC 4560 - Applied Psychophysiology**
3 Credits (3 Contact Hours)
Explores the various measures used in psychophysiology to study mind-body interactions. Exposes students to the practice of psychophysiology through an integrated hands-on laboratory experience in which students learn about psychophysiological measures by applying them. Preq: PSYC 2010.

**PSYC 4710 - Psychological Testing**
3 Credits (3 Contact Hours)
Introduction to the theory of psychological testing, emphasizing the principles of measurement and psychometric characteristics of a good psychological test. Issues in test development, administration, and interpretation are reviewed. Educational, industrial, and clinical uses of tests are examined. Preq: PSYC 2010 and 3090.

**PSYC 4750 - Brain and Behavior: An Evolutionary Approach**
3 Credits (3 Contact Hours)
Examines the interactions between the human brain and behavior from an evolutionary perspective. Topics can include: hunger, stress, sleep, sexual attraction, memory, decision making, in-group, male-female interaction, and maladaptive behaviors. Includes Honors sections. Preq: PSYC 2010 and Junior or Senior standing.

**PSYC 4800 - Health Psychology**
3 Credits (3 Contact Hours)
Study of the role of health-related behaviors in the prevention, development and/or exacerbation of health problems. Emphasis on the biopsychosocial model and its application in the assessment, treatment, and prevention of health problems. Preq: PSYC 2010. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PSYC 4820 - Positive Psychology**
3 Credits (3 Contact Hours)
Examines the research, theories, and applications of the psychology of human strengths and well-being. Fundamental research into the cultural, emotional, personality, cognitive/motivational, and developmental correlates of strengths and well-being is examined, as well as application of these principles to a variety of organizational settings. Preq: PSYC 2010.

**PSYC 4880 - Theories of Psychotherapy**
3 Credits (3 Contact Hours)
Survey of alternative theories of psychological treatment for behavioral and emotional disorders. Various theoretical assumptions, techniques, and applications of each approach are examined and compared, and case examples are considered. Preq: PSYC 3700 or PSYC 3830.

**PSYC 4890 - Seminar in Advanced Psychology**
3 Credits (3 Contact Hours)
Seminar course covering various advanced psychology topics. An understanding of fundamental psychological concepts is required. Includes primary source readings, substantial written work, and/or collection and analysis of psychological data. May be repeated for a maximum of six credits if different topics are covered. Preq: Any 3000-level PSYC course. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**PSYC 4900 - Senior Division Honors Research I**
2-4 Credits (2-4 Contact Hours)
Preparation and defense of a research proposal. Proposed project should be empirical, historical, or theoretical in nature. Preq: Junior standing and consent of instructor.

**PSYC 4910 - Senior Division Honors Research II**
2-4 Credits (2-4 Contact Hours)
Completion of the proposed research project resulting in a written thesis. Preq: PSYC 4900.

**PSYC 4920 - Senior Laboratory in Psychology**
1 Credit (2 Contact Hours)
Students complete an integrative review of topics in psychology in the context of producing a reflective portfolio. Preq: Senior standing.

**PSYC 4930 - Practicum in Clinical Psychology**
3 Credits (1 Contact Hours)
Students apply classroom theory in solving individual and community problems through interaction with community agencies and other professional groups in the mental health area. Students have limited but well-controlled contact with actual clinical problems as they occur in the community environment. Preq: PSYC 3830. Coreq: PSYC 4931.

**PSYC 4931 - Practicum in Clinical Psychology Laboratory**
0 Credits (5 Contact Hours)
Non-credit laboratory to accompany PSYC 4930. Coreq: PSYC 4930.

**PSYC 4950 - Practicum in Applied Psychology**
3 Credits (1 Contact Hours)
Students are provided practical experience in the area of applied psychology. Students usually are involved in a project designed to help solve an industrial problem through a direct application of industrial or social psychology. Preq: Consent of instructor. Coreq: PSYC 4951.

**PSYC 4951 - Practicum in Applied Psychology Laboratory**
0 Credits (5 Contact Hours)
Non-credit laboratory to accompany PSYC 4950. Coreq: PSYC 4950.

**PSYC 4970 - Directed Studies in Psychology**
1-4 Credits (1-4 Contact Hours)
Study under the direction of a faculty member of a particular topic agreed upon by the student and faculty member. May be repeated for a maximum of 12 credits. Includes Honors sections. Preq: Consent of instructor.

**PSYC 4980 - Team-Based Research**
1-4 Credits (1-4 Contact Hours)
Students conduct psychological research and learn about phases of the research process with a team of their peers under the direction of a faculty member. The collaborative nature of psychological research is emphasized. May be repeated for a maximum of 18 credits. Includes Honors sections. Preq: Consent of instructor.
Religion

**REL 1010 - Introduction to Religion**
3 Credits (3 Contact Hours)
Study of the variety of religious experience and expression in human life.

**REL 1020 - World Religions**
3 Credits (3 Contact Hours)
Survey of major religious traditions of the world. Includes Honors sections.

**REL 3000 - Studying Religion: Theories and Methods**
3 Credits (3 Contact Hours)
Discussion- and presentation-based seminar in which students read the writings of the great theorists of religion since the eighteenth century. Social-scientific, phenomenological, and cultural approaches to the study of religion are explored. Basic methodologies and tools for studying religion are also introduced. Preq: Any REL course.

**REL 3010 - The Old Testament**
3 Credits (3 Contact Hours)
Survey of the books of the Old Testament with special consideration given to the development of the concepts, institutions, and theology of the ancient Hebrews.

**REL 3020 - Survey of New Testament Literature**
3 Credits (3 Contact Hours)
Study of the books of the New Testament from the standpoint of their occasion, content, literary form, and basic theology.

**REL 3030 - The Quran**
3 Credits (3 Contact Hours)
Survey of Islamic Scripture, its origins, content, and interpretation, with attention to the development of Hadith and Sunna as well.

**REL 3050 - Constructing Scripture**
3 Credits (3 Contact Hours)
Historical exploration of the development of Jewish and Christian scriptures. Emphasis is given to reading texts that were excluded from the Hebrew Bible and the New Testament and the role the canonical played in constructing "orthodoxy."

**REL 3060 - Judaism**
3 Credits (3 Contact Hours)
Examines the development of Judaism from biblical to modern times.

**REL 3070 - The Christian Tradition**
3 Credits (3 Contact Hours)
Examination of the development of Christianity in Western civilization from the post-New Testament period to the present, stressing institutional growth and changes, theological currents, and interaction of Christianity with culture.

**REL 3080 - Religions of the Ancient World**
3 Credits (3 Contact Hours)
Selected religious movements in ancient Mesopotamia, Egypt, Canaan, and the Greco-Roman world with emphasis on movements outside the Judeo-Christian tradition.

**REL 3090 - The Religious History of the American South**
3 Credits (3 Contact Hours)
As the label "Bible Belt" implies, the American South has long appeared as a distinct religious region within the United States. This course introduces students to southern religious history, emphasizing longstanding religious diversity and vexing racial issues, alongside the history of Protestant Christianity.

**REL (HIST) 3100 - History of Religion in the United States**
3 Credits (3 Contact Hours)
Development of religion in the U.S. from the Colonial period to the 20th century. Attention is devoted to analyzing the broad currents in religious movements and religious thought that have given shape to the American pluralistic experience. May also be offered as HIST 3100.

**REL 3110 - African American Religion**
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits (Contact Hours)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>REL 3120</td>
<td>Hinduism</td>
<td>3</td>
<td>Study of the religious milieu in the U.S. rooted in our African heritage. Background on African tribal religion is included, along with Christian denominations and new religions such as Nation of Islam, Rastafarianism, Voudun, Santeria, and Candomble.</td>
</tr>
<tr>
<td>REL 3130</td>
<td>Buddhism</td>
<td>3</td>
<td>A study of the history, practices, ideas, and social institutions associated with the variety of Indian religious traditions commonly called &quot;Hinduism&quot; from their origins to the present.</td>
</tr>
<tr>
<td>REL 3140</td>
<td>Buddhism in China</td>
<td>3</td>
<td>Study of Buddhism in Chinese history since the second century. Examination of the translation and interpretation of the texts, major Chinese Buddhist schools, monastic life, and the comprehensive influence of Buddhism on Chinese culture and society. All readings and discussions are in English.</td>
</tr>
<tr>
<td>REL 3150</td>
<td>Islam</td>
<td>3</td>
<td>A study of the origins, development, and history of the religion of Islam and Islamic cultures from the time of the Prophet to the present.</td>
</tr>
<tr>
<td>REL 3170</td>
<td>History of Native American Religion and Culture</td>
<td>3</td>
<td>Study of Native American religion and culture from the pre-Columbian era to the present. Examines how Native American religious traditions in a variety of cultural contexts of North America have impacted, and have been impacted by, changing historical circumstances. May also be offered as HIST 3170.</td>
</tr>
<tr>
<td>REL 3200</td>
<td>Jesus in History, Faith and Film</td>
<td>3</td>
<td>An investigation of the genre of ancient biography, the diverse portrayals of Jesus' life in early Christianity, and the post-Enlightenment &quot;Quest for the Historical Jesus.&quot; The course also analyzes contemporary cinematic portrayals of Jesus's life as a way of further exploring the relationship between producer, social location, and constructions of the past. Preq: Sophomore standing.</td>
</tr>
<tr>
<td>REL 3300</td>
<td>Contemporary Issues in Religion</td>
<td>3</td>
<td>Examination of a variety of issues of broad concern to scholars of religion today. Issues may vary. May be repeated for a maximum of six credits with departmental consent.</td>
</tr>
<tr>
<td>REL 3350</td>
<td>Islam and the West</td>
<td>3</td>
<td>Focuses on challenging popular representations of antagonism between Islam and the West to elucidate the complex relationship between the two.</td>
</tr>
<tr>
<td>REL (HIST) 3510</td>
<td>Ancient Near East</td>
<td>3</td>
<td>History of the peoples and civilizations of the Near East from the Sumerians to the establishment of Roman power in this region. Includes geography, mythology, religious, and economic currents as well as the methods and discoveries of archaeology. May also be offered as HIST 3510.</td>
</tr>
<tr>
<td>REL (HIST) 3730</td>
<td>Age of the Protestant Reformation</td>
<td>3</td>
<td>Evolution of Modern Europe (ca. 1500-1660), as affected by the Reformation, wars of religion, and growth of nation-states. Study includes intellectual advances and the beginnings of European expansion overseas. May also be offered as HIST 3730.</td>
</tr>
<tr>
<td>REL 3990</td>
<td>Junior Research Colloquium</td>
<td>3</td>
<td>Colloquium offered each spring for junior Religious Studies majors. Students enroll individually with a faculty member of their choice and develop, in consultation with him or her, a research project suited to the student's interests. All students meet four times as a group to present the discuss their research. Preq: Junior Religious Studies major.</td>
</tr>
</tbody>
</table>
REL 4010 - Studies in Biblical Literature and Religion
3 Credits (3 Contact Hours)
Critical examination of a selected topic in biblical studies. Topics vary from year to year. May be repeated once for credit.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

REL 4020 - Studies in Religion
3 Credits (3 Contact Hours)
Thorough examination of a selected topic in one or more of the religious traditions of the world or of religious life in a particular region. Topics vary from year to year. May be repeated once for credit.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

REL 4100 - Holy Lands
3-6 Credits (3-6 Contact Hours)
Rotating study abroad trips to areas of historical importance to Judaism, Christianity, Islam and other religious traditions. Students visit archaeological sites, museums, and sacred spaces of global importance and gain needed world-perspective as they encounter other cultures.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

REL (HIST) 4520 - History of Early Christianity
3 Credits (3 Contact Hours)
Study of the history, social and doctrinal, of early Christianity up to 600 A.D. May also be offered as HIST 4520.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

REL 4900 - Senior Seminar
3 Credits (3 Contact Hours)
Capstone-style seminar offered each fall for senior year Religious Studies majors, who conduct research, make presentations, and engage in weekly discussions on a topic chosen by the faculty member organizing the seminar. Course represents the final synthesis of skills developed throughout the major. Preq: Senior Religious Studies major or minor.

REL 4920 - Creative Inquiry: Religion
1-4 Credits (1-4 Contact Hours)
Small group work is performed on particular issues with emphasis on involving students in research. Content varies. May be repeated for a maximum of nine credits. Preq: Consent of instructor.

REL 4970 - Religion Honors Research
3 Credits (3 Contact Hours)
Students conduct research, clearly define the topic, and complete an annotated bibliography under the supervision of thesis advisor. Preq: Consent of department chair and thesis advisor.

REL 4980 - Religion Honors Thesis
3 Credits (3 Contact Hours)
In consultation with thesis advisor and departmental thesis committee, students write, revise, defend, and complete their theses. Preq: REL 4970 and consent of department chair and thesis advisor.

