Course Listings

This Catalog offers information about the academic programs and support services of the University. This Catalog is as accurate as possible, but the information may not remain current for all of the academic year. Circumstances may prompt changes in courses, course content, credits, fees, regulations, semester calendar, curriculum, degrees offered, and other University matters. Such changes authorized by the University apply both to prospective students and to those previously enrolled, unless the latter are specifically exempted.

Not all courses are offered each semester or session. Students should consult the current class schedule book and the departmental office for specific details regarding frequency of offerings in specific courses.

Course descriptions are listed alphabetically by fields. (See the BIOM prefix and the College of Osteopathic Medicine of OSU College Catalog for osteopathic medicine course descriptions.)

Explanation of Course Listings

A course listing is comprised of the following elements, in order:

Course Number. All courses are identified by numbers composed of four digits. The first digit indicates the class year in which the subject is ordinarily taken, although enrollment is not exclusive as to student classification, the second and third digits identify the course within the field and the last digit identifies the number of semester credit hours the course carries. A course number beginning with 0 indicates that the course does not carry University credit. A course number ending in 0 indicates that the course carries variable credit. An asterisk (*) following the four-digit number indicates the course is approved for graduate credit.

Those numbered 5000 and above are primarily for graduate students, and only graduate students and selected seniors with consent of the instructor may enroll in them. Courses numbered 3000 and 4000 may be taken for graduate credit if the course number is labeled with an asterisk. Extra work is required of a graduate student in a 3000- or 4000-level course.

General Education Requirement Codes. The capital letters in parentheses preceding some course titles designate courses fulfilling various undergraduate general education requirements. (See "Academic Regulations.")

Course Title. The title of the course is printed in boldface letters.

Statement of Variable Credit. Each course number ending in zero is followed by a statement of the credit that may be earned. Typical entries are 1-6 credits, maximum 6 and 1-3 credits, maximum 12, the first part of the entry indicating the permissible credit per enrollment, followed by a statement of the maximum credit which may be earned in the course through repeated enrollment.

Laboratory Hours. If a course contains a laboratory, the number per week of laboratory hours are stated, e.g., Lab 3.

Prerequisite(s). Prerequisites from the same department as the course being described are listed first, with no departmental abbreviation and in increasing numerical order. If from another department, that departmental abbreviation must precede the number of the prerequisite course. Those courses having prerequisites from both within and from outside the department bear combination entries such as 3303 and STAT 2012. Prerequisites are listed in the following manner:

Prerequisites: A, B or C
  A or B or C is acceptable
Prerequisites: A, B and C
  A and B and C are required
Prerequisites: A, and B or C
  A and either B or C
Prerequisites: A and B, or C
  Both A and B, or C required
Prerequisites: A, or B and C
  Either A or both B and C required
Prerequisites: A or equivalent and B
  Both A, or the equivalent of A, and B are required
Prerequisites: A, and B or equivalent
  Both A and B, or the equivalent of B, are required
Prerequisites: A and B, or equivalents
  Equivalents of both A and B are acceptable.

Where no prerequisites are listed for courses numbered 5000 or 6000 level is graduate standing in addition to any other prerequisites listed. Instructors may waive prerequisites when student background justifies. Prior approval of instructor may be required in problems courses, independent study, internships, thesis and dissertation courses, and courses taught in a professional school.

Description of Course Content. The content of the course and its major emphases are described. Courses which are taught under another name and number are indicated by the statement Same course as 0000. Credit may not be earned in both courses so cross-referenced.
Abbreviations Used

A&S  Arts and Sciences
ABSE  Applied Behavioral Studies in Education
ACCT  Accounting
AERO  Aerospace Studies--Air Force
AG  Agriculture
AGCM  Agricultural Communications
AGEC  Agricultural Economics
AGED  Agricultural Education
AM  Arts Management
AMST  American Studies
ANSI  Animal Science
ANTH  Anthropology
ARCH  Architecture
ART  Art
ASTR  Astronomy
AVED  Aviation Education
BADM  Business Administration
BAE  Biosystems Engineering
BCOM  Business Communications
BHON  Business Honors
BIOC  Biochemistry
BIOL  Biological Science
BIOM  Biomedical Sciences
BOT  Botany
BSPR  Business Professions
BUSE  Business Education
CDIS  Communication Sciences and Disorders
CHE  Chemical Engineering
CHEM  Chemistry
CIED  Curriculum and Instruction Education
CIVE  Civil Engineering
CLML  Cell and Molecular Biology
CMT  Construction Management Technology
CPSY  Counseling Psychology
CS  Computer Science
DHM  Design, Housing and Merchandising
ECEN  Electrical and Computer Engineering
ECON  Economics
EDLE  Educational Leadership
EDTC  Educational Technology
EDUC  Education
EET  Electrical Engineering Technology
ENGL  English
ENGR  Engineering
ENSC  Engineering Science
ENTO  Entomology
ENVR  Environmental Science
EPSY  Educational Psychology
ETM  Engineering and Technology Management
FIN  Finance
FLL  Foreign Languages and Literatures
FOR  Forestry
FPST  Fire Protection and Safety Technology
FRCD  Family Relations and Child Development
FREN  French
FRNS  Forensic Sciences
GENE  Genetics
GENG  General Engineering
GENT  General Technology
GEOG  Geography
GEOL  Geology
GRAD  Graduate
GREK  Greek
GRMN  German
HES  Human Environmental Sciences
HHP  Health and Human Performance
HIST  History
HONR  Honors College
HORT  Horticulture
HRAD  Hotel and Restaurant Administration
HRAE  Human Resources and Adult Education
IEM  Industrial Engineering and Management
INTL  International Studies
JAPN  Japanese
JB  Journalism and Broadcasting
LA  Landscape Architecture
LATN  Latin
LBSC  Library Science
LEIS  Leisure
LSB  Legal Studies in Business
MAE  Mechanical and Aerospace Engineering
MATH  Mathematics
MBA  Master of Business Administration
MC  Mass Communications
MCAG  Mechanized Agriculture
MET  Mechanical Engineering Technology
MGMT  Management
MICR  Microbiology
MKTG  Marketing
MLSC  Military Science
MSIS  Management Science and Information Systems
MTCL  Medical Technology
MUSI  Music
NATS  Natural Science
NSCI  Nutritional Sciences
OCED  Occupational Education
PET  Petroleum Technology
PHIL  Philosophy
PHYS  Physics
PLNT  Plant Science
PLP  Plant Pathology
POLS  Political Science
PSYC  Psychology
REL  Religious Studies
REMS  Research, Evaluation, Measurement, and Statistics
REM  Rangeland Ecology and Management
RUSS  Russian
SCFD  Social Foundations
SDEV  Student Development
SOC  Sociology
SOIL  Soil Science
SPAN  Spanish
SPCH  Speech Communication
SPED  Special Education
STAT  Statistics
TCOM  Telecommunications Management
TH  Theater
TIED  Technical and Industrial Education
UNIV  University
VAPP  Veterinary Anatomy, Pathology and Pharmacology
VBSC  Veterinary Biomedical Sciences
VCS  Veterinary Clinical Sciences
VIDP  Veterinary Infectious Diseases and Physiology
VMED  Veterinary Medicine
VMS  Veterinary Medicine and Surgery
ZOOL  Zoology
Accounting (ACCT)

2103 Financial Accounting. Prerequisite: 24 semester credit hours, including ENGL 1113 and MATH 1483 or equivalent. Financial accounting concepts and the use of financial accounting information in decision making.

2203 Managerial Accounting. Prerequisite: 2103. Manages for U.S. and international organizations. Concepts and objectives, planning and control of sales and costs, analysis of costs and profits.

3013 Federal Income Taxation. Prerequisite: 2203. Federal income tax and its relationship to business decision-making; primary emphasis on recognition of the important tax consequences that attach to business transactions and the impact on business decision making.

3203 Cost Accounting. Prerequisites: 2203 with a grade of "C" or better and STAT 2023. Cost accumulation systems, allocating product costs, planning and controlling costs, standard costing, and profitability analysis.


3403 Financial Accounting II. Prerequisite: 3303 with grade of "C" or better. Continuation of financial accounting theory and problems.

3423 Financial Accounting and Reporting Concepts. Prerequisite: 3603 with grade of "C" or better. Theory and concepts underlying financial accounting and reporting.

3603 Accounting Information Systems. Prerequisite: 2203 with a grade of "C" or better. Accounting system design and installation.

4010 Accounting Projects. 1-6 credits, maximum 6. Prerequisites: consent of instructor and 3203 and 3403. Special topics, projects and independent study in accounting.

4013* Advanced Federal Income Taxation. Prerequisite: 3013 with a grade of "B" or better. Federal income tax law applicable to individuals, corporations, partnerships, trusts and estates, and other specialized topics.

4203* Topics in Management Accounting. Prerequisites: 2203 with grade of "C" or better and MGMT 3223. Integrative course in cost and management accounting; use of accounting information for internal decision making.

4303* Non-business, Fiduciary and Institutional Accounting. Prerequisite: 3403 with grade of "C" or better. Fund and governmental accounting, bankruptcies, receiverships, estates, and trusts.

4403* Financial Accounting III. Prerequisite: 3403 with grade of "C" or better. Consolidated statements and other financial accounting topics.

4433 Financial Accounting and Reporting Applications and Research. Prerequisite: ACCT 3433 with a grade of "C" or better. Developing financial research skills and applying them to accounting and reporting issues.

4453* EDP Auditing. Prerequisite: 4503 or consent of instructor. EDP auditing as it applies to the business environment. Impact of computer-based systems on control and auditing, total systems control analysis, and specific EDP auditing techniques as they apply to computer-based systems.

4503 Auditing. Prerequisite: 3403, 3603. Auditing theory, procedures and practices.

5000 Thesis. 1-6 credits, maximum 6. For students writing reports and theses in accounting.

5013 Seminar in Tax Research. Prerequisite: 4013 or consent of instructor. Development and administration of federal tax law with emphasis on the development of tax research skills.

5023* Seminar in Estate and Gift Taxation. Prerequisite: 5013 or consent of instructor. Federal tax law applicable to estate and gift taxation and income taxation of estates and trusts.

5033 Seminar in Oil and Gas Taxation. Prerequisite: 5013 or consent of instructor. Federal income tax laws applicable to the petroleum and other extractive industries.

5043* Seminar in Partnership Taxation. Prerequisite: 5013 or consent of instructor. Federal income tax laws applicable to partnerships and partners.

5053 Seminar in Corporate Taxation. Prerequisites: graduate standing and 5013 or consent of instructor. Federal income tax law applicable to corporations and to other entities in their capacity as corporate shareholders.

5103* Financial Accounting and Analysis. Prerequisites: admission to MBA program or consent of MBA director. Development of the ability to read and to analyze financial statements and to use this information along with other types of information in decision making.

5110 Special Topics and Individual Work in Accounting. 1-10 credits, maximum 10. Prerequisite: consent of instructor. Individual work on special topics, projects or readings selected to acquaint students with significant accounting literature.

5113* Managerial Accounting. Prerequisite: 5103. Interpretation of accounting data in planning, controlling and decision making.

5123 Enterprise Resource Planning. Prerequisites: graduate standing and 5113, 5111, MSIS 5643, or consent of director of MIS/AIS. Resource planning for global business organizations. Integrated data flow and computer software for enterprise resource planning. Integration of transactional analysis, fundamental accounting practice, financial planning, and supply chain forming the basis for study in this integrated approach to enterprise resource planning. Same course as MSIS 5123.

5133* International Oil and Gas Accounting. Prerequisite: graduate standing. Financial accounting and reporting for U.S. and international oil and gas operations. Domestic and international joint venture accounting. Accounting for international concession and profit sharing agreements.

5203 Seminar in Contemporary Accounting Theory I. Prerequisite: 3403. Origin and development of accounting and a critical study of modern accounting theory.

5303 Seminar in Contemporary Accounting Theory II. Prerequisite: 3403. Critical study of contemporary accounting theory.

5313 Financial Statement Analysis. Prerequisite: consent of graduate coordinator. A study of the demand and supply of financial data, properties of numbers derived from financial statements, the role of financial information in investment decisions, and features of the decision-making environment.

5400 Practicum in Professional Accounting. 1-6 credits, maximum 6. Prerequisite: 30 semester credit hours of accounting. An accounting policy course studying auditing, tax, systems, internal and external reporting and international aspects of business cases.

5503 Advanced Auditing. Prerequisite: 4503. Emphasis on auditing aspects of EDP, use of statistical sampling techniques in connection with audits of financial data, filings with the SEC and other regulatory agencies and other public accounting related topics.

5603 Accounting-based Information Systems. Prerequisite: 18 credit hours of accounting including 4203. Concepts underlying the design and use of an effective accounting information system.

5613 Business Systems Controls and Risk Analysis. Prerequisite: consent of MIS/AIS director and admission to the MIS/AIS program. Controlling and auditing business information systems including management and applications controls, electronic commerce and internet-related controls, and evaluation of system performance through use of audit software.

5713 Seminar in International Accounting. Prerequisites: 3403 and consent of graduate coordinator. Accounting issues faced by multinational enterprises and internationally listed companies, including diversity in financial reporting and harmonization.

5803 Seminar in Cost-Managerial Accounting. Prerequisite: 18 credit hours of accounting. Intensive study of cost managerial accounting theory relating to problems of an advanced nature.

5900 Graduate Internship in Accounting. 1-3 credits, maximum 3. Prerequisites: admission to master's program; consent of graduate coordinator. Supervised internship in public accounting, industry, or not-for-profit organizations. May be counted as elective hours only.

5902 Research Report. Prerequisite: consent of supervising professor and coordinator of graduate programs in accounting. Methods used in research and report writing in accounting. Independent investigation and writing of an acceptable report on a topic approved by the student's supervising professor. Restricted to candidates seeking the M.S. in accounting degree and not available to students who have credit in 5000.
Aerospace Studies—Air Force (AERO)

1111 Foundations of the U.S. Air Force I. Lab 1. Doctrine, mission and organization of the United States Air Force through a study of the total force structure, strategic offensive and defensive forces, general purpose forces, and aerospace support forces.


2111 Evolution of U.S. Air Force Air and Space Power I. Lab 1. Growth and development of aerospace power through history beginning with first manned flights and continuing through World War II.

2211 Air Power History II. Lab 1. Development and growth of aerospace power from the period following World War II through the Vietnam conflict; concepts of peaceful deployment of US air power.

3103 Air Force Leadership Studies I. Lab 2. The study of the fundamental leadership, management, and communication skills required of an Air Force junior officer. Basic managerial processes, management of forces in changing environments, organizational power, politics and managerial strategy and tactics.

3203 Air Force Leadership Studies II. Lab 1. The application of leadership, management, and communication skills required of an Air Force junior officer. The individual as a leader in the Air Force environment, individual motivational and behavioral processes, group dynamics, leadership and management ethics, counseling and evaluating are discussed.

3504 Field Training Encampment Program. Prerequisite: consent of professor of aerospace studies. Practical training on an Air Force base. Junior officer training, familiarization training in most functional aspects of a typical Air Force base. Includes career orientation, small arms firing, flight orientation rides, and survival training.

4103 (S)National Security Affairs I. Lab 2. The formulation, organization and context of national security-civil-military interaction and the evolution of strategy. Review of the military profession and officership.

4203 (S)National Security Affairs II. Lab 1. Strategy and management of conflict; implementation of national security and regional world issues. Review of societal issues in the military profession and the military justice system.

4402 Summer Professional Development Training Program. Prerequisite: consent of professor of aerospace studies. Students spend from two to three weeks on an Air Force base working in their intended specialty under supervision of an experienced officer. Leadership and management principles applied to day-to-day experiences.


Agricultural Communications (AGCM)

2103 Communications in Agriculture. Lab 2. Prerequisite: ENGL 1113. Fundamentals of agricultural newswriting and other communication methods. Careers in and the role of the media in agriculture and related fields.

2108 Communicating Agriculture to the Public. Lab 2. Prerequisite: junior standing in the College of Agricultural Sciences and Natural Resources or consent of the instructor. Understanding and application of writing principles and communications theory as related to public issues in agriculture and the environment. Practice in writing for a variety of media and preparation of other communications as part of a communications campaign strategy.

3213 Layout and Design for Agricultural Publications. Lab 4. Prerequisite: 2103. Fundamentals of layout and design as applied to agricultural publications, such as brochures, newsletters and fliers. Practical application of design principles, typography, desktop-publishing software, and printing practices. Opportunity for service-learning experiences.

3223 Web Design for Agricultural Organizations. Lab 4. Prerequisite: 2103. Development of World Wide Web sites for agricultural organizations. Practical application of theory and skills related to visual design, computer software, writing, editing, and project management. Opportunities for service-learning experiences.

4203* (S)National Security Affairs II. Lab 1. Prerequisite: junior standing. Professional preparation and development for careers in agricultural communications. Skills, resume and portfolios, presentations, networking and job interview. Requirements and procedures. Completing required supervised internship related to academic major.

4300 Internships in Agricultural Communications. 1-6 credits. Prerequisite: consent of internship coordinator and adviser. Supervised work experience with approved employers in agricultural communications including agricultural publications, radio stations, television stations, public relations offices, advertising firms, government offices, and other related opportunities. Presentation required following the internship.

4413 Agricultural Communications Product Development. Lab 4. Prerequisites: JB 2393; senior standing and consent of instructor. The development of agricultural communications projects with focus in either broadcast or print media. Practical application of writing, editing and design skills as well as software applications.

Agricultural Economies (AGEC)

1114 (S)Introduction to Agricultural Economics. Prerequisite: MATH 1463 or 1513. Economic theory of production, marketing and consumption of agricultural products. The role and structure of agriculture in the American economy. Policies to achieve efficiency and welfare goals in agriculture. No general credit for students also taking ECON 1113 or ECON 2103.

3010 Internship in Agricultural Economics. 1-6 credits, maximum 6. Prerequisite: approval of internship committee and adviser. Supervised work experience with approved public and private employers in agricultural economics including banks, farm credit services, agricultural chemical firms, Soil Conservation Service, congressional offices and other opportunities. Credit will not substitute for required courses. Graded on pass-fail basis.

3101 Professional Career Development. Prerequisites: junior standing and agricultural economics or agribusiness major status. Overview of the various areas of specialization within agricultural economics and agribusiness and their associated career opportunities and obligations. Development and improvement of written communication, oral communication, and leadership skills.

3213 (S)Quantitative Methods in Agricultural Economics. Lab 2. Prerequisites: 1114, STAT 2023 or equivalent, and MSIS 2103, AG 2112 or equivalent. Indices, graphics, budgeting, discounting, basic statistical measures, use of microcomputers, and price analysis. Basic background methods for some courses involving analysis.

3323 Agricultural Product Marketing and Sales. Prerequisites: 1114, ENGL 1113, SPCH 2713. Fundamentals of agricultural marketing management and planning applied to specific agricultural product (input and output) marketing problems. Institutional differences between agricultural and non-agricultural marketing environments. The role of the individual sales representative in a marketing and sales organization. Written and oral presentations of marketing and sales information required of all students.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
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<tbody>
<tr>
<td>3403</td>
<td>Agricultural Business Records and Analysis</td>
<td>Lab 2. Prerequisites: 3413 and ACCTG 2103. Financial accounts, production and statistical records and their practical application to the successful management of the farm or ranch and other agricultural businesses.</td>
</tr>
<tr>
<td>3423</td>
<td>Farm and Agribusiness Management</td>
<td>Prerequisites: 3423, 3213. Fundamentals of managerial functions as applied to agricultural firms. Organization and management of human, financial, and physical assets for the profitable operation of an agricultural business. An introduction to business planning, enterprise budgeting, financial statements, and record keeping.</td>
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<tr>
<td>3463</td>
<td>Agricultural Cooperatives</td>
<td>Prerequisites: 3333, 3423. An evaluation of the fundamental principles, objectives, structure, finance, and management associated with the cooperative organization. An analysis of the cooperative business organization within the modern economy: history, legislation, and evolution. An examination of careers related to cooperatives.</td>
</tr>
<tr>
<td>3503*</td>
<td>(S)Agricultural Resource Economics</td>
<td>Prerequisite: 1114 or ECON 2103. Framework for analyzing natural resource management decisions. Applications of microeconomic theory to the management of soil, water and other resources, with special emphasis on the institutions having an impact on management opportunities. Supply of and demand for natural resources, resource allocation over time, rights of ownership, and public issues of taxation, police power and eminent domain.</td>
</tr>
<tr>
<td>3603*</td>
<td>Agricultural Finance</td>
<td>Prerequisite: 3423. Farm financial management; preparation and analysis of financial statements, including computer applications; financial intermediaries; serving agriculture; procedures for evaluating investments; alternative means of acquiring control of farm resources.</td>
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<tr>
<td>3990</td>
<td>Special Problems in Agricultural Economics</td>
<td>1-3 credits, maximum 3. Directed study of selected agricultural economics topics.</td>
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<tr>
<td>4101</td>
<td>Agricultural Economics Seminar</td>
<td>Prerequisites: senior standing and agricultural economics or agribusiness major status. Contemporary problems in agricultural economics.</td>
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<tr>
<td>4213*</td>
<td>Quantitative Price Analysis</td>
<td>Prerequisites: 3213, 3333, MATH 2103, and ECON 3023 or 3113. Quantitative analysis of agricultural supply and demand in situations involving risk and uncertainty within the institutional setting of agricultural markets. Use of spreadsheets to perform regression analysis and simulation of potential market outcomes. Analysis of specific agricultural market cases with written and oral presentation of the results.</td>
</tr>
<tr>
<td>4423*</td>
<td>Advanced Agribusiness Management</td>
<td>Prerequisites: 3213, 3333, 3603, MATH 2103, and ECON 3023 or 3113. Application of modern decision theory in the uncertain environment that the agricultural business operates. Planning, organizing, implementing, coordinating, and controlling problems associated with establishing an agricultural business, achieving firm growth, and operating the firm through time. Use of spreadsheets to perform production planning and analysis related to agricultural business operation with linear programming, simulations and other tools. Analysis of the interaction of resources, prices and production alternatives.</td>
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<tr>
<td>4403*</td>
<td>Advanced Farm and Ranch Management</td>
<td>Prerequisites: 3213, 3333, 3603, MATH 2103, and ECON 3023 or 3113. The development of problem solving and risk management skills needed on the modern farm or ranch. Use of spreadsheets to perform production planning and analysis of farm and ranch problems with linear programming, simulations, and other tools. Analysis of the acquisition of resources and the use of information systems in managing the individual farm or ranch business.</td>
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<tr>
<td>4413*</td>
<td>Agricultural Law</td>
<td>Prerequisite: 1114. Survey of law with emphasis on agricultural problems and applications. Contract law, tort law, property law, real estate transactions, oil and gas leases, business organization, estate planning and credit.</td>
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<tr>
<td>4503*</td>
<td>Environmental Economics and Resource Development</td>
<td>Prerequisite: 3503 or ECON 3113 or consent of instructor. Economic, social and political factors relating to conservation, natural resource development and environmental quality. Valuation of priced and non-priced natural and environmental resources. Analysis of environmental and natural resource policy and the role of public and private agencies in conservation and development.</td>
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<tr>
<td>4513*</td>
<td>Farm Appraisal</td>
<td>Lab 2. Prerequisite: 3423. Estimating the market value of agricultural real estate using the three approaches to value. Determining the feasibility and profitability of land purchases.</td>
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<tr>
<td>4703*</td>
<td>(S)American Agricultural Policies</td>
<td>Prerequisites: 3213, 3333, MATH 2103, and ECON 3023 or 3113. Economic characteristics and problems of agriculture; evolution and significance of programs and policies.</td>
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<tr>
<td>4723*</td>
<td>(S)Rural Economic Development</td>
<td>Prerequisite: 1114. Concepts and theories of regional and community economics, including input-output, economic base, simulation, budget location, and routing. Oklahoma applications.</td>
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**International Agricultural Economics Tour**

Prerequisite: Consent of Instructor. A two-three week international travel component. Provides an integrated approach to the cultural, agricultural, historical, technological, political, economic, and religious backgrounds of the region. Comparison of the agricultural business environment of the region to that of the U.S.

**Problems of Agricultural Economics**

1-6 credits, maximum 6. Open to students with consent of instructor only. Research on special problems in agricultural economics.

**Thesis or Report in Agricultural Economics**

1-6 credits, maximum 6. For students working for a M.S. degree in agricultural economics. Independent research and thesis under the direction and supervision of a major professor.

**Professional Experience in Agricultural Economics**

1-6 credits, maximum 6. Prerequisites: approval of internship committee and adviser. Supervised professional experience with approved public and private employers in agricultural economics including banks, production credit associations, federal land banks, soil conservation service, and other agricultural related firms. Credit will not substitute for required courses. Designed for Master of Agriculture program.

**Research Methodology**

Prerequisites: selection of a thesis adviser and a thesis topic. Using the scientific method to solve problems in agricultural economics. Written ten-page thesis proposal.

**Mathematical Economics**

Prerequisites: differential calculus and ECON 3113. Mathematical tools necessary for formulation and application of economic theory and economic models.

**Applications of Mathematical Programming**

The application of concepts and principles of existing linear and nonlinear programming techniques to agricultural problems.

**Advanced Agricultural Prices**

Prerequisite: 3103, STAT 4043. Demand and price structures, price discovery, time series and agricultural price research methods.

**Econometric Methods**

Prerequisites: 5103 and ECON 4213 or STAT 4043. Application of econometric techniques to agricultural economic problems, theory and estimation of structural economic parameters.

**Agricultural Market Policy and Organization**

Marketing firm decisions; structure, conduct and performance of agricultural industries; interregional trade theory; and government policies that influence decisions.

**Production Economics**

Prerequisite: 5103. Analysis of micro static production economics problems; factor-product, factor-factor and product-product relationships; functional forms for technical unit and aggregate production functions; maximizing and minimizing choice rules; firm cost structure; scale relationships.
5503* Economics of Natural and Environmental Resource Policy. Prerequisites: 4503 or ECON 3513 and 5113 or ECON 3213. Economic analysis of specific natural resource use with particular emphasis on agricultural and forestry problems. Methods for estimation of nonmarket prices. Cost benefit analysis of long term natural resource use and environmental policy. Elementary computer simulation of long term resource use and environmental policy.

5603* Advanced Agricultural Finance. Prerequisite: 3603. Financial structure of agriculture, firm financial planning and management, financial intermediation in agriculture and agricultural finance in developing countries.

5703* Economics of Agriculture and Food Policy. Prerequisites: 4703 and 5103. Application of welfare criteria and economic analysis to agricultural, food and rural development problems and policies.

5713* Rural Regional Analysis. Prerequisite: 5103. Concepts of market and nonmarket based rural welfare; theories of regional growth as applied to rural areas; methods of regional analysis including computable general equilibrium; analysis of policies and programs for improving welfare of rural population groups.

5723* Rural Development Planning. Economics of market based planning for developing and developed countries; methods of incentive planning with emphasis on agricultural and rural project analysis; methods of agricultural and rural sector incentive planning with emphasis on general equilibrium results.

5733* International Agricultural Policy and Development. Review and evaluation of agricultural trade and development policies emphasizing developing countries. Objectives, constraints and instruments of national food and agricultural trade policy in an interdependent world. Efficiency, stability, distribution, equity and market structure in commodity trade.

5990* Advanced Studies. 1-6 credits, maximum 6. Open to graduate students with consent of instructor only. Investigation in designated areas of agricultural economics.

6000* Research Problems. 1-15 credits, maximum 24. Open to students pursuing graduate study in agricultural economics beyond the requirements for a master's degree. Independent research and thesis under the direction and supervision of a major professor.

6102 Teaching Practicum in Agricultural Economics. Lab 4. Prerequisites: two semesters of graduate study in agricultural economics. Philosophies of resident and nonresident teaching, general tasks performed, review, evaluation and lecture organization, preparation and presentation.

6103* Advanced Applications of Mathematical Programming. Prerequisites: 5103, 5113. General presentation of nonlinear optimization theory and methods followed by applications of linear programming. Use of GAMS/MINOS optimization software package.

6113* Systems Analysis for Agriculture. Prerequisites: 5103, STAT 4043, knowledge of BASIC or FORTRAN. Methodology of systems modeling developed. Problem definition, design of abstract models and the simulation of dynamic agricultural systems with time delays, storage, feedback and stochastic variation. Theory and application of modeling with differential equations and optimal control procedures.

6213* Advanced Econometrics. Prerequisites: 5213 or ECON 5243, STAT 4203 and 4213 recommended. Using advanced econometric techniques in applied research. Linear and nonlinear hypothesis testing, non-nested hypothesis tests, Monte Carlo hypothesis testing, stochastic simulation, ARIMA models, and multivariate time series modeling. Extensive use of SAS and SHAZAM statistical software packages.

6300* Agricultural Marketing Seminar. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Current developments in theory, techniques for evaluating marketing behavior, market legislation and market development.

6303* Advanced Agricultural Marketing. Prerequisite: 5303. Marketing theory, market structure and performance, governmental regulation and policy, and bargaining in agricultural markets.

6400* Seminar in Farm Management and Production Economics. 1-6 credits, maximum 6. Prerequisite: 5403 or consent of instructor. Scientific research methodology applied to problems of resource efficiency.

6403* Advanced Production Economics. Prerequisite: 5403. Micro dynamic production economic problems under risky conditions; recent developments in agricultural risk management, measuring utility, stochastic efficiency and decision theory; potential application of inventory, replacement, simulation, game theoretic, Bayesian and nonlinear programming models in production economics research.

6700* Agricultural Policy and Rural Resource Development Seminar. 1-2 credits, maximum 2. Frontier issues in agricultural policy, natural resources and rural development.

Agricultural Education (AGED)

2303 Personal Leadership Skills in Agriculture. Self-awareness and understanding of behavior preferences. Recognition and development of opportunities for self-improvement. Personal values and use of those values to guide goals and decisions. Effective uses of interpersonal skills to improve quality of relationships and service to others. Awareness of and the ability to present information about issues related to agriculture. Improvement of personal effectiveness.

3101 Laboratory and Clinical Experiences in Agricultural Education. Preprofessional clinical experiences. Preparation for student teaching. Laboratory and clinical experiences to enhance technical skills.

3103 Foundations and Philosophies of Teaching Agricultural Education. Lab 2. Prerequisite: 21 semester credit hours in agriculture with a 2.50 GPA. Roles and responsibilities of the agricultural education teacher; types of program offerings; steps of the teaching-learning process; planning for agricultural education in relation to other educational programs in school systems.

3203* Planning the Community Program in Agricultural Education. Lab 2. Prerequisite: 3103. Determining resources and trends of local communities with respect to agricultural education and agribusiness. Emphasis on agricultural education program policies, FFA chapter advisement, planning and managing the instructional program, identification and completion of records and reports required of a teacher of agricultural education in Oklahoma.

3303* Leadership Skills for Agricultural Organizations. Identification of styles and roles of leadership: development of leadership techniques and skills required in working with organizations and youth groups; dynamics of group action, methods of resolving conflict, of communicating, of guiding, and of evaluating; ethical considerations for leaders.

3403 Agricultural Agencies and Information Transfer. Prerequisites: junior standing or consent of adviser. Enabling legislation having an impact on federal and state agricultural agencies; corporate agricultural groups, cooperatives, federal, state and private agricultural research entities/organizations and farm organizations. Scope of U.S. and Oklahoma agriculture. Systems providing technical information, financing, markets and distribution of agricultural and food products. Theory involving the dynamics of change, diffusion of innovations and mediums of communication.

4103* Methods and Skills of Teaching and Management in Agricultural Education. Lab 2. Prerequisites: 3203, junior standing in the College of Agriculture, full admission to the University Teacher Education program and concurrent enrollment in 4200. Facets of the teaching-learning process including teaching methods, basic teaching skills, proper classroom management techniques and motivational techniques and ideas. Preparation for student teaching which is to be completed during the same semester.

4113 Laboratory Instruction in Agricultural Education. 10 credits. Lab 30. Prerequisites: 3103, 3203, concurrent enrollment in 4103 and 4200. Methods of teaching agricultural education in a laboratory setting. A study of laboratory safety instruction, methods of teaching, and application of technical agricultural skills to the secondary program.

4200 Student Teaching in Agricultural Education. 10 credits. Lab 30. Prerequisites: 3203, junior standing in the College of Agriculture, full admission to the University Teacher Education program and concurrent enrollment in 4103. Full-time directed experience in an approved agricultural education department. Applications of methods and skills in agricultural education as related to selecting, adapting, utilizing, evaluating curriculum materials and experiences to meet educational goals and facilitate learning for individual students. Roles, responsibilities, interactions, of school personnel and parents. Study of professional education groups and organization and operation of school systems. Graded on a pass-fail basis.
4030 Professional Development in Agriculture. Prerequisite: junior standing. Preparation of professionals in agricultural business and industry and related areas who have career goals directed toward service, leadership, management, communications, production, processing, marketing, and education outside the public school setting. Development of professionalism through relationship building, networking, interviews, community involvement, business correspondence, websites and the resume.

4300 Agricultural Education Internship. 3-6 credits, maximum 6. Prerequisites: professional course sequence and consent of adviser/internship coordinator. Supervised full-time internships in approved county extension offices, agricultural businesses or government agencies, for students preparing career paths in agricultural education. Not intended for teacher certification. Maximum credit requires a 12-week internship in addition to a report and final seminar.

4713 (International Programs in Agricultural Education and Extension. World hunger and its root causes. The function of international agencies, organizations, foundation and churches in improving the quality of life for people of the developing nations. Roles of agricultural education and extension at all levels for enhancing the effectiveness of indigenous programs of rural development and adult education.

4990 Seminar and Problems in Agricultural Education. 1-3 credits, maximum 6. Small group and/or individual study and research in problems relating to programs of occupational education in agriculture.

5000 Research and Seminar. 1-6 credits, maximum 6. Independent research and thesis under the direction and supervision of a major professor.

5100 Organizing Curriculum and Programs of Agricultural Education. 1-3 credits, maximum 6. Studies of student and community agricultural needs as bases for localizing, personalizing and utilizing a basic core curriculum and other components essential to effective local agricultural education programs.

5123 Adult Programs in Agricultural and Extension Education. Determining adult needs, priorities, participation in educational activities and adoption of new ideas and practices. Designing, organizing conducting, and evaluating adult education programs in agricultural and extension education.

5500 Directing Programs of Supervised Experience. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Determining the supervised training needs and opportunities of individual students. Planning for supervision of agricultural education training programs and 4-H club projects. Analysis of training opportunities in production agriculture, agricultural businesses and individual career development.

5752 Leadership in Agriculture. Lab 2. Concepts, principles and philosophies of leadership applied to agricultural contexts. Importance of traits, perceptions and behaviors to success of agricultural professionals in leadership roles. Dimensions and style of leadership for varying situations.

5823 Advanced Methods of Teaching Agriculture. Advanced concepts and methods relevant for both formal and informal presentations. Effects methods may have on individuals involved in the learning experience. Demonstrations of proficiency in use of various advanced methodologies, technologies and concepts.

5863 Methods of Technological Change. Processes by which professional change agents influence the introduction, adoption, and diffusion of technological change. Applicable to persons who work closely with people in formal and non-formal educational settings.

5900 Graduate Internship in Agriculture. 1-6 credits, maximum 6. Prerequisite: admission to Master of Agriculture program; consent of graduate coordinator. Supervised internship in agricultural education, government agency, industry, Cooperative Extension, or not-for-profit organizations.

5940 Styles of Leadership for Agricultural Education. 1-3 credits, maximum 8. Study of what leadership is and how current leadership styles have an impact on the success of present day agricultural organizations. Utilization in reference bank of videotapes of current leaders as reference base for study.


5990 Problems in Agricultural and Extension Education. 1-3 credits, maximum 8. Securing and analyzing data related to special problems or investigation in designated areas of agricultural education.

6000 Research in Agricultural Education. 1-16 credits, maximum 16. Prerequisite: approval of major adviser. Open to students pursuing graduate study beyond the requirements for a master’s degree. Independent research and thesis under the direction and supervision of a major professor.

6100 Developments in Agriculture and Extension Education. 1-3 credits, maximum 6. Developing trends in agricultural and extension education. Pending and anticipated organizational and structural changes and changing emphases in goals and objectives. Functional relationships with other agencies.

6103 History and Philosophical Foundations of Agricultural and Extension Education. Prerequisite: graduate standing. History and philosophical foundations of agricultural and extension education. Philosophy and its role in life, rise of education in America, philosophical foundations of education in America, legislation having an impact on agricultural and extension education, education in agriculture, and current issues in agricultural extension education.

6120 Teaching Agriculture in Higher Education. 1-3 credits, maximum 6. The teaching-learning matrix functioning in both undergraduate and advanced study in the field of agricultural education. Discriminate review and assessment of recently developed instructional methods and trends.

6200 County Extension Program Development. 1-3 credits, maximum 6. A systematic study and use of methods of developing county extension programs, giving attention to sources of essential basic information, determination of problems and needs of people, functions of lay people and the various groups of extension workers. Uses of committees, step-by-step procedures, coordinated county and state plans and characteristics of effective programs.

6223 Program Evaluation in Agriculture and Extension. Prerequisite: graduate standing. Program evaluation theory and methodology (quantitative and qualitative) presented through a service learning framework. Problem-based approach having students submit a proposal that addresses an evaluation need presented by a community-based program.

Agriculture (AG)

1011 Orientation. Required of all freshmen in the College of Agricultural Sciences and Natural Resources. Methods of study, advisement system, organization of curriculum and discussion of requirements and career opportunities in various fields of agriculture. Graded on pass-fail basis.