REL 4990 - Independent Study
1-3 Credits (1-3 Contact Hours)
Study of selected problems, issues, or movements in religion under the direction of a faculty member chosen by the student. Student and faculty member develop an individualized course of study approved by the department chair prior to registration. May be repeated for a maximum of six credits. Preq: Consent of instructor.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

Rural Sociology

RS 3010 - Rural Sociology
3 Credits (3 Contact Hours)
Study of human social relationships as influenced by life in the open country and in small towns and villages, including considerations of
the rural population, rural social institutions, processes of change in agricultural technology, and community area planning and development.

RS (SOC) 3030 - Methods of Social Research I
4 Credits (3 Contact Hours)
Introduction to methods of social research: research design, sampling, measurement, reliability, and validity; the relationship between theory and research. Coordinating laboratory introduces students to computer literacy through research. Required of all Sociology majors. Includes Honors sections. May also be offered as SOC 3030. Preq: SOC 2010; and one of STAT 2200 or STAT 2300. Coreq: RS 3031.

RS (SOC) 3031 - Methods of Social Research I Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany RS 3030. May also be offered as SOC 3031. Coreq: RS 3030.

RS (SOC) 4010 - Human Ecology
3 Credits (3 Contact Hours)
Analysis of the interrelationships between the physical world, modifications in natural environments, human settlement patterns, and institutions that both encourage and regulate environmental modification. Emphasizes conditions whereby natural resources become public policy concerns. May also be offered as SOC 4010. Preq: Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

RS (SOC) 4590 - The Community
3 Credits (3 Contact Hours)
Close analysis of the development of contemporary communities and their place in society. Continuing effects of industrialization, migration, and technological change on community location and structure are examined. Structural relations of social class, status, and the associations among institutions are explored. May also be offered as SOC 4590. Preq: Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

RS (SOC) 4950 - Field Experience
3 Credits (1 Contact Hours)
Students participate in selected field placements under supervision for eight hours weekly and in a one-hour seminar per week. May be repeated once for credit. May also be offered as SOC 4950. Preq: SOC 2010 or SOC 2020; and Junior standing; and consent of instructor. Coreq: RS 4951.

RS (SOC) 4951 - Field Experience Laboratory
0 Credits (8 Contact Hours)
Non-credit laboratory to accompany RS 4950. May also be offered as SOC 4951. Coreq: RS 4950.

RS (SOC) 4980 - Independent Study
1-3 Credits (1-3 Contact Hours)
Individual readings or projects in sociological areas not covered in other courses. A written proposal must be approved by the instructor directing the work and by the department chair prior to registration. May be repeated for a maximum of six credits. May also be offered as SOC 4980. Preq: Consent of instructor.

Russian

RUSS 1010 - Elementary Russian
4 Credits (3 Contact Hours)
Training in pronunciation, grammatical forms, and syntax with a view to giving the student the fundamentals necessary to hold simple conversations and to read simple Russian texts. Coreq: RUSS 1011.

RUSS 1011 - Elementary Russian Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany RUSS 1010. Coreq: RUSS 1010.

RUSS 1020 - Elementary Russian
4 Credits (3 Contact Hours)

RUSS 1021 - Elementary Russian Laboratory
RUSS 2010 - Intermediate Russian
3 Credits (3 Contact Hours)

RUSS 2011 - Intermediate Russian Laboratory
0 Credits (1 Contact Hours)

RUSS 2020 - Intermediate Russian
3 Credits (3 Contact Hours)

RUSS 2021 - Intermediate Russian Laboratory
0 Credits (1 Contact Hours)

RUSS 2970 - Creative Inquiry in Russian
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Arrangements with faculty members must be established prior to registration. Preq: Consent of faculty member.

RUSS 3050 - Russian Conversation and Composition
3 Credits (3 Contact Hours)

RUSS 3070 - Russian Civilization
3 Credits (3 Contact Hours)
Introduction to significant elements of Russian civilization. Emphasis is on social, geographical, political, and artistic aspects of modern Russia. Taught in Russian. Preq: RUSS 2020.

RUSS 3400 - Russian Culture of the Nineteenth Century
3 Credits (3 Contact Hours)
Study of achievements in art, science, music, and literature in Russia during the 19th century. Taught in English.

RUSS 3600 - Russian Literature to 1910
3 Credits (3 Contact Hours)
Study of key texts in the modern literary tradition in Imperial Russia from Pushkin to Chekhov. Readings and lectures are in English.

RUSS 3610 - Russian Literature Since 1910
3 Credits (3 Contact Hours)
Study of key texts in modern Russian and Soviet literature with particular focus on Russian modernist movements and Socialist Realism. Readings and lectures are in English.

RUSS 3970 - Creative Inquiry in Russian
1-4 Credits (1-4 Contact Hours)
Students focus on a special research area under the guidance of a faculty member. After acquiring the requisite background, students formulate hypotheses for a group project, develop a critical framework, and initiate research on a specific topic.

RUSS 3980 - Directed Reading
1-3 Credits (1-3 Contact Hours)
Directed study of selected works in Russian. May be repeated for a maximum of six credits. Preq: RUSS 2020.

RUSS 4600 - Tolstoy and Dostoevsky
3 Credits (3 Contact Hours)
Examines a selection of major works by Leo Tolstoy and Fyodor Dostoevsky with particular focus on their literary, political, and philosophical aspects as well as their importance within the modern European literary tradition. Readings and lectures are in English. Preq: Junior standing.
RUSS 4970 - Creative Inquiry in Russian
1-4 Credits (1-4 Contact Hours)
Continuation of research initiated in RUSS 3970. Students complete their project and disseminate their research results. Preq: RUSS 3970.

Science and Technology in Society

STS 1010 - Survey of Science and Technology in Society
3 Credits (3 Contact Hours)
Surveys historical, philosophical, and social studies of science; introduces the basic requisites for scientific and technological literacy; and considers the problems of responsible participation in a scientifically and technologically advanced society.

STS 1020 - Ideas, Machinery, and Society
3 Credits (3 Contact Hours)
Interdisciplinary discussion course introducing the fundamental themes of STS: the influence of social groups on the development of science and technology and the effects of science and technology on society.

STS 1200 - Topics in Science and Technology in Society
3 Credits (3 Contact Hours)
Explores ethical, policy and social issues raised by the complex interactions among science, technology and society. Topics vary depending on the instructor.

STS 1710 - Scientific Skepticism
3 Credits (3 Contact Hours)
Investigation of unusual phenomena using scientific methodology. Explores the interplay of science, pseudoscience, and society through development of critical thinking skills. Discussion-oriented course that focuses on case studies of extraordinary claims.

STS 2150 - A Critical Approach to the Global Challenge of Technological Revolutions
3 Credits (3 Contact Hours)
This course takes a broad, humanistic perspective for understanding the challenges posed by scientific and technological revolutions, including innovations like nanotechnology, environmental preservation, bio-technology, digital technology, and nuclear fusion. Students learn skills and strategies for thinking critically about the nature of radical change in science and technology as it affects society.

STS 2160 - Critical Analysis of a Current STS Issue
3 Credits (3 Contact Hours)
Critical analysis of a current science and technology issue with significant controversial and societal consequences (e.g., global warming, methods of energy production). Students retrieve, analyze, evaluate, present and discuss relevant information to develop basic competence in science and mathematics and in the evaluation of scientific and technological issues. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Sophomore standing.

STS 3010 - Science in Context
3 Credits (3 Contact Hours)
Develops an understanding of the social character of scientific activity. Through the study of current work by leading historians, sociologists, and philosophers of science, students develop a comprehensive grasp of the social foundations of modern scientific inquiry.

STS 3030 - Technology, Culture and Society
3 Credits (3 Contact Hours)
Addresses issues that arise from the interaction of technology with its social and cultural context. To better understand how technologies relate to societies and cultures, students learn to use the analytic tools required to evaluate the significance of technology, as well as its relations to social endeavors and cultural endeavors.

STS 4980 - Creative Inquiry
1-3 Credits (1-3 Contact Hours)
Students conduct research into Science and Technology in Society with a team of their peers under the direction of a faculty member. The collaborative character of research in science and technology in society is emphasized. Includes Honors sections. May be repeated for a maximum of 12 credits.

STS 4990 - Independent Study
1-3 Credits (1-3 Contact Hours)
Study of selected topics under direction of a faculty member selected by the student. Student and faculty member develop a course of study designed for the individual student and approved by the STS program coordinator prior to registration. May be repeated for a maximum of
six credits. Students are expected to have completed their General Education Science and Technology in Society Requirement before enrolling in this course. Preq: Consent of instructor.

### Secondary Education

**EDSC 2260 - A Professional Approach to Secondary Algebra**  
3 Credits (3 Contact Hours)  
Focuses on the pedagogical content knowledge needed to teach algebra effectively. It helps students master algebraic concepts, connections and representations at a deep level and solve meaningful real world problems. Students also explore the history of mathematical and algebraic thought and create meaningful and engaging lessons. Preq: Secondary Education major in Mathematics Teaching Area or Mathematics Teaching major.

**EDSC 3240 - Practicum in Secondary English**  
3 Credits (2 Contact Hours)  
Pre-service secondary English teachers gain both content and pedagogical knowledge by observing and reflecting upon the classroom practices of selected in-service high school English teachers. Coreq: EDSC 3241.

**EDSC 3241 - Practicum in Secondary English Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany EDSC 3240. Coreq: EDSC 3240.

**EDSC 3260 - Practicum in Secondary Mathematics**  
3 Credits (2 Contact Hours)  
Pre-service secondary mathematics teachers gain both content and pedagogical knowledge by observing and reflecting upon the classroom practices of selected in-service high school mathematics teachers. Coreq: EDSC 3261.

**EDSC 3261 - Practicum in Secondary Mathematics Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany EDSC 3260. Coreq: EDSC 3260.

**EDSC 3270 - Practicum in Secondary Science**  
3 Credits (2 Contact Hours)  
Pre-service secondary science teachers gain both content and pedagogical knowledge by observing and reflecting upon the classroom practices of selected in-service high school science teachers. Coreq: EDSC 3271.

**EDSC 3271 - Practicum in Secondary Science Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany EDSC 3270. Coreq: EDSC 3270.

**EDSC 3280 - Practicum in Secondary Social Studies**  
3 Credits (2 Contact Hours)  
Pre-service secondary social studies teachers gain both content and pedagogical knowledge by observing and reflecting upon the classroom practices of selected in-service high school social studies teachers. Coreq: EDSC 3281.

**EDSC 3281 - Practicum in Secondary Social Studies Laboratory**  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany EDSC 3280. Coreq: EDSC 3280.

**EDSC 4120 - Directed Student Teaching in Secondary School Subjects**  
12 Credits (1 Contact Hours)  
Program of supervised observation and teaching in cooperation with selected public schools. Opportunities are provided for prospective teachers to obtain experiences in the subject area. Students are sectioned according to teaching fields: English, social science, mathematical sciences, modern languages, science. Enrollment is limited. Coreq: EDSC 4121.

**EDSC 4121 - Directed Student Teaching in Secondary School Subjects Laboratory**  
0 Credits (33 Contact Hours)  
Non-credit laboratory to accompany EDSC 4120. Coreq: EDSC 4120.

**EDSC 4170 - Teaching Internship in the Secondary School**  
6 Credits (16 Contact Hours)  
Full-time, supervised teaching internship for one semester in cooperation with a participating South Carolina secondary school. Reserved
for students seeking certification in critical-need teaching areas. May be repeated for a maximum of 12 credits. To be taken Pass/No Pass only. Preq: EDF 3010 and EDF 3020 and EDF 3350 and EDLT 4980; and one of the following: EDSC 4240, 4250, 4260, 4270; and consent of School of Education by way of approving student's application.

**EDSC 4240 - Teaching Secondary English**
3 Credits (2 Contact Hours)
Development of instructional practices and materials appropriate for secondary English; familiarization with curriculum materials; includes field experiences in local schools in preparation for student teaching. Taught fall semester only. Includes Honors sections. Preq: Second semester Junior standing, admission to the professional level, ED 1050 and EDF 3010 and EDF 3020 and EDF 3350; at least 18 hours of English coursework and a minimum grade-point average of 2.5. Preq or concurrent enrollment: EDLT 4980. Coreq: EDSC 4241.

**EDSC 4241 - Teaching Secondary English Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany EDSC 4240. Coreq: EDSC 4240.

**EDSC 4250 - Teaching Secondary Modern Languages**
3 Credits (2 Contact Hours)
Development of instructional practices and materials appropriate for secondary modern languages; familiarization with curriculum materials; includes field experiences in local schools. Taught fall semester only. Includes Honors sections. Preq: Second semester Junior standing, admission to the professional level, ED 1050 and EDF 3010 and EDF 3020 and EDF 3350; at least 18 hours of English coursework and a minimum grade-point average of 2.5. Preq or concurrent enrollment: EDLT 4980. Coreq: EDSC 4251.

**EDSC 4251 - Teaching Secondary Modern Languages Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany EDSC 4250. Coreq: EDSC 4250.

**EDSC 4260 - Teaching Secondary Mathematics**
3 Credits (2 Contact Hours)
Development of instructional practices appropriate for secondary mathematics; familiarization with curriculum materials, planning, and implementation of lessons; includes field experiences in local schools. Taught fall semester only. Includes Honors sections. Preq: Admission to the professional level, ED 1050 and EDF 3010 and EDF 3020 and EDF 3350; at least 18 hours of English coursework and a minimum grade-point average of 2.5. Preq or concurrent enrollment: EDLT 4980. Coreq: EDSC 4261.

**EDSC 4261 - Teaching Secondary Mathematics Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany EDSC 4260. Coreq: EDSC 4260.

**EDSC 4270 - Teaching Secondary Science**
3 Credits (2 Contact Hours)
Development of instructional practices and materials for teaching secondary school science (biological, earth, and physical sciences); familiarization with secondary science curriculum materials; includes field experiences in local schools. Taught fall semester only. Includes Honors sections. Preq: Second semester Junior standing, admission to the professional level, ED 1050 and EDF 3010 and EDF 3020 and EDF 3350; at least 18 hours of English coursework and a minimum grade-point average of 2.5. Preq or concurrent enrollment: EDLT 4980. Coreq: EDSC 4271.

**EDSC 4271 - Teaching Secondary Science Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany EDSC 4270. Coreq: EDSC 4270.

**EDSC 4280 - Teaching Secondary Social Studies**
3 Credits (2 Contact Hours)
Development of instructional practices and materials appropriate for secondary social studies; familiarization with curriculum materials; includes field experiences in local schools in preparation for student teaching. Taught fall semester only. Includes Honors sections. Preq: Second semester Junior standing, admission to the professional level, ED 1050 and EDF 3010 and EDF 3020 and EDF 3350; at least 18 hours of English coursework and a minimum grade-point average of 2.5. Preq or concurrent enrollment: EDLT 4980. Coreq: EDSC 4281.

**EDSC 4281 - Teaching Secondary Social Studies Laboratory**
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany EDSC 4280. Coreq: EDSC 4280.

**EDSC 4370 - Technology in Secondary Mathematics**
3 Credits (3 Contact Hours)
Students learn how to integrate calculators, data collectors, and computers in the secondary mathematics curriculum. They solve problems
from middle school, Algebra I, Geometry, and Algebra II courses. Preq: Second semester Junior standing, admission to the professional level. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**EDSC 4440 - Teaching Internship in Secondary English**
9 Credits (27 Contact Hours)
Interns design, implement, and critically reflect upon instructional units and teaching practices in supervised secondary English classes. Interns must provide evidence of performance that meets national and state teaching standards for secondary English. Taught spring semester only. Preq: EDSC 4240. Coreq: EDSC 4540.

**EDSC 4460 - Teaching Internship in Secondary Mathematics**
9 Credits (27 Contact Hours)
Prospective secondary mathematics teachers apply teaching and learning theories in a field-based setting through an internship in a secondary public school classroom. Taught spring semester only. Preq: EDSC 4260. Coreq: EDSC 4560.

**EDSC 4470 - Teaching Internship in Secondary Science**
9 Credits (27 Contact Hours)

**EDSC 4480 - Teaching Internship in Secondary Social Studies**
9 Credits (27 Contact Hours)
Supervised observation and teaching in cooperation with a mentor teacher in a secondary public school. Students design, implement, and critically reflect upon curricular and instructional practices in public secondary social studies classrooms. Taught spring semester only. Preq: EDSC 4280. Coreq: EDSC 4580.

**EDSC 4540 - Secondary English Capstone Seminar**
3 Credits (2 Contact Hours)
Seminar in conjunction with EDSC 4440. Interns reflect upon and solve problems regarding teaching events, share effective teaching practices, and devise ways to document dimensions of effective teaching. Taught spring semester only. Preq: EDSC 4240. Coreq: EDSC 4440 and EDSC 4541.

**EDSC 4541 - Secondary English Capstone Seminar Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany EDSC 4540. Coreq: EDSC 4540.

**EDSC 4560 - Secondary Mathematics Capstone Seminar**
3 Credits (2 Contact Hours)
Capstone seminar accompanying supervised secondary mathematics teaching internship. Satisfies part of the requirements for South Carolina secondary certification. Taught spring semester only. Preq: EDSC 4260. Coreq: EDSC 4460 and EDSC 4561.

**EDSC 4561 - Secondary Mathematics Capstone Seminar Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany EDSC 4560. Coreq: EDSC 4560.

**EDSC 4570 - Secondary Science Capstone Seminar**
3 Credits (2 Contact Hours)
Capstone seminar accompanying supervised high school science teaching internship. Satisfies part of requirement for South Carolina secondary science certification. Offered spring semester only. Preq: EDSC 4270. Coreq: EDSC 4470 and EDSC 4571.

**EDSC 4571 - Secondary Science Capstone Seminar Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany EDSC 4570. Coreq: EDSC 4570.

**EDSC 4580 - Secondary Social Studies Capstone Seminar**
3 Credits (2 Contact Hours)

**EDSC 4581 - Secondary Social Studies Capstone Seminar Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany EDSC 4580. Coreq: EDSC 4580.
EDSC (BIOL) 4820 - Laboratory Techniques for Teaching Science
3 Credits (1 Contact Hours)
Focuses on basic lab skills needed to plan, prepare, and conduct inquiry-based laboratories and to familiarize pre-service teachers with a variety of scientific equipment and their methodologies. Topics include ways to integrate technology into the classroom, lab safety, and the development of inquiry-based classroom activities. May also be offered as BIOL 4820. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: EDSC 4821.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EDSC (BIOL) 4821 - Laboratory Techniques for Teaching Science Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany EDSC 4820. May also be offered as BIOL 4821. Coreq: EDSC 4820.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

EDSC (ENGL) 4850 - Composition and Language Studies for Teachers
3 Credits (3 Contact Hours)
Examines the principles and practices of composing and teaching composition. Includes a historical study of English language with attention to phonology, morphology, syntax, semantics, and practical aspects of language grammars. Serves as a practicum in composing and assessing processes, collaborative learning, writers purposes, audience expectations, and language conventions. May also be offered as ENGL 4850. Preq: ENGL 3100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

Sociology

SOC 2010 - Introduction to Sociology
3 Credits (3 Contact Hours)
Sociological perspective: the study of contemporary groups, organizations, and societies in terms of human social behavior, social change, social structure, and social institutions. Includes Honors sections.

SOC 2020 - Social Problems
3 Credits (3 Contact Hours)
Social problems involving the family, education, health care, political and legal systems, economy, population, environment, community; and special problems associated with age, economics, racial status, and gender inequality.

SOC 2050 - Introductory Sociology Laboratory
1 Credits (3 Contact Hours)
Overview of major sociological fields. Examines core competencies and the Sociology major. Relevant career and academic development issues are investigated. E-portfolios are established and expanded. Preq: Sociology major. Preq or concurrent enrollment: SOC 2010 or SOC 2020.

SOC 2350 - Introduction to Leadership
3 Credits (3 Contact Hours)
Introduction to leadership in various organizational settings from a sociological perspective. Examines the concept of leadership, leadership traits, types of leadership, and the evolution of leadership behaviors in the 19th and 20th centuries.

SOC 2880 - The Criminal Justice System
3 Credits (3 Contact Hours)
Social systems analysis of criminal justice agencies. Primary focus is on law enforcement and corrections and their interagency relationship with courts and prosecution. May also be offered as JUST 2880.

SOC 2890 - Criminology
3 Credits (3 Contact Hours)
Study of nature and causes of criminal behavior; societal attempts to control crime; social responses to crime, criminals, and the criminal justice system. May also be offered as JUST 2890.

SOC 3020 - Social Research Methods I
3 Credits (3 Contact Hours)
This course is the first in a two-semester methods sequence, and focuses on conceptual issues related to research design, and on examples
of an array of data collection and analysis techniques. Topics include the research process, linking theory and methods, conceptualization and measurement, sampling, research design, and research ethics. Preq: SOC 2010 or SOC 2020. Preq or concurrent enrollment: SOC 2050.

**SOC (RS) 3030 - Methods of Social Research I**
4 Credits (3 Contact Hours)
Introduction to methods of social research: research design, sampling, measurement, reliability, and validity; the relationship between theory and research. Coordinating laboratory introduces students to computer literacy through research. Required of all Sociology majors. Includes Honors sections. May also be offered as RS 3030. Preq: SOC 2010 and one of STAT 2300 or STAT 3300. Coreq: SOC 3031.

**SOC (RS) 3031 - Methods of Social Research I Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany SOC 3030. May also be offered as RS 3031. Coreq: SOC 3030.

**SOC 3040 - Social Research Methods II**
4 Credits (3 Contact Hours)
This course is the second in a two-semester methods sequence, and provides a brief review of research design and a concentrated focus on statistical analysis. Topics include organizing and coding data, indexes and scales, measures of central tendency and variability, and univariate, bivariate and multivariate statistics. Includes Honors sections. Preq: SOC 3020; and one of STAT 2300 or STAT 3090 or STAT 3300. Coreq: SOC 3041.

**SOC 3041 - Social Research Methods II Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany SOC 3040. Coreq: SOC 3040.

**SOC 3100 - Marriage and Intimacy**
3 Credits (3 Contact Hours)
Examination of mate selection, living together, marital relations, family planning, conflict resolution, divorce and remarriage, later life adjustments, and singlehood as a lifestyle in the U.S. Includes Honors sections.

**SOC 3110 - The Family**
3 Credits (3 Contact Hours)
Introduction to the family as a social institution. Primary focus is on families in the U.S. with comparisons to other cultures. Topics include history of the family, trends in family formation and dissolution, division of labor, intergenerational relationships, family violence, and policy. Analyses of race, class, and gender are incorporated. Includes Honors sections. Preq: SOC 2010 or SOC 2020.

**SOC 3300 - Work and Occupations**
3 Credits (3 Contact Hours)
Introduces changes in the structure of work from preindustrial to postindustrial periods. Topics include the effects of stratification on career decisions, career paths and implications for life changes, social effects of scientific management of work, unionization, globalization, the rise of multinational corporations, and cross-cultural comparisons of management styles. Preq: SOC 2010 or SOC 2020.

**SOC 3310 - Urban Sociology**
3 Credits (3 Contact Hours)
Urbanization as a social process and related conditions of work, family structure, social mobility, crime, lifestyle, technology, and development of urban areas in the Third World. Preq: SOC 2010 or SOC 2020 and sophomore standing.

**SOC 3400 - Sport and Society**
3 Credits (3 Contact Hours)
The sociological perspective is employed in order to examine the social institution of sport. Students examine sports in context with other social institutions and their dialectical relationship, as well as how sports both influence and are influenced by other social processes relating to gender, family, race, ethnicity, deviance, violence and social class. Preq: SOC 2010 or SOC 2020.

**SOC 3500 - Self and Society**
3 Credits (3 Contact Hours)
Social psychology from the sociological viewpoint. Examines interactional and group influences on such individual conditions as childhood and life-course development, language, emotions, motives, sexuality, deviance, and self-concept. Preq: SOC 2010 or SOC 2020 or PSYC 2010.

**SOC 3510 - Collective Behavior and Social Movements**
3 Credits (3 Contact Hours)
SOC (ELE, PSYC) 3560 - Social Science of Entrepreneurship
3 Credits (3 Contact Hours)
Examines those areas of the social sciences that have direct relevance for entrepreneurs. Topics include processes by which entrepreneurs are shaped by social institutions such as the family and community, public policy implications and influences on entrepreneurship, risk perception, decision making, motivation, leadership, and group dynamics. May also be offered as ELE 3560 or PSYC 3560. Preq: SOC 2010 or SOC 2020 or SOC 2350 or PSYC 2010 or POSC 1010 or POSC 1020 or POSC 1040.

SOC 3600 - Social Class and Poverty
3 Credits (3 Contact Hours)
Overview of economic stratification and inequality. Topics include measuring and explaining inequality, how inequality is reproduced in society, and the consequences for life outcomes. Course also focuses on poverty, including its nature, causes, demographics and consequences. Preq: SOC 2010 or SOC 2020.

SOC 3800 - Introduction to Social Services
3 Credits (3 Contact Hours)
Fundamentals of casework practice, including philosophy and values, models of group work, and ethics in social services work. Preq: SOC 2010 or SOC 2020.

SOC 3910 - Sociology of Deviance
3 Credits (3 Contact Hours)

SOC 3920 - Juvenile Delinquency
3 Credits (3 Contact Hours)
Study of nature, extent, and causes of juvenile delinquency; societal attempts to control delinquent conduct and gang violence; emergence of the juvenile justice system. Preq: SOC 2010 or SOC 2020.

SOC 3940 - Sociology of Mental Illness
3 Credits (3 Contact Hours)
Mental illness as a social phenomenon, including cultural and social influence, organizational settings of mental health-care delivery, legal issues, patient-therapist relationships, and mental illness intervention as social control. Includes Honors sections.