2003 (N)Agriculture and the Environment. A study of agricultural ecosystems for the non-agriculture major. Discussion of contemporary issues related to agriculture and the environment including conservation of natural resources, water quality, use of fertilizer and chemicals, intensive animal production, animal well-being, land utilization, and use of genetically engineered plants and animals.

2112 Microcomputer Techniques in Agriculture. Lab 2. Operation and capabilities of microcomputers in agricultural applications. Simple programming, data analysis, graphical display, spreadsheets, word processing.

3010 Internships in Agriculture. 1-3 credits, maximum 12. Supervised internships with business, industry or governmental agencies including cooperating veterinarians. Graded on pass-fail basis.

3080 International Experience. 1-18 credits, maximum 36. Prerequisite: consent of the associate dean of the college. Participation in a formal or informal educational experience outside of the USA.

3090 Study Abroad. 1-18 credits, maximum 36. Prerequisites: consent of the Study Abroad office and associate dean of the college. Participation in an OSU reciprocal exchange program.

4010 Honors Seminar. 1-6 credits, maximum 6. Role of agriculture in society and adjustments to change in the economy.

American Studies (AMST)


3950 Special Topics in American Studies. 3 credits, maximum 6. Particular topics (popular culture, regionalism, myth, subcultures, race, ethnicity) to illustrate the use of interdisciplinary methods in American studies.
Animal Science (ANSI)

1124 Introduction to the Animal Sciences. Lab 2. Species adaptability, product standards and requirements, areas and types of production, processing and distribution of products, includes meat animals, dairy and poultry.

1133 Fundamentals of Food Science. Food industry from producer to consumer and the current U.S. and world food situations.

1223 Exploring the Science of Animal Agriculture. Lab 2. An introductory course describing the principles, methods, applications and value of biological research with farm animals. Course also offered for honors credit.


2253 Meat Animal and Carcass Evaluation. Lab 2. Prerequisite: 1124. Evaluation of carcases and wholesale cuts of beef, pork and lamb; factors influencing grades, yields and values in cattle, swine and sheep.

3012 Beef Production. Lab 2. Prerequisites: 1124 and 2123. Modern production and management practices for beef cattle operations. No credit for animal science students with credit in 4612, 4621, 4631 or 4641.

3021 Sheep Production. Lab 2. Prerequisites: 1124 and 2123. Modern production and management practices for sheep operations. No credit for animal science students with credit in 4542.

3031 Swine Production. Lab 2. Prerequisites: 1124 and 2123. Modern production and management practices for swine operations. No credit for animal science students with credit in 4643.

3033 Meat Technology. Lab 3. The basic characteristics of meat and meat products as they relate to quality. Product identification, economy, nutritive value, preservation and utilization. No credit for students with credit in AGRON 2233 or 3333.

3101 Undergraduate Seminar. Prerequisites: 60 credit hours and animal science major status. An in-depth consideration of the various areas of specialization in the field of animal science and their associated career opportunities and obligations.

3113 Quality Control. Lab 2. Prerequisites: organic chemistry and MICRO 2124 or equivalent. Application of the principles of quality control in food processing operations to maintain the desired level of quality.

3154* Food Microbiology. Lab 2. Prerequisites: MICRO 2124 and organic chemistry. Relationship of microorganisms to food manufacture and preservation, to food spoilage and microbial food poisoning and to various aspects of primary food production. Same course as MICRO 3154.

3182 Meat Grading and Selection. Lab 4. Prerequisite: 2253. Classifying and grading carcases and wholesale cuts of beef, pork and lamb; factors influencing quality and value.

3210 Animal and Product Evaluation. 1-2 credits, maximum 4. Prerequisite: consent of instructor. Advanced instruction in evaluating slaughter and breeding animals, and grading and evaluating meat, poultry and dairy products.


3301 Food Sanitation Laboratory. Lab 2. Prerequisites: 3323 or concurrent enrollment, and MICRO 2124. Exercises to illustrate quantitative or qualitative methods for monitoring foods, food ingredients or processing procedures and equipment for proper attainment of sanitation.

3302 Food Sanitation. Prerequisite: organic chemistry. Principles of sanitation in food processing, distribution, preparation and service. Emphasis on control of food spoilage and food-borne illnesses.

3333* Meat Science. Lab 3. Prerequisites: 2253, CHEM 1215 or equivalent. Anatomical and basic chemical and physical characteristics of meat animals studied. The application of scientific principles to the processing and economical utilization of meat animals, as well as in the manufacture of meat products, emphasized in the laboratory.

3373 Food Chemistry. Lab 2. Prerequisite: 3543 or organic chemistry. Basic composition, structure and properties of foods and the chemical changes or interactions that occur during processing and handling.

3422 Horse Management and Production. Nutrition, feeding, reproduction and physical conditioning of horses. Current management concepts as they apply to the health and well being of horses.

3423* (N) Animal Genetics. Prerequisite: introductory biology. The basic principles of heredity including: kinds of gene action, random segregation, independent assortment, physical and chemical basis of heredity, mutations, sex-linkage, chromosome mapping, multiple alleles and chromosomal inversion; introduction to quantitative inheritance and population genetics.

3433* Animal Breeding. Lab 2. Prerequisite: 3423. The application of genetic principles to livestock improvement; study of the genetic basis of selection and systems of mating; and the development of breeding programs based on principles of population genetics.


3493* Marketing and Utilization of Milk. Lab 2. Prerequisites: 1124 and AGEC 1114. Marketing and utilization of milk, pricing, quality control, procurement, processing and utilization, product distribution and factors affecting consumption.

3523 Pet and Companion Animal Management. Current concepts and management principles related to pet and companion animal species and their roles in society. Discussion of the human-animal bond, service animals, kennel and catery management, anatomy, internal and external parasites, toxins, restraint and handling, training, reproduction, nutrition, genetics and breeding.

3543* (N) Principles of Animal Nutrition. Prerequisite: CHEM 1215 or equivalent. Basic principles of animal nutrition including digestion, absorption and metabolism of the various food nutrients; characteristics of food components; measure of body needs; ration formulation.

3603* Processing Dairy Foods. Lab 3. Prerequisites: MICRO 2124 and organic chemistry. Theory and practice in formulation and processing: butter and margarine, cottage cheese, blue and processed cheeses; evaporated and sweetened condensed milk; ice cream; ice milk and other frozen desserts.

3612 Rangeland and Pasture Utilization. Lab 2. Prerequisite: AGRON 3213 or 3913. Integration of livestock production with rangeland and pasture management practices.

3653* Applied Animal Nutrition. Lab 2. Prerequisite: 3543. Composition, characteristics and nutritive value of feeds and ration additives; qualitative and quantitative nutrient requirements of each of the classes of livestock; formulation of rations for each of the classes of livestock.

3753 Basic Nutrition for Pets. Nutrients, nutrient requirements, feeding practices, food sources and diet management for pets and companion animals as well as exotic animals and birds.

3763* Analysis of Food Products. Lab 2. Prerequisite: organic chemistry. Application of quantitative chemical and physical methods of analysis to the examination of foods.

3903 (N) Agricultural Animals of the World. The production and utilization of agricultural animals by human societies.

4023 Poultry Science. Lab 2. Prerequisites: 1124, and 2123 or 3543. The relationship of the biological concepts and functions of poultry to management practices, incubation procedures, and economic factors utilized by poultrymen in the commercial production of table and hatching eggs, broilers, turkeys and other poultry meat.

4333* Processed Meat. Lab 3. Prerequisite: 3033 or 3333. Meat and meat product composition. Techniques in the molding and forming of meat; sausage formulation; curing; quality control; and cost analysis.

4423 Horse Science. Lab. 2. Prerequisites: 3433, 3443 and 3653. Current concepts and production principles related to the horse industry including nutrition, reproduction, herd health, functional anatomy and implications, social behavior, and applying principles of psychology in horse management and training.

4553* Sheep Science. Lab 2. Prerequisites: 3433, 3443 and 3653. Breeding, feeding, management and marketing of commercial and purebred sheep.

4613* Cow-Calf and Purebred Beef Cattle Management. Lab 2. Prerequisites: 3433, 3443, and 3653. Application of scientific knowledge, management principles and research advances to modern commercial cow-calf and purebred beef cattle production.

4632* Stocker and Feedlot Cattle Management. Lab 2. Prerequisites: 3612, 3653. Application of scientific knowledge, management principles and research advances to modern stocker and feedlot cattle operations.

4643* Swine Science. Lab 2. Prerequisites: 3433, 3443 and 3653. Application of genetic, physiological, microbiological, nutritional and engineering principles to the efficient production of swine.

4712 Livestock Sales Management. Lab 2. Prerequisite: 3433. Advertising of purebred livestock; performance data and breeding values in the merchandising of purebred livestock; photography and ad copy layout; conduct of an actual livestock auction, including animal selection, advertising, animal preparation, clerking, receipt of payments, sales budgets and transfer of registration papers.

4803* Animal Growth and Performance. Prerequisite: an upper-division course in animal science. Physiological and endocrine factors affecting growth and performance of domestic animals.

4843 Applications of Biotechnology in Animal Science. Lab 3. Prerequisites: 3423 and BIOCH 3653. Training in current biotechniques used in protein, hormone and molecular genetic research in food and animal science. Theory and applications of the various techniques.

4853 Capstone for Animal Agriculture. Lab 2. Prerequisite: senior standing. Examination of the role of animal agriculture in society, the importance of research and current issues. Oral and written reports.

4900 Special Problems. 1-6 credits, maximum 6. Prerequisite: consent of instructor. A detailed study of an assigned problem by a student wishing additional information on a special topic.

4910* Animal or Food Industry Internship. 3-12 credits, maximum 12. Prerequisite: consent of instructor. Full-time internship at an approved production, processing or agribusiness unit or other agency serving animal agriculture. Maximum credit requires a six-month internship in addition to a report and final examination. Graded on a pass-fail basis.

4973 Rangeland Resources Planning. Lab 3. Prerequisites: 3612 and AGRON 4954. Inventory or range resources; survey and evaluation of ranch practices, and economic analysis. Development of a comprehensive ranch management plan. Managing rangeland and ranch resources in a social context. Written and oral reports. Field trips required. Same course as AGRON 4973.

5000* Research and Thesis. 1-6 credits, maximum 6. Independent research planned, conducted and reported in consultation with a major professor.

5010* Special Problems. 1-3 credits, maximum 6. Special problems in areas of animal science other than those covered by the individual graduate student as a part of his research and thesis program.

5110* Seminar. 1 credit, maximum 3. A critical review and study of the literature; written and oral reports and discussion on select subjects.

5113* Basic Reproductive Physiology. Prerequisite: ZOOL 3204. Female and male reproductive processes, the influences of environmental factors upon these processes and the application of reproductive physiology to animal production.

5120* Special Topics in Food Science. 1-4 credits, maximum 4. Prerequisites: graduate standing and/or consent of instructor. Advanced topics and new developments in food science especially with reference to foods of animal origin.

5213* Advances in Meat Science. Prerequisites: BIOCH 4113 and ZOOL 3204 or equivalent. Development of muscle and its transformation to meat. Properties of meat and their influence on water-binding, pigment formation, texture and fiber characteristics.

5303* Advanced Animal Breeding. Prerequisites: 3433 or equivalent and STAT 4013. Basic concepts of population genetics as related to theoretical animal breeding including heritability, genetic correlations, selection methods, inbreeding and heterosis.

5373* Advanced Ruminant Nutrition. Lab 2. Prerequisite: 3653. Factors influencing nutrient requirements of ruminants for maintenance, growth, re-proportion and lactation, and their implications with regard to husbandry practices and nutritional management of livestock; application of current concepts of ruminant livestock nutrition; use of microcomputer programs in diet evaluation and formulation, beef gain simulation, and problem solving.

5720* Advanced Nonruminant Nutrition. Prerequisite: BIOC 3653. An in-depth study of the digestion, absorption and metabolism of nutrients in nonruminant domesticated farm animals. Unique metabolic characteristics of nonruminant species contrasted with ruminant animals. Fundamentals of energetics as related to animal performance.

5722* Protein Nutrition. Prerequisite: BIOC 5753. Nutritional, biochemical and clinical aspects of protein metabolism as it relates to nutritional status.

5782* Vitamin and Mineral Nutrition. Prerequisite: BIOC 5753. Development of the concept of dietary essential minerals and vitamins. Individual minerals and vitamins for animal species from the standpoint of chemical form, availability, requirements, biochemical systems, deficiencies and excesses, and estimation in foods and feed.

6000* Research and Thesis. 1-10 credits, maximum 30. Prerequisite: M.S. degree. Open only to students continuing beyond the level of the M.S. degree. Independent research, planned, conducted and reported in consultation with and under the direction of a major professor.

6003* Population Genetics. Prerequisites: 5303 or equivalent and STAT 4023. Population concept of genetics with emphasis on quantitative inherited traits and statistical techniques utilized in population genetics. Gene and genotypic frequencies, estimation of genetic parameters within a population and the forces which can alter the magnitude of these genetic parameters and inbreeding.

6010* Special Topics in Animal Breeding. 1-3 credits. Prerequisite: consent of instructor. Advanced topics and new developments in animal breeding and population genetics.

6110* Seminar. 1 credit, maximum 3. A critical analysis of the objectives and methods of research in the area of animal science. Review of the literature, written and oral reports and discussion on select topics.

Anthropology (ANTH)

2353 General Anthropology. Anthropology, emphasizing the study of human physical evolution (physical anthropology) and cultural evolution (archaeology).

3353* Cultural Anthropology. Introduction to culture, various sub-disciplines of cultural anthropology, anthropological concepts and capsule ethnographies of assorted ethnic groups.

3823 North American Indian Cultures. Pre-contact and traditional subsistence patterns, social organization and ideology with emphasis on specific groups in each culture area.

4123 Archaeology of North America. Factors influencing the initial peopling of North America, the spread and diversification of hunting and gathering economies, the rise of agricultural systems and emergence of extensive and complex political units.

4633* Racial and Cultural Minorities. Ethnic and racial groups in contemporary pluralistic society, including a cultural-historical perspective on their origins, social relations, value systems and goals.
Applying Behavioral Studies in Education (ABSE)

5793 Intellectual Assessment of Children and Youth. Prerequisites: 5783 or consent of instructor. Adm to the psychology program or consent of the instructor. Directed readings or research on significant topics in anthropology.

4990 Special Topics in Anthropology. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Directed readings or research on significant topics in anthropology.

Applied Behavioral Studies in Education (ABSE)

5793 Intellectual Assessment of Children and Youth. Prerequisites: 5783 or consent of instructor. Adm to the psychology program or consent of the instructor. Directed readings or research on significant topics in anthropology.

Architecture (ARCH)

1111 Introduction to Architecture. Lab 2. An introduction to the School of Architecture and OSU resources and how to use them. Introduction to the professional practice and architectural engineering and the issues facing these professions in the next century. Introduction to the educational processes and objectives required for becoming a professional architect or architectural engineer.

2216 Architectural Design Studio III. Lab 16. Prerequisite: grade of "C" or better in 2116. Problems in architectural design.

2263 Building Systems and Materials. Prerequisite: grade of "C" or better in 2116. Architectural, structural, environmental control systems and materials in architecture.


3083 (H) History and Theory of Baroque Architecture. Prerequisite: 2003. History and theory of baroque architecture in the west world particularly the later, baroque period.

3100 Special Topics in Architecture. 2-6 credits, maximum 12. Subjects to be selected by the faculty in architecture from advances in state-of-the-art areas.

3116 Architectural Design Studio IV. Lab 16. Prerequisite: grade of "C" or better in 2216 and admission to third year. Problems in architectural design.

3126 Structures: Steel, Timber and Concrete. Lab 4. Prerequisite: grade of "C" or better in 2116. Analysis and design of steel, timber and concrete structures in architecture.

3134 Environmental Control: Thermal Systems and Life Safety. Lab 2. Prerequisite: MATH 1715 or MATH 1513. A survey of the fundamental and mechanical systems for buildings as well as the basic principles of life safety.

3143 Structures: Analysis I. Prerequisite: grade of "C" or better in ENSC 2143. Structural theory for applications in architecture.

3216 Architectural Design Studio V. Lab 16. Prerequisite: grade of "C" or better in 3116. Problems in architectural design.

3223 Structures: Timbers. Lab 2. Prerequisite: grade of "C" or better in 3223. Analysis and design of timber structures used in architecture.

3224 Structures: Steel II. Lab 2. Prerequisites: grades of "C" or better in 3126 and 3143. Design and analysis of multi-story steel frames, trusses, arches and other architectural structure components.

3253 Computer Applications in Architecture I. Prerequisite: concurrent enrollment in ARCH 3216. Introduction to 2-D and 3-D AUTOCAD and plotting and their application in the design process.

3323 Structures: Steel I. Lab 2. Prerequisite: grade of "C" or better in 3113. Analysis and design of steel structures used in architecture.

3433* Environmental Control: Acoustics and Lighting. Prerequisite: MATH 1513 or 1715. A survey of architectural acoustics, electrical and lighting systems for buildings.

4034* Computer Applications in Architectural Engineering. Prerequisite: grade of "C" or better in 4143. Computer applications in architectural engineering introducing AUTOCAD; computer programming; and the use of commercial analytical software.

4225* Structures: Concrete II. Lab 4. Prerequisites: grades of "C" or better in 3126 and 3143. Design and analysis of multi-story reinforced concrete frames and prestressed and post-stressed concrete structural components used in application and design.

4273* Field Study in Europe I. Prerequisite: senior standing in architecture or consent of instructor. On-site analysis and study of European architecture, culture and urban design.

4417 Architectural Design Studio VII. Lab 20. Prerequisite: grade of "C" or better in 417. Problems in architectural design.

4443* Structures: Analysis II. Lab 2. Prerequisites: grades of "C" or better in 3434 and MATH 2363. Mathematical formulation of architectural structural behavior. Matrix applications, finite element, finite differences, stability considerations and three-dimensional structural modeling.
5117* Architecture Design Studio VI. Lab 20. Prerequisite: grade of ‘C’ or better in 3216. Problems in architectural design.

5000* Special Problems. 1-6 credits, maximum 6. Lab 3-18. Prerequisite: consent of instructor and head of the School. Theory, research or design in related disciplines. Plan of study to be determined jointly by student and graduate faculty.

5023* Masonry Design and Analysis. Prerequisite: grade of ‘C’ or better in 4123. Analysis and design of low-rise masonry structures and multi-story masonry shear walls including, code requirements, analysis techniques, design of components and detailing of architectural engineering contract documents, conforming to the relevant codes.

5073* History and Theory of the Architecture of Frank Lloyd Wright and His Contemporaries. Prerequisite: 4073. A study of the architecture of Frank Lloyd Wright and his contemporaries in the late 19th and early 20th centuries.

5083* History and Theory of Japanese Architecture. Prerequisite: admission to the professional school or consent of instructor. Historical Japanese architecture from 200 BC to 1980; Shinto, Buddhist, Zen, Sukiyi, Zukuri, Minka and contemporary subjects.

5100* Special Topics. 3-6 credits, maximum 15. Subjects to be selected by the graduate faculty in architecture to cover state-of-the-art advances.

5116* Architectural Design Studio VII. Lab 16. Prerequisites: grades of ‘C’ or better in 3126, 3226, 3236, 4216. Enrollment in appropriate architecture seminar required. Problems in architectural design.


5193* Management of Architectural Practice. Prerequisite: fifth-year standing in architecture or architectural engineering or consent of instructor. Principles of management as applied to the private practice of architecture and architectural engineering.

5217* Architectural Design Studio VIII. Lab 16. Prerequisite: grade of ‘C’ or better in 5116 or consent of instructor. Problems in architectural design.

5233* Advanced Architectural Lighting Design. Prerequisite: 3433. Lighting applications in contemporary architectural design, including offices, schools, churches and health care facilities. Applications of the principles learned to design of the student’s choice.

5293* Architectural Project Management. Prerequisite: fifth-year standing in architecture or consent of instructor. Principles of management as applied to architectural and architectural engineering projects.

5373* Field Study in Europe II. Prerequisite: senior standing in architecture or consent of instructor. On-site analysis and study of European architecture, culture and urban design.

6000* Special Problems. 1-15 credits, maximum 15. Lab 3-18. Prerequisite: consent of instructor and head of the School. Theory, research or design investigation in specific areas of study in the field of architecture and its related disciplines. Plan of study determined jointly by student and graduate faculty.

6053* Computer Applications in Architecture. Lab 3. Prerequisite: MECDT 4013 or equivalent of “C” or better in 4443. Analysis techniques for architectural structures including stability, space frames, computer applications, guyed towers and project research.

6207* Creative Component in Architecture. Lab 20. Prerequisite: 6117. A design project based on a program previously developed by the student to include a written report and supportive documents when appropriate. Must be approved by the project adviser and completed in the final semester of the graduate program.

6214* Graduate Design Studio. Lab 12. Prerequisite: 6117. Independent projects or competitions. May be combined with 6206 with approval of adviser.

6244* Structures: Analysis III. Prerequisite: grade of ‘C’ or better in 4443. Analysis techniques for architectural structures including stability, space frames, computer applications, guyed towers and project research.

6283* Architecture Seminar II. Seminar for graduate students only. Architectural criticism.

6343* Structures: Steel III. Prerequisite: grade of ‘C’ or better in 4443. Plastic analysis and design of structural steel frames utilizing load and resistance factor design.

6543* Structures: Concrete III. Prerequisite: grade of ‘C’ or better in 5244. Design of prestressed concrete structures, including pre- and post-tensioning.

Art (ART)

1103* Drawing I. Lab 6. A freehand drawing experience designed to build basic skills and awareness of visual relationships. A sequence of problems dealing with composition, shape, volume, value, line, gesture, texture and perspective. A variety of media explored.

1113* Drawing II. Lab 6. Prerequisite: 1103. Objective and subjective approaches to visual problem-solving in a variety of black and white and color media. The analysis and manipulation of form, light, space, volume, and the formal aspects of perspective.

1203* Color and Design. Lab 6. Introduction to visual problem-solving. Organization of the two-dimensional plane; line, shape, value, texture, and color theory dealing with its visual and psychological aspects.

1803* Introduction to Art. An introduction to the analysis and interpretation of visual arts. Visual, emotional and intellectual aspects of art in painting, sculpture, printmaking and architecture.

2113* Life Drawing. Lab 6. Prerequisite: 1113. Introduction to life drawing with emphasis on preliminary linear construction and structural aspects of the figure, including the study of general body proportions, rapid visualization and figure-ground relationships.

2283* Three-dimensional Design. Lab 6. Prerequisite: 1103. Exploration of three-dimensional form and space stressing organization of design elements, development of concepts and manipulation of materials. Investigation of linear space, modular ordering, mass/volume and color through projects of a conceptual and applied nature.
2213 Color Theory. Lab 6. Prerequisite: 1103. Intensive, structured investigation into the nature and properties of color. Hue, value, chroma, and additive color mixing theory as well as the expressive qualities, symbolic potential, and psychological impact of pigment color.

2403 Illustration I. Lab 6. Prerequisite: 1113, 1803. Introduction to historic and contemporary illustration and consideration of a wide range of illustrative styles. Required experiments with media and consideration of alternate ways of illustrating a message through conceptual and compositional variations.

2413 Typography I. Lab 6. Prerequisites: 1103, 1113, 1803. An investigation of letter forms and their characteristics and a study of spacing, leading, type selection, layout alternatives, type specification and copy fitting. Preliminary introduction to typography as a communication medium. An understanding of typographic terminology and measuring systems while developing hand skills and introducing computer technology.

2423 Graphic Design I. Lab 6. Prerequisite: 1113. Exploration of basic design principles—line, form and color, as visual communication. Problem solving, generation of ideas, development of concepts and the integration of word and image. Technical and presentation skills.

2603 Art History Survey I. A study of the arts, artists, and their cultures from prehistoric times through the Early Renaissance.

2613 Art History Survey II. A study of the arts, artists, and their cultures from the Early Renaissance to the present.

2623 Research Methods for Art History. Prerequisite: 1803. An introduction to research methodology and writing art history. Required of art history majors.

3110 Life Drawing Studio. 3 credits, maximum 9. Lab 6. Prerequisite: 2113 or consent of instructor. The development of formal and expressive aspects of drawing by direct observation of the figure and its environment. Emphasis on media experimentation, aesthetic considerations, personal concepts, and anatomy.

3123 Oil Painting. Lab 6. Prerequisites: 1113, 2203, or consent of instructor. The development of skills in oil painting stressing form and content, visual perception and individual expression. Technical instruction applicable to individual problems and needs.

3133 Watercolor Painting. Lab 6. Prerequisites: 1103, 2203, or consent of instructor. The development of skills in watercolor painting stressing form and content, visual perception and individual expression. Structured assignments in color mixing, wet-on-dry techniques, wet-into-wet techniques, brush handling, paper supports and surface manipulation.


3343 Jewelry and Metals. Lab 6. Prerequisites: 1113, 2203, or consent of instructor. Fabrication and forming techniques for non-ferrous metals. Cold joining, silver soldering, surface treatment and elementary stone setting. Applications toward either wearable or small scale sculptural format.

3403 Illustration II. Lab 6. Prerequisites: 2403, 2413, 2423. Exploration of typographic communication through a variety of problems. Type as the visual solution with emphasis on its functional, decorative and creative application. Use of computer software to capture, create and alter electronic images for use in graphic design and illustration applications with an emphasis on concept and thematic development.

3423 Graphic Design II. Lab 6. Prerequisites: 2403, 2413, 2423. Use of computer and traditional methods to enhance design skills and solution of design projects from concept to the comprehensive. Evaluation and design of symbols and logos and their various applications, leading to an understanding of system design. Introduction to graphic design production and the preparation of art for reproduction.

3433 Applied Graphic Design. Lab 6. Prerequisite: 2413. Design problems with special attention to signage, exhibition design, packaging, display, and point of purchase. Use of model-building tools and study of structure and form to introduce the student to problem-solving and finishing techniques. Development of concepts into models.

3443 Computer Graphics I. Lab 6. Prerequisites: 2403, 2413 and 2423. Use of computer software to capture, create and alter electronic images for use in graphic design and illustration applications with an emphasis on concept and thematic development.

3503 Ceramics. Lab 6. Prerequisites: 1113, 2203 or consent of instructor. Methods of clay preparation, hand building, wheel forming methods, methods of decoration and glazing, firing and kiln construction. Involvement with ceramic materials and processes.

3603 (H) History of Classical Art. Stylistic, philosophical and formal qualities of art in the Classical world. The creation of the Greek ideal and its dissemination in the Roman world through architecture, sculpture, and painting.

3613 (H) History of Medieval Art. Architecture, sculpture, painting and mosaic in the Christian world, c. 400-1400. Early Christian and Byzantine periods in Southern Europe and concurrent developments in the North, including Carolingian, Romanesque and Gothic.

3623 (H) History of Italian Renaissance Art. Architecture, sculpture and painting in Italy, c.1300-1580. Major artists in their local contexts (e.g. Leonardo in Milan, Michelangelo in Florence, and Titian in Venice).

3633 (H) History of Baroque Art. Art in 17th century Europe. Architecture, sculpture and painting of the Catholic Reformation (e.g. Caravaggio and Bernini in Italy, Velasquez in Spain, Rubens in Flanders), concluding with painting in non-sectarian, Protestant Netherlands (Rembrandt and Vermeer).

3643 History of Graphic Design. Evolution of graphic communication from prehistoric times to the present. Investigation of the origins of printing and typography in Europe leading to the design of the printed page, the impact of industrial technology upon visual communication and the study of the growth and development of modern graphic design.

3653 (H) History of 19th Century Art. Art of 19th century Europe—ideals, conflicts, escapes and triumphs, beginning with the French Revolution and ending in 1900.

3663 (H)History of American Art. Visual arts in America from the Colonial period to the present. Major styles, ideas and uses of material in architecture, painting, sculpture and design.

3673 (H)History of Northern Renaissance Art. Art in Northern Europe, c. 1200-1550. Panel painting in the Netherlands (e.g. Van Eyck, Bosch), and book illustration in Germany (Dürer).

3683 (H,I)Survey of Asian Art. Arts of India, China, Japan and related countries in their historical and cultural settings. Traditions of painting, sculpture and architecture from their beginnings to the modern period.

3700 Printmaking: Relief. 3 credits, maximum 9. Lab 6. Prerequisites: 1113 or consent of instructor. Understanding and control of carving, processing and creating prints from wood, linoleum and plastic. Development of images utilizing both traditional and contemporary approaches to relief printmaking.

3720 Printmaking: Intaglio. 3 credits, maximum 9. Lab 6. Prerequisites: 1113 or consent of instructor. Understanding and control of intaglio techniques; preparation, processing, and editing of images from metal plates. Development of concepts and images through traditional and contemporary approaches to the intaglio process.

3730 Printmaking: Lithography. 3 credits, maximum 9. Lab 6. Prerequisites: 1113 or consent of instructor. Understanding and control of the procedures of drawing, processing and printing editions from stones and metal plates. Development of concepts and images through the medium of lithography.

4100 Advanced Drawing. 3 credits, maximum 9. Lab 6. Prerequisite: 3110. Investigation of drawing stressing the development, abstract ideas and individual imagery.

4120 Oil Painting Studio. 3 credits, maximum 9. Lab 6. Prerequisite: 3123. Oil painting with emphasis on personal development of visual ideas and technique.
4623
(H) History of Prints and Printmaking. A survey of graphic art in Europe and the United States, c. 1450-1950. Woodcut, intaglio and lithography by major masters (e.g. Dürer, Rembrandt, Goya, Picasso). Print as a document of social history in the West. 1.5 credits, maximum 6. Lab 6. Prerequisites: 3333, 4413 or consent of instructor. Self-designed special topics in studio art or graphic design. By contract only.  

5203* 
Arts Marketing and Audience Development. An examination of marketing arts events. Public relations and promotions, subscription sales, event sales and box office management, and developing new audiences. 3 credits, maximum 6. Lab 6. Prerequisites: 3333, 4413 or consent of instructor. Self-designed special topics in studio art or graphic design. By contract only.  

5303* 
Fundraising and the Arts. Basic charitable fundraising strategies including development of ongoing donor programs, fundraising events, planned giving, corporate and business sponsorships and grantwriting. 1-3 credits, maximum 6. Lab 6. Prerequisites: 4413 or consent of instructor. Self-designed special topics in studio art or graphic design. By contract only.  

5403* 
Law and the Arts. Legal and contractual issues specific to fine and performing arts organizations. Establishment and maintenance of 501c not-for-profit organizations, unions and contracts, ADA compliance and OSHA. 1-3 credits, maximum 6. Lab 6. Prerequisites: 4413 or consent of instructor. Self-designed special topics in studio art or graphic design. By contract only.  

Arts and Sciences (A&S)  

1100 
An Introduction to the Arts. 1-3 credits, maximum 6. Prerequisites: participation in the Oklahoma Summer Arts Institute and consent of department head. Workshop experience in creative writing, dramatic performance, studio arts or music performance. Enrollment restricted to Oklahoma Summer Arts Institute participants.  

1111 
Freshman Orientation. Orientation for freshmen. Study techniques, evaluation of one’s abilities and the making of proper educational and vocational choices.  

1221 
Honors Freshman Orientation. Prerequisite: Honors Program participation. Orientation for freshmen to Arts and Sciences Honors program, introduction to University academic expectations, techniques for achieving academic success, and substantive introduction to material in selected academic disciplines. No credit for students with credit in A&S 1111.  

2000 
Special Topics. 1-3 credits, maximum 6. Selected interdisciplinary topics presented in lecture or seminar format.  

3003 
Arts and Sciences Honors Supervised Research. Prerequisites: Honors Program participation, consent of instructor and A&S Honors program director. Introduction to research or other creative activity in student’s major field through participation in professor’s research or creative activities.  

3080 
International Experience. 1-18 credits, maximum 36. Prerequisite: consent of the Study Abroad office and associate dean of the college. Participation in an O S U reciprocal exchange program.  

5010* 
Arts Management Principles. Basic principles of managing performing arts and art museum organizations. Relationships of arts organizations to the community, budgeting, structure, income sources.
Astronomy (ASTR)

1014 (N) The Solar System. Recent discoveries about the sun, planets, moons, asteroids, meteoroids, and comets; formation and future of the solar system; interplanetary travel, colonization, terraforming, and the search for extraterrestrial life. Offered in the fall semester. No credit for those with credit in 1104.

1024 (N) Stars, Galaxies, and the Universe. Recent discoveries about the structure and life cycles of stars, galaxies and the universe; the search for extraterrestrial intelligence; interstellar travel, black holes, wormholes, and black holes. Offered in the spring semester. No credit for those with credit in 1104.

3023 Astrophysics. Prerequisite: PHYS 2114 or consent of instructor. ASTR 1024 recommended. Analysis and interpretation of astronomical phenomena in terms of the laws of physics; e.g., stellar structure, the interstellar medium, galaxies and cosmology.

Aviation Education (AVED)

1113 Theory of Flight. A ground school course covering Federal Aviation Regulations, theory of flight, power plant operation, service of aircraft components, navigation and meteorology. Fulfills the ground school training needed for a Private Pilot Certificate.

1222 Primary Flight Laboratory. Lab 4. Meets the flight requirements for the FAA Private Pilot Certificate. Flight instruction conducted under FAR Part 141. Special fee required. Graded on a pass-fail basis.


1503 History of Manned Space Flight. Significant historical concepts and events leading to the current status of space exploration.

2113 History of Aviation. History of aviation from its early developments to the present. Historic events and the role of government as they relate to the evolution of the regulatory infrastructure of the aviation industry.

2122 Commercial Flight Laboratory I. Lab 4. Prerequisite: 1222. First of three flight laboratories required for FAA commercial flight certifi cate with instrument rating. Flight instruction conducted under FAR Part 141. Special fee required.

2132 Commercial Flight Laboratory II. Lab 4. Prerequisite: 2122. Dual instrument flight instruction to meet requirements for FAA instrument rating. Flight instruction conducted under FAR Part 141. Special fee required.

2142 Commercial Flight Laboratory III. Lab 4. Prerequisite: 2132. Final flight lab to meet requirements for the FAA commercial pilot certificate. Flight instruction conducted under FAR Part 141. Special fee required.


2203 Impact of Aviation and Space Exploration on Society. Survey of significant events and ideas and their economic and social impact on society.

2213 Theory of Instrument Flight. Prerequisite: 1403. Instrument flight rules, the air traffic system and procedures, the elements of forecasting weather trends. Preparation for FAA instrument computer-based knowledge exam.


2633 Air Traffic Control and the National Airspace System. Prerequisite: 1113. In-depth knowledge in the subject of air traffic control and the national airspace system facilities, equipment and associated development. Enroute and terminal control areas, computerization and automation, flight service systems, ground-to-air systems and integrated telecommunications networks.


3243 Human Factors in Aviation. Prerequisite: PSYC 1113. The study of people interacting with the aviation environment. Individual and group performance, equipment design, physical environment, and procedure development.

3333 Advanced Aircraft Systems. Prerequisite: 2313. Study of complex aircraft systems. Electronic flight instruments, inertial navigation, and aircraft monitoring systems.

3341 Multi-engine Flight Laboratory. Lab 2. Prerequisites: Private Pilot Certificate and FAA Third-class Medical Certificate. Dual flight instruction to meet requirements for the FAA multi-engine rating. Flight instruction conducted under FAR Part 141. Special fee required.

3441 Aerobatic Flight. Lab 2. A minimum of ten hours dual flight training. Basic, intermediate and advanced aerobatic flight maneuvers including sequencing and dimensional box spacing. Special fee required.

3443* Aviation Law. Prerequisite: LSB 3213. Insight pertinent to federal governing bodies in addition to local and international laws forming the present structure of aviation law. Practices and pitfalls in aviation activities and a basic legal research capability.

3513 Aviation Management. Prerequisite: 50 credit hours. Managing the major elements of the aviation industry including aircraft manufacturing and air transportation system.

3523 Airport Planning and Management. Prerequisite: 50 credit hours. Overview of the major functions of airport management including master planning. Study of the socio-economic effects of airports on the communities they serve.

3533 Aircraft Turbine Engine Operation. Principles of physics and gas laws pertaining to turbine powered aircraft operation. Turbine powerplant systems theory with emphasis on safe and efficient operation of turbine powered aircraft.

3553* General Aviation Management. Prerequisite: 50 credit hours. Functions of management in general aviation and airport operations including information systems, maintenance, regulatory impact, physical facilities, flight operations, political forces and administration.

3563 Aviation Marketing. Prerequisite: 50 credit hours. Marketing aviation products for the major elements of the aviation industry.
3573 Aviation Finance. Prerequisite: 50 credit hours. Financing the major elements of the aviation industry including general aviation, aircraft manufacturing and airports.

3663* Air Transportation: The Industry. Prerequisite: 50 credit hours. Broad understanding of the air transportation industry and an in-depth knowledge of the organizational structures, managerial functions and operational aspects of today's major, national, and regional air carriers. Historical perspectives, regulators and associations, economic characteristics, labor relations and marketing of modern air carriers.

4100* Specialized Studies in Aviation. 1-3 credits, maximum 6. Prerequisite: 50 credit hours. Independent studies, seminars, and training within selected areas of aviation.

4113* Aviation Safety. Prerequisite: 55 credit hours. Overview of flight safety including studies in human factors, weather, aircraft crashworthiness, accident investigation, and aviation safety programs. Students will be introduced to elements of aviation safety in ground and flight operations.


Preparation for the FAA Fundamentals of Instructing and Flight Instructor-Airplane Written Examinations.

4200* Internship in Aviation. 1-12 credits, maximum 12. Prerequisite: 55 credit hours. Individually supervised internship in aviation career areas. Directed field experience related to the participant's area of concentration.

4213* Current Trends and Issues in Aviation. Prerequisite: 3663. Analysis of current issues facing management in various segments of the aviation industry. Specific areas include issues affecting the safety, efficiency and economy of aviation. Application of previously learned concepts to case studies of practical problems to develop deeper understanding of the subject.

4231 Flight Instructor: Airplane Flight Laboratory. Lab 2. Prerequisites: 2142, 4133. Dual flight instruction to meet the requirements for the FAA flight instructor: airplane certificate. Flight instruction conducted under FAR Part 141. Special fee required.

4303* Aviation Weather. Prerequisite: GEOG 3033. Familiarization with weather products needed to enhance flight safety.

4331 Flight Instructor: Instrument Flight Laboratory. Lab 2. Prerequisite: 4231. Dual flight instruction to meet the requirements of adding an instrument flight instructor rating to the flight instructor certificate. Flight instruction conducted under FAR Part 141. Special fee required.

4333* Advanced Aircraft Performance. Prerequisite: 50 hours. A study of advanced aircraft performance including appropriate physical laws, atmospheric properties and power plant technology.

4643* Aviation Navigation Global Positioning Systems. Prerequisite: 50 credit hours. Overview of the theory and operation of the GPS in the private and public sector.

4653 (I)International Aviation Issues. Prerequisite: 50 hours. The fundamental knowledge, comprehension and the abilities to apply, analyze, synthesize and evaluate international aviation issues.

4703* Crew Resource Management. Prerequisites: 2142, 3243. Decision making and communication to improve effective crew management. Ten hours in a dual flight control multi-engine simulator. Special fee required.

4771 Flight Instructor: Multi-engine Flight Laboratory. Lab 2. Prerequisite: 4231. Dual flight instruction to meet the requirement for adding a multi-engine flight instructor rating to the flight instructor certificate. Flight instruction conducted under FAR Part 141. Special fee required.

4943* Basic Aircraft Accident Investigation. Prerequisite: 50 credit hours. A study of statutes, regulations and regulatory agency requirements that influence aircraft accident investigation.

4953* Corporate Aviation Management. Prerequisites: 2142 and 3341. Study of management principles and practices of corporate aviation. Equipment acquisition, legal requirements, government regulations, aircraft maintenance management, and investment decision-making.

4973* Air Transport Law. Study of the legal system as it relates to air transport law and governance of the air transportation industry.

4990 Pilot Proficiency Flight. 1-2 credits, maximum 4. Lab 32. Required for students entering the aviation education program who possess all FAA certificates/ratings required for the aviation sciences degree.

5000* Master's Report or Thesis. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Individual research problems in aerospace education.

5020* Seminar in Aerospace Education. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Individual research problems in aerospace education.

5052* Guided Reading and Research. Prerequisite: consent of instructor. Guidance in reading and research required for completing the report for the M.S. in aviation and space science program.

5103* Aviation Career Development. Aviation career development in private and public aviation organizations.

5113* Aviation Safety Program Development. Prerequisite: 4113. A detailed examination of risk management and accident prevention in the aviation industry. Organization and operation of safety programs including OSHA requirements, performance measurements, cost analysis, and systems safety analysis.

5200* Graduate Internship in Aviation and Space. 1-6 credits, maximum 6. Directed field experiences in aerospace education for master's students.

5203* Aeromedical Factors. Prerequisite: 3243. The study of aeromedical factors that influence pilot performance. The study of life support equipment designed to increase aviation safety.


5702* Simulation in Aviation. Prerequisite: 3341. Preparation for the practical skills required for a career as a professional pilot. Skill areas comparable to those required for the FAA Airline Transport Pilot rating.

5711* Airline Transport Pilot. Prerequisite: 3341. Designed for the professional pilot. Completion of the course assists in preparation for the FAA Airline Transport Pilot written examination.

5720* Current Issues in Aerospace Education. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Current issues in aerospace education.

5813* Earth Observations: Land. Prerequisite: GEOG 4333. A study of systems orbiting earth that collect data on the land.

5823* Space Science: Sun, Inner Planets and Asteroid Belt. A study of the sun, inner planets and asteroid belt.

5833 Earth Observations: Water. A study of systems orbiting earth that collect data on the water.


5850* Directed Readings in Aerospace Education. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Directed studies in aerospace education.

5853* Earth Observations: Air. Prerequisite: GEOG 3033. A study of systems orbiting earth that collect data on the atmosphere.

5910* Practicum in Aerospace Education. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Directed observation and supervised clinical experiences in aerospace education.


6203* Aviation Physiology. Prerequisite: 5023 or equivalent. The study of the complexities of pilot performance as it relates to human physiology, human factors and aviation safety.

6303* Aviation and Space Safety Data Analysis. Practical application and research of aviation and space safety data bases.

6313* Administration of Aviation Institutions. A study of the organization and administration of public and private aviation institutions. Study of the impact of economic and governmental systems on these institutions.
Data not available.
3223 (N)Survey of Human Diseases. Prerequisite: 1114 or equivalent. Types of diseases, such as metabolic, genetic, infectious. Biolog- 
cal processes involved in disease. Impact of disease on human activity and of human activity on disease patterns. For the nonbiology 
major.

3232 (N)Human Reproduction. Prerequisite: 1114. Human reproduction is dealt with in terms of anatomy, physiology, embryology, genetics and evolution. Birth control, and teratogenic sub-
stances as well as pregnancy and childbirth. For the nonbiology major.

3253 (N)Environment and Society. Prerequisite: 1114 or equivalent strongly recommended. The impact of human activities and population growth on the natural world. Analysis of the 
potential of technological and societal changes to have an impact on the environment. For the nonbiology major.

3263 (N)Plants and People. Prerequisite: 1114 or consent of instructor. Types of plants, form and function, history of uses of plants and plant products for food and beverages, fiber, medicin-
al purposes, and in people’s surroundings. For the nonbiology major.

3604 Biological Principles for Teachers. Lab 2. Prerequisites: 1114, CHEM 1314, ZOOL 3204. Capstone course in biology for potential sci-
ence teachers. Review of biological phenomen-a and principles as related to the curriculum.

5100* Current Topics in Biology for Teachers. 1-4 credits, maximum 4. Prerequisite: approval of instructor. Acquaints the primary or second-
ary teacher with recent advances in biology. May include lecture, laboratory or field work.

Biomedical Sciences (BIO/M)

5013* Medical Biostatistics. Prerequisite: graduate standing. Fundamentals of biostatistics in-
cluding parametric and non-parametric statisti-
cal methods with applications to biomedical 
research, clinical epidemiology and clinical medicine.

5020* Biomedical Sciences Seminar. 1-4 cred-
its, maximum 4. Prerequisite: graduate stand-
ing. Literature and research problems in bio-
medical sciences.

5117* Gross and Developmental Anatomy. Lab 3. Prerequisite: graduate standing in the bio-
medical sciences program. General and spec-
cific concepts of regional morphology through didactic presentations and laboratory dissec-
tions. Emphasis on the range of normal for the various organ systems and their interrelation-
ships. Application of anatomical knowledge in clinical situations.

5124* Histology. Lab 4. Normal microscopic tissue architecture. Lecture and laboratory presenta-
tion for the histologic concepts of the basic tissues and organ systems. Basis for pathologi-
cal and physiological principles.

5132* Neuroanatomy. Lab 1. Prerequisite: gradu-
ate standing in the biomedical sciences pro-
gram. A continuation of gross anatomy to in-
clude anatomy of the head region. Emphasis on 
neuroanatomy. Laboratory sessions on head 
and brain dissection and special demonstra-
tions. The relation of basic principles with on-
theatropic medicine and neurology in clinical 
correlation sessions.

5215* Medical Biochemistry. Broad survey of the 
chemical classes and metabolic processes that 
are consistent with the normal functions of 
systems. Functions and interrelationships of 
these processes in human metabolism to pro-
vide a foundation for understanding the chem-
istry of disease states when discussed in the second-year program.

5316* Medical Microbiology and Immunology. Lab 2. Prerequisite: 5215. Similarities and dif-
fences among pathogenic microorganisms. Characteris-tics, pathogenesis and control of medically important microorganisms and disor-
ders of the immune system. Laboratory exer-
cises on the basic serological and microbi-
ological procedures used in the diagnosis of infectious diseases.

5415* General Pathology I. Prerequisites: gradu-
ate standing. The reaction of the body to dis-
eseases and the description and identification of 
basic disease processes in terms of morphol-
ogy, physiology and chemistry. Major processes 
such as cell injury, cell death, healing, neopla-
sia, inflammation, and diseases of develop-
ment and aging. Basic disease processes and 
ability to recognize and describe basic disease 
processes from gross and microscopic speci-
mens.

5425* General Pathology II. Prerequisite: gradu-
ate standing. Continuation of General Pathol-
ogy I.

5513* Pharmacology I. Prerequisite: 5215, 5616. General principles of drug action, drugs acting 
on the autonomic nervous system, and drugs used in treating infectious diseases and can-
cer. The mode of action, pharmacogenetics, 
physiologic effects, therapeutic indications, 
and adverse reactions to these drugs.

5523* Pharmacology II. Prerequisite: 5513. Con-
tinuation of Pharmacology I.

5616* Medical Physiology. Prerequisite: 5215. The integration of structure and function of the 
human body with a functional analysis of the 
organ systems. Comprehension of the physi-
ologic principles and control mechanisms that 
maintain homeostasis. Discussion of all sys-
tems of the body, and analysis of various inter-
relationships. The fundamental dynamic view 
of physiology upon which subsequent clinical 
learning is dependent. Problem-solving tech-
niques utilized to develop and examine student 
understanding.

6000* Research and Dissertation. 1-15 credits, 
maximum 45. Lab 1-15. Prerequisite: consent of major advise.r. Research in biomedical sci-
ences for Ph.D. degree.

6010* Topics in Biomedical Sciences. 1-3 cred-
its, maximum 3. Prerequisite: consent of in-
structor. Tutorials in areas of biomedical sci-
ences not addressed in other courses.

6113* Human Embryology. Lab 2. Prerequisite: 5117 
or consent of instructor. Formation of the fetus 
from conception through development of the 
organs and organ systems with discussions of congenital malformations.

6124* Advanced Histology. Lab 4. Prerequisite: 
5214. Histochemical techniques used in the 
identification of cells or tissues based on the 
localization of cell organelles or cell products 
using electron microscopy, immunofluores-
cence, cryosectioning, and immunoperoxidase 
labelling.

6133* Biology of Transplantation. Prerequisites: 
basic course in immunology; graduate stand-
ning; consent of instructor. The biology of organ 
and cell transplantation, including study of im-
une aspects, technical aspects, organ dona-
tion and preservation, transplant tolerance, 
genetic manipulation of graft tissues, use of feto/ster cells in transplantation, and biomi-

edical ethics related to transplantation.

6143* Biomedical Electron Microscopy. Lab 4. Prerequisite: graduate standing. The theory and 
application of transmission and scanning elec-
tron microscopy in a biomedical setting.

6153* Islet Cell Biology and Diabetes. Prerequi-
site: graduate standing; consent of instructor. 
An overview of the current knowledge in the 
field of islet cell biology and the clinical as-
psects of diabetes.

6214* Advanced Topics in Medical Biochem-
istry. Prerequisite: 5215 or concurrent enroll-
ment. Chemical basis of protein, carbohydrate, 
lipid, nucleic acid, steroid and porphyrin struc-
ture, function and metabolism as related to health and disease.

6223* Medical Genetics. Prerequisite: 5215. De-
velopments in genetic principles including bio-
chemical, molecular cytological, clinical, diag-
nostic, prevention and inheritance of genetic 
disorders in humans.

6233* Enzyme Analysis. Lab 2. Prerequisite: 6214. 
Characteristics, separation, detection, assays, 
kinetcs, mechanisms of catalysis, inhibition or 
inactivation, and clinical applications of en-
zyme analysis.

6243* Human Nutrition. Lab 2. Prerequisite: 5215. Role of vitamins and minerals in maintaining 
normal metabolism, role of nutrients in provid-
ing athletic and immune system performance, 
and pathophysiology associated with nutrient 
deficits and nutrient excesses. Role of drugs in 
inducing cancer and increasing nutrient re-
quirements.

6253* Biotechnology of Hormone Action. Prereq-
site: 6233. Biochemical mechanisms behind pep-
tide and steroid hormone action.

6263* Techniques in Molecular Biology. Lab 4. Prerequisite: 5215, 5316. Consent of in-
structor. Transformation of bacterial and mammal-
ian cells; purification of nucleic acids; cloning of 
DNA fragments; labeling of nucleic acids with 
non-radioactive probes; analysis of DNA and 
RNA by electrophoresis and hybridization; DNA 
sequencing; design, synthesis and use of oli-
gonucleotides; site-directed mutagenesis; de-
tection of rare nucleic acids by the polymerase 
chain reaction and expression of proteins.
6313* Diagnostic Parasitology. Lab 2. Prerequisites: 5316; Animal parasites of humans with a focus on the laboratory identification of the medically important protozoan and helminth diseases.

6323* Diagnostic Virology. Lab 4. Prerequisites: 5215, 5316. Viruses causing disease in humans with emphasis on the laboratory diagnosis, prevention, and treatment of viral diseases.

6333* Immunology. Prerequisites: 5215, 5316. The experimental basis of immunology and immunopathology.

6343* Microbial Physiology. Lab 2. Prerequisites: 5215, 5316. The chemical composition, growth and metabolism of prokaryotic organisms including regulation and control of metabolic pathways with emphasis on metabolism unique to microbes.

6353* Molecular Virology. Lab 2. Prerequisites: 5215, 5316. Consent of instructor. The fundamental molecular biology of the virus life cycle using one virus as a model to examine penetration, gene regulation, replication, assembly and egress, as well as host immunological response and epidemiology.

6413* Graduate General Pathology and Laboratory Medicine. Lab 2. Prerequisite: graduate standing. An introduction to the structural and functional abnormalities at the tissue level that manifest as disease states in organ systems, with emphasis on a patho-physiologic approach to etiology and pathogenesis of disease.

6513* Neuropharmacology. Prerequisites: 5513, 5523. The pharmacology of agents affecting central nervous system (CNS) function, the interaction of drugs with receptors, and the action of endogenous neuromodulators at CNS sites of action.

6523* Cardiovascular Physiology and Pharmacology. Prerequisites: 5513, 5523. Physiologic and pharmacologic mechanisms of cardiovascular smooth muscle function and control at the molecular, cellular, tissue and organ system levels.

6543* Principles of Drug Action. Prerequisites: 5513, 5523. The molecular basis of drug uptake, distribution, physiologic action, and elimination from the body including pharmacogenetics, drug allergy, drug resistance, drug tolerance and physical dependence, and chemical mutagenesis, carcinogenesis, and teratogenesis.

6553* Neurochemistry. Prerequisites: 5215, 5616. Introduction to the fundamental aspects of neurochemistry using both cellular and molecular approaches.

6554* Neurochemical Basis of Disease. Prerequisites: 5215, 5616, 6543. Introduction to the cellular and molecular aspects of disease states as they relate to changes in neurochemistry.

6563* Neuroimmunoneuroendocrinology. Prerequisites: 5513, 5523, 5616. The molecular, structural and cellular bases of the bidirectional communication between the immune and neuroendocrine systems.

6613* Environmental Physiology. Prerequisite: 5616. Environmental parameters, including barometric pressure, temperature, light, gravity, noise, and crowding, having an impact on homeostatic mechanisms in the normal human with special emphasis on acute and chronic adaptations in response to changes in environmental parameters.

6623* Epithelial Transport and Electrophysiology. Prerequisites: 5215, 5616. Transport processes across biological membranes and various electrophysiological methods related to membrane transport.

6643* Neurophysiology. Prerequisite: 5616. Fundamental concepts of the motor and sensory components of the nervous system with emphasis on integrative mechanisms.

Biosystems and Agricultural Engineering (BAE)

1012 Engineering Software. Lab 3. Prerequisite: programming major. Introduction to microcomputer software packages useful in engineering analysis and report preparation.

2002 Introduction to Engineering Design. Lab 4. Prerequisite: sophomore standing in the College of Engineering, Architecture and Technology. Implementation of creativity and design fundamentals of the motor and sensory components of the nervous system with emphasis on integrative mechanisms.


3113 Quantitative Biology for Engineers. Prerequisites: ENSC 2213, 3233. Engineering quantification of biological systems from micro to macroscopic including cellular, microbial, individual plants and animals, and ecosystems. System processes such as transport phenomena, bioenergetics, thermodynamics, enzyme kinetics, metabolism, bioregulation, and agroecosystem modeling.

3213 Machinery for Production and Processing. Lab 2. Prerequisites: 1012, 2012 and ENSC 2112. Function, design, operation and application of machine elements used in the production and processing of biological materials.

3323 Soil and Water Resource Engineering. Prerequisite: ENSC 3233. Engineering analysis applied to soil and water resources. Design principles and practice for engineering systems including pumping plants, irrigation and drainage systems, and erodible channels.

3423 Physical Properties of Biological Materials. Lab 2. Prerequisites: BIOL 1304; ENSC 2122 and 3233. Basic engineering fundamentals applied to characterization and determination of physical properties of biological materials. Physical characteristics; water relations; and rheological, thermal, aerodynamic, and electromagnetic properties of biological materials, including soils. Flow properties of non-Newtonian fluids and granular solids. Principles and techniques for measurement and determination of properties.

4001 Seminar. Prerequisite: senior standing. Preparation for professional practice through case studies about ethics, legal liability, safety, and societal issues. Practical professional communication experience.

4012 Senior Engineering Design Project I. Lab 6. Prerequisites: 2002; senior standing, admission to professional school. Team work on professional level design projects, using design procedures to develop specifications, propose alternative solutions, consider external constraints, develop drawings or plans, conduct test and evaluate designs.


4213* Precision Agriculture. Lab 2. Prerequisites: MATH 1513, senior standing. Introduction to the concepts of precision agriculture including analysis of spatial variability, relationships of fertility and crop response, geographical information systems, variable rate technology, optical sensing, global positioning systems, and yield mapping. Case studies included for detailed analyses. Same course as SOIL 4213.


4313* Hydrology I. Prerequisites: CHEM 1515, PHYS 2014, ENSC 3233. Basic principles of surface and groundwater hydrology and their application to engineering problems. The hydrologic cycle, weather and hydrology, precipitation, evaporation, transpiration, subsurface waters, stream flow hydrographs, hydrologic and hydraulic stream routing, probability of hydrologic events, application of hydrologic models. Same course as CIVE 3843.

4353* Mechanical Design II. Prerequisites: ENGS 1403, 2122, ENSC 3233. Design of power transmission systems, including belts, chains and gears. Selection of electric motors, actuators, encoders, and related electromechanical components. Selection and application of hydraulic and pneumatic components in machine design applications. Design practice in the form of short projects integrating the various segments covered in the course. Same course as MAE 4353.

4400* Special Problems. 1-4 credits, maximum 4. Investigations in specialized areas of agricultural engineering.
4413* Processing Biological Materials. Prerequisites: 3423; ENSC 3233, course in heat transfer. Materials handling. Size reduction and agglomeration of biological materials. Fan characteristics. Dehydration. Special emphasis on design of systems and equipment for materials handling, grain drying and storage.


5000* Thesis and Research. 1-6 credits, maximum 6. Prerequisite: consent of major professor.

5030* Engineering Practice. 1-12 credits, maximum 12. Prerequisite: B.S. degree in agricultural engineering. The identification, analysis and synthesis of an authentic problem in agricultural and biological engineering. Solution of the problem will involve making engineering decisions tempered by real-time restraints, economic realities, and limited data with due consideration for environmental and social implications.

5413* Instrumentation in Biological Process Considerations. 4-5 credits, maximum 5. Prerequisite: MATH 2323. Theory of similitude and its use in planning, conducting and analyzing experiments in engineering and biological sciences.

6502* Problems in Soil and Water Engineering. 2-6 credits, maximum 6. Prerequisite: consent of instructor. Problems associated with erosion control, drainage, flood protection and irrigation.

6540* Problems in Farm Power and Machinery. 2-6 credits, maximum 6. Prerequisite: consent of instructor. Literature review and analytical studies of selected farm power and machinery problems. Written report required.

6580* Problems in Transport Processes. 2-6 credits, maximum 6. Prerequisite: consent of instructor. Literature review and analysis of heat and mass transport and interval diffusion in biological materials. Transport phenomena at interfaces, thermal and cryogenic processing, drying, packed and fluidized bed systems. Thermal and moisture control processing affecting quality of food products. Written report required.

6610* Advanced Research and Study. 1-10 credits, maximum 20. Prerequisite: approval by the student’s advisory committee. Research and study at the doctoral level on the topic related to the student’s doctoral program and field of interest.

Botany (BOT)

3005* (N)Field Botany. Lab 6. Prerequisite: BIOL 1114 or equivalent. Botanical field techniques, the vegetation of North America, and the flora of Oklahoma. Terminology of description, use of taxonomic keys, techniques of specimen preservation, field recognition of plant taxa and communities and controlling ecological factors, economic and wildlife significance of dominant taxa, principles of classification and nomenclature. Four weekend field trips required.

3013* Biological Microtechnique. Lab 3. Prerequisite: BIOL 1404 or 1604. Techniques for preparation of biological materials for microscopic examination. Same course as ZOOL 3013.

3024* Plant Diversity. Lab 4. Prerequisite: BIOL 1404. Forms and life histories of selected plants with emphasis on some of the less familiar forms. The diversity of plant forms as well as basic similarities in life histories for microscopic examination. Same course as ZOOL 3013.


3233* Plant Anatomy. Lab 3. Prerequisite: BIOL 1404. Structure of cells, tissues and organs of plants. Consideration of structure as related to ontogeny, phylogeny and function.

3460* Plant Physiology Laboratory. 1-2 credits, maximum 2. Lab 2-4. Prerequisite: 3463 or concurrent enrollment. Skills in techniques for working with plants, experiments involving nutrition, respiration, photosynthesis, water relations, translocation, hormones, growth and development. Students having credit in BIOL 3014 should enroll for one hour; all others enroll for 2 hours credit.

3463* Plant Physiology. Prerequisite: BIOL 1404. Plant subcellular structure, water relations, water absorption and ascent of sap, translocation, gaseous exchange, nutrition, enzymes, respiration, photosynthesis, growth, development, reproduction, tropisms, hormones, dormancy and seed germination.

3693* Plant Geography. Prerequisite: BIOL 3034 or equivalent. Plant and animal communities, community theory, the role of competition, predation, and demography in structuring plant and animal communities, succession, current controversies in ecology, with emphasis on primary literature.

4123* Ethnobotany. Prerequisite: one course from BIOL 1404 or 1604, HORT 1013, 3024, PLNT 1213, or consent of instructor. Uses of plants by past and present cultures for food, fiber and medicinal purposes. The role of plants in traditional rituals and religious practice.

4213* Botanical Limnology. Lab. 3. Prerequisite: BIOL 1404 or equivalent strongly recommended. Taxonomy, ecology, and physiology of freshwater algae and vascular aquatic plants, with special reference to their role in overall limnological dynamics. Field trips required.

4374* Agrostology. Lab 4. Prerequisite: BIOL 1404. Grasses and the principles involved in their classification. Field trips required.

4400 Undergraduate Research. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Undergraduate research problems in botany.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A research project under the direction of a faculty member resulting in a written report to be judged by a second faculty member as well. An oral presentation made at a departmental seminar. Required for graduation with departmental honors in botany.

5000* Research. 1-6 credits, maximum 6. Research for the M.S. degree.

5104* Mycology. Lab 4. Prerequisite: graduate standing. A systematic study of the fungi, with emphasis on taxonomy, comparative morphology and fungal biology. Taught in the Department of Plant Pathology. Same course as PLP 5104.
5110* Problems in Botany. 1-5 credits, maximum 8. Prerequisite: consent of instructor. Special studies in any area of botany.

5153* Ecosystem Analysis. Prerequisite: BIOL 3034; CHEM 3015 or equivalent. Theory and principles of ecosystem ecology focusing on metabolism and biogeochemical cycles in terrestrial and aquatic systems. Application of principles to current issues of environmental change and management. Same course as ZOOL 5153.

5232* Cytogenetics Laboratory. Lab 4. Prerequisite: PLNT 5492 or concurrent enrollment. Cytogenetic research techniques, especially karyotyping; observation and interpretation of cytogenetic phenomena including mitosis, meiosis and chromosomal aberrations.

5423* Plant Mineral Nutrition. Prerequisite: 3463 or equivalent. Uptake, translocation, metabolism, and biochemical function of mineral nutrients in higher plants.

5523* Advanced Ecology. Lab 3. Prerequisite: Strongly recommended to have taken 4023 or BIOL 3034 or equivalent. Physiological and evolutionary aspects of plant ecology as revealed by recent research. Spring recess field trip required.

5753* Physiology of Plant Growth and Development. Prerequisite: 3463 or equivalent. Molecular mechanisms of growth and development, subcellular organization and function, plant hormones, photomorphogenesis, germination and dormancy, senescence and abscission, plant rhythms. Application of physiological principles to agriculture.

5763* Plant Tissue Culture. Lab 3. Prerequisite: 3463 or BIOL 3014 or equivalent. Skills in sterile technique, media preparation, embryogenesis and organogenesis. Survey of the major types of tissue culture and their application to crop and horticultural species. Introduction to general principles of genetic engineering of plant cells.

5813* Plant Developmental Genetics. Prerequisite: BIOL 3024 or equivalent. Discussion of morphogenesis, embryogenesis, gametogenesis, and the regulation of gene expression during plant development. Emphasis on recent genetic, experimental, and molecular studies of development in higher plants.

5823* Plant Morphology. Lab 3. Prerequisite: 3024. Comparative study of the form and life cycle of representative genera of the major taxa of vascular plants. Field trips required.

5850* Botany Seminar. 1 credit. Maximum 6. Required of senior and graduate majors.

5923* Environmental Plant Physiology. Prerequisite: 3463 or equivalent. Effects of light, temperature, water, soil and other environmental factors on physiological responses of plants; photosynthesis, water relations, water and temperature stress, flowering, dormancy and germination.


Business Administration (BADM)

1111 Business Freshman Orientation. Prerequisite: freshman standing only. Required of all first semester freshmen in the College of Business Administration. Integration of concepts from the CBA and OSU; survival skills; and a study of the career opportunities and curriculum in the various business departments.

2010 Special Topics. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Special topics and independent study in business.

3080 International Experience. 1-18 credits, maximum 36. Prerequisite: consent of the associate dean of the college. Participation in an OSU reciprocal exchange program.

3090 Study Abroad. 1-18 credits, maximum 36. Prerequisite: consent of the Study Abroad office and associate dean of the college. Participation in an OSU reciprocal exchange program.

3153* Strategy and Integration in Organizations. Prerequisites: FIN 3113, MGMT 3123, MKTG 3213 or concurrent enrollment. Development of international business strategy based on the integration of economic, accounting, financial, management and marketing concepts.

4010 Business Projects. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Special advanced topics, projects and independent study in business.

4050* Business Colloquium. 3-9 credits, maximum 9. Prerequisite: junior standing and consent of the instructor and the dean. Study of an interdepartmental and interdisciplinary nature of various important issues and aspects of the business and economic environment. Provides an intellectual challenge for the able student with a strong interest in scholarship.

4113* New Venture Creation. Prerequisite: business core courses or consent of instructor. Steps involved in starting a new business. Development of a business plan for a venture of student’s choosing. Examination of franchising or acquisition of an existing business as alternative steps to business ownership.

5013* Research Methods for Business. Prerequisite: STAT 2023, admission to MBA program or approval from MBA director. Role of Bayesian and inferential statistics in business research and management decision making. Measurement, scaling, survey methods, and forecasting. Applications to marketing; managerial, human resource; financial, and production planning, and other related business topics. Use of computers in statistical analysis.

5113* Entrepreneurship and Venture Management. Prerequisite: admission to MBA program or consent of MBA director. Enterprise creation and problems faced by entrepreneurs in early growth stages of business ventures. An interdisciplinary problem-solving approach with emphasis on “live” case studies and plans for new business ventures. Emphasis is on entrepreneurship rather than problems faced by going concerns.

5200* Selected Master of Business Administration Topics. 3-6 credits, maximum 6. Prerequisite: admission to the Master of Business Administration program. Selected topics dealing with business decision making and contemporary business issues.

5613* The External Environment of Business. Prerequisite: admission to MBA program or approval from MBA director. Social, ethical, regulatory and political forces as they impact on the organization. Attention to organizational response to these forces through management policies and strategies.

5713* Analysis of the Multinational Firm. Prerequisite: admission to MBA program or consent of MBA director. Identification and analysis of the managerial, financial and market problems facing the multinational firm. Focus is empirical and stressing application of ecological and quantitative tools to the study of the multidimensional nature of the international business environment.

6000 Research and Thesis. 1-9 credits, maximum 30. Prerequisite: approval of advisory committee.

6100* Seminar in Business Administration. 3-6 credits, maximum 6. Prerequisite: consent of instructor. Interdisciplinary in nature; focused on research methodology.

Business Communications (BCOM)

3113 Written Communication. Prerequisite: 50 semester credit hours. Analysis of business communication problems in terms of generally accepted communication principles. Practice in written messages; specifically, special good-will letters, neutral and good-news, disappointing, persuasive and employment messages.

3223 Organizational Communication. Prerequisite: 50 credit hours. Communication theory and process; common and special problems associated with interpersonal and organizational communication affecting business decisions and operations. Principles and methods of basic and applied research in business and communication; practice in administrative report writing. Analysis of selected business cases.

3333 Business Report Writing. Prerequisite: six hours of English. Fundamentals of writing business reports, including coverage of mechanics, content, and structure of business reports. Practice in writing business reports as well as oral presentations of reports.

5113* Seminar in Administrative Communication. Understanding and application of valid and relevant communication principles and theories. Designed to develop management-level personnel who can effectively and efficiently use oral and written communications as administrative tools to organizational functioning.
5210 Business Communication Applications. 1-3 credits, maximum 3. Application of communication techniques to the business setting. Interpersonal communication skills necessary for the manager in a business organization. Problems and applications within the modern business setting.

Business Education (BUSE)

6000 Doctoral Thesis. 1-10 credits, maximum 10. Prerequisite: advanced graduate standing and approval of department head. Independent research for the doctoral thesis. Credit is given upon completion of the thesis.

Business Honors (BHON)


4063 Topics in Contemporary Business. Prerequisites: junior standing, admission to the Honors Program. Topics of interest in the contemporary business and economic environment. The social role of the corporation; U.S. competitiveness and business and environmental issues.

4073 Literature in Business. Prerequisites: junior standing, admission to the Honors Program. Foundations of American business through selected literary masterpieces.


4990 Business Honors Thesis. 1-5 credits, maximum 5. Prerequisites: Honors Program participation, senior standing, college approval. A guided reading and research program ending with an honors thesis under the direction of a faculty member, with second faculty reader and oral examination. Required for graduation with college honors in business.

Chemical Engineering (CHE)

2033 Introduction to Chemical Process Engineering. Prerequisites: CHEM 1515, ENSC 2213. Application of mathematics and scientific principles to solving chemical engineering problems. Simple material and energy balances applied to process design. The nature and application of unit operations and unit processes to the development of chemical processes.

3013 Rate Operations I. Prerequisite: admission to CHE Professional School. Basic rate equations for heat, mass and momentum transport; the transport analogies, solutions and correlations for predicting transport rates for practical applications; utilization in design and analysis of process equipment.

3112 Cell Biology. Prerequisites: BIOL 1114 and BIOL 1403 or 1604; CHEM 1314 and 1515. Structure and function of living cells, dynamics of these structures and the functions which they perform.

3254 Immunology. Lab 1. Prerequisite: MICR 2124. The vertebrate host's ability to defend itself against foreign invasion. Chemistry and biology of the acquired immune response. Same course as MICR 3254.

4001 Professional Transitions in Microbiology and Cell and Molecular Biology. Prerequisites: declared microbiology or cell and molecular biology major with minimum 70 hours earned and consent of instructor. Understanding major areas and employment activities in microbiology, cell biology and molecular biology fields. Evaluating and understanding scientific and professional literature, and making the transition from undergraduate education to postgraduate education or employment. Same course as MICR 4001.

4013 Laboratory Techniques in Molecular Genetics. Lab 5. Prerequisites: BIOL 3014, MICR 2124. The art and practice of scientific research with hands-on experience. Techniques including PCR/DNA sequencing, blots, ELISA, and other genetic/forensic techniques.

4123 Virology. Prerequisite: BIOL 3014 or one course in biochemistry. Corequisite: 3224. Virus-host interactions including structure-function of animal, plant, and bacterial viruses. Discussion of the molecular biology of virus infection and development. Same course as MICR 4123.

4264 Cell Physiology. Lab 3. Prerequisite: BIOL 3653 or BIOL 3014. Cellular activities and fundamental physiological processes. Same course as ZOOL 4264.

4273 Developmental Biology. Prerequisite: BIOL 3024. The molecular biology and molecular genetics of developmental processes such as cell division, differentiation, migration, cell-cell communication, and gene expression in a wide variety of organisms.

4323 Bioenergetics. Prerequisites: BIOL 3653 or BIOL 3014. Bioenergetics reactions and mechanisms involved in energy production in plants, animals and microbial systems. Same course as MICR 4323.

4990 Special Problems. 2-4 credits, maximum 8. Prerequisite: consent of instructor. Minor investigations in the field of cell and molecular biology.

4993 Senior Honors Project. Prerequisites: departmental invitation, senior standing, Honors Program participation. A research project under the direction of a faculty member resulting in a written report to be judged by a second faculty member. Required for graduation with departmental honors in CLML.

Cell and Molecular Biology (CLML)

3112 Cell Biology. Prerequisites: BIOL 1114 and BIOL 1403 or 1604; CHEM 1314 and 1515. Structure and function of living cells, dynamics of these structures and the functions which they perform.

3254 Immunology. Lab 1. Prerequisite: MICR 2124. The vertebrate host’s ability to defend itself against foreign intrusion. Chemistry and biology of the acquired immune response. Same course as MICR 3254.

4001 Professional Transitions in Microbiology and Cell and Molecular Biology. Prerequisites: declared microbiology or cell and molecular biology major with minimum 70 hours earned and consent of instructor. Understanding major areas and employment activities in microbiology, cell biology and molecular biology fields. Evaluating and understanding scientific and professional literature, and making the transition from undergraduate education to postgraduate education or employment. Same course as MICR 4001.

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4001 Professional Transitions in Microbiology and Cell and Molecular Biology. Prerequisites: declared microbiology or cell and molecular biology major with minimum 70 hours earned and consent of instructor. Understanding major areas and employment activities in microbiology, cell biology and molecular biology fields. Evaluating and understanding scientific and professional literature, and making the transition from undergraduate education to postgraduate education or employment. Same course as MICR 4001.
4002* Chemical Engineering Laboratory I. Lab 6. Prerequisites: 3013, 3473, and 4333. Applications of heat, mass, and momentum transfer, unit processes, and unit operations principles to the analysis of bench and pilot-scale equipment. Interpretation of experimental data and the presentation of results are emphasized.

4112* Chemical Engineering Laboratory II. Lab 6. Prerequisites: 4002, 3113, and 4473. A continuation of 4002.

4124* Chemical Engineering Design I. Lab 2. Prerequisites: 4002, 3113, and 4473. Economic analysis of process plants and systems of equipment; methods for estimating plant investment requirements and operating costs; economic evaluation and optimal design of chemical process systems; basic equipment and process design calculations.

4224* Chemical Engineering Design II. Lab 2. Prerequisite: 4124. A continuation of CHE 4124. Economic analysis of process plants and equipment. Design of chemical processing equipment and chemical plants. Application of computer techniques to chemical engineering design.

4293 Introduction to Biomedical Engineering. Prerequisites: ENSC 2213, 3233, MATH 2155. Introduction to engineering principles applied to biomedical applications. Mathematical modeling, biomechanics, biofluid mechanics, drug delivery, artificial organs, transport in biological systems, and modeling of biological systems.


4343 Environmental Engineering. Prerequisites: 3473, 4333. Application of science and engineering principles to minimize the adverse effects of human activities on the environment. National and state environmental regulations; predictive movement and fate of chemicals in the geospheres; multi-media pollution assessment, analysis and control.

4473* Chemical Reaction Engineering. Prerequisites: 3473, 4333. Principles of chemical kinetics rate concepts and data treatment. Elements of reactor design principles for homogeneous systems; introduction to heterogeneous systems.

4581 Senior Seminar. Prerequisite: senior standing in the CHE department. Recent developments in chemical engineering and the process industries.

4840* Process Control Laboratory. 2-5 credits. Prerequisites: 3013 and MATH 2233. Experimental study of control loop performance including: process dynamics, sensors, feedback controllers, and control valves. Analog and digital techniques including: pneumatic and electronic components, programmable controllers, and computer simulation with colorgraphics.

4843* Chemical Process Instrumentation and Control. Prerequisite: 4124. Instruments for measuring temperature, pressure, composition and other process variables; different modes of control and their influence on process stability. System analysis and design through linearization technique.

4990 Special Problems. 1-5 credits, maximum 5. Lab 3-15. Prerequisite: senior standing. Training in independent work, study of relevant literature and experimental investigation of an assigned problem.

5000* Master’s Thesis. 1-6 credits, maximum 6. Prerequisite: approval of major professor. Methods used in research and thesis writing.