SOC 3970 - Substance Abuse: Social Causes, Consequences and Treatment
3 Credits (3 Contact Hours)
Examination of the history and impact of substance use in our culture, from a sociological perspective. Topics include the various reasons individuals and groups partake of drugs and alcohol, our cultural obsession with substances, theories regarding addiction, drug and alcohol control policy and benefits and costs of substance use. Preq: SOC 2010 or SOC 2020.

SOC (RS) 4010 - Human Ecology
3 Credits (3 Contact Hours)
Analysis of the interrelationships between the physical world, modifications in natural environments, human settlement patterns, and institutions that both encourage and regulate environmental modification. Emphasizes conditions whereby natural resources become public policy concerns. May also be offered as RS 4010. Preq: Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

SOC 4030 - Technology, Environment, and Society
3 Credits (3 Contact Hours)

SOC 4040 - Sociological Theory
3 Credits (3 Contact Hours)
Survey of the development of sociological theory. Required of all Sociology majors. Preq: SOC 2010 or SOC 2020; and Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

SOC 4080 - Honors Thesis Research I
3 Credits (3 Contact Hours)
Reading and research related to senior honors thesis. Completion of junior honors requirements and approval of department chair and thesis advisor required. Preq: Honors status and SOC 3020.

**SOC 4090 - Honors Thesis Research II**
3 Credits (3 Contact Hours)
Research and writing related to the senior honors thesis. Preq: Honors status and honors section of SOC 3040 and SOC 4080.

**SOC 4140 - Policy and Social Change**
3 Credits (3 Contact Hours)
Uses the sociological perspective to examine policy development, implementation, and evaluation in the public and private sectors. Specifically, focuses on values and ethics and effects of social change efforts on the outcomes of policy formation, social planning, and implementation. Preq: SOC 2010 or SOC 2020; and Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**SOC 4300 - Sociology of Organizations**
3 Credits (3 Contact Hours)
Analysis of administrative organizations and voluntary associations; applied analysis of their formal and informal group relations, communications, and effectiveness. Preq: SOC 2010 or SOC 2020 and Junior standing.

**SOC 4320 - Sociology of Religion**
3 Credits (3 Contact Hours)
Sociological analysis of religious systems and movements and their influence on other social institutions. Preq: SOC 2010 or SOC 2020 and Junior standing.

**SOC 4330 - Globalization and Social Change**
3 Credits (3 Contact Hours)
Examination of the social and historical causes of development and underdevelopment. Various sociological theories of development are reviewed. Selected countries are examined in an international context. Preq: SOC 2010 or SOC 2020 and Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**SOC 4440 - Sociology of Education**
3 Credits (3 Contact Hours)
Examines the relationship between education and society. Topics include theoretical perspectives, school organization, social mobility and stratification in schools, race and gender, tracking and school reform. Preq: SOC 2010 or SOC 2020 and Junior standing.

**SOC 4500 - Sociology of Groups and Group Processes**
3 Credits (3 Contact Hours)
Sociological perspectives on groups, group dynamics and group performance. Topics include status, power, justice, legitimacy and leadership. Preq: SOC 2010 or SOC 2020 or PSYC 2010.

**SOC (RS) 4590 - The Community**
3 Credits (3 Contact Hours)
Close analysis of the development of contemporary communities and their place in society. Continuing effects of industrialization, migration, and technological change on community location and structure are examined. Structural relations of social class, status, and the associations among institutions are explored. May also be offered as RS 4590. Preq: Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**SOC 4600 - Race and Ethnicity**
3 Credits (3 Contact Hours)
Investigation of sociological perspectives on race, ethnic relations, and social stratification. Includes analysis of the impact of social class on minority movements. Preq: SOC 2010 or SOC 2020 and Junior standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**SOC 4610 - Sociology of Sex and Gender**
3 Credits (3 Contact Hours)
Examination of theoretical and empirical approaches to the sociology of sex and gender, focusing primarily on contemporary American society. Focuses on how gender intersects with race, ethnicity, social class and sexuality, and how major institutions in society are sites for
the maintenance and reproduction of gender roles, expectations and differentiation. Includes Honors sections. Preq: SOC 2010 or SOC 2020 and Junior standing.

**SOC 4620 - Men, Masculinity, and Society**  
3 Credits (3 Contact Hours)  
Consideration of masculinity and social order: norms, roles, relationships, and activities; identity and socialization: work, family, sexuality, war, sports, including subcultural comparisons. Preq: SOC 2010 or SOC 2020 and Junior standing.

**SOC 4710 - Population Issues and Methods**  
3 Credits (3 Contact Hours)  
Study of demographic concepts, theory, and research methods for vital statistics, migration, and population distribution and projections. Considers collection and processing of demographic data and organization of demographic data systems. Includes Honors sections. Preq: ANTH 2010 or RS 3010 or SOC 2010 or SOC 2020.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**SOC 4800 - Medical Sociology**  
3 Credits (3 Contact Hours)  
Study of sociocultural factors in the etiology and treatment of physical illness, medical occupations and professions, and the organization of health care delivery systems. Preq: SOC 2010 or SOC 2020 and Junior standing.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**SOC 4810 - Aging and Death**  
3 Credits (3 Contact Hours)  
Sociological orientation to aging populations focusing on the impact of health care, welfare, and retirement systems. Includes dying as a social phenomenon, suicide, euthanasia, and funerals. Preq: SOC 2010 or SOC 2020 and Junior standing.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**SOC 4840 - Child Abuse and Treatment**  
3 Credits (3 Contact Hours)  
Comprehensive examination of child abuse, neglect, and exploitation as major social problems; causes, effects, and prevalence of physical, sexual, and emotional maltreatment; definitional controversies; social policy and legal considerations; therapeutic approaches for children and their caretakers; child maltreatment and the judicial system. Preq: Junior standing.  
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**SOC 4860 - Creative Inquiry in Sociology**  
1-3 Credits (1-3 Contact Hours)  
Investigates topics and engages in action research projects selected by faculty and students. Goals, research, activities, and outcomes vary from semester to semester and project to project. May be repeated for a maximum of 12 credits. Preq: Consent of instructor.

**SOC (RS) 4950 - Field Experience**  
3 Credits (1 Contact Hours)  
Students participate in selected field placements under supervision for eight hours weekly and in a one-hour seminar per week. May be repeated once for credit. May also be offered as RS 4950. Preq: SOC 2010 or SOC 2020; and Junior standing; and consent of instructor. Coreq: SOC 4951.

**SOC (RS) 4951 - Field Experience Laboratory**  
0 Credits (8 Contact Hours)  
Non-credit laboratory to accompany SOC 4950. May also be offered as RS 4951. Coreq: SOC 4950.

**SOC 4970 - Sociology Senior Laboratory**  
1 Credits (3 Contact Hours)  
Concludes overview of theory, research, methodology, and fields of sociology. Students add to and finalize complete portfolio, and prepare for post-degree careers and major field test. Students must have a 2.0 cumulative grade-point ratio to enroll in this course. Preq: SOC 2050 with a passing grade and Senior standing.

**SOC (RS) 4980 - Independent Study**  
1-3 Credits (1-3 Contact Hours)  
Individual readings or projects in sociological areas not covered in other courses. A written proposal must be approved by the instructor.
directing the work and by the department chair prior to registration. May be repeated for a maximum of six credits. May also be offered as RS 4980. Preq: Consent of instructor.

**SOC 4990 - Seminar in Selected Topics in Contemporary Sociology**  
3 Credits (3 Contact Hours)  
Sociological areas of current interest are explored. May be repeated by special arrangement for a maximum of six credits. Preq: SOC 2010 or SOC 2020.

**Spanish**

**SPAN 1010 - Elementary Spanish**  
4 Credits (3 Contact Hours)  
Course for students with no previous experience in Spanish study. The fundamentals of grammar and vocabulary are taught, and a foundation is provided for building oral and written proficiency. Three hours a week of classroom instruction and one hour a week in the language laboratory. Coreq: SPAN 1011.

**SPAN 1011 - Elementary Spanish Laboratory**  
0 Credits (1 Contact Hours)  
Non-credit laboratory to accompany SPAN 1010. Coreq: SPAN 1010.

**SPAN 1020 - Elementary Spanish**  
4 Credits (3 Contact Hours)  
Continuation of SPAN 1010. Preq: SPAN 1010 or a score of S1020 on the Modern Language Placement Test. Coreq: SPAN 1021.

**SPAN 1021 - Elementary Spanish Laboratory**  
0 Credits (1 Contact Hours)  
Non-credit laboratory to accompany SPAN 1020. Coreq: SPAN 1020.

**SPAN 1040 - Basic Spanish**  
4 Credits (3 Contact Hours)  
Condensed first-year course for students who have previously studied Spanish. Upon completion, students are prepared to enter Intermediate Spanish. Coreq: SPAN 1041.

**SPAN 1041 - Basic Spanish Laboratory**  
0 Credits (1 Contact Hours)  
Non-credit laboratory to accompany SPAN 1040. Coreq: SPAN 1040.

**SPAN 1510 - Spanish for Graduate Students**  
3 Credits (3 Contact Hours)  
Intensive program only for graduate students preparing for the reading examination in Spanish. A minimum grade of B on a final examination will satisfy graduate school modern language requirement.

**SPAN 2010 - Intermediate Spanish**  
3 Credits (3 Contact Hours)  
Intermediate course to practice listening, speaking, reading, and writing. Grammatical structures and basic vocabulary are reviewed systematically. Includes literary and cultural perspectives. Includes Honors sections. Preq: SPAN 1020 or a score of S2010 on the Modern Language Placement Test. Coreq: SPAN 2011.

**SPAN 2011 - Intermediate Spanish Laboratory**  
0 Credits (1 Contact Hours)  

**SPAN 2020 - Intermediate Spanish**  
3 Credits (3 Contact Hours)  

**SPAN 2021 - Intermediate Spanish Laboratory**  
0 Credits (1 Contact Hours)  
SPAN 2210 - Accelerated Spanish II
6 Credits (6 Contact Hours)
Accelerated intermediate course that may be taken in lieu of SPAN 2010 and 2020. Through conversation, composition, dictation, and intensive grammar review, proficiency is stressed. Includes literary readings and cultural perspectives. May not be taken by students who have completed SPAN 2010 or 2020. Preq: SPAN 1020.

SPAN 2970 - Creative Inquiry in Spanish
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Arrangements with faculty members must be established prior to registration. Preq: Consent of faculty member.

SPAN 3020 - Intermediate Spanish Grammar and Composition
3 Credits (3 Contact Hours)

SPAN 3040 - Introduction to Hispanic Literary Forms
3 Credits (3 Contact Hours)
Introduction to the basic structures and elements of fiction, poetry, drama, and essay, including literary and critical theory, with readings in 19th- and 20th-century Spanish and Spanish-American literature. Preq: SPAN 3020 or SPAN 3050.

SPAN 3050 - Intermediate Spanish Conversation and Composition I
3 Credits (3 Contact Hours)
Practice in spoken Spanish with emphasis on vocabulary, pronunciation, intonation, and comprehension. Includes written work to increase accuracy and assignments in the language laboratory. Preq: SPAN 2020 or a score of S3050 on the Modern Language Placement Test.

SPAN 3060 - Spanish Composition for Business
3 Credits (3 Contact Hours)

SPAN 3070 - The Hispanic World: Spain
3 Credits (3 Contact Hours)
Introduction to the significant aspects of the culture of Spain from its origins to the present. Emphasizes the artistic, social, historical, political, and contemporary issues of the Iberian Peninsula. Preq: SPAN 2020.

SPAN 3080 - The Hispanic World: Latin America
3 Credits (3 Contact Hours)
Introduction to the significant aspects of the culture of Spanish-American countries. Emphasis is placed on the development of the political, economical, geographical, social, and artistic aspects of Spanish America from the indigenous period to the present. Preq: SPAN 2020.

SPAN 3090 - Introduction to Spanish Phonetics
3 Credits (3 Contact Hours)

SPAN 3100 - Summer Immersion Program
6 Credits (6 Contact Hours)
Conducted entirely in Spanish for eight hours daily. Consists of activities that combine interrelating cultural topics with language skill practice. Frequent opportunities to converse with native speakers during meals and on excursions. Students receive six credits, three of which may be taken in lieu of SPAN 2020. Preq: SPAN 2010.

SPAN 3110 - Survey of Spanish-American Literature
3 Credits (3 Contact Hours)
Literary movements, influences, authors, and works from the Colonial period to the present. Preq: Six credits in Spanish at the 3000 level, including at least one course in literature or culture.

SPAN 3130 - Survey of Spanish Literature I
3 Credits (3 Contact Hours)
Literary movements, influences, and authors from the beginning to the end of the 17th century; representative works, discussions. Preq: Six credits in Spanish at the 3000 level, including three credits of literature or culture.
SPAN 3140 - Hispanic Linguistics
3 Credits (3 Contact Hours)
Familiarizes students with the theory and practice of linguistics applied to Spanish, in order to deepen their knowledge of phonetics, morphology, syntax, semantics and linguistic change. Preq: SPAN 3020.

SPAN 3160 - Spanish for International Trade I
3 Credits (3 Contact Hours)
Introduction to commercial Spanish; study of the spoken and written language, protocol, and cultural environment of the Spanish-speaking business world. Business vocabulary, basic business and cultural concepts, and situational practice. Reading and analysis of commercial texts. Preq: Two 3000-level Spanish language, literature, or culture courses.

SPAN 3180 - Spanish Through Culture
3 Credits (3 Contact Hours)
Topic-generated conversation course in Spanish through a broad array of artistic manifestations in the Hispanic World emphasizing conversation and short written exercises. Focuses on one Hispanic culture topic which provides a basis for class discussion and short written compositions in Spanish. Preq: One 3000-level course in Spanish.

SPAN 3820 - Spanish-Language News
1 Credits (1 Contact Hours)
Weekly discussions of Spanish-language news articles in the foreign press with an emphasis on politics and on the connections among political, economic, social, and cultural trends. Emphasizes Spanish vocabulary as well as cross-cultural contrasts with the United States. May be repeated for a maximum of three credits. Preq: SPAN 2020.

SPAN 3910 - Honors Introduction to Hispanic Literary Forms
1 Credits (1 Contact Hours)
One-hour independent study to allow honors students to pursue supervised research on some aspect of Hispanic literature. Preq: Membership in Calhoun Honors College.

SPAN 3920 - Survey of Spanish Literature (Honors)
1 Credits (1 Contact Hours)
Independent study allowing honors students to pursue supervised research on witchcraft in 15th- and 16th-century Spain. Preq: Membership in Calhoun Honors College. Preq or concurrent enrollment: SPAN 3130.

SPAN 3930 - The Hispanic World: Latin America (Honors)
1 Credits (1 Contact Hours)
One-hour independent study to allow honors students to pursue supervised research on a topic related to Hispanic American history, politics, geography, economics, social institutions, or artistic movements. Preq: Membership in Calhoun Honors College. Preq or concurrent enrollment: SPAN 3080.

SPAN 3970 - Creative Inquiry in Spanish
1-4 Credits (1-4 Contact Hours)
Students focus on a special research area under the guidance of a faculty member. After acquiring the requisite background, students formulate hypotheses for a group project, develop a critical framework, and initiate research on a specific topic.

SPAN 3980 - Directed Reading
1-3 Credits (1-3 Contact Hours)
Directed study of selected topics in Spanish literature, language, and culture. May be repeated for a maximum of six credits. Preq: Consent of department chair.

SPAN 4010 - New Spanish Fiction
3 Credits (3 Contact Hours)
Study of selected readings by popular emerging and established authors of Spain, with emphasis on current cultural trends. Readings include, but are not limited to, detective novels, regional fiction, and fiction from marginalized groups in Spain. Preq: SPAN 3000-level literature course.

SPAN 4030 - Spanish American Women Writers
3 Credits (3 Contact Hours)
In-depth study of selected literary works by Spanish American women. Representative authors are studied within their philosophical and sociopolitical contexts. Preq: Spanish 3000-level literature course.

SPAN 4040 - Nineteenth and Twentieth Century Spanish Literature
3 Credits (3 Contact Hours)
Selected readings from major authors in Spain. Emphasis is on readings in poetry, theatre, short story, and novels from the 19th to the early 20th century. Preq: Spanish 3000-level literature course.

SPAN 4050 - International Trade, Film, and Literature
3 Credits (3 Contact Hours)
Readings and films on the social, economic, and political changes of the Hispanic world. Preq: Spanish 3000-level literature or culture course.

SPAN 4060 - Hispanic Narrative Fiction
3 Credits (3 Contact Hours)
Topic-generated readings from Spanish America and/or Spain. Readings consider gender issues, the family, ethnicity, religion, politics, history, or socioeconomic issues in the Hispanic world. Preq: Spanish 3000-level literature or culture course.

SPAN 4070 - Hispanic Film
3 Credits (3 Contact Hours)
Films are "read" as texts that mirror Hispanic society. Besides learning about cinematographic techniques in Spanish, topics include comparative analysis of film and literature, film as propaganda, film as "blockbuster," and the cinematic depiction of social, cultural, and historical realities of Hispanic nations. Preq: Spanish 3000-level language, literature, or culture course.

SPAN 4090 - Comprehensive Writing in Spanish
3 Credits (3 Contact Hours)
Study of stylistics in addition to grammar review; writing paragraphs, short compositions, and creative papers in Spanish on both fiction and non-fiction topics. Preq: Any 3000-level Spanish course.

SPAN 4110 - Advanced Spanish Conversation and Composition
3 Credits (3 Contact Hours)
Continuation of SPAN 3050 with emphasis on greater fluency and sophistication in oral and written expression. Preq: SPAN 3050.

SPAN 4150 - Spanish for Health Professionals
3 Credits (3 Contact Hours)
Medical concepts and terminology in Spanish; designed for students who plan to work in professions related to public health care. Preq: Six credits in Spanish at the 3000 or 4000 level.

SPAN 4160 - Spanish for International Trade II
3 Credits (3 Contact Hours)
Study of more complex business vocabulary, cultural concepts, and environment of Hispanic markets. Social, political, and economic issues related to Spanish-speaking countries and their current economies in global marketing. Economic geography of Hispanic countries, company organization, management, banking, investment, goods and services, and marketing. Preq: SPAN 3160.

SPAN 4170 - Professional Communication
3 Credits (3 Contact Hours)
Skill-oriented course, taught in a seminar format. Students learn established "protocol" for addressing various Spanish-speaking audiences and learn to give professional presentations in Spanish. Preq: Spanish 3000-level course.

SPAN 4180 - Technical Spanish for Health Management Professionals
3 Credits (3 Contact Hours)
Technical health communication course in Spanish with emphasis on managerial and business aspects of the international health industry. Preq: SPAN 4150 and six additional credits in Spanish at the 3000 or 4000 level.

SPAN 4190 - Health and the Hispanic Community
3 Credits (3 Contact Hours)
Study of cultural aspects of health and health services in Hispanic populations. Taught in Spanish. Preq: Six credits in Spanish at the 3000 or 4000 level.

SPAN 4200 - Hispanic Drama
3 Credits (3 Contact Hours)
Exploration of contemporary Hispanic theatre. The production and reception of the plays are analyzed paying particular attention to notions of dramatic genre. Focuses on the change and continuity of the plays as well as their historical, cultural, and ideological backgrounds. Preq: Two 3000-level Spanish literature or culture classes.

SPAN 4210 - Spanish-American Modernism and Postmodernism
3 Credits (3 Contact Hours)
In-depth study of Spanish-American modernism and postmodernism with focus on narrative and poetry. Preq: Any 3000-level Spanish literature course.

**SPAN 4220 - The Contemporary Spanish-American Novel**
3 Credits (3 Contact Hours)
New trends in the development of the Spanish-American novel from the 1940s to the present. Preq: Spanish 3000-level literature course.

**SPAN 4230 - Advanced Topics in Hispanic Linguistics**
3 Credits (3 Contact Hours)
Continuation of SPAN 3140 with advanced topics. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: SPAN 3140.

**SPAN 4350 - Contemporary Hispanic Culture**
3 Credits (3 Contact Hours)
Study of social, political, economic, and artistic manifestations of contemporary Hispanic culture. Preq: Spanish 3000-level civilization or culture course.

**SPAN 4380 - Spanish Honors Research**
3 Credits (3 Contact Hours)
Individual honors research conducted under the direction of Language Department faculty. May not be used to satisfy requirements for the major in Modern Languages-Spanish or Language and International Trade or the minor in Spanish. Preq: Junior standing and membership in Calhoun Honors College.

**SPAN 4390 - Spanish Honors Thesis**
3 Credits (3 Contact Hours)
Individual honors research conducted and thesis completed under the direction of Language Department faculty. May not be used to satisfy requirements for the major in Modern Languages-Spanish or Language and International Trade or the minor in Spanish. Preq: Junior standing and SPAN 4380 and membership in Calhoun Honors College.

**SPAN 4910 - Hispanic Narrative Fiction (Honors)**
1 Credits (1 Contact Hours)
One-hour independent study to allow honors students to pursue supervised research on the socio-political climate under Franco's dictatorship, with emphasis on contemporary literary theory. Preq: Membership in Calhoun Honors College. Preq or concurrent enrollment: SPAN 4060.

**SPAN 4920 - Contemporary Latin American Novel (Honors)**
1 Credits (1 Contact Hours)
One-hour independent study to allow honors students to pursue supervised research in the literary and cinematographic images of magic realism. Preq: Membership in Calhoun Honors College. Preq or concurrent enrollment: SPAN 4220.

**SPAN 4970 - Creative Inquiry in Spanish**
1-4 Credits (1-4 Contact Hours)
Continuation of research initiated in SPAN 3970. Students complete their project and disseminate their research results. Preq: SPAN 3970.

**SPAN 4980 - Independent Study**
1-3 Credits (1-3 Contact Hours)
Directed study of selected topics in Spanish language, literature, and culture. May be repeated for a maximum of six credits. Preq: Consent of department chair.

**SPAN 4990 - Special Topics**
3 Credits (3 Contact Hours)
Study of timely or special topics in Spanish. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Consent of department chair.

### Special Education

**EDSP 3700 - Introduction to Special Education**
3 Credits (3 Contact Hours)
Survey of students with disabilities and with gifts/talents. Individuals with Disabilities Education Act is emphasized, including general educator's role in serving students with special needs. Characteristics, assessment, and effective instructional procedures for students of
varying exceptionalities are addressed. Includes Honors sections. Students must have a minimum grade-point average of 2.0 to enroll in this course.

**EDSP 3720 - Characteristics and Instruction of Individuals with Learning Disabilities**
3 Credits (3 Contact Hours)
In-depth coverage of characteristics and identification procedures for individuals with learning disabilities. Effective instructional strategies are addressed. Students participate in field experiences throughout the semester. Offered fall semester only. Preq: EDSP 3700. Coreq: EDSP 3721 and EDSP 3740.

**EDSP 3721 - Characteristics and Instruction of Individuals with Learning Disabilities Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany EDSP 3720. Coreq: EDSP 3720.

**EDSP 3730 - Characteristics and Instruction of Individuals with Intellectual Disabilities and Autism**
3 Credits (3 Contact Hours)
In-depth study of the etiology, assessment procedures, learning and behavioral characteristics, and effective instructional strategies related to the education of individuals with intellectual disabilities and autism. Students participate in a field experience throughout the semester. Preq: EDSP 3720 and EDSP 3740; and admission to professional level. Preq or concurrent enrollment: EDSP 3750. Coreq: EDSP 3731 and EDSP 4910.

**EDSP 3731 - Characteristics and Instruction of Individuals with Intellectual Disabilities and Autism Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany EDSP 3730. Coreq: EDSP 3730.

**EDSP 3740 - Characteristics and Strategies for Individuals with Emotional/Behavioral Disorders**
3 Credits (3 Contact Hours)
In-depth coverage of characteristics and identification procedures for individuals with emotional or behavioral disorders. Effective instructional strategies and behavior management are addressed. Students participate in field experiences throughout the semester. Preq: EDSP 3700; and admission to professional level. Coreq: EDSP 3720 and EDSP 3741.

**EDSP 3741 - Characteristics and Strategies for Individuals with Emotional/Behavioral Disorders Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany EDSP 3740. Coreq: EDSP 3740.

**EDSP 3750 - Early Intervention Strategies for Young Children with Special Needs**
3 Credits (3 Contact Hours)
Provides students with a working knowledge of the history and legal precedence for providing early intervention services, the characteristics of young children with special needs and their families, and effective instructional techniques for working with this population. Students participate in field experiences throughout the semester. Coreq: EDSP 3751.

**EDSP 3751 - Early Intervention Strategies for Young Children with Special Needs Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany EDSP 3750. Coreq: EDSP 3750.

**EDSP 4900 - Teaching Writing to Students with Disabilities**
1 Credits (1 Contact Hours)
Prepares students to deliver writing instruction and to administer curriculum-based assessments. Effective instructional strategies for individuals with disabilities in the areas of written expression, writing mechanics and spelling are addressed. Preq: EDSP 4910 and admission to the professional level. Coreq: EDSP 4920 and EDSP 4930 and EDSP 4940 and EDSP 4960 and EDSP 4970.

**EDSP 4910 - Educational Assessment of Individuals with Disabilities**
3 Credits (2 Contact Hours)
Introduction to assessment process (verification) in special education. Includes procedural safeguards; data collections via informal and standardized procedures; issues in assessment; psychometric properties of standardized tests; and administration, scoring, and interpretation of selected instruments. Offered spring semester only. Preq: EDSP 3720 and EDSP 3740; and admission to the professional level. Coreq: EDSP 3730 and EDSP 4911.