5030 Professional Practice. 2-6 credits, maximum 8. Prerequisites: senior standing and consent of instructor. Application of chemical engineering principles to the solution of real-life engineering problems in a real or simulated industrial environment. Includes application of design and testing procedures, economic evaluation and reporting on one or more assigned projects.

5110 Special Topics In Chemical Engineering. 2-3 credits, maximum 6. Lab 2-6. Prerequisite: consent of instructor. Small group and individual projects in unit operations, unit processes, chemical kinetics, computer applications, process modeling or any of a wide range of chemical engineering topics. May be repeated for credit if subject matter varies.

5123 Advanced Chemical Reaction Engineering. Prerequisite: 4473. Advanced principles and applications of chemical kinetics in catalysis, heterogeneous systems, non-ideal reactions, polymerization and biological reactions.

5213 Selected Diffusional Unit Operations. Mass transfer in fluids. Diffusion in liquids and gases. Equilibrium stage and transfer unit concepts. Mass transfer concepts of diffusional unit operations such as adsorption, crystallization, drying, humidification and liquid extraction.

5283* Biomedical Engineering. Prerequisite: consent of instructor. Application of fundamental clinical engineering principles to biochemical, biomedical and physiological processes. Fermentation technology, biological mass transfer and kinetics, bioreactor design and scale-up, artificial organs, drug delivery formulations, pharmocokinetics, biomaterials, and human physiology.

5293* Biomedical Engineering. Prerequisite: consent of instructor. Application of fundamental engineering principles to biomedical processes. Transport in biological systems, drug delivery, tissue engineering, biomaterials, artificial organs, physiological modeling, and biomedical sensors.

5413* Fundamentals of Polymer Engineering. Fundamental principles in the engineering of macromolecules. Various aspects of polymer engineering including: processing and molderability, polymer physical chemistry, mass-transfer, rheological and mechanical properties, industrial production and applications.

5423* Process Heat Transfer. Application of fundamental principles of single-and two-phase fluid dynamics and heat transfer to the design and analysis of process heat transfer equipment.


5703 Optimization Applications. Prerequisite: graduate standing. A survey of various methods of unconstrained and constrained linear and non-linear optimization. Applications of these methodologies using hand-worked examples and available software packages. Intended for engineering and science students. Same course as ECEN 5703, IEM 5023 and MAE 5703.

5733 Neural Networks. Prerequisite: graduate standing. Introduction to mathematical analysis of networks and learning rules, and on the application of neural networks to certain engineering problems image and signal processing and control systems. Same course as ECEN 5733 and MAE 5733.

5743 Chemical Engineering Process Modeling. 3 credits, maximum 6. Chemical engineering systems and process models. Analytical and numerical methods for solving non-linear systems of equations or systems of equations, with computer methods in a chemical engineering context.

5793 Advanced-process Design and Economics. Prerequisites: 4124, 4224. Application of chemical engineering principles to the design and analysis of process equipment and plants; prediction and extrapolation of thermal and physical properties; methods for design and synthesis of process units and equipment.


5853* Advanced Chemical Process Control. Prerequisite: 4843 or equivalent. General concepts and approaches of model-based control. Studies in the application of process-model-based control and model-predictive control on multi-variable, nonlinear, nonstationary, noisy processes.

5873 Air Pollution Control Engineering. Causes, effects and control of atmosphere pollution. Same course as GIVE 5873.

5990 Special Problems. 2-4 credits, maximum 9. Prerequisite: consent of instructor. Individual report topics in chemical engineering involving operations, processes, equipment, experiments, literature search, theory, computer use or combinations of these.

6000 Doctoral Thesis. 2-15 credits, maximum 30. Prerequisite: approval of major professor. The doctoral candidate will register for a minimum of 15 semester credit hours in each semester during which laboratory work is in progress. Methods used in research and thesis writing. An original investigation of a problem in chemical engineering and its report in a dissertation.

6010 Chemical Engineering Seminar. 1-3 credits, maximum 3. Advanced research and development topics.
6023* Chemical Engineering Science I. Prerequisites: 5213 and 5423. Theoretical aspects of fluid dynamics, heat transfer and mass transfer. Boundary layer theory, multiphase flow theory of diffusion and interphase mass transfer. Analogies between heat, mass and momentum transfer.

6113* Chemical Engineering Science II. Prerequisite: 6023. Continuation of 6023. Theoretical aspects of fluid dynamics, heat transfer and mass transfer. Boundary layer theory, multiphase flow. Theory of diffusion and interphase mass transfer. Analogies between heat, mass and momentum transfer.

6223* Advanced Chemical Engineering Thermodynamics. Prerequisite: 3943. Phase equilibrium in multicomponent systems. Irreversible processes. Properties of fluids and the prediction of properties by statistical methods. Application of thermodynamics to unit operations.

6440* Advanced Topics in Chemical Engineering. 3-6 credits, maximum 9. Topics in chemical engineering unit operations in design. Advanced mathematical techniques in chemical engineering problems. May be repeated for credit if subject matter varies.


6703* Research Methods in Chemical Engineering. Prerequisites: M.S. or Ph.D. candidacy in chemical engineering or consent of instructor. Methods and skills required to successfully conduct chemical engineering research projects. Maintaining research records, experiment design, data validation, results presentation, and research ethics.

Chemistry (CHEM)

1014 (L,N)Chemistry in Civilization. Lab 2. Symbols, methods and contributions to society of the chemical sciences. Includes polymers, pollution, energy, consumer chemicals, drugs, nuclear science and other topics. No credit for students with credit in 1215, 1314.

1215 (L,N)General Chemistry. Lab 2. Prerequisite: MATH 0123 or high school equivalent. The beginning chemistry course recommended for students in the applied biological sciences. No credit for students with credit in 1014, 1314.

1225 (N)General Chemistry. Lab 2. Prerequisite: 1215 or advanced placement. A continuation of general chemistry, recommended for students in the applied biological sciences. No credit for students with credit in 1515.

1314 (L,N)General Chemistry. Lab 2. Prerequisite: MATH 1513 or concurrent enrollment in 1613, 1715 or a higher level math course. The beginning chemistry course recommended for students in basic biological sciences (including premedical science and pre-veterinary science), physical sciences and engineering. No credit for students with credit in 1014, 1215.

1413 (L,N)Inquiry-based Chemistry. Lab 3. Prerequisite: PHYS 1313 recommended. Directed inquiry and hands on study of chemical reactions. Recommended for elementary education majors as model course to learn and teach science.

1414 (L,N)General Chemistry for Engineers. Prerequisites: one year of high school chemistry or one semester of college chemistry and MATH 1513 or concurrent enrollment in 1613, 1715 or a higher level math course. Survey course for engineers needing only one semester of chemistry. Thermodynamics, atomic structure, solid state, materials, equilibria, acids and bases and electrochemistry. No credit for students in 1314.

1515 (L,N)General Chemistry. Lab 2. Prerequisite: 1314 or advanced placement. A continuation of general chemistry. No credit for students with credit in 1225.

2113 Principles of Analytical Chemistry. Prerequisites: 1515 and MATH 1513 or 1715. Modern theories of solutions, separation techniques and methods of analysis.

2122 Quantitative Analysis Laboratory. Lab 6. Prerequisite: 2113 or concurrent enrollment. Laboratory work related to material covered in CHEM 2113.

2990 Special Problems in Chemistry for Non-majors. 1-2 credits, maximum 2. Prerequisite: 1515 or concurrent enrollment. Independent training in chemistry at the lower-division level.

3015* The Chemistry of Organic Compounds. Lab 4. Prerequisites: 1215 and 1225 or equivalent. Terminal, one-semester non-majors course in organic chemistry covering the general principles of nomenclature, structures, bonding, methods of preparation, reactions and uses of acyclic, cyclic, and aromatic compounds. No credit for students with credit in 3053 or 3112.

3053* Organic Chemistry. Prerequisite: 1515 or equivalent. Hydrocarbons and their derivatives, including specific compounds of theoretical, biological or industrial importance. No credit for students with credit in 3015.

3112 Organic Chemistry Laboratory. Lab 6. Prerequisite: 3113 or concurrent enrollment. Laboratory exercises related to theoretical principles covered in CHEM 3053 and 3113. No credit for students with credit in 3015.

3153* Organic Chemistry. Prerequisite: 3053. A continuation of 3053.

3164 Physical Science for Teachers. Lab 2. Prerequisites: 1314, GEOL 1114, PHYS 1114. Capstone course in physical science for potential science teachers. Review of physics and chemistry principles and phenomena as related to the curriculum.

3353 Descriptive Inorganic Chemistry. Prerequisite: 1225 or 1515. Structures and properties of the elements and their many compounds in the broadest sense which includes the modern technologically important materials, organometallics, and inorganic substances of biological significance.

3434* Physical Chemistry I. Prerequisites: 2113, MATH 2155. Introductory theoretical analysis of molecular structure, chemical bonding and macroscopic chemical systems using quantum theory, classical and statistical thermodynamics and kinetics. Students who are not chemistry majors may receive graduate credit.

3532* Physico-Chemical Measurements. Lab 6. Prerequisites: 2122, 3434. Apparatus, experimental methods and calculations employed in physico-chemical investigations.

3533* Physical Chemistry II. Prerequisite: 3434. A continuation of 3434. Students who are not chemistry majors may receive graduate credit.

4020 Modern Methods of Chemical Analysis. 1-5 credits, maximum 5. Lab 2. Prerequisites: 2122, 3434. Theoretical and laboratory study of modern techniques, reagents and instruments employed in analytical chemistry.

4101* Laboratory and Chemical Safety. Instruction on chemical safety, prudent laboratory practices, and federal, state, and OSU regulations on safety. Graded on a pass-fail basis.


5000* Thesis. 1-6 credits, maximum 6. Investigations, chiefly experimental, with necessary conferences. Familiarizes the student with methods used in research in chemistry.

5011* Graduate Seminar. Preparation and presentation of seminars, usually on subjects of current interest taken from the literature. Completion of 1 credit hour required for M.S. degree.

5103* Physical and Chemical Separations. Prerequisite: one year of physical chemistry. Principles of bulk and multi-stage separation methods: chromatography, liquid-liquid extraction and zone melting.

5113* Equilibrium and Kinetics in Analytical Chemistry. Prerequisite: one year of physical chemistry. Physical and chemical principles of equilibrium and kinetics as applied to analytical problems.

5220* Modern Topics for Teachers. 1-6 credits, maximum 6. Prerequisite: teaching experience. Designed to help elementary and secondary science teachers improve their subject matter competence in chemistry. Content varies, depending on the needs of specific groups of teachers.

5221* Chemistry of High Polymers. Prerequisites: 3153 and 3434 or equivalent. Preparation and polymerization of organic monomers; properties and uses of resulting high polymers; theories of polymerization; inorganic and natural organic polymers.
5260* Inorganic Chemistry I. 1-3 credit hours, maximum 3. Prerequisite: 3353 or equivalent, and 3 hours of physical chemistry. Bonding theory, molecular symmetry and structure, characterization of inorganic compounds, coordination chemistry, crystal field theory, solution chemistry, and mechanisms of inorganic reactions in solution.

5283* Solid-state Chemistry. Prerequisite: 5260. Structure, bonding, and properties of crystalline and amorphous inorganic solids. Emphasis on the characterization of inorganic solids and phase transitions in inorganic solids.


5373* Spectrometric Identification of Organic Compounds. Lab 3. Prerequisite: 4320. Lectures on ultraviolet, circular dichroism, infrared, nuclear magnetic resonance (NMR) and mass spectrometry (MS). More advanced techniques in NMR and MS stressed. Hands-on training and use of modern spectroscopic instrumentation in laboratory.

5443* Mechanism and Structure in Organic Chemistry. Prerequisites: 3153 and 3553. Relationship of properties of organic compounds to their structure; mechanisms of organic reactions.

5583* Chemical Thermodynamics I. Prerequisite: 3553. Statistical and classical thermodynamics applied to chemical systems.

5623* Quantum Chemistry I. Prerequisite: 3553. Fundamentals of quantum mechanics, including classical mechanics, wave representation of matter, the Schrodinger equation and atomic structure.

5960* Inorganic Chemistry II. 1-3 credits, maximum 3. Prerequisite: 5260. Chemistry of main group and transition metal organometallic compounds, metal clusters, and catalysis by organometallic polymers, bioinorganic chemistry, and materials chemistry.

6000 Research. 1-12 credits, maximum 55. Prerequisite: M.S. degree in chemistry or permission of instructor. Independent investigation under the direction and supervision of a major professor.

6011* Advanced Seminar. Prerequisite: 5011 or M.S. degree. Preparation and oral presentation of critical reviews on chemical subjects. Usually related to the student’s research area. Completion of 1 credit hour required for the Ph.D. degree.

6050* Special Topics in Analytical Chemistry. 1-6 credits, maximum 6. Supervised study of topics and fields not otherwise covered.

6103* Electroanalytical Chemistry. Prerequisite: 4024. The theory, practice and instrumentation in various areas of modern electroanalytical chemistry.

6113* Analytical Spectroscopy. Prerequisite: 4024. Survey of selected topics in analytical applications of spectroscopic techniques. Fundamentally concepts as well as current trends in research, including instrumentation.

6323* Heterocyclic Compounds and Medicinal Chemistry. Preparations and reactions of cyclic organic compounds containing atoms other than carbon in the ring. Modern synthetic techniques as well as industrial methods for the preparation of heterocyclics, especially those with medicinal properties and uses as related to structural characteristics of the compounds.

6353* Chemistry of Natural Products. Prerequisite: 5323. Complex naturally occurring organic compounds such as alkaloids, terpenes and steroids.

6420* Special Topics in Organic Chemistry. 1-9 credits, maximum 9. Prerequisite: 3153. Deals with topics not covered in other courses.

6453* Chemical Kinetics. Prerequisite: 3553. The kinetics of chemical reactions and their theoretical interpretation.

6523* Quantum Chemistry II. Prerequisite: 5623 or PHYS 5613. Molecular quantum mechanics and chemical bonding.

6553* Molecular Spectroscopy. Prerequisite: 5623. Spectra and structure of molecules.

6623* Chemical Thermodynamics II. Prerequisite: 5563. A continuation of 5563.

6650* Selected Topics in Advanced Physical and Inorganic Chemistry. 1-6 credits, maximum 12. Prerequisite: consent of instructor. Supervised study of selected topics and fields not otherwise covered.

6803* Photonics I: Advanced Optics. Lab 9. Prerequisite: ECEN 3813 or PHYS 3213, or consent of instructor. Advanced optics including spectral and time characteristics of detectors, characteristics of lasers, time, spectral and spatial parameters of laser emission, interferometric techniques, and nonlinear effects such as two-photon absorption and second and third harmonic generations. Ultrashort laser pulses. Same course as ECEN 6803 and PHYS 6803.

6811* Photonics II: THz Photonics and THz-TDS. Lab 3. Prerequisite: 6803. THz photonics and THz time-domain spectroscopy (THz-TDS). Concepts and techniques of driving electronic circuits with ultrashort laser pulses to generate and detect freely propagating pulses of THz electromagnetic radiation using several optical research systems. Same course as ECEN 6811 and PHYS 6811.

6821* Photonics II: Spectroscopy II. Lab 3. Prerequisite: 6803. Operating principles and applications of laser spectroscopy of atoms, molecules, solids and complex fluids. Absorption, emission, photon correlation, coherence, time resolved Fourier transform. Raman spectroscopy and non-linear optical. Same course as ECEN 6821 and PHYS 6821.

6831* Photonics II: Spectroscopy III. Lab 3. Prerequisite: 6803. Advanced spectroscopic instruments and methods used for investigation of semi-conductors and solid state material. Stimulated emission characterized both in wavelength and in time. Time-resolved fluorescence measurements. Multiphoton excitation. Fast measuring techniques including subnanosecond detectors, picosecond streak cameras, and ultrafast four-wave mixing and correlation techniques. Time-domain photoconductivity measurements. Same course as ECEN 6831 and PHYS 6831.


6851* Photonics III: Microscopy II. Lab 3. Prerequisite: 3553 or consent of instructor. Advanced techniques of SPM. Magnetic force microscopy, Kelvin force microscopy, STM in vacuum. Characterization of materials with SPM. Nanolithography with SPM. Device Manufacturing and Analysis. Same course as ECEN 6851 and PHYS 6851.

6861* Photonics III: Microscopy III and Image Processing. Lab 3. Prerequisite: ECEN 5793. Digital image processing, including projects. Image acquisition and display, image enhancement, geometric operations, linear and nonlinear filtering, image restoration, edge detection, image analysis, morphology, segmentation, recognition, and coding/compression. Same course as ECEN 6861 and PHYS 6861.


6891* Photonics IV: Semiconductor Synthesis and Devices III. Lab 3. Prerequisite: 6803. Processing, fabrication and characterization of semiconductor optoelectronic devices in class 100/1000 cleanrooms. Clearroom operation including general procedure for material processing and device fabrication. Device processing using a variety of processing such as mask aligner, vacuum evaporators and rapid thermal annealer. Testing using optical and electrical testing apparatus such as I-V, C-V, Hall, and optical spectral measurement systems. Same course as ECEN 6891 and PHYS 6891.

Civil Engineering (CIVE)


3413 Structural Analysis. Lab 3. Prerequisite: ENSC 2143. Analysis of internal forces and deflections of structures subjected to static loading. Braces, trusses, and framed structures analyzed by appropriate classical methods. Classical methods and modern computer procedures for the analysis of statically indeterminate structures.
3513 Structural Steel Design. Lab 3. Prerequisite: 3413. Introduction to the design of structural steel members and connections in accordance with AISC specifications.

3523 Reinforced Concrete Design. Lab 3. Prerequisite: 3413. Introduction to the design of reinforced concrete elements in accordance with the strength design requirements of the ACI Building Code.

3614 Engineering Surveying. Lab 3. Prerequisite: MATH 1613 or MATH 1715. Principles and techniques of vertical and horizontal measurements related to engineering and construction projects. Linear and angular measurements, differential leveling, traverses, topographic surveys, construction surveying, horizontal and vertical curves, earthwork quantities, and design of route systems.

3623 Engineering Materials Laboratory. Lab 3. Basic construction materials including Portland cement concrete, asphalt concrete, aggregates, and composite materials. Behavioral characteristics, use, and quality control of these materials. Basic statistical procedures used for material specifications. Laboratory sessions provide "hands on" experience in performing standard tests.

3833 Transportation Engineering. Prerequisite: 3614 or consent of instructor. Planning, design and operations of transportation facilities. Vehicle characteristics and human factors in design. Traffic stream variables and their measurement techniques. Basic traffic flow models. Highway and street intersection capacity and level of service. Traffic control concepts. Transportation systems management. Application of statistical analysis and operations research to analyze transportation problems.

3713 Geotechnical Engineering. Prerequisite: ENSC 2143. Physical and mechanical properties of soils, including specific gravity, grain size distribution, plasticity, permeability, consolidation, and shear strength. Use of physical and mechanical properties to calculate stresses in a soil mass, lateral earth pressures, bearing capacity, and slope stability. Application of physical and mechanical properties to design of foundations, retaining structures and slopes.

3813 Environmental Engineering Science. Prerequisites: CHEM 1514 or 1515, MATH 2155. Engineering aspects of the life support system; the carbon-oxygen cycle; cycling of nitrogen, sulfur and phosphorus; and the hydrologic cycle. Concepts of environmental pollution and degradation. Techniques for mitigation; water and wastewater treatment, solid and hazardous waste management, and air pollution abatement. Calculation of pollution potential and treatment system parameters.


514* Project Engineering and Management. Prerequisite: graduate standing or consent of instructor. Management of the design and construction of civil engineering projects. Topics include owner’s study, formation of project teams, design coordination, construction, and project closeout.

515* Contract Administration. Prerequisite: graduate standing or consent of instructor. Methods and techniques of tracking and control of construction projects. Evaluation of current research findings to contract implementation.

516* Construction Equipment Management. Prerequisite: graduate standing or consent of instructor. Analysis of construction equipment. Performance under various operating conditions. Application of engineering fundamentals to construction. Selection and costs of equipment, prediction of equipment production rates, and unit costs of work in place.

517* Concrete Construction. Prerequisite: graduate standing or consent of instructor. Design of formwork for concrete structures. Analysis of loads, deflections, and stresses of forming systems. Evaluation of economics of formwork designs.

521* Environmental Geotechnology. Prerequisites: background in soil mechanics and basic chemistry. A study of the ability of soil to retain pollutants, effect of pollutants on chemical, physical, and geotechnical properties of soil. Description of soil remediation technologies.

523* Geotechnical Engineering Investigations. Prerequisites: 3713, 4711, and basic geology course. Description of methods of subsurface exploration, sampling, and in situ testing. Discussion includes a review of engineering geophysical methods, equipment, and methods for boring and sampling of soil and rock. Measurement of ground water conditions, and in situ testing equipment and methods such as cone penetration test, pressure meter test and others.

524* Use and Design of Geosynthetics. Prerequisites: 3713, 4711. Description of types of geosynthetics available for engineering uses. Pertinent engineering properties required to design for various functions, basic design methodology for geosynthetics for various functions, and construction and performance considerations.

526* Terrain Analysis. Prerequisites: Basic courses in soil mechanics and geology. Prediction of geotechnical engineering characteristics of geological landforms from remote sensing imagery. Emphasis on photographic stereo interpretation. Training and practice of this media in land-use applications and environmental problems.

530* Systems Analysis for Civil Engineers. Prerequisite: senior or graduate standing. Synthesis of systems modeling and simulation techniques and mathematical optimization procedures, and evaluation tools of multi-attributed systems including utility theory and decision analysis. Mathematical optimization techniques in the areas of resource allocation, transportation and water resources systems planning, structural design, construction management, and environmental and ecological problems.

531* Highway Traffic Operations. Prerequisite: 3633. Level of service, capacity and service volume concepts. Operational characteristics of uninterrupted-flow and interrupted-flow traffic facilities. The 1985 HCM procedures for analyzing the capacity of freeways, multilane and two-lane rural highways, urban arterials, signalized and unsignalized street intersections, and transit and pedestrian facilities. Administrative and planning actions for congestion management. Design alternatives and improvement strategies for effective use of urban arterial street width.


537* Design of Traffic Control Systems. Prerequisite: 3633. Traffic control systems design, available technological options and range of agency needs. Characteristics of traffic control systems. Design considerations: traffic, control systems, controllers, communications links, signal display hardware and wire. Development of timing plans using computer simulation models. Freeway surveillance (alariance and control); ramp metering, incident detection and motorist information systems. Preparation of contractual documents and construction supervision.


540* Advanced Strength of Materials. Prerequisite: 3413. General states of stress and strain, theories of failure, energy principles, beam bending, shear center, torsion of prismatic shafts, beams on elastic foundations, plates and shells, elastic stability.

541* Classical Methods of Structural Analysis. Prerequisite: 3413. Advanced analysis of indeterminate frames, trusses and arches by classical, numerical, and energy methods with emphasis on methods for hand computations.


543* Energy Methods in Applied Mechanics. Prerequisites: 3410, MATH 2233 or MAE 3323. Advanced structural mechanics from the standpoint of virtual work; energy principles and variational calculus applied to the analysis of structures, mechanisms, dynamics, and vibrations.

544* Theory of Elastic Stability. Prerequisite: 5403. General theory of elastic stability; buckling of columns; analysis of beam-columns; stability analysis of structural frames, thin-walled beams of open cross-section, and plate structures.

545* Engineering Analysis. Prerequisite: senior standing and consent of instructor. Advanced, classical mathematical skills for engineers. Dimensional analysis, general tensor analysis, curvilinear coordinates, partial differential equations, perturbation theory, integral equations, special functions, eigen function analysis, integral transform methods, variational methods.


550* Computer-aided Structural Analysis and Design. Prerequisites: 3513, 3515 and 3523 (or concurrent enrollment); senior or graduate standing. Major comprehensive design experience. Promotion of a design office atmosphere in using a team approach. Industry practitioners provide design projects and critique results. Analysis and design of complex structures and preparation of contract documents and drawings. Emphasis on modern computer-based computation and presentation tools.

551* Advanced Reinforced Concrete Design. Prerequisite: 3523. Advanced topics in reinforced concrete design with emphasis on frames, slabs, and earthquake-resistant structures.

552* Advanced Steel Structure Design. Prerequisite: 3513. Advanced topics in steel design such as plastic design, plate girders, composite design, fatigue and fracture, stability, and bracing design.

Bridge Design. Prerequisites: 3513 and 3523. Structural design of steel and concrete highway bridges, including bridge types, parts of a bridge, loads and load distribution, analysis, design, and bridge rating. Emphasis on topics of special interest to students.

Fatigue and Fracture Mechanics. Prerequisite: MAE 4333 or consent of instructor. Fracture processes in engineering materials including design considerations, failure avoidance and predictability. Fatigue processes and high-strength, toughness-limited materials emphasized. Same course as MAE 5553.

Asphalt Materials and Mix Design. Lab 1.5. Prerequisite: 3633 or consent of instructor. Principles of asphalt concrete mix design including material characteristics and performance. Evaluation of Hveem and Marshall mix design methods. Asphalt cements, rubberized asphalt polymer asphalts, emulsions, cutbacks, and aggregates. Laboratory sessions focused on the engineering properties of the materials discussed.

Concrete Materials and Mix Design. Lab 1.5. Prerequisite: senior or graduate standing. Principles of concrete mix design including material characteristics, strength and durability requirements, environmental effects and forensic analysis. ACI and CA mix design procedures. Laboratory on theoretical and practical aspects of concrete technology.

Pavement Design and Analysis. Prerequisite: 3633 or consent of instructor. Principles of pavement design including stress analyses, load and environmental effects and material characteristics. AASHTO, PCA and AI methods of pavement design, computer methods. Practical aspects of life cycle cost analyses and construction methods.

Soils in Construction. Prerequisites: 3713, 4711 or consent of instructor. Soils types and general behavior during construction; earthwork construction requirements and specific considerations for embankments, pavements, buildings and retaining structures; groundwater control during construction; soil modification and stabilization; and construction considerations for geosynthetics. Basic design considerations, including selection of placement conditions for compaction; proportioning of groundwater control systems; selection of type and amount of soil modifier, and design of geosynthetics to meet specific functions.

Soil Mechanics. Prerequisites: 3713 and 4711. Application of soil mechanics principles and concepts in geotechnical areas of permeability and seepage, settlement analysis, bearing capacity, lateral earth pressures and retaining walls, slope stability, and metastable soils.

Foundation Engineering. Prerequisites: 3713 and 4711. Types of structural foundations including footings, mats, rafts, piles and drilled shafts. Site characteristics, exploration programs, field data, test results and construction materials and methods as basis for selection of type of foundation and design. Geotechnical design procedures and considerations.

6000 Ph.D. Research and Thesis. 1-16 credits, maximum 30. Independent research under the direction of a member of the graduate faculty by students working beyond the level of Master of Science degree.

6010 Seminar. 1-6 credits, maximum 12. Prerequisites: consent of instructor and approval of the student's advisory committee. Analytical studies with suitable reports on problems in one or more of the subfields in civil engineering by students working beyond the level of Master of Science degree.


6413 Plate and Shell Structures. Prerequisite: 5403. Bending of thin plate structures to include rectangular and circular plates. Analysis of orthotropic plates by classical and numerical methods. Introduction to shell bending theory.

6433 Structural Dynamics. Analysis of bars, frames, towers, multistory building and truss structures subjected to dynamic disturbances; investigation of lumped and distributed mass systems; natural frequencies, response spectra, applications to blast loading and earthquake analyses.

6434 Finite Element Analysis in Engineering. Prerequisite: consent of instructor. Finite element methods from an advanced viewpoint. Matrix mechanics; approximation theory; weighted residual and variational statements; shape functions and element types; parametric mappings; convergence criteria and error analyses; nonlinear and transient methods; eigenanalysis; programming techniques; applications to solid mechanics, structures, fluids mechanics, and thermal problems.

6443 Boundary Element Methods in Engineering. Prerequisite: consent of instructor. Matrix formulation and solution of complex two- and three-dimensional problems cast as boundary integral equations. Synthesis of integral relationships; elementary and advanced applications in solid mechanics, structures, fluids, and thermal problems; coupling with finite element analysis.


6713 Seepage and Groundwater Flow. Prerequisite: 3713. Seepage through earthen dams and around hydraulic structures through pervious and phreatic surfaces. Seepage pressures, piping and boils. Construction and utilization of flow nets. Groundwater mechanics applications including flow characteristics and changes in flow due to pump and drain systems.

6723 Advanced Geotechnical Engineering. Prerequisites: 3713 and GEOL 1114 or 3023. Geologic occurrence and engineering significance of ground failure hazards such as slope movements, streambank erosion, subsidence, metastable soils and earthquakes. Emphasis on qualitative identification of ground failure hazards with quantitative assessing and remedial actions.

6843 Stochastic Methods in Hydrology. Prerequisites: 5843, STAT 4033. Stochastic and statistical hydrologic analyses of surface water and ground water systems. Analyses of urban and rural drainage, and detention systems. Same as BAE 6313.

6853 Modeling of Water Resources Systems. Prerequisites: 5843 and 5913. Application of finite-difference and finite-element methods to predict water flow and chemical and biological water quality in saturated-unsaturated ground waters, streams, lakes, urban areas, and watersheds.

6913 Advanced Environmental Laboratory Analysis. Lab 3. Prerequisite: 5813. Instrumental and statistical procedures of sample collection and analysis; processing samples, effluents, residues, and environmental samples. Use of gas and liquid (ion) chromatography, atomic absorption and other analytical methods.

6923 Industrial Wastes Engineering. Prerequisite: graduate standing. Theory and methods of waste minimization, waste product reduction or reuse, process changes and treatment of residuals to reduce volume and toxicity of industrial wastes.


Communication Sciences and Disorders (CDIS)

2033 Sign Languages. Prerequisite: sophomore standing. Introduction to methods of sign language currently used among the U.S. deaf society, socially and educationally, including the traditional American Sign Language (ASL), manually Coded English (MCE, SEE) and fingerspelling. Linguistic components of sign and various sociological, psychological, and adaptive communication issues having an impact on the deaf community. Two hours per week, devoted to lecture and theory, one hour involved in a variety of interactive sign language skill work in smaller groups.

2213 Phonetics. Prerequisite: sophomore standing. The analysis and description of speech at the segmental and suprasegmental levels. Development of students' perceptual and analytic skills in speech sound production. Practice using the International Phonetic Alphabet for broad and narrow transcription. Overview of the speech production mechanism and process.

3123 Audiology and Auditory. Prerequisites: 2213, 3123 and acceptance into CDIS program, previous or concurrent enrollment in 3224. Anatomy and physiology of the hearing mechanism and related physics of sound. Common etiologies of hearing disorders. Establishing hearing screening programs. Practical experience in pure tone audiometry and impedance screening.

3213 Survey of Communication Disorders. Prerequisite: sophomore standing. The normal development of speech, language and hearing. The characteristics, diagnosis and treatment of speech, language and hearing disorders among all age groups. Suggestions for related professions involved with people with communication disorders.

3224 (S) Speech and Language Development. Prerequisites: 2213, 3213 and acceptance into professional program via Declaration of Intent in CDIS. Fundamental processes and procedures of clinical practice, report writing, goal selection, production, assessment and recording of speech and language behaviors; development of interpersonal skills with clients and other health professionals; problem solving skills; professional organization and credentialing requirements.

4010 Clinic Practicum. 1-3 credits, maximum 3. Lab 2-4. Prerequisites: 4022, 4031, 4323 or 4413, senior standing, 3.25 GPA in the major and consent of adviser. Supervised clinical practicum in speech-language pathology and audiology.

4022 Clinical Methods and Issues. Prerequisites: 2213, 3213, 3224; acceptance into professional program via Declaration of Intent in CDIS. Fundamental processes and procedures of clinical practice, report writing, goal selection, production, assessment and recording of speech and language behaviors; development of interpersonal skills with clients and other health professionals; problem solving skills; professional organization and credentialing requirements.

4031 Clinical Observations. Lab 2. Prerequisites: 2213, 3213, 3224; declared communication sciences and disorders major; must be taken concurrently with or subsequent to 4022. Observation and critiquing of speech and language pathology and audiology clinical activities.

4133 Aural Rehabilitation for the Acoustically Handicapped. Prerequisites: 2213, 3123, 3213. Clinical aspects of habilitation and rehabilitation programs for the deaf and the hard-of-hearing, including speech reading, auditory training, speech conservation, speech and language therapy, hearing aid orientation and counseling. Study of amplification units including assistive listening devices.

4214 Anatomy and Physiology of the Speech Mechanism. Lab 1. Prerequisite: 3213 or consent of the instructor. Structure and function of the respiratory, phonatory, articulatory, and neural systems involved in the oral communicative processes. Laboratory experiences required.
4222* Language Analysis. Prerequisites: 3224, and one of: FLL 2443, ENGL 2443, 4003, 4013, 4063, 4093. Applications of content, form and use analysis methods to language samples of individuals with communication disorders. Analyses of word, phrase, sentence and discourse levels. Variations as a function of age, culture, modality (spoken or written), and disorder type.

4253* Diagnostic Procedures in Communication Disorders. Prerequisites: 3224, 4022. Speech and language diagnostic testing and procedures, interpreting diagnostic information and deriving appropriate treatment goals.

4313* Speech Science. Prerequisite: 4214. Scientific bases of the acoustic parameters, the perceptive and productive processes of speech, and the interrelationships of those factors during speech communication.


4443* Fluency Disorders. Prerequisite: junior standing or consent of instructor. Recent research into the nature, causes and treatment of fluency disorders. Practical classroom experience in diagnosing and treating fluency disorders.

4980 Independent Study in Communication Sciences and Disorders. 1-3 credits, maximum 3. Prerequisite: junior standing and consent of instructor. Directed readings or research in communication sciences and disorders.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a faculty member. Required for graduation with departmental honors in communication sciences and disorders.

5000* Research and Thesis. 1-3 credits, maximum 6. Prerequisite: consent of graduate faculty. Research in speech, language and hearing sciences and disorders.

5013* Research Methods in Communication Disorders. Prerequisite: 3213. Research methods with emphasis on methods used most frequently in communication sciences and disorders; experience devising, evaluating, and implementing research.


5153* Neurological Communication Disorders. Prerequisite: 4214. Communication changes occurring with aging and common neurological diseases and trauma. Neuropsychological bases and treatment of aphasia and right hemisphere disorders.

5160* Dysphagia. 2-3 credits, maximum 3. Prerequisite: 4214. Anatomical and neurophysiology of the swallowing mechanism in relation to pediatric and adult dysphagia. Evaluation, diagnosis and treatment of swallowing problems in children and adults including videofluoroscopic testing with case studies. The first two-thirds of the course focus on adult dysphagia and the latter one third on pediatric dysphagia.

5172* Motor Speech Disorders. Prerequisite: 5153. Nature, evaluation and treatment of neurologically-based motor speech disorders such as dysarthria and apraxia.

5182* Cognitive Communication Disorders. Prerequisite: 5153. Nature, evaluation and treatment of acquired cognitive communication disorders secondary to traumatic injury or dementia.

5210* Advanced Practicum. 1-6 credits, maximum 9. Prerequisite: consent of instructor. Practical experience for the advanced student on or off campus.

5232* Communication Disorders in Infants and Toddlers. Prerequisite: 3224. Family-centered assessment and intervention and prevention issues with infants and toddlers, birth to 3 years of age, who are at risk or have communication disorders. Impact of perinatal, neonatal and postnatal biological and environmental risks on developmental outcome.


5333* Voice Disorders. Prerequisite: 4313. The physiology of the vocal mechanism and factors which cause voice deviations. Recent research on diagnostic and intervention procedures in a variety of disorders. Independent study, observations in medical settings, and special demonstrations.

5422* Adaptive Communication Systems. Prerequisite: major in communication science and disorders or consent of instructor. Evaluation and management of communication disorders in individuals requiring specially adapted educational intervention programs. Adaptive communication technologies.

5431* Craniofacial Anomalies. Prerequisites: 4214, 4313. Recent research in the etiology, assessment and management of communicative disorders in individuals with orofacial anomalies.

5442* Communication Disorders in Individuals with Developmental Delay. Prerequisites: 3224, 5113. Etiology, assessment and intervention considerations for communication disorders in children and adults with varying degrees of developmental delay.

5710* Special Topics in Communication Disorders. 1-4 credits, maximum 9. Prerequisite: consent of department head. Individual and group investigations of problems in communication sciences and disorders.

5720* Seminar in Communication Disorders. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Topics relevant to the evaluation and treatment of communication disorders presented on a rotating basis.

5730* Independent Study in Communication Sciences and Disorders. 1-3 credits, maximum 3. Prerequisite: graduate standing and consent of instructor. Directed readings or research in communication sciences and disorders.

5731* Professional Issues. Prerequisite: graduate standing in speech pathology. Discussion of professional standards, ethics, practice and issues in speech-language pathology.

5742* Multicultural Applications in Communication Disorders. Prerequisites: 3224, 4253, or consent of instructor. The study of communication differences and disorders in culturally and linguistically diverse individuals. Clinical applications in assessment and intervention. Case study and program design.

5760* Portfolio. 1-2 credits, maximum 2. Prerequisite: graduate standing. Nature and preparation of professional portfolio with faculty guidance.

Computer Science (CS)

1003 Computer Literacy. Lab 2. For students with little or no personal computer skills. Use of Internet and productivity software such as word processing, spreadsheets, databases, and presentation software.