**EDSP 4911 - Educational Assessment of Individuals with Disabilities Laboratory**
EDSP 4920 - Mathematics Instruction for Individuals with Mild Disabilities
3 Credits (3 Contact Hours)
Prepares students to provide explicit instruction in mathematics for individuals with mild disabilities. Students learn to assess, analyze and teach math skills systematically. Offered fall semester only. Preq: EDSP 4910; and admission to the professional level. Coreq: EDSP 4900 and EDSP 4930 and EDSP 4940 and EDSP 4960 and EDSP 4970.

EDSP 4930 - Classroom and Behavior Management for Special Educators
3 Credits (3 Contact Hours)
Students describe various intervention strategies for increasing and maintaining appropriate behaviors and for decreasing or eliminating inappropriate behaviors. Students accurately recognize, record, and chart inappropriate behaviors; employ the least restrictive intervention; foster self-management skills; and develop preventive strategies and classwide systems for managing academic and social behavior. Offered fall semester only. Preq: EDSP 4910; and admission to the professional level. Coreq: EDSP 4900 and EDSP 4920 and EDSP 4940 and EDSP 4960 and EDSP 4970.

EDSP 4940 - Teaching Reading to Students with Mild Disabilities
3 Credits (3 Contact Hours)
Emphasizes the knowledge and skills necessary for teaching reading to students with mild disabilities. Offered fall semester only. Preq: EDSP 4910; and admission to the professional level. Coreq: EDSP 4900 and EDSP 4920 and EDSP 4930 and EDSP 4960 and EDSP 4970.

EDSP 4950 - Communication and Collaboration in Special Education
3 Credits (3 Contact Hours)
Focuses on effective communication skills for preservice special education teachers to encourage collaboration among relevant stakeholders and improve outcomes for individuals with disabilities. Preq: EDSP 4960. Coreq: EDSP 4980.

EDSP 4960 - Special Education Field Experience
3 Credits (9 Contact Hours)
Supervised practical experience prior to Directed Teaching for preservice special education teachers preparing to teach individuals with mild/moderate disabilities. Offered fall semester only. Preq: EDSP 4910; and admission to the professional level. Coreq: EDSP 4900 and EDSP 4920 and EDSP 4930 and EDSP 4940 and EDSP 4970.

EDSP 4970 - Secondary Methods for Individuals with Disabilities
3 Credits (3 Contact Hours)
Preparation for working with students with mild/moderate disabilities in secondary schools. Focus is on literature, methods, and materials for providing instruction in transition, self-determination, knowledge within content areas, functional skills, and integration into the community. Offered fall semester only. Preq: EDSP 4910; and admission to the professional level. Coreq: EDSP 4900 and EDSP 4920 and EDSP 4930 and EDSP 4940 and EDSP 4960.

EDSP 4980 - Directed Teaching in Special Education
12 Credits (34 Contact Hours)
Comprehensive course providing a full-time, semester-long experience for preservice special education teachers who plan to teach individuals with mild/moderate disabilities. Generally the last course in the program; provides teaching experience under the supervision of University and school personnel. Offered spring semester only. Preq: EDSP 4960 Coreq: EDSP 4950.

Theatre

THEA 1950 - Creative Inquiry in Theatre
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

THEA 2100 - Theatre Appreciation
3 Credits (3 Contact Hours)
Examination of the theatre event approached through historical context, play reading, analysis of production practices, and field trips to live dramatic performances. Includes Honors sections.

THEA 2670 - Stage Makeup Techniques
3 Credits (2 Contact Hours)
Practical study of basic stage makeup techniques for the acting student including corrective makeup, modeling with paint, three-dimensional makeup, prosthesis with latex, and makeup for other media. Coreq: THEA 2671.

**THEA 2671 - Stage Makeup Techniques Laboratory**
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany THEA 2670. Coreq: THEA 2670.

**THEA 2770 - Production Studies in Theatre**
3 Credits (3 Contact Hours)
Study of technical production and design including scenery, costume, and lighting through the examination of plays in production.

**THEA 2780 - Acting I**
3 Credits (2 Contact Hours)
Fundamentals of acting; basic stage techniques; exercises in interpretation, improvisation, characterization; experience in supervised scene study. Coreq: THEA 2781.

**THEA 2781 - Acting I Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany THEA 2780. Coreq: THEA 2780.

**THEA 2790 - Theatre Practicum**
1 Credit (3 Contact Hours)
Practical work in theatre on a production designed for public presentation. May be repeated for a maximum of four credits.

**THEA 2880 - Introduction to Computer-Aided Drafting**
3 Credits (2 Contact Hours)
Introduction to the basics of computer-aided drafting. Software applications include AutoCAD, Vectorworks, and WYSWYG. Coreq: THEA 2881.

**THEA 2881 - Introduction to Computer-Aided Drafting Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany THEA 2880. Coreq: THEA 2880.

**THEA 2950 - Creative Inquiry in Theatre**
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. Creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

**THEA (MUSC) 3080 - Survey of Broadway Musicals I**
3 Credits (3 Contact Hours)
Introduction to Broadway musical repertoire from the Golden Age of Broadway: 1943-1964. Emphasizes the music with attention to production detail, historical perspective, and social milieu. May also be offered as MUSC 3080.

**THEA (MUSC) 3090 - Survey of Broadway Musicals II**
3 Credits (3 Contact Hours)
Survey of Broadway musical repertoire from new conceptual shows from 1965 to the present day. Emphasizes the music with attention to production detail, historical perspective, and social milieu. May also be offered as MUSC 3090.

**THEA 3150 - Theatre History I**
3 Credits (3 Contact Hours)
Historical survey of Western and non-Western theatre. Emphasis is placed on the changing roles of the playwright, director, actor, technician, and spectator from antiquity to the Renaissance. Preq: Sophomore standing.

**THEA 3160 - Theatre History II**
3 Credits (3 Contact Hours)
Historical survey of Western theatre. Emphasis is placed on the changing roles of the playwright, director, actor, technician, and spectator from the Renaissance to the present. Preq: Sophomore standing.

**THEA 3170 - African-American Theatre I**
3 Credits (3 Contact Hours)
Acquaints students with the origin and development of African-American playwrights, plays, players, and their contributions to the American theatre from the 19th century to the Civil Rights Movement.

THEA 3180 - African-American Theatre II
3 Credits (3 Contact Hours)
Acquaints students with the development of African-American playwrights, plays, players, and their contributions to the American theatre from the Black Arts Movement to the present.

THEA (MUSC) 3290 - Musical Theatre Vocal Performance
3 Credits (2 Contact Hours)
Trains singer-actors in musical theatre repertoire. A study of repertoire via master classes, individual instruction, research of the historical context of Broadway music, studio performance, observation, and peer evaluation, culminating in a public showcase performance. May also be offered as MUSC 3290. Coreq: THEA 3291.

THEA (MUSC) 3291 - Musical Theatre Vocal Performance Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany THEA 3290. May also be offered as MUSC 3291. Coreq: THEA 3290.

THEA (ENGL) 3470 - The Structure of Drama
3 Credits (3 Contact Hours)
Introduction to the creative writing and critical study of drama. May also be offered as ENGL 3470.

THEA 3500 - Applied Theatre for Business and Industry I
3 Credits (3 Contact Hours)
Principles and practices from theatre to address social and educational issues in a wide range of settings, including teaching, justice, healthcare, political and community development; applying critical thinking and problem solving with theatre as a vehicle to develop plans for varying business approaches and models.

THEA 3670 - Costume Technology
3 Credits (2 Contact Hours)

THEA 3671 - Costume Technology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany THEA 3670. Coreq: THEA 3670.

THEA 3680 - Voice for the Stage
3 Credits (2 Contact Hours)
Study of the principles of vocal production and standard American speech for the stage; exercises in breath support and projection, improving tonal quality, and elimination of regional dialects through the study of the International Phonetic Alphabet. Preq: THEA 2780. Coreq: THEA 3681.

THEA 3681 - Voice for the Stage Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany THEA 3680. Coreq: THEA 3680.

THEA 3720 - Creative Drama
3 Credits (3 Contact Hours)
Practical applications using creative drama as a learning tool to strengthen group collaboration and creative goals. Students develop strategies for workshop designs in varying settings with focus toward exploration, discovery and broadened perspectives toward group and individual creative practice.

THEA 3740 - Stage Movement for Actors
3 Credits (1 Contact Hours)
Study of the psychological and physical sources of movement in the human body, with emphasis on the attainment of intellectual and physical control and the application of the skills to the development of a role. Preq: THEA 2780. Coreq: THEA 3741.

THEA 3741 - Stage Movement for Actors Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany THEA 3740. Coreq: THEA 3740.
THEA 3760 - Stage Directing I
3 Credits (2 Contact Hours)
Directing and staging techniques for the proscenium stage; exercises in composition, movement, picturization; experience in direction of scenes. Preq: Sophomore standing and either THEA 2770 or THEA 2780. Coreq: THEA 3761.

THEA 3761 - Stage Directing I Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany THEA 3760. Coreq: THEA 3760.

THEA 3770 - Stagecraft
3 Credits (2 Contact Hours)

THEA 3771 - Stagecraft Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany THEA 3770. Coreq: THEA 3770.

THEA 3790 - Acting Ensemble
1 Credits (3 Contact Hours)
Performance opportunities in the area of theatre for young audiences. Students are members of a theatrical touring troupe and perform in a variety of spaces and locations. May be repeated for a maximum of four credits. Preq: Consent of instructor by way of audition only.

THEA 3850 - Entertainment Rigging
3 Credits (2 Contact Hours)
A survey of theatrical rigging and its systems and practices as they apply to the entertainment industry. Preq: Production Studies in Performing Arts major. Coreq: THEA 3851.

THEA 3851 - Entertainment Rigging Laboratory
0 Credits (2 Contact Hours)
Non-credit laboratory to accompany THEA 3850. Students gain practical experience in theatrical rigging and its systems and practices as they apply to the entertainment industry. Coreq: THEA 3850.

THEA 3880 - Stage Management
3 Credits (3 Contact Hours)
Examines the vital part stage managers play in every theatrical production including organizing rehearsals, facilitating communication between director and designers, and calling cues during performances. Introduces the art and craft of stage management by incorporating Performing Arts Department and Brooks Center productions.

THEA 3950 - Creative Inquiry in Theatre
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

THEA 3980 - Special Topics in Theatre
3 Credits (3 Contact Hours)
Select areas of study in theatre not addressed by other theatre course offerings. May be repeated once. Preq: Consent of instructor.

THEA (ENGL) 4290 - Dramatic Literature I
3 Credits (3 Contact Hours)
Selected reading in the dramatic literature from the classical era of Greece and Rome to the Renaissance. May also be offered as ENGL 4290. Preq: ENGL 3100 or PA 1010. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

THEA (ENGL) 4300 - Dramatic Literature II
3 Credits (3 Contact Hours)
Principles and progress of drama from the Restoration to the present; analysis of representative plays; critical reports; discussion of trends in dramatic literature. Preq: ENGL 3100. May also be offered as ENGL 4300 or PA 1010. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
THEA (ENGL) 4470 - Playwriting Workshop  
3 Credits (3 Contact Hours)  
Workshop in the creative writing of plays. May be repeated once. Preq: ENGL 3470 or THEA 3470. May also be offered as ENGL 4470. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

THEA 4500 - Applied Theatre for Business and Industry II  
3 Credits (3 Contact Hours)  
Advanced projects to address social and educational issues using theatre as a vehicle to develop portfolio material and specialized business approaches relative to individual fields of study. Preq: THEA 3500.

THEA 4670 - Costume Design  
3 Credits (3 Contact Hours)  
Theory and practice of costume design for the theatre including the study of production concept and styles, sketching, and rendering.

THEA 4720 - Improvisation  
3 Credits (3 Contact Hours)  
Practical applications using drama to motivate collaboration, heighten analytical skills, and strengthen group thinking and processing skills. Explorations include workshop design and leadership among various venues and participant groups, honing strengths toward positive and creative problem-solving. Techniques include strategies for writers, actors, directors, visual artists, teachers, and workshop leaders. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

THEA 4760 - Stage Directing II  
3 Credits (2 Contact Hours)  
Continued study in the art of stage directing emphasizing historical and contemporary theory and methodology with a focus on special topics. Preq: THEA 3760. Coreq: THEA 4761.

THEA 4761 - Stage Directing II Laboratory  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany THEA 4760. Coreq: THEA 4760.

THEA 4770 - Stage Design  
3 Credits (2 Contact Hours)  
Study and practice in stage design, including drafting, graphics, drawing, rendering, scene painting, and light plotting. Preq: THEA 3770. Coreq: THEA 4771.

THEA 4771 - Stage Design Laboratory  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany THEA 47780. Coreq: THEA 47780.

THEA 4790 - Acting II  
3 Credits (2 Contact Hours)  
Continued study in the craft of acting for contemporary Western theatre. Students focus on monologue and scene study in a variety of performance settings. Preq: THEA 2780. Coreq: THEA 4791.

THEA 4791 - Acting II Laboratory  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany THEA 4790. Coreq: THEA 4790.

THEA 4800 - Advanced Scene Study for Actors  
3 Credits (2 Contact Hours)  
Students interpret and perform in complex plays written in heightened styles and integrating period movement into the various genres and styles of plays throughout major periods of theatre history. Styles include Elizabethan, Comedy of Manners, and early Realism. Preq: THEA 4790. Coreq: THEA 4801.

THEA 4801 - Advanced Scene Study for Actors Laboratory  
0 Credits (3 Contact Hours)  
Non-credit laboratory to accompany THEA 4800. Coreq: THEA 4800.

THEA 4870 - Stage Lighting I
3 Credits (2 Contact Hours)
Theory and practice of stage lighting through an understanding of various lighting instruments, lighting control systems, and execution of lighting designs. Coreq: THEA 4871.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

THEA 4871 - Stage Lighting I Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany THEA 4870. Coreq: THEA 4870.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

THEA 4880 - Stage Lighting II
3 Credits (2 Contact Hours)
Study of advanced stage lighting theories and practices including script analysis, technology, software and execution of lighting designs. Other topics include unions and contracts, shop orders, and assisting the lighting designer. Preq: THEA 4870. Coreq: THEA 4881.

THEA 4881 - Stage Lighting II Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany THEA 4880. Coreq: THEA 4880.

THEA 4950 - Creative Inquiry in Theatre
1-4 Credits (1-4 Contact Hours)
In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of instructor.

THEA 4970 - Scene Painting
3 Credits (2 Contact Hours)
Practical study of basic painting techniques for the theatre including layout, proper use of materials, painting styles, and texturing techniques. Coreq: THEA 4971.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

THEA 4971 - Scene Painting Laboratory
0 Credits (1 Contact Hours)
Non-credit laboratory to accompany THEA 4970. Coreq: THEA 4970.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

THEA 4990 - Independent Studies
1-3 Credits (1-3 Contact Hours)
Tutorial work for students with special interests outside the scope of existing courses. May be repeated for a maximum of six credits. Preq: Consent of instructor.

Wildlife and Fisheries Biology

WFB 3000 - Wildlife Biology
3 Credits (3 Contact Hours)
Natural history, biology, and conservation of wildlife managed by natural resource agencies. Attention is given to those factors important in the management and conservation including species distribution and abundance, habitat requirements, and life-history characteristics. Principles and problems associated with conservation of selected wildlife species are covered. Preq: One of the following combinations: BIOL 1030 and BIOL 1050 and BIOL 1040 and BIOL 1060; OR BIOL 1100 and BIOL 1110.

WFB 3010 - Wildlife Biology Laboratory
1 Credits (3 Contact Hours)
Identification of wildlife species with emphasis on game and non-game wildlife species managed or protected by state and federal agencies. One or more required weekend field trips will be scheduled. Preq: Wildlife and Fisheries Biology field of study. Preq or concurrent enrollment: WFB 3000.

WFB 3070 - Hunting and Wildlife Management
Hunting techniques used to harvest renewable wildlife resources are examined with respect to their roles in sound management practices. The effects of selected hunting regulations on wild populations, safety, and ethics are discussed. Preq: Junior standing.

**WFB (BIOL) 3130 - Conservation Biology**
3 Credits (3 Contact Hours)
Study of the biological bases for the conservation of flora, fauna, and habitats. Biological factors that influence the decision-making process are also addressed. May also be offered as BIOL 3130. Preq: BIOL 1030 and BIOL 1050 and BIOL 1040 and BIOL 1060; or BIOL 1100 and BIOL 1110.

**WFB 3500 - Principles of Fish and Wildlife Biology**
3 Credits (3 Contact Hours)
Introduction to principles of fisheries and wildlife biology on which sound management practices are based. Interrelationships of vertebrate and invertebrate biology, habitat, and population dynamics are covered. Preq: One of the following combinations: BIOL 1030 and BIOL 1050 and BIOL 1040 and BIOL 1060; OR BIOL 1100 and BIOL 1110.

**WFB 4100 - Wildlife Management Techniques**
3 Credits (1 Contact Hours)
Covers field and laboratory methods commonly used in wildlife management and research. Students interact with wildlife professionals. Topics include research methodology, estimating wildlife population characteristics, condition measures, and food habits; species determination, sex, and age; capture; population monitoring methods; GIS and mapping techniques, habitat evaluation and improvement. Preq: WFB 3000 and WFB 3500. Coreq: WFB 4101.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WFB 4101 - Wildlife Management Techniques Laboratory**
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany WFB 4100. Coreq: WFB 4100.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WFB 4120 - Wildlife Management**
3 Credits (2 Contact Hours)
Basic principles and general practices of wildlife management and conservation are covered. Major problems concerning the management of wildlife resources, with emphasis on upland game species. Laboratory work includes practical work on the Clemson University woodlands and field trips to several areas where wildlife management is being practiced. Includes Honors sections. Preq: WFB 3000 and WFB 3500. Coreq: WFB 4121.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WFB 4121 - Wildlife Management Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany WFB 4120. Coreq: WFB 4120.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WFB 4140 - Wildlife Nutritional Ecology**
3 Credits (3 Contact Hours)
Concepts of how terrestrial wildlife obtains and utilizes energy and nutrients in wild ecosystems are taught. Energy and nutrient availability are discussed in the ecological context of distribution, flow, and cycling in natural and modified foraging areas. Physiology of digestion is discussed for major homeotherms. Preq: WFB 3000 and WFB 3500.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WFB 4150 - Quality Deer Management**
3 Credits (3 Contact Hours)
Quality Deer Management (QDM) is a stewardship philosophy that provides desirable hunting experiences by producing white-tailed deer herds with a natural age and sex structure and population size appropriate for habitat conditions. The course will emphasize herd management, habitat management, hunter management and herd monitoring. Online course. Preq: Junior standing.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WFB 4160 - Fisheries Techniques**
4 Credits (3 Contact Hours)
Application of field and laboratory methods in fisheries sciences and research. Experience with fisheries equipment and techniques, including capture, handling and processing of fishes. Analysis of fisheries data. Preq: WFB 3000 and WFB 3500. Coreq: WFB 4161. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WFB 4161 - Fisheries Techniques Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany WFB 4160. Coreq: WFB 4160. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WFB 4180 - Fisheries Management and Conservation**
3 Credits (3 Contact Hours)

**WFB 4190 - Fish Ecology**
3 Credits (3 Contact Hours)
Interactions of fish with the physical and biological environment. Adaptations of organisms, populations, and communities. Impacts of human activities on major aquatic ecosystems and important fishes. Ecological principles for management of important sport, commercial, and non-game fishes. Preq: WFB 3000.

**WFB 4300 - Wildlife Conservation Policy**
3 Credits (3 Contact Hours)
Deals with the ecological rationale and management implications of public policy designed for the conservation of American wildlife resources. Emphasis is on managed-land issues. Preq: WFB 3000 and WFB 3500. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WFB 4400 - Non-Game Wildlife Management**
3 Credits (3 Contact Hours)
Basic principles and general practices of non-game wildlife management are covered. Emphasis is placed on those principles and practices most appropriately used by state agencies in their management programs for non-game species, along with real-world problems associated with implementation of such programs. Preq: WFB 3000 and WFB 3500.

**WFB 4440 - Wildlife Damage Management**
3 Credits (2 Contact Hours)
Covers the philosophical, sociological, ecological, and economical basis for controlling damage caused by animals problem wildlife populations. Emphasis is placed on fundamentals of prevention and control of damage caused by vertebrate species, especially mammals and birds. Includes interaction with federal and state agencies and private consultants. Preq: WFB 3000 and WFB 3500. Coreq: WFB 4441. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WFB 4441 - Wildlife Damage Management Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany WFB 4440. Coreq: WFB 4440. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WFB 4450 - Urban Wildlife Management**
3 Credits (3 Contact Hours)
Focuses primarily on social, scientific, and ecological aspects of managing wildlife in the urban setting. Basic wildlife management techniques as well as urban planning for wildlife are covered. Preq: WFB 3000 and WFB 3500.

**WFB 4500 - Aquaculture**
3 Credits (3 Contact Hours)
Basic aqua-cultural techniques applied to freshwater and marine organisms; past and present culture of finfishes and shellfishes around the world; principles underlying fish production; water quality, feeding, and nutrition as they influence production of cultured aquatic organisms. Preq: WFB 3000 and WFB 3500. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.
WFB 4600 - Warmwater Fish Diseases
2 Credits (2 Contact Hours)
Study of diseases in warmwater fish including infectious and noninfectious processes. Preq: WFB 3000 and WFB 3500.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

WFB 4620 - Wetland Wildlife Biology
3 Credits (3 Contact Hours)
Study of wetland wildlife habitats, emphasizing classification by physical, chemical, and biological characteristics; importance of wetland habitat for management and production of wetland wildlife species. Offered fall semester only. Includes Honors sections. Preq: WFB 3000 and WFB 3500.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

WFB 4630 - Directed Research in Aquaculture, Fisheries, and Wildlife Biology
1 Credits (3 Contact Hours)
Research problems in selected areas of aquacultural, fisheries, or wildlife science to introduce students to experimental design, research techniques, and presentation of research results. May be repeated for a maximum of three credits. Preq: Junior standing and consent of instructor.

WFB (BIOL) 4680 - Herpetology
4 Credits (3 Contact Hours)
Physiology, functional morphology, ecology, evolution, biomechanics and current literature of amphibians and reptiles. Laboratory study examines morphology and identification of world families and United States genera, as well as southeastern species. Field trips are required. May also be offered as BIOL 4680. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: WFB 4681.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

WFB (BIOL) 4681 - Herpetology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany WFB 4680. May also be offered as BIOL 4681. Coreq: WFB 4680.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

WFB (BIOL, ENT) 4690 - Aquatic Insects
3 Credits (1 Contact Hours)
Identification, life history, habitats, and interrelationships of aquatic insects; techniques of qualitative field collecting; important literature and research workers. Includes Honors sections. May also be offered as BIOL 4690 and ENT 4690. Preq: BIOL 1100 and BIOL 1110 and sophomore standing. Coreq: WFB 4691.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

WFB (BIOL, ENT) 4691 - Aquatic Insects Laboratory
0 Credits (6 Contact Hours)
Non-credit laboratory to accompany WFB 4690. May also be offered as BIOL 4691 or ENT 4691. Coreq: WFB 4690.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

WFB 4700 - Human Dimensions of Fisheries and Wildlife Management and Conservation
3 Credits (3 Contact Hours)
Human interactions with wildlife and fisheries, including social principles important for understanding and addressing wildlife management and conservation challenges, are examined and studied. Quantitative and qualitative social research methods, popular views of wildlife, stakeholder involvement, changing environmental behavior, and human attitudes towards hunting and fishing, are discussed. Preq: WFB 3130 and junior standing.

WFB 4720 - Ornithology
4 Credits (3 Contact Hours)
Biology of birds: their origin and diversification, adaptations, phylogeny, classification, structure and function, behavior, ecology, and biogeography. Field identification is emphasized, and field trips are required. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: WFB 4721.

WFB 4721 - Ornithology Laboratory
WFB (AGRB) 4750 - Economics of Wildlife Management and Policy
3 Credits (3 Contact Hours)
Integrated approach to the study of the economics of wildlife. Topics include determination of market and nonmarket value, single and multiple species management, enterprise cost and returns, marketing wildlife, leasing methods, complementarity and competitiveness with agricultural and forestry enterprises, and timber and crop damage cost estimates and control. May also be offered as AGBR 4750. Preq: AGRB 2020 or ECON 2000 or ECON 2110 or FOR 3040 or WFB 3060.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

WFB 4760 - Bird Conservation and Ecology
3 Credits (1 Contact Hours)
Field-intensive introduction to the identification, ecology, and conservation of North American birds and their habitats with an emphasis on management and applied field ornithology. Includes bird/habitat survey and census techniques. At least one weekend (Friday-Sunday) field trip is required. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: WFB 4761.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

WFB 4761 - Bird Conservation and Ecology Laboratory
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany WFB 4760. Coreq: WFB 4760.
This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

WFB 4770 - Ichthyology
3 Credits (2 Contact Hours)
Systematics, life history, distribution, ecology, and current literature of fish. Laboratory study of morphology and identification of U.S. genera, as well as all southeastern species. Field trips are required. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Coreq: WFB 4771.

WFB 4771 - Ichthyology Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany WFB 4770. Coreq: WFB 4770.

WFB 4930 - Selected Topics
1-4 Credits (1-4 Contact Hours)
Specialized topics which explore current areas of research and management in aquaculture, fisheries science, or wildlife management are examined in lecture/seminar format. May be repeated for a maximum of ten credits, but only if different topics are covered. Preq: Junior standing and consent of instructor. Coreq: WFB 4931.

WFB 4931 - Selected Topics Laboratory
0 Credits (1-4 Contact Hours)
Non-credit laboratory to accompany WFB 4930. Coreq: WFB 4930.