1113 (A)Computer Science I. Prerequisite: MATH 1513 or equivalent. Introduction to computer science using a block-structured high-level computer language language, including subprograms, arrays, recursion, records and abstract data types. Principles of problem solving, debugging, documentation and good programming practice. Elementary methods of searching and sorting. Use of operating system commands and utilities.
2133 Computer Science II. Prerequisite: 1113. Recursive algorithms. Intermediate methods of searching, mathematical analysis of space and time complexity, worst case, and average case performance.

2301 FORTRAN 77 Programming. Lab 2. Prerequisite: 1113. FORTRAN 77 control structures, arrays, subroutines, input/output. A major programming assignment will be completed by each student enrolled in the course.

2331 SAS Programming. Prerequisite: a different programming language or consent of instructor. SAS as a general purpose programming language. Data representation, input/output, use of built-in procedures, report generation.

2571 UNIX Programming. Lab 2. Prerequisite: 1113. The UNIX programming system. The programming environment. The UNIX file system and the shell. Use of pipes and filters.

2432 The C Programming Language. Prerequisite: 1113. C programming language types, operators, expressions, control flow, functions, structures, pointers, arrays, UNIX interface.

2570 Special Problems in Computer Science. 1-3 credits. Maximum 6. Prerequisites: consent of instructor and freshman or sophomore standing. Current topics and applications of computer science. Existing and new topics to computer science. Allows lower-division students to study topics not provided in existing classes. Can be individual study or a class with a new subject.

3030 Industrial Practice in Computer Science. 1-6 credits, maximum 12. Prerequisites: 3443, MATH 2155, junior standing, consent of departmental adviser. Applied computing in industry. Topics vary with cooperating employers. Written reports will be specified by adviser.

3020 ADA Programming. Prerequisite: 2133. ADA-R control structures, data structures, subprograms, types, parallel processing, exception conditions.

3363 Organization of Programming Languages. Prerequisites: 2133, 3443. Programming language constructs. Run time behavior of programs. Language definition structure. Control structures and data flow programming paradigms.


3422 File Structures. Prerequisite: 2133. Basic physical characteristics of peripheral storage devices. File organization and processing methods for sequential, direct, indexed, tree structured and inverted files. Application of data structure concepts to logical and physical file organization: Performance analysis. Elements of advanced data base systems.

3440 Computer Systems. Prerequisite: 2133. Functional and register level description of computer systems, computer structures, addressing techniques, macros, linkage, input-output operations. Introduction to file processing operations and auxiliary storage devices. Programming assignments are implemented in assembly language.

3513 Numerical Methods for Digital Computers. Prerequisites: MATH 2145, and knowledge of programming digital computer approximate solutions of algebraic and transcendental equations, solutions of linear and nonlinear equations, functional approximations, least squares curve fitting and applied topics. Practical programming experience in applications of these techniques.

3570 Special Problems in Computer Science. 1-3 credits, maximum 6. Prerequisites: junior standing and consent of instructor. Current topics and applications of computer science. Existing and new topics to computer science. Allows lower-division students to study topics not provided in existing classes. Can be individual study or a class with a new subject.


3653 Discrete Mathematics for Computer Science. Prerequisite: MATH 2145. Theory and applications of discrete mathematics models fundamental to analysis of problems in computer science. Set theory, formal logic and proof techniques, relations and functions, combinatorics and probability, undirected and directed graphs, Boolean algebra, switching logic.

4003 Mathematical Logic and Computability. Prerequisite: MATH 3413 or PHIL 3000 or 3003 or consent of instructor. Basic concepts of first order logic: soundness, completeness, compactness, Lowenheim-Skolem theorem, undecidability of first order logic, Godel's incompleteness theorem. Topics include enumerability, diagonalization, formal systems, standard and nonstandard models, Godel numberings, Turing machines, recursive functions, and evidence for Church's Theses. Same course as MATH 4003 and PHIL 4003.

4113 (A)Techniques of Computer Science for Science and Engineering. Prerequisites: one year calculus and graduate standing. For graduate and advanced undergraduate students requiring a one-semester treatment of computer topics. No background in computing topics assumed. Comprehensive treatment of the FORTRAN programming language with emphasis on numerical applications. Number systems, finite arithmetic, iterative processes, programs structuring, numerical methods, program libraries are covered.

4143 Computer Graphics. Prerequisites: 2133, MATH 2145. Interactive graphics programming: graphics hardware; geometrical transformation; data structures for graphic representations; viewing in three dimensions; representation of 3D shapes; hidden edge and hidden surface removal algorithms; shading models.

4273 Software Engineering. Prerequisites: 2133, 3443 or ECEN 3213, 3653. Fundamental characteristics of the software life cycle. Tools, techniques, and management controls for development and maintenance of large software systems. Software metrics and models. Human factors and experimental design. Same course as ECEN 4273.

4283 Computer Networks. Prerequisites: 2133, 3443 or ECEN 3213; UNIX knowledge. Computer network participation and distributed systems and their system design. Introduction to the use, structure, and architecture of computer networks. Networking experiments to describe network topology and ISO/OSI reference model. Same course as ECEN 4283.


4343 Data Structures and Algorithm Analysis I. Prerequisites: 2133, 3653. Storage, structures, data and information structures, list processing, trees and tree processing, graphs and graph processing, searching, sorting.

4443 Compiler Writing I. Prerequisites: 2133, 3443. Syntax and semantics of procedure-oriented languages and theory of translation techniques used in their compilation. Study of languages for particular application areas, including nonalgebraic languages.

4513 Numerical Methods: Analysis. Prerequisite: MATH 2233, MATH 3013, knowledge of FORTRAN. Machine computing, algorithms, and analysis of errors applied to interpolation and approximation of functions solving equations and systems of equations, curve fitting, solving linear and nonlinear systems, finite arithmetic, iterative processes, approximation of functions solving equations and applications. No background in computing topics. No credit for students majoring in computing and information science.

4570 Special Topics in Computing. 1-3 credits, maximum 5. Advanced topics and applications of computer science. Typical topics include operating systems, multiprocessor systems, programming systems or various mathematical and statistical packages. Designed to allow students to study topics not provided in existing courses.

4793 Artificial Intelligence I. Prerequisites: 2133, 3653. Broad coverage of core artificial intelligence topics, AI languages, AI representation of knowledge, problem solving, knowledge representation, logical inference, AI languages, history and philosophy of AI.

4883 Social Issues in Computing Sciences. Prerequisite: senior standing. Social implications of computer use or misuse with emphasis on the effects on the individual, society and other human institutions. Social responsibilities of people involved in using or applying computers.

4993 Senior Honors Project. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors project under the direction of a faculty member, with a second faculty reader and an oral examination. Required for graduation with departmental honors in computing and information science.

5000 Research and Thesis. 1-6 credits, maximum 6. Prerequisite: consent of major professor. A student studying for a master's degree who elects to write a thesis or a report must enroll in this course.
5013* Linear Programming. Prerequisites: MATH 3013 or IEM 4014; FORTRAN. Simplex algorithm to solve deterministic linear optimization models and applications. Considering maximization and minimization objectives; degeneracy, alternative optima and no feasible solutions. Revised simplex procedures. Duality theory, economic interpretations, dual simplex and complementary pivoting. Sensitivity analysis and parametric programming. Special cases of linear optimization problems and underlying mathematical foundations. Large-scale models including computational considerations. Same course as IEM 5013.

5030* Professional Practice. 1-9 credits, maximum 9. Prerequisites: graduate standing in computer science, consent of the department head. Experience in the application of computer science principles to problems encountered in industry and government. Participation in problems solving in the role of junior computer scientist, junior software engineer, or computer science intern. All problem solutions documented. Required written report to the major professor.

5070 Seminar and Special Problems. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Designed to allow students to study advanced topics not provided in existing courses.

5113* Computer Organization and Architecture. Prerequisite: 3443. Computer architecture, computer control, microprogrammed control, addressing structures, memory hierarchies, hardware and description languages, specific architectures, hardware simulation, emulation.

5154* Computer Science Migration. Lab 2. Prerequisite: graduate standing. A survey of computer science for students whose undergraduate major was not computer science. Programming in high-level languages. Programming in assembly language. Algorithm design and analysis. Computer system fundamentals. Fundamental data structures.

5253* Digital Computer Design. Prerequisite: ECE 3223. Analysis and design of digital computers. Arithmetic algorithms and the design of the arithmetic/logic unit (ALU). Serial and parallel data processing; control and timing systems; microprogramming; memory organization alternatives; input/output interfaces. Same course as ECE 5253.

5273* Advanced Software Engineering. Prerequisite: 4273. Continuation of 4273. Advanced theory and practice of software design methodology. Large-scale design and implementation problems. Experimental design for software engineering. Same course as ECE 5273.

5283* Computer Network Programming. Prerequisite: 4283. Detailed technical concepts related to computer and telecommunication (ALU). Serial and parallel data processing; control and timing systems; microprogramming; memory organization alternatives; input/output interfaces. Same course as ECE 5283.


5323* Design and Implementation of Operating Systems. Prerequisite: 4323. Task systems and concurrent programming; synchronization and inter process communication. Theoretical investigation of resource sharing and deadlock, memory management, strategies, and scheduling algorithms; queuing theory, distributed operating systems. System accounting, user services and utilities.

5333* Compiler Writing II. Prerequisite: 4443. Continuation of 4443. Theory and practice of compiler writing techniques. Compiler writing systems. A formal approach to compiler languages.


5413* Data Structures and Algorithm Analysis I. Prerequisite: 4343. Data structures and their application in recursive and iterative algorithms. Static and dynamic data structure representations and processing algorithms. Dynamic and virtual storage management.

5423* Information Organization and Retrieval. Prerequisite: 3423, 4343 or equivalents. An overview of database management systems, entity-relationship model, relational model, relational algebra, relational calculus, structural query language, relational database design with normalization theorems, database integrity constraints, object-oriented model.

5433* Distributed Database Systems. Prerequisites: 5423, 5283 or 5293. Overview of relational database management systems (DBMS), distributed DBMS architecture, distributed database design, overview of query processing, introduction to transaction management, distributed concurrency control, SQL server.

5513* Numerical Analysis I. Prerequisite: 4513 or MATH 4513. Algorithms and error analysis; solution of equations; interpolation and approximation theory.

5543* Numerical Analysis for Differential Equations. Prerequisites: 4513 or MATH 4513 and 4233. Advanced machine computing, algorithms, analysis of truncation and rounding errors, convergence and stability applied to discrete variable, finite element, and spectral methods in ordinary and partial differential equations. Same course as MATH 5543.

5553* Numerical Analysis for Linear Algebra. Prerequisites: MATH 3013 and CS 4513 or MATH 4513. Advanced machine computing, algorithms, analysis of rounding errors, condition, convergence, and stability applied to direct and iterative solution of linear systems of equations, linear least squares problems, including LU and QR factorization, conjugate gradients, QR algorithm, and Lanczos method. Same course as MATH 5553.

5653* Automata and Finite State Machines. Prerequisite: 5313. Finite state model, state diagrams and flow tables, equivalent states and equivalence of machines. Formal grammars, context-free languages and their relation to automata. Turing machines, computability and recursive function. Same course as MATH 5653.

5663* Computability and Decidability. Prerequisite: 5313. Effectiveness, primitive recursivity, general recursivity, recursive functions, equivalence of computability, definitions, decidability, and recursive algorithms. Same course as MATH 5663.

5793* Artificial Intelligence II. Prerequisite: 4793. Advanced knowledge representation and expert system building, including reasoning under uncertainty. Applications to planning, intelligent agents, natural language processing, robotics, and machine learning. Common lenguage, with ECE 5293, IEM 5933 and MAE 5793.

6000* Research and Dissertation. 2-15 credits, maximum 30. Prerequisites: graduate standing and approval of advisory committee. Independent research under the direction of a member of the graduate faculty. For students working toward a Ph.D. degree.

6023* Nonlinear and Integer Optimization. Prerequisites: 5013 or IEM 4014; FORTRAN or PASCAL. Theoretical and practical aspects of nonlinear and integer optimization. Development and application of nonlinear optimization techniques for unconstrained and constrained problems; sequential search, gradient, penalty and barrier, and projection methods. Development and application of integer and mixed integer techniques for unconstrained and constrained problems; implicit enumeration, branch and bound, and cutting methods. Same course as IEM 6023.

6240* Advanced Topics in Computer Organization. 2-6 credits, maximum 12. Prerequisites: 5113 and 5253. Structure and organization of advanced computer systems, parallel and pipeline architectures and organization, computation, alignment networks, conflict-free memories, bounds on computation time.

6253* Advanced Topics in Computer Architecture. Prerequisite: 5253 or ECE 5253. Innovations in the architecture and organization of computers, with an emphasis on parallelism. Topics may include pipelining, multiprocessors, data flow, and reduction machines. Same course as ECEN 6253.

6300* Advanced Topics in Programming Languages. 2-6 credits, maximum 12. Prerequisite: 5313. Interpreter models of programming language semantics, lambda calculus, LISP definition; Knuth semantic systems and their formulation, translational and denotational semantics. May be repeated with change of topics.

6350* Advanced Topics in Operating Systems. 2-6 credits, maximum 12. Prerequisite: 5323. Design and analysis of operating systems. Concurrent processes, server scheduling, models of auxiliary storage, memory management, virtual systems, performance algorithms. May be repeated with a change in topics.
6400*
Advanced Topics in Information Systems. 2-6 credits, maximum 12. Prerequisites: 5413, 5423. Principles of distributed database systems. Overview of relational database management systems (DBMS) and computer networks, distributed DBMS architecture, distributed database design, distributed concurrency control, query processing, distributed DBMS reliability.

6500*

6600*
Advanced Topics in Analysis of Algorithms. 2-6 credits, maximum 12. Prerequisite: 5413. Analysis of various algorithms. Sorting, searching, computational complexity, lower bounds for algorithms; NP-hard and NP-complete problems; parallel algorithms; proof of correctness of algorithms. May be repeated with change of topics.

6623*
Algebraic Structures of Formal Grammars. Prerequisites: 5313, 5653. Context-free languages, Kleene languages, Dyck languages, context-sensitive languages; use of algebraic systems to define languages; linear bounded automata.

6700*
Advanced Topics in Artificial Intelligence. 2-6 credits, maximum 12. Prerequisite: 5793 or consent of instructor. Machine learning; computer perception and robotics; logic programming; natural languages; understanding; intelligent agents; medical informatics. May be repeated with change of topics.

Construction Management Technology (CMT)

1214
Introduction to Construction. Lab 2. Overview of the construction industry with emphasis on construction materials, methods and systems.

2253
Construction Drawings and CAD. Lab 6. Interpretation and production of construction drawings, architectural and engineering drafting using both drafting machines and computer aided drafting.

2263
Estimating I. Prerequisites: 1214, 2253. Quantity take-off with emphasis on excavation, formwork and concrete, masonry, rough carpentry and miscellaneous specialty items.

2273
Computer Application in Construction. Lab 3. Prerequisites: 1213 and MATH 1513. Disk operating systems, introduction to programming in Basic, word processing, spreadsheets, applications to the construction industry.

2343

3273
Scheduling Construction Projects. Prerequisite: 2263. Scheduling basics including bar charts and critical-path methods; manual and computer techniques using current software; emphasis on using schedules for construction project management.

3331
Construction Practicum I. Prerequisite: 1214 or 2253. Supervised field experience in construction for 800 minimum documented time required.

3332
Construction Practicum II. Prerequisites: 3331, 2263 and CIVE 3614. Supervised temporary, full-time employment in construction, emphasizing field and office engineering and a variety of project management functions; 400 hours minimum documented time required.

3364
Structures I. Lab 3. Prerequisites: 2343, GENT 3323. Methods of structural analysis applicable to construction; design of timber structures and forms for concrete structures.

3433
Principles of Site Development. Lab 3. Prerequisite: CIVE 3614, GENT 3323. Site layout, vertical and horizontal control, surveying, instrument adjustments, site investigations, excavations, site drainage and geotechnical considerations.

3463
Environmental Building Systems. Lab 3. Prerequisite: PHYS 1214. Plumbing, heating, air-conditioning, electrical and lighting systems as applied to residences and commercial buildings.

3564
Structures II. Lab 3. Prerequisite: 3364. Analysis and design of elements in steel and reinforced concrete structures; review of shop drawings for both types of construction.

3663
Concrete Design. Lab 3. Prerequisite: MET 3323. Analysis and design of reinforced and prestressed concrete in accordance with the ACI building code.

4050
Advanced Construction Management Problems. 1-6 credits, maximum 6. Prerequisites: junior standing and consent of instructor. Special problems in construction management.

4263
Estimating II. Prerequisite: 3263. Extensive use of actual contract documents for quantity take-off, pricing and assembling the bid for several projects. Use of computers in estimating.

4273
Computer Estimating. Lab 3. Prerequisite: 4263. Various software programs applied to estimating for building construction. Automated take off (Digitizer) systems.

4283
Business Practices for Construction. Prerequisites: 4563, ACCT 2103. Principles of management applied to construction contracting, organizing office and field staff; bonding, liens, financial management practices; introduction to the construction manager concept; scheduling of values; construction billings.

4293
Construction Manager Concepts. Prerequisites: 3333, 4273, 4283. Capstone course utilizing principles of management and leadership, motivation and the use of current project management software.

4443
Construction Safety and Loss Control. Prerequisite: senior standing. A detailed study of OSHA Part 1926 - Construction Safety and Health Compliance and related safety topics; all elements of the OSHA 30-hour training course; students completing the course are OSHA Certified Competent Persons; concepts and methods of loss control.

4563
Construction Law and Insurance. Prerequisite: 3273. Legal and insurance problems as they pertain to the construction industry.

4783
Seminar. Prerequisites: CIVE 3614. Construction scheduling; construction equipment management; advanced techniques of construction project layout and control.

Counseling Psychology (CPSY)

1112
World of Work. Assists students in exploring career options through increased understanding of self and expanded knowledge of occupational information. Includes a study of the decision-making process and a look at the present and future changing world of work.

5000*
Master's Thesis. 1-6 credits, maximum 6. Prerequisite: consent of advisory committee chairperson. Report of research conducted by a student in the master's program in counseling. Credit given and grade assigned upon completion and acceptance of the thesis.

5042*
Interviewing Techniques. Basic principles underlying effective interviewing and interpersonal communication skills. Overview of various types of interviews. Application and analysis of interviews through video and audio tapes.

5123*
Medical Information in Counseling. Orientation to medical information and medical aspects of disability. Application to clinical problems in human service professions such as rehabilitation counseling, counseling psychology, and related disciplines.

5173*
Gerontological Counseling. An examination of mental health treatment modalities and approaches to counseling with older adults. An experiential component is included.

5183*
Introduction to Rehabilitation Counseling. Background, legal aspects and philosophy of rehabilitation. Overview of current practices in rehabilitation and related areas.

5223*
Psychology of Disability. Psychological and sociological implications of physical disability and illness. Dynamics involved in adjusting to disabling conditions including issues in rehabilitation, psychology, counseling, and somato-psychology.

5320*
Seminar in Counseling Psychology. 3-9 credits, maximum 9. Prerequisite: graduate standing. In-depth exploration of contemporary topics in counseling psychology.

5453*
Vocational and Career Information. Local, state and national sources of occupational information about jobs and sociological factors related to career planning and worker effectiveness.

5473*
Introduction to Counseling Practice. Prerequisite: graduate standing. Orientation to counseling practice through observation and participation. The supervised experiences permit the student and the counselor education staff to evaluate the student's strengths and weaknesses as a potential counselor or student personnel administrator.

Counseling Psychology 239
Community Counseling and Resource Development. Prerequisite: graduate standing. Application of educational, preventive, and crisis interventions in a variety of human service settings, including the development and evaluation of community helping resources.

Professional and Ethical Issues in Counseling. Prerequisite: admission to community counseling, elementary or secondary school counseling graduate program or consent of instructor. Principles and issues of professionalism and ethics. Seminar format with optional emphasis on student's thorough preparation for, and active participation in, class discussions.

Multicultural Counseling. Emphasis on effective communication skills in cross-cultural counseling or helping relationships and the integration of theoretical knowledge with experimental learning. Psycho-social factors, life styles, etc., of various cultural and ethnic groups and their influence on the helping relationship.

Secondary School Counseling and Development. Cooperation of the school counselor, teachers, principals, and parents emphasized in organizing, developing, implementing, and evaluating a counseling and development program in secondary schools.

Individual Appraisal. 3 credits, maximum 6. Methods of developing a framework for understanding individuals and techniques for data collection, assessment, and interpretation such as interviewing, testing, and case study. The study of individual differences including ethnic, cultural, and gender factors.

Developmental Interventions. Lab 2. Counseling theories and techniques for working with children, adolescents, and their parents in individual and group counseling and consulting. Laboratory portion translates theory to practice.

Career Development Theories. Historical and contemporary viewpoints advanced by Ginsberg, Super, Holland, Roe, etc. Counselors are assisted in developing the theoretical and applied foundation for career-related career education programs and for assisting individuals in career planning.

Principles of Counseling. A comprehensive foundation for counseling practice and the application of contemporary theories to further knowledge of counseling as a communication process.

Conceptualization and Diagnosis in Counseling. Prerequisites: 5473 and 5553 or consent of instructor. Foundation in skills necessary to conceptualize and diagnose clients presentation of problems in counseling. Intake interviewing and report writing skills, case conceptualization skills, and differential diagnostic skills using the DSM system.

Elementary School Counseling and Development. Cooperation of the school counselor, teachers, principals, and parents emphasized in organizing, developing, implementing, and evaluating a counseling and development program in elementary schools.

Group Process. Lab 2. Group dynamics, theory and techniques applicable to working with people of all ages in various school and non-school settings. Group member competencies are stressed during the laboratory period.

Counseling Practicum. 3-12 credits, maximum 12. Prerequisites: grade of "B" or better in 5473 and 5553; admission to the counseling and student personnel program or consent of instructor. Supervised experience in human interaction processes of counseling and consultation with the major goal of facilitating positive growth processes through individual supervision. May be conducted in a variety of settings with a wide range of developmental levels.

Rehabilitation Counseling Practicum. 1-12 credits, maximum 12. Prerequisites: graduate standing and consent of instructor. Applied experience for graduate students in counseling.

Internship in Counseling. Prerequisites: grade of "B" or better in 5593 and admission to counseling program. Supervised experience working and studying in a counseling agency or setting.

Workshop. 1-9 credits, maximum 9. Professional workshops on various topics. Designed to meet unique or special needs of professionals in various mental health fields.

Doctoral Dissertation. 1-25 credits, maximum 25. Prerequisite: consent of advisory committee. Report of research conducted by a student in the doctoral program in counseling psychology. Credit given and grade assigned upon completion and acceptance of the doctoral dissertation.

Ethical and Legal Issues in Professional Psychology. Prerequisite: consent of instructor. Ethical and legal standards applied to the professional practice of psychology.

Principles of Counseling Psychology. Prerequisite: admission to the doctoral program in counseling psychology. Development, theoretical foundations and applications of therapeutic models of counseling and psychology.

Adult Personality Assessment. Prerequisite: admission to counseling, school, or clinical psychology program. Administration and interpretation of adult personality assessment instruments such as Rorschach, TAT and DAP.

Personality Theories. Prerequisite: graduate standing. An in-depth analysis of personality theories and personality disorders.

Advanced Practicum and Supervision. 3-12 credits, maximum 12. Prerequisite: admission to counseling psychology program. For prospective counseling psychologists, counselor educators and supervisors, and practicing counselors. Supervised assistance in development of counseling, consulting and supervising competencies.

Advanced Group Interventions. Lab 1. Prerequisite: admission to counseling psychology program or consent of instructor. Discussion and exploration of various aspects of group development and treatment. Theory and application of theory. Various factors associated with group psychotherapy cohesion, dynamics and screening.

Counseling Psychology Practicum I. Prerequisite: admission into the doctoral program in counseling psychology. For prospective counseling psychologists. Individual and group supervision and didactic experiences to facilitate the development of counseling psychology competencies with clients at practicum sites. Establishing therapeutic conditions conducive to growth and change.

Counseling Psychology Practicum II. Prerequisite: grade of "B" or better in 6413. For prospective counseling psychologists. Individual and group supervision and didactic experiences to facilitate the development of counseling psychology competencies with clients at practicum sites. Integrating theory and psychological assessment skills into the practice of counseling psychology.

Counseling Psychology Practicum III. Prerequisite: grade of "B" or better in 6423. For prospective counseling psychologists. Individual and group supervision and didactic experiences to facilitate the development of counseling psychology competencies with clients at practicum sites. Building integrating consultation skills into the practice of counseling psychology.

Clinical Supervision. Prerequisite: admission to Clinical Counseling or School Psychology doctoral program, or consent of instructor. This course is designed to build the doctoral psychology student’s knowledge base in theory and research of clinical supervision in psychology and to develop and refine their supervision skills. The course covers current theory and research in supervision and includes a practical component.

Advanced Practice in Marital and Family Treatment. Prerequisite: admission to counseling, school or clinical psychology program. Advanced methods in assessment, diagnosis and treatment of marital and family problems. Skills development, professionalism, ethics and case management. Dynamics of co-therapy and joint treatment. Case consultation format. Same as PSYC 6553.

Advanced Internship in Counseling. 1-3 credits, maximum 6. Prerequisite: admission to the doctoral program in psychology. Designed to facilitate counseling effectiveness and to set the stage for a productive life of professional practice.

Directed Reading. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing.
Curriculum and Instruction Education (CIED)

0123 Improving College Reading Skills. Lab 1. Individualized instruction and lab experiences for the improvement of college reading and learning skills, including vocabulary, reading rate, comprehension, and learning strategies. May be used to fulfill the reading improvement requirement established by State Regents policy. Graded on a satisfactory-unsatisfactory basis.

1230 Reading and Study Skills for College Students. 1-4 credits, maximum 4. Lab 1-4. Instruction and laboratory experience for the improvement of reading rate, vocabulary, comprehension and study skills. Graded on pass-fail basis.

2450 Early Lab and Clinical Experience in Elementary Education I. 1-2 credits, maximum 2. Lab 3-6. Prerequisite: declaration of intention to pursue a program in Teacher Education. The initial preprofessional clinical experience in the childhood, kindergarten through grade eight. Required for full admission to Teacher Education. Graded on a pass-fail basis.

3005 Foundations of Literacy. Lab 0-2. Prerequisites: ENGL 1113, 1213, 2413. Survey of evaluation, selection and utilization of literature of childhood; introduces cognitive and linguistic foundations of literacy; language conventions needed to compose and comprehend oral and written texts. Work in school setting.

3132 Microcomputer Technologies for Education. Lab 2. Literacy level interaction with microcomputer principles and techniques related to selection, evaluation and classroom integration of instructional and tool application software.

3153 Teaching Mathematics at the Primary Level. Lab 2. Prerequisites: MATH 1513, 1483 or 1493 and MATH 3403 and 3603. Developmental levels in selection and organization of content and procedures for primary mathematics education.

3283 Foundations of Reading Instruction. Current theories of developmental reading instruction at the primary and intermediate grade levels.

3430 Early Lab and Clinical Experience in Elementary Education II. 1-2 credits, maximum 3. Lab 3-6. Prerequisite: full admission to Professional Education. Directed observation and participation in classrooms, kindergarten through grade eight. Concurrent seminar exploring multicultural education and integrated programs. Graded on a pass-fail basis.

3450 Field Experiences in the Schools, K-12. 1-2 credits, maximum 2. Lab 3-6. Prerequisite: consent of instructor. Seminars, directed observation and participation in the schools; age groups. Develops experience in meeting the mental, social, physical and cultural differences among children. Graded on pass-fail basis.

3620 Field Experiences in the Middle School. 1-4 credits, maximum 4. Lab 2-8. Seminars, directed observation, and participation in a particular subject area of the middle school (grades 5-9). Experience in meeting the mental, social, physical and cultural differences among middle school children. Graded on pass-fail basis.

3622 Middle Level Education. Lab 0-2. Overview of the nature and needs of early adolescents as well as an examination of the curriculum, instruction, and organization of middle grade schools. Field-based experience in a middle school. Graded on a pass-fail basis.

3710 Field Experiences in the Secondary School. 1-3 credits, maximum 3. Lab 2. Prerequisite: consent of instructor. Seminars, directed observation and participation in a particular subject area of the secondary school. Develops experience in meeting the mental, social, physical and cultural differences among children. Graded on a pass-fail basis.

3813 Topics of Middle School Mathematics. Prerequisite: consent of instructor. Strategies for teaching the topics of the middle grades and the mathematics basic skills area of the middle grades (grades 5-9).

4000 Field Studies in Education. 1-4 credits, maximum 4. Independent study and/or field experiences, such as spending a semester in an experimental program working with handicapped children in schools, in-depth studies in research projects, internships with school personnel. Graded on a pass-fail basis.

4003 Teaching Fundamental Concepts of Mathematics. Prerequisite: full admission to Teacher Education. Teaching of the basic mathematical areas: Number and Number Language, development at the primary and elementary school levels. Practical experiences required.

4005 Literacy Assessment and Instruction. Lab 0-2. Prerequisite: successful completion of 3005 or early childhood education major. Comprehensive survey of teaching strategies, formal and informal assessment, curriculum materials, theory, and research pertaining to reading, writing, spelling, and oral language development at the primary and elementary school levels. Practical experiences required.

4012 Integration of Literacy across the Curriculum. Prerequisites: 4005; full admission to Professional Education. Integration of reading, writing and oral language; integration of literacy instruction into the content areas in elementary school curriculum.

4013 Humaneizing the Educational Process. Provides the student with greater personal awareness and understanding of the dynamics of human relatedness within the classroom teaching-learning process.

4023 Children's Literature. Survey, evaluation, selection and utilization of materials for children; extensive reading with emphasis on books which meet the needs and interest of children through grade six.

4043 Classroom Applications of Microcomputers. Lab 2. Instructional computing course for educators; principles involved in programming a microcomputer; extended applications of tool software and telecommunications; issues and strategies for planning and implementing computer technologies in the schools.

4053* Teaching Geometry in the Secondary School. Prerequisite: full admission to Teacher Education. Overview of the present secondary mathematics textbooks. Study and comparison of contemporary basic mathematics textbooks. Recommended to be taken concurrently with 3710 and MATH 4043.


4153 Teaching Mathematics at the Intermediate Level. Lab 1. Prerequisites: 3153 and MATH 3403 and MATH 3603 and full admission to Professional Education. Selection and organization of content, procedures for instruction, and evaluation of outcomes in teaching the mathematics curriculum. Some attention to instruction in upper grades of the elementary school.

4213 Introduction to the Visual Arts in the Curriculum. Lab 4. Provides an understanding of the theoretical basis for the use of art activities in developing sensory perception and aesthetic sensitivity as an integral part of the curriculum. Includes a wide range of opportunities for student involvement in experimentation and exploration with a variety of two- and three-dimensional art media. Emphasis on both creative expression and appreciation of the visual arts in the home, school and community as a vital aspect of instruction in the school, preschool level through grade eight.

4222 Application of Advanced Technologies to Instruction. Production, utilization, application of media available through advanced technologies. Systematic instructional technology approach to teaching-learning process.

4233 Reading Diagnosis and Remediation. Lab 1. Prerequisites: full admission to Professional Education. Identification and treatment of reading problems in the classroom including group and individual diagnostic procedures. Practical experiences required.

4253 Language Arts in the Elementary School Curriculum. Prerequisite: full admission to Teacher Education. The purposes, selection and organization of content, teaching and learning procedures, and evaluation of outcomes in elementary school listening, speaking and writing.

4260 Skill Development in the Reading Program. 1-3 credits, maximum 3. Lab 0-4. Relationship between reading skills, child development and curriculum, and instructional strategies for sequential skill development in reading.

4263* Teaching and Learning Foreign Languages in the Elementary Schools (Grades 1-8). Purpose, selection and organization of foreign language curriculum content, teaching and learning theories, and procedure and evaluation of outcome for diverse students. Teaching techniques and materials for grades 1-8.

4270 Reading in Content Areas in the Elementary School. 1-3 credits, maximum 3. Lab 0-4. Integration of reading instruction in the elementary school curriculum with emphasis upon application of reading to various content areas.

Teaching Reading in the Elementary School. Lab 0-8. Application of skills, techniques and materials utilized in the effective teaching of reading in the elementary schools.

Young Adult Literature. Survey of print and non-print literature. The purposes, selection and organization of content, teaching and learning procedures and evaluation of outcomes in elementary school science.

Science in the Middle Level Curriculum. Prerequisites: enrollment in 3620 and full admission to Teacher Education. Objectives, organization, and selection of science content and the analysis of teaching, learning, and evaluation procedures for middle level science.

Science in the Elementary School Curriculum. Prerequisite: full admission to Teacher Education. Purposes, selection and organization of content, teaching and learning procedures and evaluation of outcomes in elementary school science.

Design and Management of the Elementary School Classroom. Prerequisite: full admission to Professional Education. Design and management of the physical, social, intellectual, cultural, special needs, and learning materials aspects of the school environment, kindergarten through grade 8. Purposes, selection, and organization of classroom management systems and teaching approaches.

Internship in Elementary Education. 1-12 credits, maximum 12. Lab 3-36. Prerequisites: concurrent enrollment in 4453 or 4730 and full admission to Professional Education. Taken concurrently with the student teaching internship. Includes student teaching seminar (one hour). Based on curriculum and teaching theory in 4713, planning and organizing for the secondary classroom in a diverse society, grades 7-12. Classroom management and discipline approaches as well as teacher research, parental involvement, school climate and community relations. Available in discipline-specialized sections: English/language arts, mathematics, science, and social studies.

Planning and Management in the Multicultural Classroom, K-12. Prerequisites: 4713 and full admission to Professional Education. Taken concurrently with the student teaching internship. Includes student teaching seminar (one hour). Based on curriculum and teaching theory, planning, and organizing for the secondary classroom in a diverse society, grades K-12. Classroom management and discipline approaches as well as teacher research, parental involvement, school climate and community relations. Available in discipline-specialized sections: art, foreign language.

Master's Report or Thesis. 1-6 credits, maximum 6. Prerequisite: consent of adviser. Students studying for a master's degree enroll in this course for a total of 2 credit hours if they write a report or 6 hours if they write a thesis. Thesis.

Teaching Foreign Languages in the Schools. Prerequisite: full admission to Professional Education. Curriculum, materials, methods and procedures related to foreign languages (grades K-12).

Teaching Science in the Secondary School. Prerequisites: full admission to Teacher Education and content of instructor. Materials and procedures in the teaching of reading in secondary schools for content area teachers.

Environmental Education. 1-4 credits, maximum 4. Lab 1. Development of (teacher/leader) competencies in the content, methods, philosophy, and historical perspective of contemporary environmental education curricula using both indoor and outdoor settings as a multidisciplinary learning laboratory.

Teaching and Learning in the Secondary School. Prerequisite: full admission to Teacher Education. Purposes, selection and organization of curriculum content, teaching and learning theories and procedures, and evaluation of outcomes for diverse students. Teaching techniques and materials in grades 7-12 subject areas. Available in certification disciplines: art, English/language arts, foreign languages, mathematics, science, social studies.

Internship in the Secondary Schools. 1-12 credits, maximum 12. Lab 3-36. Prerequisites: concurrent enrollment in 4724 or 4730 and full admission to Professional Education. Supervised observation and student teaching in fields in which the student intends to qualify for teaching certification. Development of awareness of and experience with mental, social, physical and cultural differences among adolescents. Graded on a pass-fail basis.

Planning and Management in the Multicultural Secondary Classroom. Prerequisites: 4713; full admission to Professional Education or 4003 and 4053. Taken concurrently with the student teaching internship. Includes student teaching seminar (one hour). Based on curriculum and teaching theory in 4713, planning and organizing for the secondary classroom in a diverse society, grades 7-12. Classroom management and discipline approaches as well as teacher research, parental involvement, school climate and community relations. Available in discipline-specialized sections: English/language arts, mathematics, science and social studies.

Teaching Science in the Secondary School. Prerequisites: full admission to Professional Education and content of instructor. Materials and procedures in the teaching of science in the secondary school. Materials, methods and classroom procedures related to science in the secondary school.

Teaching Science in the Elementary School. Prerequisite: full admission to Professional Education. Purposes and methods of teaching environmental education in formal and informal settings. The tools of research in children's literature and the nature and direction of contemporary children's book publishing.

Middle School Curriculum. Theory of planning and developing learning experiences appropriate to the needs and interests of early adolescents.

Kindergarten-Primary Curriculum. Study of kindergarten-primary curriculum including philosophy, history, current practice and issues. For administrators, teachers and students in curriculum and early childhood education.

Teaching Science in the Elementary School. Materials, methods and classroom procedures related to science in the elementary school.


Environmental Education in the Curriculum. Integration of environmental concepts in the total school curriculum. Review of K-12 environmental education curricula and methods of teaching environmental education in formal and nonformal settings.

Intermediate (4-6) Mathematics Education. The study of the theory and research in mathematics curriculum and instruction at the intermediate (4-6) grade levels. Problem solving, fractions, decimals, percent, and applications.

5270* Practicum in School Mathematics. 1-3 credits, maximum 6. Lab 2-6. Diagnostic and therapeutic procedures in mathematics with students of all ages. Laboratory classes provide for clinical experiences in evaluation and instruction with children experiencing difficulty in mathematics.

5273* Kindergarten-Primary (K-3) Mathematics Education. Theory and research on mathematics learning and teaching from the preschool level through the early elementary years. Study and analysis of children's construction of mathematics knowledge and the implications for teaching. Methods for promoting conceptual understanding and enthusiasm for the further study of mathematics.

5280* Workshop in Science Education. 1-4 credits, maximum 4. Develops and/or implements elementary and secondary science programs.