WFB 4980 - Senior Portfolio
1 Credits (1 Contact Hours)
Collection of Web-based materials representing the creative and scientific papers, presentations, and résumés written by students to satisfy curriculum requirements. Students are regularly informed regarding the format and content of their portfolios. Preq: Senior standing and Wildlife and Fisheries Biology field of study. Preq or concurrent enrollment: FNR 4990.

Women's Studies

WS 1030 - Women in Global Perspective
3 Credits (3 Contact Hours)
Cross-cultural and multidisciplinary introduction to issues facing women globally. Issues may include women and work, violence against women, reproduction and women's health, sexuality and rites of passage, women and the weight of tradition, movements for women's empowerment.

WS 2300 - Women and Leadership I
3 Credits (3 Contact Hours)
Students survey the history of leadership theory and study the unique challenges and opportunities faced by women leaders using case studies and contemporary research. Assessments of students' individual leadership strengths and weaknesses are included.

**WS 2400 - Women and Leadership II**
3 Credits (3 Contact Hours)
The theory and practice of successful leadership. Students read contemporary theories identifying best practices for leadership; research and develop a leadership project that engages significantly with local communities; and hone their own leadership philosophy. Guest speakers in leadership positions enhance understanding of leadership skills and strategies. Preq: WS 2300.

**WS 3010 - Introduction to Women's Studies: Women's Lives**
3 Credits (3 Contact Hours)
Interdisciplinary course exploring the unique features of women's lives from childhood to old age. Content is based on new research in many disciplines, including psychology, sociology, history, literature, and the arts. Preq: Sophomore standing.

**WS (COMM) 3160 - Girlhood, Media, and Popular Culture**
3 Credits (3 Contact Hours)
Explores how the mass media and popular culture contribute to social constructions of girlhood. Employing the critical lens of feminist and communication theories, students examine mediated depictions of girls as well as how girls actively produce and negotiate media and popular culture. May also be offered as COMM 3160. Preq: COMM 2010 with a C or better or WS 3010.

**WS (PHIL) 3490 - Theories of Gender and Sexuality**
3 Credits (3 Contact Hours)
Examines the philosophical dimensions of contemporary debates about the relation of sex, gender, and sexuality. May also be offered as PHIL 3490.

**WS 3900 - Women's Studies Internship**
3 Credits (8 Contact Hours)
Faculty-supervised internship provides Women's Studies minors with relevant work experience, mentoring, and networking opportunities with local leaders in business, government, and non-profit organizations. Preq: Women's Studies minor, Junior standing, and consent of internship coordinator.

**WS 4010 - Senior Seminar**
3 Credits (3 Contact Hours)
In-depth exploration and analysis of a special topic in the areas of women's and leadership studies, culminating in a senior project documented in written, oral, visual and/or multimedia presentations. Topics vary based on student research interests. Preq: Senior standing in Women's Leadership.

**WS (ANTH) 4230 - Women in the Developing World**
3 Credits (3 Contact Hours)
Comparative anthropological study of women and their status in developing countries around the world. A survey of women's daily lives in a global context, emphasizing education, economics, and the environment. Case studies include microfinance, literacy, reproductive rights and practices, and the impact of religious fundamentalism on women. May also be offered as ANTH 4230. Preq: Sophomore standing. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WS (ENGL) 4360 - Feminist Literary Criticism**
3 Credits (3 Contact Hours)
Introduces the germinal works of feminist literary theory and criticism. Outlines the development of modern literary criticism by studying feminist versions of the major critical methodologies. May also be offered as ENGL 4360. Preq: ENGL 3100. This 4000-level course has a 6000-level counterpart. Students should refer to the Graduate Announcements for the 6000-level description and requirements.

**WS 4590 - Selected Topics in Women's Studies**
1-3 Credits (1-3 Contact Hours)
Topics change from semester to semester and are announced prior to registration. May be repeated for a maximum of six credits, but only if different topics are covered.

**WS 4900 - Creative Inquiry**
1-3 Credits (1-3 Contact Hours)
Small group work on particular issues with emphasis on involving students in research. Content varies. May be repeated for a maximum of six credits. Preq: Consent of instructor.
WS 4950 - Independent Study
1-3 Credits (1-3 Contact Hours)
Course of study designed by the student in consultation with a faculty member who agrees to provide guidance, discussion, and evaluation of the project. Student must confer with faculty member prior to registration. May be repeated for a maximum of six credits. Preq: Consent of instructor.

World Cinema

WCIN 4040 - Study Abroad Transfer
3-6 Credits (3-6 Contact Hours)
Course for credit transfer of a curriculum-appropriate course taken during an approved study abroad experience. Requires a minimum of two contact hours per weeks for at least 15 or the equivalent. May be repeated for a maximum of six credits. To be taken Pass/No Pass only. Preq: Consent of program director.

WCIN 4550 - History of Non-Western Cinemas
3 Credits (2 Contact Hours)
Close study of the development of a specific national or regional non-Western cinema (e.g., Japanese, Indian, Chinese, African, Middle Eastern) in terms of its aesthetic, theoretical and sociopolitical dimensions. Cinematographic and storytelling techniques in Western and non-Western filmmaking forms are compared. Preq: ENGL 3570. Coreq: WCIN 4551.

WCIN 4551 - History of Non-Western Cinemas Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany WCIN 4550. Coreq: WCIN 4550.

WCIN 4570 - Global Hollywood
3 Credits (2 Contact Hours)

WCIN 4571 - Global Hollywood Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany WCIN 4570. May also be offered as ENGL 4571. Coreq: WCIN 4570.

WCIN 4580 - Adaptations of World Classics
3 Credits (2 Contact Hours)
Study of selected film and/or other media adaptations of classics in world literature, with attention to adaptation theory, language, form, history and culture. Topics vary. May also be offered as ENGL 4580. Preq: ENGL 3570. Coreq: WCIN 4581.

WCIN 4581 - Adaptations of World Classics Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany WCIN 4580. May also be offered as ENGL 4581. Coreq: WCIN 4580.

WCIN 4620 - World Documentary
3 Credits (2 Contact Hours)
Introduces students to the history, theory and form of documentary practice in international context. Through a selection of representative works, students examine the ethical, legal, aesthetic and social concerns inherent in the genre. Preq: ENGL 3570. Coreq: WCIN 4621.

WCIN 4621 - World Documentary Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany WCIN 4620. Coreq: WCIN 4620.

WCIN 4760 - Filmmaking for Mobile Media
3 Credits (2 Contact Hours)
Students apply their knowledge of film theory and techniques through low-to-no-budget digital videos for dissemination on mobile media devices such as smartphones and tablet computers. Students will learn to operate low-budget video equipment and edit video on professional editing software in a hands-on workshop. May also be offered as ENGL 4760. Preq: DPA 3070 or ENGL 3570. Coreq: WCIN 4761.

WCIN 4761 - Filmmaking for Mobile Media Laboratory
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany WCIN 4760. May also be offered as ENGL 4761. Coreq: WCIN 4760.

**WCIN 4960 - Capstone Seminar**
3 Credits (2 Contact Hours)
In-depth exploration and analysis of a special topic in World Cinema, culminating in a capstone project documented in written, oral, visual and multimedia presentation. Students apply their expertise to produce research of publishable quality and scope. Senior standing in World Cinema major. Coreq: WCIN 4961.

**WCIN 4961 - Capstone Seminar Laboratory**
0 Credits (3 Contact Hours)
Non-credit laboratory to accompany WCIN 4960. Coreq: WCIN 4960.

**WCIN 4990 - World Cinema Practicum**
3-6 Credits (3-6 Contact Hours)
Students apply their practical and theoretical knowledge to a substantive project involving their internship experience and/or creative option. Course provides elements of pre-professional training. Preq: Junior standing in the World Cinema major.

### Youth Development Program

**YDP 3000 - Youth Development in Society**
3 Credits (3 Contact Hours)
The course provides an overview of youth development in society. It examines social change and its impact on youth development, the historical development of youth programs, programs and plans designed to be responsive to youth issues, and supports to assist youth in becoming healthy, productive, and engaged citizens. Preq: Youth Development Studies major.

**YDP 3050 - Theory and Philosophy of Youth Development Work**
3 Credits (3 Contact Hours)
This course examines the philosophical, conceptual, and theoretical frameworks of positive youth development from the perspective of real-world application within developmental systems. Students explore both the distinctiveness and complementarity between problem-focused and youth development approaches to youth work, and work on building a common language for the field. Preq: Youth Development Studies major.

**YDP 3100 - Youth Development and the Family**
3 Credits (3 Contact Hours)
This course focuses on youth in the context of family development and interpersonal family dynamics. Students gain knowledge and skills to strengthen families and foster youth well being. Students also gain the skills to develop effective programs involving the family unit and the ability to conceptualize youth development from a systemic perspective. Preq: Youth Development Studies major.

**YDP 3150 - Community and Youth Development Systems**
3 Credits (3 Contact Hours)
This course focuses on organizations and systems that offer opportunities for youth to reach their potential and develop competencies and assets. These approaches include studying educational systems that foster success, community organizations that engage youth in becoming leaders and contributing members, and environments that are conducive to youth well being. Preq: Youth Development Studies major.

**YDP 3200 - Youth Development in Sport and Physical Activities**
3 Credits (3 Contact Hours)
This course examines the role of community-based sports in developing healthy youth, specifically the ways in which sport programs can be designed to maximize physical, intellectual, emotional, and social outcomes. Focus is on the role of key adults and institutions in the delivery of youth sport experiences. Preq: Youth Development Studies major.

**YDP 3250 - Working with Diverse Youth**
3 Credits (3 Contact Hours)
This course focuses on diversity in youth-oriented programs and settings, and provides an understanding of how race, ethnicity, gender, religion, disability, and social class affect youth development work. An emphasis is placed on building a working knowledge of cultural awareness and sensitivity as applied to the design of youth activities. Preq: Youth Development Studies major.

**YDP 3300 - Designing Effective Youth Programs**
3 Credits (3 Contact Hours)
This course introduces students to a variety of approaches to youth development programming. The main focus is on intentional or
purposeful program planning designed to achieve targeted youth outcomes. As a class, students design a youth development program that is delivered as a component of YDP 3400. Preq: Youth Development Studies major.

**YDP 3350 - Youth Activity Facilitation and Leadership**
3 Credits (3 Contact Hours)
This course provides a foundation for effective activity leadership to meet the needs of diverse youth populations. The course focuses on applying experiential learning approaches; different activity types; choosing activities based on intentionality, specificity, and applicability; activity sequencing; building individual and group efficacy; and activity debriefing and processing. Preq: Youth Development Studies major.

**YDP 3400 - Delivering Effective Youth Programs**
3 Credits (3 Contact Hours)
This course provides students with the knowledge and tools to deliver and present effective and intentional youth development programs. The course builds on the content of YDP 3300, and focuses on key programming issues, such as animation plans, equipment and facilities, program flexibility, risk management, and formative and summative assessment. Preq: Youth Development Studies major.

**YDP 3450 - Creative Activities for Youth**
3 Credits (3 Contact Hours)
This course examines the use of various creative activities in youth programs. Students explore the cognitive strengths of various creative activities, how to integrate creativity into youth programs, the importance of creative activities in community identity, and the availability of community resources. Preq: Youth Development Studies major.

**YDP 4400 - Youth Program Assessment and Evaluation**
3 Credits (3 Contact Hours)
Youth development has generated best practice programs as a consequence of evidence-based assessment and evaluation. This course familiarizes students with current best practice programs. Evaluation design concepts and strategies provide a knowledge base that prepares students with the skills to employ in evaluations of youth development programs. Preq: Youth Development Studies major.

**YDP 4450 - Administration of Youth Development Organizations**
3 Credits (3 Contact Hours)
This course examines approaches and strategies for the successful administration of youth organizations. Students explore organizational missions, structures, personnel management, legal issues, promotion, financial management, assessment, and strategic planning within the context of public, not-for-profit, and private youth-serving agencies and organizations. Preq: Youth Development Studies major.

**YDP 4500 - Professional Issues and Ethics in Youth Development**
3 Credits (3 Contact Hours)
This course provides an intensive study and culminating discussion of contemporary problems, techniques, and ethical issues in youth development. In addition, students are introduced to the process of developing original research questions in the youth development field. Preq: Youth Development Studies major.

**YDP 4550 - Youth and Technology**
3 Credits (3 Contact Hours)
This course examines the uses of technology by youth. Students explore the current uses of technology by different types of youth, the ethical issues related to youth and technology, and socio-cultural changes resulting from the use of technology by youth. Preq: Youth Development Studies major.

**YDP 4990 - Youth Development Fieldwork**
3 Credits (2 Contact Hours)
This course provides practical experience linking students to new hands-on learning opportunities in youth serving agencies/organizations. Students are required to complete a minimum of 60 hours of experiential learning in a supervised youth services setting. Students develop a professional portfolio and special project as part of this experience. Preq: Youth Development Studies major.

**YDP 4991 - Youth Development Fieldwork Laboratory**
0 Credits (4 Contact Hours)
Non-credit laboratory to accompany YDP 4990. Coreq: YDP 4990.