5323* Teaching Social Studies in the Schools. Curriculum, materials, methods and procedures related to social studies.

5350* The Visual Arts in the Curriculum. 1-3 credits, maximum 6. Lab 2. Creative approaches to the use of two- and three-dimensional media as they relate to various aspects of education. Opportunities available for periodic group and individual evaluation in order to give direction and significance to future growth.

5423* Literacy Instruction in Primary Grades. Analysis of growth in literacy from the preschool level through early elementary years. Examination of literacy learning processes and instructional procedures.

5433* Literacy and Technology Across the Curriculum. Study of the development and use of reading and writing across the content areas with an emphasis on the reading and writing abilities of middle and secondary school students. Instructional approaches to keep literacy and knowledge of a subject matter.

5463* Reading Assessment and Instruction. Prerequisite: 5423 or 5433 or consent of instructor. Development of knowledge of reading assessment and instruction for children and adults who find reading difficult. Laboratory experience for authentic assessment and tutoring in reading.

5473* Reading and Writing Difficulties. Study of research and formal assessment tools related to reading and writing difficulties in children and adults.

5483* Literacy and Technology Across the Curriculum. The characteristics of computer-facilitated learning relating to broad definitions of literacy. Use of a variety of computer and literacy tools across the curriculum.

5523* Practicum in Reading Instruction. Lab 0-2. Evaluation and instruction in reading and writing for children who experience difficulty learning to read. Collaboration among teachers, learners and resource personnel.

5613* Effective Teaching of Mathematics in the Secondary School. Prerequisite: consent of instructor. Advanced practicum on secondary school mathematical education. Includes study of current research findings in mathematical education, teaching strategies, materials and evaluation procedures in the secondary school. For experienced classroom teachers, superintendents, principals and supervisors.

5623* Multicultural and Diversity Issues in Curriculum. Understanding of the historical and contemporary perspectives toward cultural diversity. Development of an awareness of diverse cultural and language communities; understanding of critical issues of race, class, gender, and ethnicity in education; perennial issues of multiculturalism in public education and in global society; a comprehensive overview of principal and multicultural education.

5633* Developmental Reading for College and Adult Learners. Identification of the needs, materials, curriculum, instructional strategies for college and adult readers. The study of illiteracy. Consideration of the development, organization and supervision of programs for such learners.

5664* Integrating Teaching in the Secondary School. Inservice for middle to secondary teachers especially with professional development in their own school settings and in further graduate work. Examination of own practices through reflection and research, study of diverse adolescents, sharing of teaching approaches and materials across the curriculum, and exploration of outreach to school, family, and community. Teacher leadership.

5720* Education Workshop. 1-8 credits, maximum 8. For teachers, principals, superintendents and supervisors who need advanced curriculum and instruction coursework related to K-12 subject areas and pedagogy, in the areas of instruction and administration. Students must register for the full number of credit hours for which the workshop is scheduled for a particular term.

5730* Seminar in Education. 1-6 credits, maximum 6. Seminar topics may differ depending upon the nature of current interests and topics in American education.

5750* Seminar in Mathematics Education. 1-6 credits, maximum 6. Lab 0-6. Prerequisite: consent of instructor. Problems, issues and trends in mathematics education.

5850* Directed Study. 1-3 credits, maximum 3. Lab 1-3. Prerequisite: consent of instructor. Directed study for master's level students.


6030* Contemporary Issues in Curriculum Studies. 1-6 credits, maximum 6. Examination of selected contemporary topics in curriculum studies.

6033* Analysis of Teaching. Advanced study of multiple forms of analysis of teaching such as behavioral, phenomenological, and constructivist with emphasis on major research on teacher reflection and teacher narrative.

6043* Curriculum Leadership. A study of curriculum leadership and implications for schooling; focus on what it means to be a curriculum leader in times of major societal change and educational reform.

6080* Seminar in Science Education. 1-6 credits, maximum 6. Problems, issues and trends in science education. Focus at the pre-service or in-service level.

6113* Curriculum of the Elementary School. Contemporary trends, philosophies and points of view in elementary school education.

6133* Theory to Practice in Education. A culminating seminar demonstrating the application of theory from several disciplines to the practical problems of education: curriculum development, organization, teaching strategies and evaluations.

6152* Current Issues in Art in the School Curriculum. Problems, issues and trends in art education programs of the elementary and secondary schools and their relationship to the total curriculum. For teachers, supervisors and administrators.

6163* Advanced Research Strategies in Curriculum. Prerequisites: REMS 5013, REMS 5953, and SCFD 6113. Exploration of designs and methods within qualitative and quantitative research as applied to the field of curriculum. Articulation on how to ensure that both qualitative and quantitative studies meet their respective standards of rigor.

6433* Seminar in Literacy. Research of issues in literacy education using knowledge gained through both research and classroom practice.

6513* Staff Development in Literacy Education. Design and delivery of research related to staff development experiences in literacy.

6684* Language, Literacy and Culture. Lab 4. The social-cultural perspectives related to the role of language in mediating literate behaviors, cognition and action in learning contexts. Aspects of language use within various learning contexts (situated cognition) and its academic, technical and everyday discourse in understanding the interrelationships among teaching, learning, knowledge and culture.

6750* Researching Mathematics Education. 1-6 credits, maximum 6. The examination of current research in mathematics learning and teaching research designs, employed, and the generation of new hypotheses.

6850* Directed Reading. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing to enhance students' understanding in areas where they wish additional knowledge.

6863* Improvement of Instruction in Reading. Problems and issues related to reading instruction. The roles of various school personnel in changing curriculum and methods.

6880* Internship in Education. 1-8 credits, maximum 8. Lab 3-24. Prerequisite: consent of instructor. Directed off-campus experiences designed to relate ideas and concepts to problems encountered in the management of the school program.
Design, Housing and Merchandising (DHM)


1103 Basic Apparel Assembly. Lab 4. Basic apparel assembly techniques. Problems including basic fit, spreading and cutting methods and equipment, and use and application of sewing equipment including lock, chain, and overedge.

1123 Graphic Design for Interiors. Lab 6. Interior design majors only. Drafting and visual communication techniques related to interiors.

1433 Fashion Innovation and Marketing. The process of fashion innovation, variables of fashion affecting production and distribution of consumer goods; development of present structure in the fashion industry.

2003 Creative Problem Solving in Design and Merchandising. Participatory problem solving in design and merchandising; critique of proposed solutions as a positive process of evaluation.

2110 Fashion Showmanship. 1 credit, maximum 8. Preparation, production and evaluation of special fashion-related events. Professional learning experiences will include modeling techniques, organization and directing procedures.


2303 Materials and Finishes for Interior Building Systems. Prerequisites: 1003, 1123, 2993. Materials and procedures used in the design and production of interiors and building systems.

2543 Design and Space. Lab 6. Prerequisites: 1123, 2223 and 2313. Creative exploration of three dimensional spaces in interior design.

2573 (L,N)Textiles. Lab 2. Science principles as the basis for understanding fibers, the basic structure of yarns and fabrics. Relationships between the chemical composition of fibers and properties such as tensile strength, flammability, elasticity, moisture absorption, and dye affinity. Understanding science principles in relation to textile properties for evaluation of textile products. Recommended for education majors seeking knowledge to be used for innovative teaching of science principles in grades K-12. Required for all DHM majors.


2993 Communication and Presentation Techniques for Apparel and Interior Design. Lab 4. Prerequisites: 1003, ART 1103 and SPCH 2713. Creative communication methods and techniques including a variety of media for two- and three-dimensional presentations in apparel and interior design.

3002 Professional Image and Dress. Role of appearance and dress in creating a professional image for men and women. Figure and wardrobe analysis, professional clothing needs, individualized clothing decisions.

3013 Flat Pattern Design. Lab 4. Prerequisites: 2203 and MATH 1513. Interpretation of dress design developed through the medium of flat pattern; introduction to pattern drafting.

3023 Computer-aided Flat Pattern Design. Lab 4. Prerequisite: 3013. Advanced apparel design problems using flat pattern and computer-aided design (CAD) techniques.

3102 Fashion Sketching. Lab 4. Prerequisites: 1003 or 3 credit hours of art and completion of 60 credit hours. Principles and techniques of sketching in the fashion field.

3153 Mass Production of Apparel and Related Products. Lab 4. Understanding and applying mass production strategies for apparel and related products. Design for production and production operations including CAD market making and material utilization, production simulation modeling, and costing.

3203 Functional Clothing Design. Lab 4. Prerequisites: 2573, 3013 and 4 credit hours of chemistry. Problem-solving approach to functional clothing design for specialized market segments (athletic sportswear, occupational clothing, children’s wear, clothing for the handicapped) including performance evaluation of selected materials using standard methods of textile testing.

3213 (H)Heritage of Dress. Prerequisite: 3 credit hours of history. Survey of historic modes of dress as they reflect the social, economic and cultural life of a people. Application of design principles to modern dress.

3233 (H)Heritage of Interiors I. Religious, civic, commercial, and domestic architecture and furnishings prior to and including the 18th Century with emphasis on the periods which have greatly influenced housing and interior design.

3243 Design of Interior Components. Lab 1. Prerequisite: pass proficiency review. Design, materials, construction and production of interior design components including custom furnishings and interior treatments and modification.

3263 Environmental Design for Interior Spaces. Lab 4. Prerequisite: pass proficiency review. Design factors and human performance criteria for lighting, acoustics and thermal/ atmospheric comfort as they relate to the practice of interior design.

3263 Interior Design Studio I: Residential. Lab 4. Prerequisite: pass proficiency review. Studio course utilizing the design process in the analysis and planning of residential environments.

3300 Supervised Field Experience. 1-3 credits, maximum 6. Prerequisite: 3243 or consent of instructor. Field experience in specialized residential, commercial and institutional design with both historic and contemporary elements.

3353 (S)Socio-Economic Aspects of Housing. Family housing needs, present social and economic conditions affecting housing and building processes and the roles of business and government in housing.

3363 Interior Design Studio II: Small Scale Contract. Lab 4. Prerequisites: 3243 and 3263. Studio course utilizing the design process in the analysis and planning of small office, institutional and retail environments with emphasis on materials, lighting, codes and accessibility.

3373 Computer-aided Design for Interiors. Lab 4. Prerequisite: 1123. Computer-aided design and drafting for two-dimensional and three-dimensional interior systems.

3433 Fashion Retailing. Prerequisites: 1433, ACCT 2103, ECON 1113. Marketing structures at retail level; job descriptions and responsibilities at management level; financial and control functions.

3533 Decorative Fabrics. Lab 4. Prerequisite: 3 credit hours in art. Historic and contemporary textile designs. Creation of textile designs using personal inspirations, cultural expressions and a variety of techniques.

3553 Profitable Merchandising Analysis. Prerequisites: ACCT 2103, MATH 1513 or 1483. Relationship analysis of profit and loss statement. Retail mathematical calculations necessary to plan and control merchandising results, open-to-buy, mark-up, mark-down, turn-over, stock-sales ratio.

3593 Merchandising Acquisition and Allocation. In-depth study of buying and distributing merchandise.

3643 Apparel and Accessories for Special Markets. Prerequisites: 1433, PSYC 1113, SOC 1113, and completion of 45 credit hours. An analysis of the apparel and accessory needs of specialized market segments and the products designed to meet those needs, with consideration given to both product design and merchandising.

3823 Professional Practices for Interior Design. Prerequisites: 2343, 2363 and 3303. Future professional role and responsibilities, business procedures and employer-employee relationships which characterize the employment situation in interior design.

3853 Visual Merchandising and Promotions. Lab 1. Prerequisites: 1003, 1433 and completion of 60 credit hours. Study and application of principles and practices in merchandise presentation and promotions for commercial purposes.

3881 Interior Design Pre-Internship Seminar. Prerequisites: 3243, 3263, SPCH 2713. Preparation for obtaining and completing a directed practical experience in a work situation in the interior design field.
3991 Pre-internship Seminar. Prerequisites: 24 credit hours of required DHM courses with a 2.50 major GPA and SPCH 2713. Skills requisite to completion of a directed, practical experience in a work situation within the fashion industry.

3994 Internship. Prerequisites: 3433, 3553, 3663 and 3991 (apparel merchandising students); 3013 and 3991 (apparel design and production students). Directed practical experience in an approved work situation related to the fashion industry.

4003 (S) Environmental Perspectives on Apparel and Interior Design. Prerequisites: completion of 90 core credit hours. Analysis of apparel and interior design, development and use from physical, technological, economic, political, religious, social and aesthetic perspectives.

4011 Post-internship Seminar. Prerequisite: 3994. Study and comparison of student work experiences. Individual student conferences, review of merchant supervisor reactions.

4143* Design for Special Needs. Problems and alternative solutions for apparel and interiors for special groups, e.g., the aging, children, the handicapped, special markets. Includes field study or design problem.

4163* (H) Housing in Other Cultures. Housing and interior design and expressions of cultural beliefs, attitudes, family patterns and environmental influences.

4243* Draping. Lab 4. Prerequisite: 2203. Interpretation of garment design developed through the medium of draping on dress forms.

4263* Interior Design Studio III: Large Scale Contract. Lab 4. Prerequisites: 3253, 3363 and 3823. Studio course utilizing the design process in the analysis of large scale office planning and institution design including systems and specifications.

4293* Interior Design Studio IV. Lab 4. Prerequisite: 4263. Studio course developing comprehensive interior design projects in historic preservation and adaptive reuse and an advanced design project.

4323* (H) Heritage of Interiors II. Prerequisite: 3233 or consent of instructor. Exploration of the architectural environments of a variety of structures. Residential, commercial, governmental, institutional, and recreational buildings of different cultures of the 19th and 20th centuries.

4403* Advanced Apparel Design. Lab 2. Prerequisites: 3013 or 4243. Application of design and pattern-making principles and apparel assembly processes in the development of original designs.

4443* Facility Management for Contract Interiors. Philosophy and principles of facility management and the practice of coordinating the physical workplace in relation to the workplace and organizational structure of the corporate environment.

4453* Entrepreneurship and Product Development for Apparel and Interiors. Prerequisites: ECON 1113 and completion of 90 credit hours. In-depth study of entrepreneurship concepts as applied to manufacturers and retailers of apparel and interior products including product development, marketing and control, merchandising and buying, operation and management, advertising and promotion.

4523 Critical Issues in Design, Housing and Merchandising. Prerequisite: senior standing. Capstone course examining critical issues in design, housing and merchandising in the context of central themes from general education.

4810* Problems in Design, Housing and Merchandising. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Selected areas of study in design, housing and merchandising.

4820 Professional Internship. 1-6 credits, maximum 6. Prerequisites: 3623 and consent of instructor. A supervised internship experience which simulates the responsibilities and duties of a practicing professional.

4850* Special Topic Course in Design, Housing and Merchandising. 1-6 credits, maximum 6. In-depth study of specific areas of design, housing and merchandising.

4900 Honors Creative Component. 1-3 credits, maximum 3. Prerequisites: College of Human Environmental Sciences Honors Program participation, senior standing. Guided creative component for students completing requirements for College Honors in the College of Human Environmental Sciences. Thesis, creative project or report under the direction of a faculty member in the major area, with second faculty reader and oral examination.

4933* (H) Textiles and Apparel in the International Economy. Prerequisites: 2913, ECON 1113, and 90 hours. Broad multi-disciplinary study of textiles and apparel in the international economy.

5000* Master's Thesis. 1-6 credits, maximum 6. Prerequisites: graduate standing and consent of major professor. Research related directly to design, housing and merchandising for the master's thesis.

5003* Theoretical Perspectives for Design, Housing and Merchandising. A study of terminologies associated with theory. Exploration of key theories and their application to practice and research in design, housing and merchandising.

5110* Research Developments in Design, Housing and Merchandising. 1-3 credits, maximum 3. Current development and needs in research in design, housing and merchandising including application of research methods to design, housing and merchandising and research planning.

5113* Theories of Creative Process in Design and Merchandising. A study of the creative processes used in art, science, business and hybrid disciplines, with application to design and merchandising.

5233* Design Evaluation. Prerequisite: consent of instructor. Theoretical perspectives on evaluation of applied design; examination and evaluation of historic and contemporary designers, their philosophies and their work.

5240* Master's Creative Component. 1-6 credits, maximum 6. Prerequisites: consent of major professor and department head. An in-depth design application of theoretical design models and philosophies. A maximum of six hours to be used by graduate students following Plan III as the master's degree.

5273* Interpretative Theories of Material Culture. A theoretical analysis of the influences of cultural values and characteristics upon the design, acquisition and use of apparel, furnishing and building products, and the cultural diffusion of those material goods.

5343* Constructed Environment and Human Behavior. Prerequisites: 5110, 5273, PSYC 1113, SOC 1113. An exploration and evaluation of the physical attributes of the constructed environment and the interrelationships with the social and psychological aspects of human behavior.

5360* Advanced Studies in Design, Housing and Merchandising. 1-6 credits, maximum 6. Investigation into special areas in the fields of design, housing and merchandising.

5383* Design, Housing and Merchandising in Higher Education. Prerequisite: 9 credit hours in design, housing and merchandising. Development and organization of curricula and teaching methods for design, housing and merchandising.

5440* Career Internship. 1-6 credits, maximum 6. Prerequisites: consent of instructor and department head. An individualized career-oriented internship. Selected learning experiences in approved work situations in industry, government, education or research institutions related to design, housing or merchandising.

5533* Functional Apparel: Theory and Design. Lab 4. Prerequisites: 2573, 4013, 5110. A holistic approach to the study of apparel design with an emphasis on integrating knowledge of the needs and functions of the individual, the structural properties of textiles and apparel design.

5653* Merchandising Trends, Practices and Theories in Apparel and Interior Industries. Prerequisite: nine credit hours in marketing or merchandising. Current trends in merchandising; theories, concepts and processes related to management level problems.

5810* Problems in Design, Housing and Merchandising. 1-3 credits, maximum 6. Prerequisites: consent of instructor and department head. Individual and group investigations and discussions of special problems in the various phases of design, housing and merchandising.

5830* Design, Housing and Merchandising Seminar. 1-6 credits, maximum 6. Prerequisite: consent of instructor. A selected group of current issues in design, housing and merchandising.

6000* Doctoral Thesis. 1-12 credits, maximum 30. Prerequisite: consent of major professor. Research in design, housing and merchandising for the Ph.D. degree.

6133* Research Methods in Design, Housing and Merchandising. Prerequisite: consent of instructor. Survey and discussion of research methods, experiences in research design and analysis of data.
6203* Theories of Dress and Communication. Appearance as a type of nonverbal communication related to appearance. Theoretical structures depicting the use of dress in communication.

6303* Sociological, Psychological and Economic Aspects of Consumer Behavior. Prerequisite: 5653. An integration of individual or small-group psychological and economic theories related to consumer acquisition of products. Application and testing of these theories as appropriate to apparel and interior consumption processes.

6403* Merchandising Theory Application and Strategy Implementation. Prerequisite: 5653. Integration of marketing, merchandising, and management theories, strategies, models, and frameworks. Application of theories and implementation of strategies relevant to apparel and interior industries.

6410* Independent Study in Design, Housing and Merchandising. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Selected areas of design, housing and merchandising for advanced graduate students working toward the doctorate degree.

6810* Advanced Problems in Design, Housing and Merchandising. 1-6 credits, maximum 6. Prerequisites: consent of instructor and department head. Intensive individual or small-group study of problems in various areas of design, housing and merchandising for advanced graduate students who are working toward doctorate degrees.

6830* Design, Housing and Merchandising Seminar. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Problems and recent developments in design, housing and merchandising.

Economics (ECON)

1113 (S) The Economics of Social Issues. Issues-oriented approach. Basic economic principles introduced and developed through study of important social issues: for example, inflation, unemployment, poverty, discrimination, crime, population growth and environmental quality. Develops the economist's approach to social problems, and evaluates the contribution of economics to their solution. No credit for students with prior credit in 2103 or 2203. No general education credit for students also taking ECON 2013 or AGEC 1114.

2103 (S) Introduction to Microeconomics. Prerequisite: 15 credit hours. Goals, incentives and outcomes of economic behavior with applications and illustrations from current social issues: operation of markets for goods, services and factors of production; the behavior of firms and industries in different types of competition; income distribution; and international exchange. No general education credit for students also taking ECON 1113 or AGEC 1114.

2203 Introduction to Macroeconomics. Prerequisite: 2103 or AGEC 1114. The functioning and current problems of the aggregate economy: determination and analysis of national income, employment, inflation and stabilization; monetary and fiscal policy; and aspects of international interdependence.

3010 Special Topics in Economics. 1-3 credits, maximum 9. Prerequisites: 2203, prior approval of instructor. Analysis of a contemporary topic in economics. Course content will vary to reflect changing social issues and trends in applied economics.


3023* Managerial Economics. Prerequisite: 2203. Application of economic theory and methodology to decision problems of private industry, nonprofit institutions and government agencies; demand and cost analysis, forecasting, pricing and investment.

3113 (S) Intermediate Microeconomics. Prerequisite: 2203. How the market system organizes economic activity and an evaluation of its performance. Principles of price theory developed and applied to the interactions of consumers, producers and resource owners in markets characterized by different degrees of competition.

3123* Intermediate Macroeconomics. Prerequisite: 2203. Development of a theoretical framework for studying the determinants of national income, employment and general price level. National income accounting, consumption, investment, government spending and taxation, the supply of and demand for money. Monetary, fiscal and incomes policies considered with regard to unemployment, inflation and economic growth.

3213 Game Theory and Experimental Economics. Prerequisite: three credit hours in economics. The fundamentals of strategic actions presented in a game theory context and the validation of these ideas with economic experiments.

3313* Money and Banking. Prerequisite: 2203. The economics of money and banking. Operations of commercial banks and structure and competition of the banking industry. Organization and operation of the Federal Reserve System and its effects on interest rates, employment and prices. An introduction to monetary economics and international banking concludes the course.

3423* (S) Public Finance. Prerequisite: 3 credit hours in economics. The economics of the government sector. Scope of government activity, efficiency in government expenditures, federal budget, fiscal and debt management policy. Principles of taxation. Major tax sources, tax distribution, tax equity, and tax bias. Current public finance problems such as revenue sharing, negative income tax, urban transport systems and national health insurance.

3513 (S) Labor Economics and Labor Problems. Prerequisite: 3 credit hours in economics. Economic analysis of contemporary labor market problems and survey of U.S. unionism. The labor force, education and training, discrimination, inflation and unemployment theories of the labor movement, economic impact of unions and public policy toward labor.

3523* (S) Poverty and Economic Insecurity. Prerequisite: 3 credit hours in economics. Problems, programs and proposals for dealing with poverty and economic insecurity.

3613* (I,S) International Economic Relations. Prerequisite: 3 credit hours in economics. International trade and finance; international economic organizations; the foreign economic policy of the U.S.

3713* (S) Government and Business. Prerequisite: 3 credit hours in economics. Methods of measuring the extent of monopoly power in American industries and ways of evaluating the effects of this power on consumer welfare. U.S. antitrust laws, their enforcement and landmark court decisions under these laws.

3813* Development of Economic Thought. Prerequisite: 3 credit hours in economics. The ideas of great economists with emphasis upon economic concepts and systems of thought in relation to social, ethical and political ideas under evolving historical conditions.

3823 American Economic History. Economic development and economic forces in American history; emphasis upon industrialization and its impact upon our economic society since the Civil War. Same course as HIST 4513.

3903* (S) Economics of Energy and the Environment. Prerequisite: 2105. Issues related to the development and use of energy resources, and the management of the natural environment.

4000 Economics Honors Seminar. 3-6 credits, maximum 6. Prerequisite: Honors Program participation. Topical seminar in economics for junior and senior students in the Honors Program. Special problem areas of the economy or the economics discipline. Appropriate for Honors students in any major.

4010* Basic Studies in Economics. 1-6 credits, maximum 6. Prerequisite: 3 credit hours in economics. Economic concepts, theory, issues and problems. Designed for elementary and secondary teachers. Economics education teaching methods included.

4213* Econometric Methods. Prerequisites: 2203, STAT 3013 or 4013. Basic quantitative methods used in economic analysis emphasizing applications to economic problems and interpretation of empirical results. Statistical analyses, regression and forecasting techniques using computer programs.

4223* Business and Economic Forecasting. Prerequisite: 2203, STAT 3013 or 4013. Forecasting business and economic variables. Regression models and time series models such as exponential smoothing models, seasonal models, and Box-Jenkins models. Evaluation of methods and forecasting accuracy. Application of methods using computer programs.

4313* Advanced Banking. Prerequisite: 3313. Central and commercial banking, including Federal Reserve policymaking, banking structure, capital adequacy and taxation of banks. Friedman's proposals for monetary and banking reform.

4413* State and Local Government Finance. Prerequisite: 3 credit hours in economics. State and local government revenue and expenditure patterns in a federal fiscal system; intergovernmental fiscal problems; taxation in a federal system; adjustment to economic growth and change.
### Labor and Public Policy
Prerequisite: 3513 or MGMT 3313 or BUSL 3213. Public policy affecting union management relations; common law, state and federal legislation; Wagner, Taft-Hartley and Landrum-Griffin Acts; labor dispute adjustment with emphasis on the theory, legal status and practice of arbitration, in both private and public sectors.

### International Economic Development
Prerequisite: 3 credit hours in economics. Problems of underdeveloped economics related to the world economy; obstacles to economic growth and policies for promoting growth.

### Economics of Industries
Prerequisite: 2103. Industrial organization of major U.S. industries. The structure-conduct-performance paradigm is used to evaluate how costs and concentration interact with pricing, marketing and R&D decisions to affect industry profitability, technological progress, and the efficient allocation of resources. Case studies included.

### Economic Analysis of Law
Prerequisite: 3 credit hours in economics. Use of economic analysis to explain how certain laws exist and to evaluate the effects of various alternative rules of law on economic efficiency and behavior. Emphasis on the economics of the common law areas of property, contracts, and torts. Also, products liability, crime and punishment, distributive justice, and discrimination.

### Comparative Economic Systems
Prerequisite: 2203. Comparative analysis of the economic theory and institutions of capitalism, socialism, and mixed systems.

### Urban and Regional Economics
Prerequisite: 3 credit hours in economics. Urban and regional economics; the spatial aspects of poverty, land use, the urban environment and rural industrial development.

### Economics Honors Thesis
Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in economics.

### Research and Thesis
1-6 credits, maximum 6. Workshop for the exploration and development of research topics. Research leading to the master's thesis.

### Research Report
Prerequisite: consent of committee chairperson. Supervised research for M.S. report.

### Research and Independent Studies
1-3 credits, maximum 10. Prerequisite: consent of departmental committee under a workshop arrangement or supervised independent studies.

### Contemporary Environmental Policy
Economic, social and political factors that influence the formation and implementation of environmental policy. Environmental policy instruments (including pollution taxes, standards and marketable pollution permits), measurement of environmental damages and risk. Risk comparison, regulatory issues, health risk assessment, and risk communication. Political-economic considerations.

### Macroeconomic Analysis
Prerequisite: three hours of economics or consent of instructor. Study of the determinants of aggregate output, employment, price level, and interest rates, including international aspects. Monetary, fiscal, and exchange rate policies and impact on the macroeconomy and business environment. No credit for Ph.D. students in economics.

### Managerial Economics
Economic theory applied to business decision making. Concepts of microeconomics and macroeconomics related to understanding the economic system; analysis of policy, forecasting, and international economics. No credit for Ph.D. students in economics.

### Microeconomic Theory I
Prerequisites: 3113, MATH 2265 or MATH 2713. Contemporary price and allocation theory with emphasis on comparative statics.

### Microeconomic Theory II
Prerequisites: 3123, MATH 2265 or MATH 2713. National income, employment and the price level from the point of view of comparative statics.

### Mathematical Economics I
Prerequisites: 3113, MATH 2265 or equivalent. Mathematical concepts of single variable and multivariate calculus, topological properties of Euclidean space, convergence, linear algebra, optimization theory and the Kuhn-Tucker Theorem with applications from economic theory.

### Econometrics I
Prerequisite: 4213 or STAT 4043. Theory and application of econometrics to economic problems. Topics include OLS, GLS, distributed lags, serial correlation, heteroskedasticity, and simultaneous equations.

### Monetary Economics I
Contemporary issues in monetary theory and policy. Demand for money and supply of money theory, interest rate theory and issues in monetary policy.

### Economics of the Public Sector I
Allocation and distribution effects as well as incidence of governmental budget policies.

### Economics of the Public Sector II
Fiscal policy as a means of promoting economic stabilization and growth.

### Labor Market Theory and Analysis
A critical evaluation of the theoretical and empirical literature dealing with labor market processes; wage determination and the impact of unions on relative wages; estimation of aggregate labor supply; resource allocation and labor mobility; the inflation-employment tradeoff and the economics of labor market discrimination.

### International Finance
Open economy macroeconomics and the role of devaluation, fiscal and monetary policy in the open economy, monetary approach to the balance of payments, portfolio balance and asset market approaches to the determination of exchange rates.

### Economic Development I
Characteristics and problems of less-developed countries. Criteria of growth and development with emphasis on strategies for development. The role of capital labor, technological progress and entrepreneurship. Growth models.
6223* Mathematical Economics II. Prerequisite: 5223. A mathematical approach to general equilibrium and welfare economics.

6243* Econometrics II. Prerequisite: 5243. Advanced econometric theory covering single and simultaneous equations models, seemingly unrelated regressions, limited dependent variable models, causality, and pooled models.

6313* Monetary Economics II. Intensive analysis of classical monetary theory and individual research on selected problems in monetary economics. The ideas of Patinkin, Wickesell, Fisher and Keynes.

6803* History of Economic Thought. Economic theories from the 18th century until the present with emphasis on the origin and improvement of analytical tools.

6813* Seminar in Economics Systems. Selected topics dealing with the economic theory and institutions of capitalism, socialism, communism, and fascism. Individual research, seminar reports, and group discussion of reports.

Education (EDUC)

1111 Orientation to Education. Lab. 1. Study of the profession of education with emphasis on the skills, qualities and student support services available throughout the campus. Graded on a pass-fail basis.

2510 Innovative Education Studies. 1-3 credits, maximum 6. Designed to meet unique or special needs of individuals involved in education. Topics include contemporary approaches to meeting educational challenges on the professional as well as the personal classroom experience. Graded on a pass-fail basis.

3080 International Experience. 1-18 credits, maximum 36. Prerequisite: consent of the associate dean of the college. Participation in a formal or informal educational experience outside of the USA.

3090 Study Abroad. 1-18 credits, maximum 36. Prerequisite: participation in an OSU reciprocal exchange program, consent of the Study Abroad office, and associate dean of the college. Participation in a formal study abroad program in which a semester or year is spent in full-enrollment at a university outside the U.S.

3110 Honors Directed Study. 1-3 credits, maximum 3. Prerequisite: admission to the College of Education’s Honor Program. Individualized directed study approved by a sponsoring professor or Honors coordinator.

4050 Honors Colloquium. 1-9 credits, maximum 9. Prerequisites: consent of instructor or honors coordinator. Study of an interdepartmental and interdisciplinary nature of various important issues and aspects as related to the field of education. Provides an intellectual challenge for the able student with a strong dedication to scholarship.

4110 Teacher Education Seminar. 1-6 credits, maximum 6. Problems, trends, and pertinent education issues. May include simulation, small-group instruction and field-based experiences. For the pre-service or in-service level.

4920 Teacher Education Practicum. 1-9 credits, maximum 9. Prerequisites: admission to Professional Education. Directed observation and supervised laboratory and clinical experiences in appropriate teacher education program areas. Appraisal and learning theory approaches employed.

5110 Contemporary Educational Issues. 1-6 credits, maximum 6. Contemporary topics and issues in the broad field of education. May include television intersection, small group discussion and outreach and field experience. Written reports required. Graded on a pass-fail basis.

5910 Educational Field Experiences. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Guided field experience appropriate to a specific program of study. Field experience preceded and followed by appropriate on-campus seminars, readings and reports.

Educational Leadership (EDLE)

5000* Thesis or Report. 1-10 credits, maximum 10. Prerequisite: consent of instructor. Master’s students may earn up to two hours of credit for a report or six hours of credit for a thesis. Students working on a specialist’s report may earn a maximum of 10 hours of credit.

5253* The Principalship. Prerequisite: 5000-level course in school administration or equivalent. Strategies, techniques and solutions used by the principal in the administration and leadership of a public school.

5473* Supervision of Instruction. Application of modern approaches to instructional supervision through practice in recording and analyzing teacher behavior in actual classroom settings. Clinical and group methods for improving instruction.

5633* Community Education. Purpose, organization and administration of community education and its various components.

5720* Education Workshop. 1-4 credits, maximum 8. Analysis of organizational, administrative, and instructional problems by common schools and higher education personnel.

5723* Education Law. Study of the legal framework of education (constitutional law, case law, and Oklahoma law) with emphasis on church-state issues, tort liability, teachers’ rights, and student rights.

5813* Leadership and Agency. Furthering understanding about leadership and agency through exploring and examining contemporary and perennial issue from multiple perspectives in diverse educational contexts.

5973* Historical Background of Contemporary Issues in Higher Education. The history of American colleges and universities to the present; an overview of major contemporary issues in American higher education.

5983* Administration and Law in Higher Education. Overview of the organization and administration operations and analyses of social, political and legal influences on colleges and universities.


6003* Educational Ideas. Decision-making processes used in educational systems and use of modern technologies for curricular enhancement and professional development.

6233* Critical Issues in Higher Education. Issues that have shaped and are shaping higher education in American society.

6243* Connecting Theory and Practice in Administering Schools. Application of research findings and theoretical concepts to best practice in administering educational organizations.

6253* Professional Development and Instructional Improvement. Developmental perspectives of human, conceptual and technical skills needed for continuing professional development and instructional improvement through supervisory processes.

6323* Public School Finance. Development of conceptual bases in economics of education, taxation, distribution systems, policy analysis; application to Oklahoma school finance; and introduction to budget development.


6353* The Superintendency. Integration of theory and practice through examination of roles and responsibilities of the superintendent. Leadership, communications and the changing nature of public education.

6393* The Human Factor in Administering Schools. Analysis and critique of current issues in school personnel administration such as recruitment, selection, promotion, morale, salary, staff relations and teacher assessment.

6423* The Politics of Education. Activities of schools as they relate to the political environment, e.g., voter behavior, change strategies and community power structures.

6453* Special Topics in Education Law. Analysis and critique of selected topics in school law relating to public school administration.

6453* Higher Education Law. National and state constitutional provisions, laws, and court cases concerning higher education. Considerable legal research required.

6573* Special Topics in Education Facilities. Analysis and critique of validity of selected established standards and research in education facilities.

6583* The Impact of College on Students and on Society. The psychological and sociological impact that attending four-year colleges and universities has on undergraduates from their freshman year until they graduate.
Psychology of Learning. Application to education of the principles and theories of the psychology of learning.

5510* Practicum in School Psychology. 2.6 credits, maximum 6. Prerequisites: admission to school psychology program and consent of instructor. Supervised experience in the schools of psychological service delivery. Assessment, consultation, direct interventions and development of professional practice for school psychologists within school settings. Science-based child-success model. Two-three semester sequence.

5620* Practicum with Exceptional Learners. 1-8 credits, maximum 8. Lab 1-8. Prerequisite: consent of instructor. Supervised individual and group experience with exceptional learners. The particular experience (learning disability, mental retardation, gifted, etc.) is determined by the student’s field of specialization.

5663* Creativity for Teachers. Theoretical origins of creativity and their concomitant applications in the learning environment. Blocks to creative thinking, imagination, imagery, creativity testing, decision making and innovation. Creative problem solving and teaching techniques and methods to maximize creative potential in all kinds and types of students.

5713* Transpersonal Human Development. Human development in terms of individual consciousness, focusing on the implications of such extraordinary states of consciousness as those associated with hallucinogenic drugs and mystical religious experience. Integration of psychological and religious interpretations of development. Applications to practical problems in education and psychology.

5720* Educational and School Psychology Workshop. 1-9 credits, maximum 9. Workshop on various topics related to educational and school psychology.

5753* Psychoeducational Assessment of Preschoolers. Relevant issues and challenges associated with the intellectual, social and behavioral assessment of preschool children, from the viewpoint of research, discourse and policy initiatives. The link between assessment and intervention.

5763* Teaching Methods and Techniques for the Gifted and Talented. Subject and content related to the learning facilitation that is process-oriented and doing-centered. The role of the teacher as facilitator, counselor and non-directive change agent. Individualized educational plans, involving independent study, tutoring, correspondence, clustering, mentors, learning centers, resource centers.

5783* Psycho-educational Testing of Exceptional Individuals. Intensive practice in the selection, administration and interpretation of individual tests, appropriate for exceptional individuals.


5803* Advanced Intellectual Assessment, Contem- porary Theories and Assessment of Intelli- gence. Prerequisites: 5783 or equivalent; good standing in school, counseling, or clinical psychology program, or consent of instructor. Examination of contemporary theories and cognitive abilities and intelligence to new assessment technology. Appropriate for school, counseling, or clinical psychology students who are already familiar with such the Wechsler Series and the Stanford Binet IV.

5863* Developing Programs for the Gifted and Talented. Programs based on various philosophies and structural concepts of gifted and talented education, e.g., mainstreaming, self-contained, pullouts, magnet schools, time blocking, acceleration and enrichment. Programs designed for general and specific academic ability, however, exposure will be provided to creative and productive thinking programs, leadership programs, and visual and performing arts programs. Specific models included.

5933* Altered States of Consciousness in Human Development. Theory and research concerning the role of altered states of consciousness in human development. Practical techniques for facilitating healthy human development which might be of use to counselors, teachers, and other human service workers. Techniques include guided imagery, progressive relaxation and especially, meditation.

5962* Developing Support Resources for Gifted and Talented Programs. Development, management, and evaluation of volunteer programs in intraclass and extra-class settings. Program types include parent-aid, volunteer-aid, mentors, tutors, group sponsors. Developing community interest, finding external resources, external funding and resource information sources.

5993* Identification and Behavior Characteristics of the Gifted and Talented. Cognitive, affective, and behavioral characteristics of the gifted and talented. Selection of tests and interest inventories. Selection and/or developing of nomination/recommendation forms/models, inventories, checklists, rating scales, sociograms as well as data abstraction from cumulative and anecdotal records. Membership of gifted/talented identification committees.

6000* Doctoral Dissertation. 1-25 credits, maximum 25. Prerequisite: consent of advisory committee chairperson. Report of research conducted by a student in the doctoral program in educational school psychology. Credit given and grade assigned upon completion and acceptance of the doctoral thesis.

6300* Doctoral Seminar in School Psychology. 3-6 credits, maximum 6. Prerequisite: admission to school psychology doctoral program. Research in school psychology in areas such as philosophy of science, major areas of emphasis, research design, ethical concerns, solving problems in schools, and publication. Scientific and professional ethics and standards of psychologists.

6333* Introduction to Psychotherapy with Children and Adolescents. 3 credits. Prerequisite: 5113. Development of individual and group skills in therapy with children and adolescents. Applications of theories of psychotherapy to a variety of disorders and coping skills, crisis intervention and adaptive social skills training.

6403* Adult Development. Theory and research concerning human development during the adult years, with particular applications for serving adult populations in education and education-related settings.

6110* Seminar in School Psychology. 1-3 credits, maximum 6. An assessment of psychological techniques that are useful in applied problems encountered in the internship.

6113* Child Personality Assessment. Prerequisite: admission to school psychology or counseling psychology program, or consent of instructor. The personal and social assessment of children using objective and projective techniques.

6133* History and Systems of Psychology. History and systems of psychology related to contemporary psychology.

6143* Introduction to Developmental Psychopharmacology. Prerequisites: graduate student in School of Applied Health and Educational Psychology, or psychology, or 5103, or equivalent; consent of instructor. Introduction to biological basis of behavior and behavior disorders. Review of the biological systems associated with psychopharmacological treatments. Major drug classes and their role in the treatment of developmental psychopathology.

6163* Emotion and Cognition. The relationship between emotion and cognition as it relates to knowing and learning. History, wisdom and the interdependence of affect and cognition, the effects of mood on memory, emotion in feminist epistemology, the role of feeling in the writing process, intuition, and narrative thought. Exploration of potential research.

6210* Internship in School Psychology. 3-6 credits, maximum 12. Prerequisites: admission to school psychology program; completion of all course work; completed readiness for internship form and approval of school psychology faculty. Supervised field experience of nondoctoral school psychologists by certified school psychologists for a maximum of 1200 hours over the course of an academic year, or half-time for two years.

6310* Doctoral Practicum in School Psychology. 1-5 credits, maximum 5113, or consent of instructor. Advanced practica for doctoral students in school psychology. Supervised experiences in assessment, consultation, intervention and supervision activities in a non-school setting.

6323* Psychological Consultation. Prerequisite: admission to graduate program in the SAHEP or psychology program. Models and strategies for the delivery of special services in the schools and other agencies that focus on serving the mental health needs of children, adolescents and adults. The use of consultation as a problem solving alternative to the assessment/label approach.

6333* Instructional Assessment and Consultation. Prerequisite: admission to College of Education or psychology program; or consent of instructor. Development of skills in consulting with educational and agency personnel and families regarding academic and educational functioning. Systematic curriculum-based assessment and measurement techniques as well as planning, implementing and evaluating instructional interventions. Evaluation of the instructional environment.
6343* Behavioral Assessment and Consultation. Prerequisites: 5113 or equivalent; admission to school psychology, counseling psychology, or counseling psychology program; or consent of instructor. Development of psychological skills in systematic behavioral assessment and consultation with application to school, agency and home settings. Systematic behavioral observation, data collection and intervention design, implementation and evaluation.

6460* Internship in Educational Psychology. 1-9 credits, maximum 9. Prerequisite: consent of instructor. Supervision and guidance of teaching and service in educational psychology. May be repeated for credit when work assignment varies. Includes supervised experiences in educational psychology during the first semester of each new teaching assignment. Includes cooperative planning and evaluation.

6533* Human Motivation. A theoretically-oriented approach to the concept of motivation; essential precursors to human behavior and applications to the solution of real and hypothetical problems.

6610* Doctoral Internship in School Psychology. 3-6 credits, maximum 6. Prerequisites: admission to school psychology doctoral program, completion of all course work; readiness for internship form, approved by school psychology faculty. Supervised experience of doctoral school psychologists for final preparation to enter the profession of school psychology. Designed to fulfill requirements of APA and State Board of Examiners of Psychologists.

6613* Instructional Systems Design. A practically-oriented coverage of analyzing, defining, sequencing and validating instructional systems. Developing educational objectives, course development, matching instruction to individual differences and evaluation of systems. Techniques of developing and validating instructional components.

6850* Directed Readings in Educational and School Psychology. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing in educational and school psychology.

6880* Internship in Education. 1-8 credits, maximum 8. Lab 3-24. Prerequisite: admission to advanced graduate program and consent of area coordinator. Directed off-campus experiences designed to relate ideas and concepts to problems encountered in the management of the school program.

Educational Technology (EDTC)

3123 Applications of Educational Technologies. Lab 2. Introduction to the design and development of instruction using educational media and technology. Materials development, contemporary applications of computers and other electronic systems to instruction. Integration of instructional design, instructional media, and instructional computing.

4113* Multi-media Program Production. Prerequisite: 3122. Design and production of synchronized automatic sound slide programs coordinated with subject matter content. Includes photographic techniques, audio recording and sound-mixing methods, graphics, and synchronizing techniques. Individual projects required.

4703* Computer Applications in the Middle School Science Curriculum. Principles and techniques relating to using microcomputer technology in teaching middle school science; microcomputer interfacing, simulation, and interactive video-disc.

5000* Master's Report or Thesis. Prerequisite: consent of instructor. Students studying for a master's degree enroll in this course for a total of 2 credit hours if they write a report or 6 hours if they write a thesis.

5103* Advanced Computing Applications in Education. Lab 0-2. Includes educational applications involving authoring systems, data-base management, hardware interfacing, and non-instructional uses within the school environment. Impact of current issues on instructional computing.

5113* Videotape Television for Instruction. Educational design and production of videotape using single camera, small studio production and other technology. Individual and team projects.

5153* Computer-Based Instruction Development. Lab 0-2. Prerequisite: 4113. Examinations of curriculum strategies, related research issues, and techniques for developing computer-based instruction. Students will develop and evaluate computer-based instruction with case studies.

5720* Education Workshop. 1-8 credits, maximum 8. For teachers, principals, superintendents and supervisors who have definite problems in instruction or administration. Students must register for the full number of credit hours for which the workshop is scheduled for a particular term.

5753* Educational Technology Strategies. Lab 1. Principles of designing instructional units and courses incorporating integrated advanced technologies within the framework of the current educational environment. Contemporary education issues. Advanced educational technology: importation, implementation issues, accessibility, linkage to curricula, support, planning, and teacher empowerment. Assumes concept of teacher as designer/conductor vs. teacher as consumer.

5773* Administration and Supervision of Audiovisual Materials. Building, planning, selecting and purchasing equipment and materials, surveying existing materials, and planning and financing adequate programs. For administrators or teachers who are responsible for audiovisual programs.

5850* Directed Study. Prerequisite: consent of instructor. Directed study for master's level students.

6000* Doctoral Dissertation. Required of all candidates for the Doctor of Education degree. Credit is given upon completion of the thesis.

6850* Directed Reading. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing to enhance students' understanding in areas where they wish additional knowledge.

6880* Internship in Education. Prerequisite: consent of instructor. Directed off-campus experiences designed to relate ideas and concepts to problems encountered in the management of the school program.

6910* Practicum. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Helps the student carry out an acceptable research problem (practicum) in a local school situation. Credit given upon completion of the written report.

Electrical and Computer Engineering (ECEN)


3113 Energy Conversion. Lab 2. Prerequisites: 3021, 3613. Physical principles of electromagnetic and electromechanical energy conversion devices and their application to conventional transformers and rotating machines. Network and phasor models; steady-state performance.

3213 Microcomputer Principles and Applications. Lab 2. Prerequisite: junior standing or above. Introductory microcomputers. Digital logic elements and number systems, memory components and organization. Microprocessors and microcomputer system architecture, assembly language programming, software development, interfacing techniques.


3313 Electronic Devices and Applications. Prerequisites: 3021, 3713. Semiconductor electronic components including MOSFETs, BJTs, JFETs, and OpAmps. Emphasis on device models and use of solid state electronic devices to analyze, synthesize and design amplifiers and switching circuits. SPICE simulations are extensively utilized. Basic building blocks for analog and digital applications.
Electro-optic and acousto-optic modulators. Optics and optical systems. Ray matrices. In-MATH 2155, MATH 3013. Review of classical characteristics and state-of-the-art of advanced power application aspects; control aspects; characteristics of inverters and waveshaping devices; applications of electronic devices, components, and their characteristics, economic factors, safety, reliability, aesthetics, ethics and social impact.

4130 Power Electronics. Prerequisite: 3113. Power electronic devices, components, and their characteristics; DC to AC conversion; fundamental aspects; control aspects; characteristics and state-of-the-art of advanced power inverter and power conditioning topologies.

4153 Power System Analysis and Design. Prerequisite: 3113. Power system component models from circuit theory. Formulation and design of the load flow model and the optimum economic generator allocation problem utilizing computer methods.


4243 Computer Architecture. Prerequisites: 3213 and 3233. Functional organization and hardware design of digital computer systems with emphasis on microprocessor-based systems. CPU organization, features of microprocessors including advanced 32-bit CPU's, memory system design including cache, virtual memory, error detection and correction, I/O operations including direct memory access and peripheral interface design.

4263 Computer Engineering Projects. Lab 2. Prerequisites: 3233, 4013 and 4213. Team projects involving design, construction, and testing of hardware interfaced with mini- and micro-computers in instructional laboratories. Emphasis on software and hardware documentation. IEEE-488 bus; interface chips; comparison of mini-computer operating systems; IEEE-488 bus; bus analyzer; LSI interface chips; micro- and micro-computers as laboratory tools and system components.

4273 Software Engineering. Prerequisites: 3213, 3653 or CS 2133, 3442. Fundamental characteristics of the software life cycle. Tools, techniques, and management controls for development and maintenance of large software systems. Software metrics and models. Human factors and experimental design. Same course as CS 4273.


4303 Digital Electronics Circuit Design. Lab 2. Prerequisite: 3233, 3313. Theory of digital and electronics circuits. Digital logic families TTL, ECL, NMOS, CMOS, GaAs. Large signal models for transistors. Implementation at RAM and ROM. Circuit design for LSI and VLSI.


4353 Communication Electronics. Prerequisite: 3313. Design of tuned voltage and power amplifiers, oscillators and mixers, modulation and detection, and parametric amplifiers.

4413 Automatic Control Systems. Prerequisite: 3723 or MAE 3723. Properties of feedback control systems, mathematical models of basic components, state-variable models of feedback systems, time-domain analysis, stability, transform analysis, frequency domain techniques, root-locus design of single input single output systems and simple compensation techniques. Same course as MAE 4053.


4703 Active Filter Design. Lab 2. Prerequisites: 3413 and 3713. Introduction to passive filters; operational amplifiers as network elements; filter specifications; design of active filters. Laboratory design projects and computer simulations.


4773 Real Time Digital Signal Processing. Prerequisite: 4763 or equivalent. DSP Processor architectures and programming. A/D, D/A, polled and interrupt-driven I/O. Real-time implementation of FIR/IIR filters, the FFT, and other DSP algorithms on special purpose DSP hardware from Motorola, Texas Instruments and others. Link between DSP theory and practical implementation.


5000 Thesis or Report. 1-6 credits, maximum 6. Prerequisite: approval of major professor. A student studying for the master's degree will enroll in this course for a maximum of six credit hours.
5030* Professional Practice. 1-8 credits, maximum 8. Experience in application of electrical engineering principles to typical problems encountered in industry and government engineering design and development projects. Solutions to the problems require participation by the student in the role of junior engineer or engineer-intern. Problem solutions involve economics and ecological considerations as well as technology, and must be adequately documented.

5050* Seminar. 1-12 credits, maximum 12. Prerequisite: consent of adviser. Students investigate certain engineering problems not normally covered in existing courses.


5123* Engineering Systems Reliability Evaluation. Techniques and concepts needed for evaluating the long-term and short-term reliability of a system. Topics include static and spinning generation capacity, transmission, composite, interconnected, and dc system reliability evaluations; and power system security. Applications to systems other than power systems included. For students with little or no background in probability or statistics.

5153* Direct Energy Conversion. Energy conversion techniques and applications; thermo-electrics, thermionics, fuel cells, MHD and other processes involving electrical, mechanical and thermal energies. State-of-the-art developments in direct energy conversion using selected papers from journals and other publications. Gives the student a proper perspective of the possibilities and problems associated with satisfying future energy requirements.


5253* Digital Computer Design. Prerequisite: 3233. Analysis and design of digital computers. Arithmetic algorithms and the design of the arithmetic/logic unit (ALU); Serial and parallel data processing; control and timing systems; microprogramming; memory organization alternatives; input/output interfaces. Same course as CS 5253.

5263* VLSI Digital Systems Design. Prerequisite: 4303; recommended: 5253. Design of very large-scale digital systems on a single chip. Review of MOS technology, building. An example of fabrication techniques. Systematic structures for control and data flow; system timing; highly concurrent systems. Experimental opportunities available.

5273* Advanced Software Engineering. Lab 2. Prerequisite: 4273. Continuation of 4273. Advanced theory and practice of software design method and implementation problems. Experimental design for software engineering. Same course as CS 5273.

5283* Computer Vision. The development of machine vision and advanced image understanding techniques for robotics; automated inspection, calibration and recognition. Motion, object recognition, segmentation, representation, and 3-D analysis.


5353* Advanced Power Electronics. Prerequisite: 4133. Characteristics of high power semiconductor devices and the application of such devices to power conditioning, inversion, and wave shaping at high power levels.

5363* CMOS Analog Integrated Circuit Design. Prerequisite: 4313. Advanced study of solid state CMOS linear integrated circuits. Topics include: Op Amps, comparators, multipliers, D/A and A/D converters and Op Amp building blocks. Op Amp building blocks include, differential pairs, current mirrors, gain, output stages, and references. VLSI layout and circuit simulation using SPICE.


5463* Nonlinear System Analysis and Control. Prerequisite: 4413 or MAE 4053. Failure of superposition of effects; phase-plane analysis; limit-cycles; Lyapunov stability; hyperstability and input-output stability; controllability and observability of nonlinear systems; feedback linearization; robust nonlinear control system design. Same course as MAE 5463.


5483* Digital Data Acquisition and Control. Prerequisite: undergraduate course in programming. Use of microcomputers operating in real-time applied to engineering systems for data acquisition and control, use of analog to digital, digital to analog, and digital input/output, synchronous and asynchronous programming. Competence in the engineering use of microcomputers through lectures and laboratory applications. Same course as MAE 5483.

5493* Software Design for Real-time Distributed Systems. Prerequisite: 5483 or MAE 5483 or consent of the instructor. Fundamental concepts associated with the design of software for implementation on distributed computer systems using real-time operating systems. Parallel computing in a real-time environment and control algorithm design. State-of-the-art boards including analog-to-digital and digital-to-analog equipment and newest computer-aided software engineering tools. Same course as MAE 5493.

5513* Stochastic Systems. Prerequisites: 3513 and 4503 or STAT 4033. Theory and applications involving probability, random variables, functions of random variables, and stochastic processes, including Gaussian and Markov processes. Correlation, power spectral density, and nonstationary random processes. Representation of linear systems, stochastic processes. State-space formulation and covariance analysis. Same course as MAE 5513.

5523* Estimation Theory. Prerequisite: 5513 or MAE 5513. Optimal estimation theory including linear and nonlinear estimation of discrete and continuous random functions. Wiener and Kalman filter theory included. Same course as MAE 5523.
5533* Modern Communication Theory. Prerequisite: 5513. Noise as a random process, analog and digital signal detection in the presence of noise, optimum receiver design using signal space concepts and introduction to information theory. Trade-offs between bandwidth, signal-to-noise ratio and the rate of information transfer. Example system designs include earth satellite, deep space and terrestrial communication systems and computer communication networks.

5543* Data Transportation and Protection. Data and its representation; finite field matrices, pseudorandom sequences; information protection; space division networks; synchronization; and channel and error control.

5553* Telecommunications Systems. Prerequisite: graduate standing or consent of instructor. Ways and means that voice, data and video traffic is moved long distances. Data networks (Ethernet and Token Ring Local Area Networks; FDDI and SMDS Metropolitan Area Networks; Internet, Frame Relay, and ATM Wide Area Networks); the telephone system (POTS, network synchronization, SDH, SONET, cellular telephone); and video (NTSC, switching and timing, compressed video standards such as MPEG and Px64, HDTV).


5623* Antenna Theory. Prerequisite: 3613. Fundamental antenna parameters, including directivity, efficiency, radiation resistance, and pattern. Analysis of dipole, loop, aperture, broadband, and traveling wave antennas. Array theory. Introduction to numerical techniques used in modern antenna design.


5653* Foundations of Electrodynamics I. Prerequisite: 3613. Rigorous derivation of Maxwell's equations utilizing Coulomb's law and postulates of special relativity; the invariance of Maxwell’s equations under Lorentz transformations, the four-vector form of Maxwell’s equations, scalar and vector potential functions, solutions of the Laplace and Poisson equations, solutions of the homogeneous and inhomogeneous wave equations with applications to guided waves, radiation and scattering.

5703* Optimization Applications. Prerequisite: graduate standing. A survey of various methods of unconstrained and constrained linear and nonlinear optimization. Applications of these methodologies using hand-worked examples and available software packages. This applications oriented course is intended for engineering and science students. Same course as CHE 5703, IEM 5023 and MAE 5703.

5713* Linear Systems. Prerequisite: graduate standing or consent of instructor. Introduction to the fundamental theory of finite-dimensional linear systems with emphasis on the state-space representation. Mathematical representations of systems; linear dynamic systems; controllability, observability, and stability; linearization and realization theory; and state feedback and state observer. Same course as MAE 5713.

5733* Neural Networks. Prerequisite: graduate standing. Introduction to mathematical analysis of networks and learning rules, and on the application of neural networks to certain engineering problems in image and signal processing and control systems. Same course as CHE 5733 and MAE 5733.

5753* Digital Processing of Speech Signals. Prerequisite: 4763 or 5763. Digital signal processing; speech production; digital modeling of speech; short time analysis and synthesis; the short time Fourier transform, linear predictive coding and solution of the normal equations; vocal tract spectrum calculation; speech coding; homomorphic processing; applications of speech processing. Introduction to more advanced topics as time permits.

5763* Digital Signal Processing. Introduction to discrete linear systems, frequency-domain design of digital filters; quantization effects in digital filters; digital filter hardware, discrete Fourier transforms, high-speed convolution and correlation with application to digital filtering; introduction to Walsh-Fourier theory.

5773* Intelligent Systems. Prerequisite: 5733 or MAE 5733. Introduction to the state-of-the-art intelligent control and system synthesis techniques, including oversampled A/Ds, neural networks and learning rules, and on the application to industrial and defense applications. Emerging intelligent algorithms (e.g., NN, FS, GA, EP, DES); intelligent control architecture (e.g., bottom-up, top-down, semiotics); reinforcement learning and hybrid systems; and case studies and design projects. Same course as MAE 5773.

5793* Digital Image Processing. Prerequisite: 4763 or 5765. Digital image processing including image acquisition and characterization, transforms, coding and compression, enhancement, restoration and segmentation. Use of modern image processing software on Sun and IBM work stations.


5833* Fiber-Optic Communication Systems. Prerequisite: graduate standing or consent of instructor. Five generations of fiber-optic communication systems described in detail. Technical advances and increased capability of each system. Historical framework of how technical capability at the time forced technical decisions. A systems engineering point of view emphasizing optimization of all components of the optical fiber link.

5853* Ultrafast Optoelectronics. Prerequisite: graduate standing or consent of instructor. Combining ultrafast laser pulses with electronic circuitry. Increased device performance. Optoelectronic/electrical pulses as short as 0.2 psec. High performance areas illustrating the power of advanced techniques in applications.

6000* Research. 1-30 credits, maximum 30. Prerequisite: consent of major professor. Independent research for students continuing graduate study beyond the level of the M.S. degree.

6050* Special Topics. 1-9 credits, maximum 9. Prerequisite: consent of instructor. Subjects to be selected by the graduate faculty in electrical engineering to cover state-of-the-art advances.

6123* Special Topics in Power Systems. Prerequisite: 5113. Selected relevant current topics related to power system operation and planning.

6253* Advanced Topics in Computer Architecture. Prerequisite: 5253 or CS 5253. Innovations in the architecture and organization of computers, with an emphasis on parallelism. Topics may include pipelining, multiprocessors, data flow, and reduction machines. Same course as CS 6253.


6423* System Identification. Prerequisite: 5473 or 5713 or MAE 5473 or MAE 5713. Linear and nonlinear system modeling of random systems. Models of linear time-invariant systems, nonparametric methods and preliminary model development, parameter estimation methods, convergence and consistency, asymptotic distributions of parameter estimates. Nonlinear modeling. Same course as MAE 6423.

6453* Adaptive Control. Prerequisite: 5473 or 5713 or MAE 5473 or MAE 5713. Analysis and design of control techniques that modify their performance to adapt to changes in system operation. Review of systems analysis techniques, including state variable representations, linearization, decoupling, covariance analysis, stability, and linear quadratic Gaussian design. On-line parameter estimation, model reference adaptive systems, self-tuning regulators, stable adaptive systems. Same course as MAE 6453.
Electrical Engineering Technology (EET)

1003 Introduction to Microcomputer Programming

1104 Fundamentals of Electricity
Lab 3. Prerequisites: MATH 1513 and consent of department. Elementary principles of electricity covering basic electric units. Ohm’s law, Kirchoff’s law, circuit solutions, network solutions, magnetism, inductance and capacitance.

1244 Circuit Analysis I
Lab 4. Prerequisites: 1104, co-requisite MATH 1613. Analysis of AC electric circuits. The use of network theorems and phasors, coupled circuits, resonance, filters, and power.

2213 Essentials of Electricity
Lab 2. Prerequisites: MATH 1513, 1613. Electric circuits and machines, including Ohm’s law, magnetism, direct-current motors, generators and controls, alternating current, single-phase circuits, polyphase circuits and alternating current machinery. For non-electronics majors only.

2303 Technical Programming
Lab 3. Prerequisites: 1104, MATH 1513 or completion of comparable engineering science courses. Introduction to machine programming using industrial standard languages, emphasis on problems from science and technology.

2354 Pulse and Digital Techniques
Lab 3. Prerequisites: 1244 and 1225. Electronic circuits used in digital control and computation. Pulse generation, Boolean algebra and logic circuits.

2635 Solid State Devices and Circuits
Lab 1. Prerequisites: 1244, MATH 1613. Diodes, transistors, LSI linear devices; their operation and applications in electronic circuits.

3005 Electronics Analysis I
Prerequisites: 1104, 1244, 2244, 2635. MATH 1513, 1613. Evaluation of circuit analysis. Advanced study of basic circuits. Introduction to computer simulation. Use of basic calculus in circuit analysis. Must obtain a "C" or better before admission to other 3000 level EET courses. Intended for transfer and returning students. Enrollment by adviser consent.

3015 Electronics Analysis II
Prerequisites: 3005, MATH 2123. Use of calculus in circuit analysis. Must obtain a "C" or better before admission to other 3000-level EET courses. Intended for transfer and returning students. Enrollment by adviser consent.

3104 Elements of Electricity and Electronics
Lab 1. Prerequisite: MATH 1513. Essentials of electricity, controls, and electronics for non-majors. No credit for EET majors.

3113 Circuit Analysis II

6463* Advances in Nonlinear Control. Prerequisite: 5463 or MAE 5463. Introduction to vector fields and Lie algebra; controllability and observability of nonlinear systems; local decompositions; input-output and state-space representation of nonlinear systems; feedback linearization; controlled invariance and distribution; control of Hamiltonian systems. Same course as MAE 6463.

6483* Robust Multivariable Control Systems
Prerequisite: 5713 or MAE 5713. Introduction to multivariable systems; SISO robustness vs. MIMO robustness; multivariable system poles and zeros; MIMO transfer functions; multivariable frequency response analysis; multivariable Nyquist theorem; performance specifications; stability of feedback systems; linear fractional transformations (LFT's); parameterization of all stabilizing controllers; structural singular value; algebraic ricatti equations; H2 optimal control; H-infinity controller design. Same course as MAE 6483.

6523* Information Theory
Prerequisite: 5513 or consent of instructor. Physical theory of information (Shannon theory) including information measure and transmission rates and capacities. Source coding theory including algebraic and error-correcting codes. Design of waveforms for noise immunity. Information transfer in learning systems.

6803* Photonics I: Advanced Optics
Lab 9. Prerequisite: 3813 or PHYS 3213 or consent of instructor. Advanced optics including spectral and time characteristics of detectors, characteristics of lasers, time, spectral and spatial parameters of laser emission, interferometric techniques, and nonlinear effects such as two-photon absorption and second and third harmonic generations. Emphasis on ultrashort laser pulses. Same course as CHEM 6803 and PHYS 6803.

6811* Photonics II: THz Photonics and THz-TDS
Lab 3. Prerequisite: 6803. THz photonics and THz time-domain spectroscopy (THz-TDS). Concepts and techniques of driving electronic circuitry with ultrashort laser pulses to generate and detect freely propagating pulses of THz electromagnetic radiation using several operational configurations. Same course as CHEM 6811 and PHYS 6811.

6821* Photonics II: Spectroscopy II
Lab 3. Prerequisite: 6803. Operating principles and applications of laser spectroscopy of atoms, molecules, solids and complex fluids. Absorption, emission, photon correlation, coherence, time resolved Fourier transform. Raman spectroscopy and non-linear optical. Same course as CHEM 6821 and PHYS 6821.

6823* Advanced Optical Techniques
Prerequisite: 5813 or 5853. State-of-the-art optical devices and research methodologies. Investigation and discussion of contemporary developments in non-linear optical devices and laser applications. Includes both analytical and experimental techniques.
3124 Project Design and Fabrication. Lab 1. Prerequisites: 1244, 2544, 2635. Methods of design, analyzing and fabricating electronic circuits using standard software packages. Heat transfer characteristics and problem solutions are included.

3234 Nondestructive Testing. Lab 2. Commonly used nondestructive testing in industry: radiography, Magnetflux, liquid penetrant, ultrasonic and eddy current testing.

3254 Microprocessors I. Lab 1. Prerequisites: 2544. An introduction to microcontrollers and their uses in embedded applications. Topics include system architecture, assembly language, structured programming, memory systems, user I/O, timers, peripherals, etc.

3264 Microprocessors II. Lab 1. Prerequisites: 2544, 3254. A continuation of EET 3254. Programming and interfacing of microcontrollers in embedded application including interrupts, EEPROM, serial programming, interfacing, power management, algorithms, stepper motor control.

3354 Advanced Circuits I. Lab 1. Prerequisites: 1244, 2635, MATH 2133, GENT 3123. Corequisite: EET 3113. Bandpass signaling principles and circuits. The Fourier transform; AM, SSB, FM, and PM signaling; binary modulated bandpass signaling (PSK and PSK); superheterodyne receivers; phase-locked loop (PLL); modulators and mixers; frequency multiplication; special purpose I/C’s.


3524 Advanced Logic Circuits. Lab 1. Prerequisites: 2544, 2635, 3254. Computer-based design, simulation and implementation of digital/mixed-signal systems using programmable logic, field programmable gate arrays, ASICs and system-on-chip technology.

3533 Introduction to Telecommunications. Lab 1. Prerequisites: 2544, 2635, 3254. Introductory course to the field of telecommunications. Study of the various technologies and how the application of these technologies work together to form functioning systems and networks.

4050 Advanced Electronic Problems. 1-4 credits, maximum 4. Prerequisites: junior standing and consent of head of department. Special problems in the electronic area.

4153 Data Communications. Lab 3. Prerequisites: 3263, 3363, 3534 and 3733. Data communications including point-to-point, LANs, WANs, and switched networks. Topologies, protocols, routing, error detection and correction, text compression, modulation techniques, OSI, TCP/IP, Internet, and ISDN. Laboratory focus on design, assembly, test, demonstration, oral and written presentation of the design project. Capstone course for the computer option.

4314 Elements of Control. Lab 3. Prerequisites: 3113, 3123, 3363, GENT 3123. Principles of analog and digital control, with emphasis on the analysis of feedback control systems in their various conceptual configurations. Application of feedback control theory to the analysis and design of present day circuits and systems. Use of circuit analysis software.


4514 Advanced Telecommunication Topics. Lab 1. Prerequisite: 3533. Study of data transmission techniques between digital electronic devices.

4523 Introduction to Telecommunications Management. Lab 1. Prerequisite 4514. Study of the effective management of telecommunications systems. Traffic engineering, quality of service and associated design costs are examined.


4832 Senior Project. Lab 3. Prerequisite: 20 credit hours of upper-division electronics courses or consent of instructor. For the student’s last semester. A synthesis of all pertinent skills and knowledge developed in the curriculum. Students work as product design group developing a useful or marketable electronics product or device through design, assembly, test, and demonstration phases. Graded written and oral presentations.

Engineering (ENGR)


1311 Introductory Engineering Graphics. Principles, techniques and skills of graphics as used in engineering.

1322 Engineering Design with CAD. Lab 2. Introduction to engineering design using modern design methodologies and state-of-the-art computer-aided design tools. Hands-on design, construction and testing through participation in a design project contest.


2030 Co-op Industrial Practice I. 1-6 credits, maximum 12. Prerequisites: sophomore standing and permission of Co-op coordinator. Pre-engineering industrial practice. Written reports as specified by advisor. Application of credit to meet degree requirements varies with level and department.

2070 Orientation Projects. Lab 2-6. 1-3 credits, maximum 3. Prerequisite: pre-engineering standing and approval of Co-op coordinator. Projects to assist students with special needs to adjust to engineering curriculum.

3030 Co-op Industrial Practice II. 1-6 credits, maximum 12. Prerequisites: junior standing and permission of Co-op coordinator. Pre-engineering industrial practice. Written reports as specified by adviser. Application of credit to meet degree requirements varies with level and department.

3061 Domestic Scholars Experience. Prerequisite: consent of the coordinator of CEAT Student Services. Participation in the domestic scholars experience.

3080 International Experience. 1-18 credits, maximum 36. Prerequisite: consent of the associate dean of the college. Participation in a formal or informal educational experience outside of the USA.

3090 Study Abroad. 1-18 credits, maximum 36. Prerequisites: consent of the Study Abroad office and associate dean of the college. Participation in an OSU reciprocal exchange program.

3111 Introduction to Engineering for Transfer Students. Prerequisite: transfer status with 28 or more credit hours. Adjustments from previous college situation needed to select a proper course of studies based on abilities, aptitudes and interests.

3333 Acoustics of Music and Speech. Prerequisite: 45 credit hours completed. Algebra base treatment of the physical principles of sound in music and speech, and the sense of hearing. Sound production by musical instruments, acoustic response of auditoriums, and principles of sound reinforcement.

4030 Co-op Industrial Practice III. 1-6 credits, maximum 12. Prerequisites: senior standing and permission of Co-op coordinator. Pre-engineering industrial practice. Written reports as specified by advisor. Application of credit to meet degree requirements varies with level and department.

4060 Topics in Technology and Society. 1-3 credits, maximum 6. Problems of society relating to technology and added problems stemming from their solution. Minimal reliance on mathematics; for engineering and nonengineering students.

Engineering Science (ENSC)

2112 Statics. Lab 2. Prerequisites: PHYS 2014 and MATH 2145. Results of force systems, static equilibrium of rigid bodies and statics of structures. Shear and moment diagrams.

2113 Statics. Prerequisites: MATH 2145 and either PHYS 1114 or 2144. Results of force systems, static equilibrium of rigid bodies, statics of structures, and fluid statics. Shear and moment diagrams.
Elementary Dynamics. Prerequisite: 2112. Kinematics and kinetics of particles, systems of particles, and rigid bodies from a Newtonian viewpoint utilizing vector algebra and calculus. Work energy and impulse momentum principles.

Elementary Dynamics. Prerequisite: 2113. Kinematics and kinetics of particles, systems of particles, and rigid bodies from a Newtonian viewpoint using vector algebra and calculus. Work-energy and impulse-momentum principles. Planar and three-dimensional kinematics and kinematics of rigid bodies.

Strength of Materials. Prerequisite: 2112. Bending moments, deformation and displacements in elastic and plastic deformable bodies.


Thermodynamics. Prerequisites: CHEM 1515, PHYS 2014, MATH 2145. Properties of substances and principles governing changes in form of energy. First and second laws.

Introduction to Electrical Science. Prerequisites: PHYS 2114 and MATH 2155. Elements of electrical engineering; AC and DC circuits, mesh and node formulation of network equations, steady-state response to sinusoids, energy, power and power factor.

Fluid Mechanics. Prerequisites: 2112/2113, MATH 2233 (or concurrent enrollment). The study of fluid properties, statics, conservation equations, dimensional analysis and similarity, viscous flow in ducts, inviscid flow, boundary layer theory, open channel flow, turbomachinery and fluid measurement techniques.

Materials Science. Prerequisite: CHEM 1314 or CHEM 1515. Introductory level. Relationship between structure and properties of materials and engineering applications. Atomic, microscopic and macroscopic properties.

Engineering and Technology Management (ETM)

Seminar. 1-6 credits, maximum 6. Prerequisites: admission to the master's program or consent of instructor. Guided study in a topic area selected to enhance a student's program.

Introduction to Strategy, Technology, and Integration I. Prerequisite: admission to the M.S. in ETM program or consent of instructor. The first part of the capstone and the second credit hour of the creative component requirement. Proposal for a project to be completed for the ETM 5311 course. Substantive use of ETM course material, and a notable and relevant contribution to the student's organization. Participation in formal critique and discussion of other proposals.

Capstone to Strategy, Technology and Integration II. Prerequisite: admission to the M.S. in ETM program or consent of instructor. The second part of the capstone and the third and final credit hour of the creative component requirement. Presentation of student's project. Substantive use of ETM course material, and a notable and relevant contribution to the student's organization. Participation in formal critique and discussion of other projects.

Enterprise Integration. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Management and group issues inherent in the application and implementation of high performing work teams. The team's roles in improving organizational performance, along with the best practice procedures and techniques that increase team effectiveness.

Benchmarking. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Benchmarking as an effective approach to study and adopt or adapt methodologies representing best specific practices from any industry, or identify and assess performance based on equivalent and common measures, usually from those in the same or similar industries, including competitors.

Strategic Project Management. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Overview of traditional project management concepts and techniques (i.e., Gantt charts, PERT, CPT) along with several technical issues related to their effective use. Fundamental nature of the problems associated with several technical issues related to their effective use. Fundamental nature of the problems associated with effectively managing and coordination of multiple discrete projects within an overall systems integration initiative. A framework for addressing these problems.

Problem Solving and Decision Making. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Patterns utilized by successful managers for decision making. Organizational skills, investigation through questioning and logic, decision making among alternatives, and ensuring the success of decisions. Analyzing problems and decisions, appraising situations, managing problems of human performance, and implementing processes.

Process Discipline. Prerequisite: admission to the M.S. in ETM program or consent of instructor. A combination of theory and practice for understanding processes involved in any production.

Technology Forecasting and Assessment. Prerequisite: admission to the M.S. in ETM program or consent of instructor. A framework and analytical tools for developing technological foresight. Technology monitoring, forecasting and assessment in the context of a family of emerging technologies.

Comprehensive Planning. Prerequisite: admission to the M.S. in ETM program or consent of instructor. Continuous and systematic process of thought about the future, resulting in a plan or specific course of action for communicating, coordinating, and controlling activities. Strategic, long-range, tactical, operational, contingency and performance planning.

Failure Mode and Effects Analysis in Design. Prerequisite: admission to the M.S. in ETM program or consent of instructor. A design technique for reducing risk and improving reliability of a system, design or process. Potential failures in any of these studied methodically during design. The concepts, tools and techniques applicable to any product or process.

Engineering Technology

(See specific technology programs listed alphabetically)

English (ENGL)

Composition for International Graduate Students. Lab 2. Review of complex sentence structure and organizational patterns, with an emphasis on documented research paper writing and oral presentation. Graded on a satisfactory-unsatisfactory basis.

Basic Composition. Intensive instruction in grammar and error avoidance (especially the differences between spoken and written English), paragraph structure, and essay writing. May be used for skills remediation or to satisfy high school curricular deficiency in English. Graded on a satisfactory-unsatisfactory basis.

Studies in English Composition. 1-2 credits, maximum 2. Special study in composition to allow transfer students to fulfill general education requirements as established by Regent's policy.

Freshman Composition I. The fundamentals of expository writing with emphasis on structure, development and style.

International Freshman Composition I. Lab 2. Restricted to students whose native language is not English. Expository writing with emphasis on structure and development. Special attention to problems of English as a second language. This course may be substituted for 1113.

Freshman Composition II. Prerequisite: 1101 or 1113. Expository composition with emphasis on technique and style through intensive and extensive readings.
1223  
**International Freshman Composition II.** Prerequisite: 1113 or 1123. Restricted to students whose native language is not English. Exposure to composition with emphasis on technique and style in writing research papers. May be substituted for 1213.

1313  
**Critical Analysis and Writing I.** Prerequisites: English ACT score of 30 and 3.50 overall high school or transfer GPA. Review of fundamentals as necessary. Individualized instruction in writing on topics based on discussion of students’ interests. Class size limited. This course may be substituted for 1113.

1413  
**Critical Analysis and Writing II.** Prerequisites: “A” or “B” in 1113 or 1313, English ACT score of 30 and consent of course director. Individualized writing growing from discussions of books and ideas. Class size limited. This course may be substituted for 1213.

1923  
**(H)Masterpieces of Literature.** Readings in the great works of the most important writers of Britain and America, such as Shakespeare, Dickens, T'wain, Faulkner, and others.

2333  
**Introduction to Technical Writing.** Prerequisite: 1113. Does not meet any part of the six-hour composition requirement for the bachelor’s degree. Technical literature and publications in the student’s area of specialization. Emphasis on clarity, simplicity and careful organization.

2413  
**(H)Introduction to Literature.** Fiction, drama/film and poetry. Written critical exercises and discussion.

2443  
**(H)Languages of the World.** A comprehensive survey of world languages. The essential structural and historical organization of languages. The process of languages as a basic human function. Same course as FLL 2443.

2453  
**(H)Introduction to Film.** Lab 2. The study of editing, cinematography, sound, and performance in key films, as the form of motion picture shapes, personal and national identity.

2513  
**(H)Introduction to Creative Writing.** Literary composition with emphasis on techniques and style through readings and writings in fiction, poetry and drama.

2543  
**Survey of British Literature I.** The beginnings through the Neo-Classical Period.

2653  
**Survey of British Literature II.** The Romantic Period to the present.

2773  
**Survey of American Literature I.** The Puritans through the Romantic Period.

2883  
**Survey of American Literature II.** The Romantic Period to the present.

3030  
**Fiction Writing.** 3 credits, maximum 6. Prerequisite: 2513. Directed readings and practice in writing fiction with special attention to techniques.

3040  
**Poetry Writing.** 3 credits, maximum 6. Prerequisite: 2513. Directed readings and practice in writing poetry with special attention to techniques.

3050  
**Scriptwriting.** 3 credits, maximum 6. Prerequisite: 2513. In a workshop setting, the reading and discussion of screenplays produced by students’ peers and by professionals, completion of exercises on action and characterization, and the writing of a short, fictional screenplay.

3123  
**(H)Classical Mythology.** Classical Greek and Roman myths and their cultural context. Selections from Homer, Hesiod, Vergil, Ovid.

3163  
**(H)World Literature I.** Selected literary masterpieces exemplifying ideals and values in Western cultures.

3173  
**(H)World Literature II.** Selected literary masterpieces exemplifying ideals and values in non-Western cultures. Emphasis on the study of non-Western literature available in English.

3183  
**(H)Native American Literature.** Origins and development of a literary tradition in its historical and cultural context.

3193  
**(H)African-American Literature.** Origins and development of a literary tradition in its historical and cultural context.

3200  
**Special Problems in Language and Literature.** 1-3 credits, maximum 3. Prerequisite: 9 credits hours of English. Specialized readings and independent study.

3203  
**Advanced Composition and Rhetoric.** Prerequisite: 1113 hours of English. Theories of regulative grammar and rhetoric as applied to the writing process.

3240  
**Criticism.** 3 credits, maximum 6. Study and application of principal critical theories in literature, film or technical writing.

3323  
**Technical Writing.** Prerequisites: 1113, 1213, and junior standing. Applied writing in areas of specialization. Intensive practice in professional writing modes, styles, research techniques and editing/rewriting specialized audiences and/or publications. This course may be substituted for 1213 with an “A” or “B” in 1113 and consent of the student’s college.

3333  
**(H)Short Story.** Origins, development, theory and craft of the short story.

3353  
**(H)Film as Literature.** Plays, novels and short stories that have been brought to the screen since the invention of motion pictures; examination of that process with emphasis on aesthetics and theory.

3363  
**(H)Drama.** Close study of representative plays of various periods (for example, Classical, Renaissance, Restoration, Modern, and others) and of the main formal categories (tragedy, comedy).

3410  
**(H)Popular Fiction.** 3 credits, maximum 6. Study of certain popular genres of fiction including science fiction, detective fiction, Western fiction, horror and the grotesque, the romance, American humor. Course content varies by semester. Exploration of the characteristics and evolution of the genre while developing skills in reading, writing and thinking critically.

3453  
**(H)History of American Film.** Lab 2. Introduction to the history of American cinema, the principal eras in American film history, key directors, and the main genres. Basic approaches to film history and key theorists.

3463  
**(H)History of International Film.** Lab 2. Introduction to the history of international cinema and the principal eras in film history, focusing on the moments when different national cinemas flourished.

3603  
**(H)British Literature to 1600.** Close study of various works in the context of cultural, political, and artistic developments throughout Europe, such as the Arthurian legend, the grail myth, the troubadours.

3633  
**(H)British Literature 1600-1800.** Thematic and historical concerns of the seventeenth and eighteenth centuries.

3643  
**(H)British Literature 1800-1900.** A variety of topics focusing on literary and cultural development in the nineteenth century, i.e., scary novels, women writers, sensationalist literature.

3653  
**(H)British Literature Post 1900.** Various topics in the literature and culture of England and Ireland, i.e. the city, survival, Irish Renaissance.

3703  
**(H)American Literature to 1800.** Historical development. Major writers and their works.

3713  
**(H)American Literature 1800-1900.** Historical development. Major writers and their works.

3723  
**(H)American Literature Post 1900.** Historical development. Major writers and their works.

3813  
**(H)Readings in the American Experience.** Life in the New World from the colonial to the postmodern era using a multiplicity of interdisciplinary texts that demonstrate the emergence and ongoing evolution of distinctive American identities.

4003*  
**History of the English Language.** The growth of the English language.

4013*  
**English Grammar.** The traditional terminology and concepts of English grammar leading or evolving into the several current systems of description.

4053*  
**Descriptive Linguistics.** The methodology of linguistic analysis.

4083*  
**Applied Linguistics.** The study of topics in psycholinguistics, including language and the brain, animal communication and language acquisition.

4093*  
**Language in America.** Historical development of American English. Regional, social and cultural language differences.

4223*  
**Introduction to Old English.** The basics of pronunciation, vocabulary, and grammar, enabling students to read short works in prose and poetry.

4233*  
**Old English Poetry: Beowulf.** Prerequisite: 4223. A close reading of the poem, taking into account the original Old English manuscript and recent translations.
5313* Internship, Teaching English as a Second Language. Supervised teaching of beginning through advanced English as a second language courses.

5333* Seminar in TESL: Testing. Standardized testing for teaching English as a second language.

5573* Studies in the History of Rhetoric. An exploration of selected topics and texts in the history of Western rhetoric from Plato to the present.

5410* Seminar in British Literature of the 16th Century. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 16th century.

5420* Seminar in British Literature of the 17th Century. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 17th century.

5440* Seminar in British Literature of the 19th Century. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 19th century.

5460* Seminar in Modern Literature. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of modern literature.

5520* Internship in Technical Writing. 1-6 credits, maximum 6. Practice in writing appropriate documents such as proposals, manuals (software, hardware, reference, training), articles, functional specifications in job-simulation situations. Review of academic materials as appropriate.

5533* Seminar in Advanced Technical Writing. Specialized writing projects growing out of student’s special interests and emphasizing the student’s career preparation. Coverage of manuals, proposals, and visual aids used to communicate technical information.

5543* Seminar in Scientific and Technical Editing. Managing technical documentation production; developing scientific and technical editing skills; special emphasis on editing project.

5563* History of Scientific and Technical Literature. Structural, stylistic and rhetorical analysis of selected scientific and technical works.

5573* Theories of Communication. Survey of a broad range of theories of communication and application of those theories to technical communication.

5580* Environmental Writing. Consideration of the historical, political, cultural, and ethical contexts of modern environmentalism and examination of the rhetorical strategies in several types of environmental discourses, including risk communication, environmental impact statements, scientific papers and research reports, EPA communications, and other forms of environmental writing directed toward the general public. Major writing projects tailored to individual research interests and career goals with the aim of producing a publishable document.

5593* Proposal and Grant Writing. Exploration of principles and practices for writing proposals and grants, in part by surveying research in argumentation and persuasion, and in part by applying principles and practices of rhetorical analysis, document design, and publication management appropriate to this genre.

5630* Seminar in Early American Literature. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 17th and 18th centuries.

5660* Seminar in American Literature of the 19th Century. 3 credits, maximum 6. Selected writers and their works, themes and literary developments of the 19th century.

5680* Seminar in Contemporary Literature. 3 credits, maximum 6. Selected writers and their works, themes and literary developments in contemporary literature.

5730* Seminar in Fiction Writing. 3 credits, maximum 6. Writing fiction at the professional level.

5740* Seminar in Poetry Writing. 3 credits, maximum 6. Writing poetry at the professional level.

5750* Seminar in Scriptwriting. 3 credits, maximum 6. Scriptwriting at the professional level.

5990* Special Problems. 1-3 credits, maximum 6. Investigation into a designated area of English leading to material for creative component option (M.A.). Graded on a pass-fail basis.


6110* Seminar in Single Author or Work. 3 credits, maximum 9. A study of one text and its various readings; or a study of the development and range of a writer’s work in the English language.

6130* Studies in Fiction Writing. 3 credits, maximum 6. Prerequisite: 5730. Individual projects in fiction.

6140* Studies in Poetry Writing. 3 credits, maximum 6. Prerequisite: 5740. Individual projects in poetry.

6150* Studies in Scriptwriting. 3 credits, maximum 6. Prerequisite: 5750. Individual projects in scriptwriting.

6210* Seminar or Directed Study. 1-6 credits, maximum 9. Specialized readings or independent studies.

6220* Seminar in Genre. 3 credits, maximum 9. The development, traditions, concerns or characteristics of genre in selected texts. Major genres and subgenres considered.

6250* Seminar in Race, Region or Gender. 3 credits, maximum 9. A study of the complex relations between race, region or gender and the texts that represent them.

6253* Studies in New Media. Selected work in new media, for example film, literary adaptation to film, film and television.

6260* Studies in Literary Criticism. 3 credits, maximum 9. Selected work in literary criticism, for example ancient and neo-classical, 19th century, 20th century.

6350* Topics in Rhetorical Theory. 3 credits, maximum 6. Study of advanced topics in rhetorical theory and research. May focus on an important thinker, or a specific theme, or some combination of thinkers and themes.

6410* Topics in Linguistics. 3 credits, maximum 9. Prerequisite: 5143. Study of advanced topics in linguistic theory and research.

6420* Topics in Second Language Acquisition. 3 credits, maximum 9. Prerequisite: 5243. Study of topics in second language theory and research.


Entomology (ENTO)

2003 (N)Insects and Society. A course for non-majors that emphasizes the impact of insects on society. Influence of arthropods in beliefs, culture and fears and the view of insects in folklore and mythology from ancient times to present. Focus on the use of insects as models and systems in biological research. Exposure to the use of insects in teaching, music, art, literature and the cinema.

2023 Introduction to the Science of Entomology. Lab 2. Basic structure, function and classification of insects and closely related animals. Coverage of insects in ecosystems and development of control programs that reduce reliance on chemical pesticides.

3003 Livestock Entomology. Lab 2. Economic importance, biology and control of pests affecting domestic animals.

3021 Postharvest Insect Pests. Lab 2. Prerequisite: 2023 (or concurrent enrollment) or 3003. The biology and management of insect pests of bulk-stored grains, flour, feed, dried fruits and nuts, and those of quarantine significance for export of fresh fruits and vegetables within food processing plants, warehouses, wholesale and retail distribution systems.

3043 Insect Physiology. Prerequisites: 2023; one course in organic chemistry, nine credit hours of biology. Functions of the organ systems of insects. Lecture-demonstrations of selected insect physiology techniques. Same course as 5043.

3331 Insect Pests of Agronomic Crops. Lab 2. Prerequisite: 2023 or concurrent enrollment. Sampling and decision-making processes for evaluation and control of insect pest populations in agronomic crops. Coverage of identification of pests and beneficials and damage symptoms resulting from insect feeding in crops.

3421 Horticultural Insects. Prerequisite: 2023 or concurrent enrollment. Identification, biology and control of pests attacking horticultural crops. Emphasis on pests injurious to vegetables, fruits, pecans, greenhouse plants, turf and ornamental trees and shrubs.
Insect Physiology.

Advanced Systematic Entomology. 1-5 credits. 

Prerequisites: consent of instructor. Mechanics of proposal development and the peer review system. Effective use of scientific literature, and the development of hypotheses, objectives, and experimental design and methods through intensive writing and discussion.

Laboratory-Integrated Control Management

Prerequisites: consent of instructor. Modern theory and practices for management of insect pests and pathogens in plant production systems, emphasizing an ecologically-based, integrated approach. Basic concepts of pest management, decision-making, cost/benefit analysis, and risk/benefit analysis.

Advanced Agronomic Entomology

Prerequisites: Introduction to biotechnology in arthropod and pathogen control. Applications of biotechnology in controlling arthropod pests of plants and animals and plant pathogens. Introduction to underlying technology, products being deployed, their effectiveness and associated problems or concerns resulting from their use.

Laboratory-Integrated Pest Management

Prerequisites: 2023 and PLP 3344 or equivalent and a general genetics course; or consent of instructor. Individual or small group study of research leading to master's thesis or doctorate, with supervision of a major professor.

Doctoral Research and Dissertation

Prerequisites: for graduate students majoring in science-based fields, especially those nearing graduation. Skills needed for effective job application and interviewing, career development and advancement, communication with professional colleagues and the public, and personal professional development. Same course as PLP 5992.

Career Skills and Professionalism for Scientists

Prerequisites: graduate standing. For graduate students majoring in science-based fields, especially those nearing graduation. Skills needed for effective job application and interviewing, career development and advancement, communication with professional colleagues and the public, and personal professional development. Same course as PLP 5992.

Environmental Science

1113 Elements of Environmental Science

Prerequisites: biology, chemistry, ecology, economics, geology, hydrology, mathematics, physics, and other agricultural sciences to environmental issues. Addressing environmental problems from the standpoint of ethics, risk, and scientific and social feasibility. Emphasis on agricultural systems and natural resources.

Internships in Environmental Science

Prerequisites: consent of instructor. Individual or small group study of selected problems in environmental science. Course may be used twice for up to six credit hours to meet degree requirements.

4813 Environmental Science Applications and Problem Solving

Prerequisites: AGEC 3503, BISC 3105, or consent of instructor. Supervised internships with business, industry, or governmental agencies in environmental assessment and remediation.

4500 Environmental Science Problems

Prerequisites: Introduction to biotechnology in arthropod and pathogen control. Applications of biotechnology in controlling arthropod pests of plants and animals and plant pathogens. Introduction to underlying technology, products being deployed, their effectiveness and associated problems or concerns resulting from their use.
emission calculations) and environmental chemical wastewater treatment, fugacity (air monitoring, environmental sampling, such as ecological risk assessment, water chemistry and environmental law.

5300 Seminar in Environmental Science. 1-3 credits, maximum 10. Prerequisite: graduate standing. Topics and issues in the broad field of environmental science. Group discussions and presentations by students using an integrated team approach. Prerequisites: ENVR 5100 on plan-of-study. Required for environmental management specialization.

5600 Environmental Management Internship and Report. 1-6 credits, maximum 12. Prerequisites: 5500 and consent of director. Internship on environmental problem solving project(s) and submission and approval of a formal report. Course must be completed within three consecutive semesters from initial enrollment.

Family Relations and Child Development (FRCD)

2003 Dynamics of Family Relationships. An ecological approach to interpersonal relationships through study of the processes in the family that influence the way members relate to each other throughout their lives. Practice in application of principles is included.

2100 Preprofessional Laboratory Experience. 1-4 credits, maximum 4. Lab 2-8. Realistic experiences in different career areas, acquainting students with the diversity of roles and responsibilities as applied to the variety of audiences served. Professional behavior and ethics.

2113 (S) Human Development Within the Family: A Lifespan Perspective. Human development within the family described from a lifespan perspective. The principles of development and dynamics of behavior and relationships.

2213 Human Sexuality and the Family. Sexual development emphasizing personal adjustment and interaction with family and culture.

2413 Resource Management for Individual and Family. Principles and procedures of management and their relationships to human and material resources. Emphasis given to the consumer in the marketplace, financial management and time and energy management.

2613 The Professional in Individual, Family, and Community Services. Skills in decision-making, priority-setting, self-assertion, and self-assessment. Volunteer and field experience options available in the field of family services.

3013 (S) Early Adulthood. Study of the unique characteristics of development during early adulthood. Theories of adult development with emphasis on application to program development and providing services for adults.

3023* Child and Parent in Social Context. Parenting philosophies and styles; programs for children, families, and caregivers; emphasis on effective ways for the home, school, workplace and community to work together to provide for optimum development of children of various cultures and ethnic groups.

3112 Parent-Child Relationship. For parents, teachers or others who expect to be responsible for young children. Increases understanding of the needs and feelings of both the developing child and the adult caregiver. A wide variety of philosophies and techniques explored out of which individuals can devise their own comfortable, effective parenting styles.

3143 (S) Marriage. Consideration of courtship and marriage with special emphasis on building a healthy paired relationship; communication and decision making; and coping with problems as money, sex, role taking, in-laws and children.

3213 (S) Social, Emotional and Language Development in Early Childhood. Study of appropriate experiences in social, emotional, and language development.


3253 Child Development and Guidance: School Age. Influence of family, schools, peers, and the community on the physical, cognitive, social and emotional development of children in the school years. Education as a profession, cultural pluralism in the schools, and school organization. Observation and application of principles of child development and guidance in experiences with school-age children.

3300 Development of Creative Expression, Play and Motor Skills in Early Childhood. Prerequisite: one course in child development. Consideration of appropriate experiences in the areas of play, art, music and motor skills for children. Observation and participation with children groups.

3333 (S) Child Development and Guidance: Adolescence. Development of the adolescent physically, socially, intellectually and emotionally with emphasis on the search for identity, sexuality, vocational choice and interpersonal relations. Observation of adolescents.

3403 Literature and Literacy in Early Childhood. Consideration of appropriate experiences in the areas of literature and language arts.

3413 Family Economic Decision Making. Helping individuals make more effective choices as consumers. Relevant concepts, theories, and research from economics, family economics, marketing, and statistics. Information-imperfect markets, assessing consumer information, seeking redress, bargaining, inflation, decision-making models, the concept and measurement of quality and assessment of the performance of markets.
3433 **Family Finance.** Prerequisite: junior standing. Problems faced by consumers in the changing economy; impact of family financial decisions on a consumption-oriented society. Management of family resources including financial planning, credit, insurance, savings, investments, tax and estate planning.

3503 **Cognitive Development in Early Childhood.** Prerequisite: 2113 or equivalent. Study of major theories of cognitive development. Application to appropriate experiences in physical and natural sciences, mathematics and social studies.

3613 **Professional Services for Children and Families.** Study of current major issues and selected services for children and families.

3623 **Fundamentals for the Helping Professional.** Prerequisites: 2613, 3613. Development of fundamental skills and techniques used by those in various helping professions as viewed from the systems theory perspective. Observation and interviewing techniques, problem-solving and advocacy skills, and introduction to grant writing.

3753 (S) **Family Development.** Relationships over the life course within the American family. Variations in form and function of the family system related to cultural, economic, and social contexts.

3810 **Practicum in FRCD.** 1-9 credits, maximum 9. Prerequisites: 3213 and 3233, or 3613 and 3623. Observation and participation in programs for children, youth, adults and families. Supervision by FRCD faculty members or their designates.

4000 **Senior Thesis.** 1-6 credits, maximum 6. Prerequisites: 4743, STAT 2013, senior standing, consent of instructor. Supervised research for the bachelor's degree.

4103 **Managing Career Decisions.** Applications of decision making models for career and life planning. Self-assessment, career alternatives, career mobility, work/family issues and resource identification. Student seeking teacher certification will complete a module on methods of teaching career education.

4113 **Professionalism, Issues and Actions.** Prerequisite: senior standing. Current issues and strategies for professional development, integration of core concepts and theories, and involvement in public policy.

4123* **Observation and Assessment of Family Interaction.** Examination of family interaction through observation and assessment techniques. Focus on whole family functioning and the functioning of multiple family relationships.

4133 **Organizing and Administering Programs for Families and Individuals.** Development, management, and evaluation of programs serving families and individuals.

4203 **Strategies for Teaching.** Learning theories and strategies for planning, teaching and evaluating formal and nonformal programs. Not applicable for teaching licensure.

4213 **Media, Materials and Techniques in Presentations.** Lab 2. Application of educational principles to specific subject matter. Experience with a variety of technological aids for presentation, including multimedia and distance learning, computers and a variety of teaching aids. Development of proficiency in use of various media.

4220 **Field Experience Preparation for Kindergarten and Primary.** 1-4 credits, maximum 4. Prerequisite: admission to Teacher Education. Classroom-management, priority-setting, self-assessment, classroom organization and management, selection of appropriate content, and teaching strategies in public schools and state accredited programs.

4252 **History and Philosophy of Early Childhood Education.** Prerequisites: courses in child development and early childhood education and senior or graduate standing. History of early childhood education; theoretical foundations and methods of early childhood curriculum models, including multicultural and nonexist approaches; and current major issues in early childhood education.

4353 **Strategies for Working with Adults in Community Settings.** Theories of adult development and they activities of adults in family-related programs. Implications are analyzed in relation to planning and selecting programs, media, and teaching strategies.

4413* **Management of Volunteer Programs.** Prerequisite: junior, senior or graduate standing. For family and human service professionals who will have responsibility for utilizing volunteer personnel in achieving program goals. Overview of issues in volunteering, management and leadership strategies for maximizing volunteer effectiveness and strategies for evaluating volunteer service.

4420 **Internship in Early Childhood Education.** 1-7 credits, maximum 12. Lab 3-21. Prerequisites: 2100, 3213, full admission to Teacher Education with written consent of the coordinators of Early Childhood Education and certification offices. Teaching experience in both infant-kindergarten and grades 1-3. Graded on a pass-fail basis.

4423 **Family Resource Management.** Analysis of the human, environmental and financial resources of the family. Practical application of management principles in the development and utilization of family resources. Emphasis on interpersonal competence.

4463 **Child Development and Guidance: Infancy and Toddlerhood.** Development and behavior of infants and toddlers. Directed observation with children of this age.

4522 **Critical Issues in Family Relations and Child Development.** Prerequisite: senior standing. An examination of the place of family relations and child development in the context of broader themes. An exploration of the students' specialization and its implications for an educated life.

4533* (S) **Adulthood: Middle Years.** Study of the unique characteristics of life between young adulthood and the later years. Special emphasis on physical, intellectual, personal, family and career development in middle age.

4543* (S) **Adulthood: Later Years.** Analysis of the aging process. Interrelation between physical, psychological and social development in later years. Special emphasis on multigenerational family issues and relationships.

4553 **Families in Crisis.** Study of family responses to normative and unpredictable stress. Emphasis on using current literature on selected family stresses to identify issues and community resources that promote adaptation to family crisis.

4610 **Internship.** 1-8 credits, maximum 8. Lab. Prerequisites: 2100, 2613, 3613, 3623; completion of application form requiring consent of advisor or consent of instructor. Supervised observation and participation in programs for individual, family, and community services.

4653 **Theories and Issues in Child Development.** Prerequisites: 2113; six additional hours in FRCD, or consent of instructor. Current research and issues related to child development; theories and philosophical bases underlying development.

4673 (S) **Theories and Issues in Family Relationships.** Prerequisite: 3753. Introduction to family theories. Current research and issues related to family dynamics, relationships, and crises within the context of the family system.

4743 **Fundamentals of Research Methodology in Family Relations and Child Development.** Prerequisite: STAT 2013 or equivalent. Understanding research processes and development of skills needed to be consumers of scientific literature in FRCD. Practice in reading research and statistics, introduction to how computers are used in this research and demonstration of basic principles of assessment in children and families.

4750 **Special Problems in FRCD.** 1-6 credits, maximum 6. Prerequisite: consent of instructor. Various units of work related to specific issues in family relations and child development.

4793* (S) **The Family: A World Perspective.** Family structure and interaction that transcend specific cultures or nationalities; examination of specific cultural and international family forms, their social issues and relevant services to meet their needs.

4811 **Seminar in Family Services.** Pre-employment seminar. Individual competencies related to family services, career options, and the process of seeking employment.

4823* **Family Life Education.** Philosophy and principles of family life education. Planning, implementing, and evaluating programs in community and education settings.

4850 **Special Unit Courses in Family Relations, Child Development and Early Childhood Education.** 1-6 credits, maximum 6. Various units taught by specialists in the field.

4900 **Honors Creative Component.** 1-3 credits, maximum 3. Prerequisite: College of Human Environmental Sciences Honors Program participation, senior standing. Guided creative component for students completing requirements for College Honors in College of Human Environmental Sciences. Thesis, creative project or report under the direction of a faculty member in the major area, with second faculty reader and oral examination.
500* Master's Thesis. 1-6 credits, maximum 6. Research in FRCD for M.S. degree.

5110* Directed Study in FRCD. 1-9 credits, maximum 9. Prerequisites: 5223 or 5523 and consent of instructor. Directed individual study in human development and family sciences.

5112* Computer Applications in FRCD Research. 1-3 credits, maximum 3. Prerequisite: 1503. Introduction to computer applications including word processing, analyzing and summarizing data, and using the SPPS-X package. No computer experience necessary.

5133* Research Methods in Family Relations and Child Development. Current problem areas and methodologies of research in human development and family sciences, followed by experiences in identifying researchable problems, planning a proposal, selecting appropriate procedures for carrying out studies and interpreting findings.


5190* Teaching Practicum. 1-3 credits, maximum 3. Prerequisites: six hours of graduate course work and consent of instructor. Teaching human development and family sciences; content and techniques.

5213* Child Behavior and Development. Prerequisite: consent of instructor. Current issues in child development beyond infancy explored within the context of recent research. Contrast the theoretical and methodological approaches critically evaluated.

5223* Theories of Child Behavior and Development. Prerequisite: 6 credit hours at graduate level in child development or related areas. Major theories and supportive research that contribute to the understanding of child behavior and development.

5243* Infant Behavior and Development. Prerequisite: 5223 or consent of instructor. Survey of research and theory pertaining to infant development including individual differences, perception, cognition and learning, social and emotional development, and assessment.

5273* Assessment of Infant and Child Development. Prerequisite: consent of instructor. Study and application of formal evaluative methods for the investigation of infant and child development. Supervised practice in administration, scoring, and interpretation of individual tests of cognitive ability, adaptive behavior, language development, and psychomotor development.

5290* Practicum. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Supervised experience in various settings relevant to human development and family sciences.

5333* Early Childhood Education: Curriculum. Implications of child development theory and research for planning educational programs and learning experiences appropriate for young children.

5343* Assessment Within Early Childhood Programs. Prerequisite: consent of instructor. Examination of standardized and alternative assessment strategies for documenting children's learning and development within early childhood educational contexts. Exploration and critical review of strategies for evaluating early childhood classrooms.

5353* Diversity in Early Childhood. Exploration and critical review of the state of early childhood programming with emphasis on research, theory, and policy making that best serve current diversity and multicultural issues in practice.

5363* Early Childhood Models and Practice. Curriculum development and program models for children through third grade emphasizing individual differences, equipment and materials, physical facilities and space, teacher roles, and philosophical objectives.

5373* Early Childhood Administration, Policy Analysis and Advocacy. Examination of the administration of programs for young children as well as policy evaluation and advocacy. Legal, social and economic conditions as they affect the welfare of individuals and families.


5470* Developments and Innovations in Family Relations, Child Development and Early Childhood. 1-9 credits, maximum 9. Analysis of current developments and innovative practices in one or more of the specified areas. Emphasis upon evolving concepts with implications for programs serving societal needs in these areas.

5513* Issues in Family Science. Current and classic literature in family studies. Consideration of philosophical bases and current research issues relevant to the family as a field of study.


5543* Coping with Family Crises. Strategies for helping families deal with various family crises including illness, death and divorce. Focus on dealing with these from a family systems approach.

5553* Marital and Premarital Enrichment Education. Analysis of educational models and processes that relate to enriching couple relationships. Approaches to facilitating premarital and marital enrichment, emphasizing program development, implementation, and evaluation.

5573* Adolescent in Family Context. Physical, social, emotional and intellectual development of adolescents within the context of family relationships. Exploration of research and theory as it relates to adolescent development and parent-adolescent relationships.

5583* Human Sexuality. Multiple aspects of human sexuality including physiological and psychological sexual development and response, sexual relationships, and sexual dysfunctions.

5611* Marriage and Family Therapy Pre-practicum. Pre-clinical experience for students in the marriage and family therapy (MFT) specialization. Emphasizes counseling skills and structured observations.

5613* Introduction to Marriage and Family Therapy. Prerequisite: graduate standing or consent of instructor. Historical context of family therapy. Overview of the major schools of family therapy and basic clinical skills necessary for the formation of a helping relationship.

5623* Systems Theory and Applications to the Family. Examination of the cybernetic roots and terminology used with general systems theory providing an understanding, appreciation and integration of the role of "systems" approaches to family theory and clinical practice.

5643* Models and Strategies in Marriage and Family Therapy. Exposure to the dominant models used in marriage and family therapy. Emphasis on theoretical foundations and the effective application of strategies and techniques utilized in the treatment of couples and families from an ecosystemic perspective.

5653* Diagnostic Assessment in Marriage and Family Therapy. Prerequisites: 5623; admission to marriage and family therapy specialization or consent of instructor. Recognition of the most relevant dimensions of family, systems, the array of diagnostic tools available, and measurement. Use of research knowledge to enhance the probability of meeting the therapeutic needs of troubled couples and families.

5663* Professionalism and Ethics in Marriage and Family Therapy. Prerequisites: graduate standing and consent of instructor. The development of the professional attitude and identity of a marriage and family therapist. The AAMFT Code of Ethics, family law, ethnicity, and gender issues, as related to the practice and profession of marriage and family therapy.

5690* Marriage and Family Therapy Practicum. 1-3 credits, maximum 3. Prerequisite: 1503. Preparation and orientation to marriage and family therapy specialization. Supervised clinical experience for students in the marriage and family therapy specialization.

5743* Management of Family and Community Service Programs. Functions of management applied to programs and services for children and families. Program planning, personnel decisions, resource development, marketing, community engagement, employee development, and evaluation.


5843* Family Policy Issues. Examination of federal and state legislation and case law regarding children and families. Effects of policy and law in areas such a children's rights, education, adoption, marriage, divorce, health, and social services. Law and policy formation, implementation, and evaluation.

5933* Evaluation Design. Fundamental principles of evaluation, emphasis on instrumentation.
600* Doctoral Thesis. 1-12 credits, maximum 30. Prerequisite: consent of instructor. Research in human environmental sciences for the Ph.D. degree under supervision of a graduate faculty member.

6110* Directed Study in FRCD. 1-9 credits, maximum 9. Prerequisite: 5223 or 5223 and consent of instructor. Doctoral level directed individual study in human development and family sciences.

6133* Advanced Research Methods in Family Relations and Child Development. Prerequisite: one course in research methods and one in statistics. Research design and analysis of data appropriate to the areas of family relations and child development.

6190* Research Internship. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Special research studies under the supervision of a graduate faculty member.

6223* Analysis and Application of Child Development Theory. Prerequisite: 5223. Critical analysis of selected child development theories using primary source material with demonstration of application to development, research and practice.

6243* Theory and Research in Early Cognitive Development. Prerequisite: 5213, 5223 or consent of instructor. Critical examination of the concepts and principles derived from cognitive theory.

6250* Seminar in Child Development. 1-6 credits, maximum 6. Prerequisite: 5223 or equivalent. Selected topics in child development with special attention given to recent research literature and current theory.

6253* Theory and Research in Early Social Development. Prerequisite: 5213, 5223 or consent of instructor. Research and theory pertaining to social and emotional development, including attachment, social interaction, friendships and temperament.

6363* Theories and Research in Early Communication Development. Prerequisites: 5213, 5223 or consent of instructor. Recent theories and research related to communicative and language abilities to create shareholder value and effectively manage risk.


6613* Contemporary Issues in Marriage and Family Therapy. Prerequisite: admission to marriage and family therapy specialization. Critical issues facing students in the marriage and family therapy (MFT) specialization, while taking advantage of the unique expertise of clinical faculty. Professional seminar on dialogue with participants taking an active role in the learning process.

6843* Economic and Social Foundations of Family Economics. Prerequisite: graduate standing, consent of instructor. Recent theories and research in economic and social development of our society affecting the economics of family living.

Finance (FIN)

2123 Personal Finance. A first course in the management of the individual's financial affairs. Budgeting, use of credit, mortgage financing, investment and estate planning.

3113 Finance. Prerequisites: ACCT 2203, ECON 2023, STAT 2023. Operational and strategic financial problems including allocation of funds, asset management, financial information systems, financial structure, policy determination and analysis of the financial environment.

3613 General Insurance. Introduction to the theory and general principles of insurance. A broad analysis of the elements and operation of property, casualty, health and life insurance.

3623 Property and Casualty Insurance. Prerequisite: 3613. Emphasis on loss and the insurance contract from fire, marine, property damage, automobile and other liability and loss adjustment. Rate formulation, social implications, government regulations and government regulation of the insurance industry.

3633 Life and Group Insurance. Prerequisite: 3613. Principles of insurance applied to life and human values. Group plans in industry, with coverage emphasizing the managerial point of view.

3713 Real Estate Investment and Finance. Prerequisite: 3113. An introductory course in real estate investment and finance. Planning, real estate, finance, financial planning, the institutional structure of mortgage lending, managing risks, investment strategies and decisions.


4213* International Financial Management. Prerequisite: 3113. Financial problems of multinational corporations. Designed to develop a sound conceptual understanding of the environmental factors affecting decisions of financial managers; to view the current developments in the theory of financial management to incorporate variables peculiar to international operations; and to formulate financial strategies under different business systems and ideologies.

4223 Investments. Prerequisite: 3113. Various approaches to selecting and timing investment opportunities, e.g., common stocks, bonds, commodities and options. Modern concepts of portfolio theory.

4333* Financial Management. Prerequisite: 3113. Theories and practice applicable to the financial administration of a firm. A variety of teaching methods used in conjunction with readings and cases to illustrate financial problems and techniques of solution.

4443* Banking Strategies and Policies. Prerequisites: 3113 and ECON 3313. Theories and practices of bank asset management; banking markets and competition.

4453 Bank Decision Simulation and Analysis. Prerequisite: 4443. Student teams assume the roles of senior bank officers, making decisions regarding bank assets, funding, product pricing, financial leverage, profit enhancement, risk management, and competition. Decisions are implemented through computer simulation, incorporating the decisions into an environment where the decisions of competing management teams and the local economy determine bank profitability and shareholder value. Evaluation of students' abilities to create shareholder value and effectively communicate planning and analysis through written and spoken reports.

4550* Selected Topics in Finance. 1-6 hours credit, maximum 6. Prerequisite: 3113. Advanced topics in finance. Topics are updated each semester.

4613* Risk Management. Prerequisite: 3113. Introduction to relevant analytical tools necessary for the effective management of risk.

4763* Financial Futures and Options Markets. Prerequisite: 3113. Foundation in financial futures and options markets. A balance of institutional detail necessary to understand the structure of these markets and the theoretical developments necessary to apply. Decisions are implemented through computer simulation, incorporating the decisions into an environment where the decisions of competing management teams and the local economy determine bank profitability and shareholder value. Evaluation of students' abilities to create shareholder value and effectively communicate planning and analysis through written and spoken reports.

4813* Portfolio Management. Prerequisite: 4223. Overview of portfolio management from the point of view of a trust officer, mutual fund manager, pension fund manager, or other manager of securities. Emphasizes the need of financial managers for an understanding of problems, trends, and theory of portfolio management.

4913* Advanced Risk Management. 3 credits. Prerequisites: 4223, 4613, 4763, STAT 3013. Applications of risk management concepts and skills for the development of programs to manage risk exposures.

5013* Business Finance. Prerequisite: graduate standing. An introduction to the major areas of business finance: the financial environment in which business decisions are made and the institutions found therein, the financial management practices of a firm securing financing and allocating resources among competing alternatives, and the valuation of financial assets available to the firm and individuals. Not available for MBA credit.
5053* Theory and Practice of Financial Management. Prerequisite: ACCT 5103. Concepts and theories applicable to the financial administration of a firm. Cases, problems and readings to illustrate various financial problems and techniques of solution.

5213* International Business Finance. Prerequisite: 5053. Theories and financial management practices unique to business firms which operate in, or are influenced by, an increasingly global economy.

5223* Investment Theory and Strategy. Prerequisite: 5053. Selected investment topics and advanced portfolio management techniques.

5243* Financial Markets. Prerequisite: 5053. An analysis of the structure of financial markets, the determination of financial rates, the functioning of and the flow of funds.

5550* Special Topics in Finance. 1-6 credits, maximum 6. Prerequisite: 5053. Theoretical and applied aspects of specialized financial areas. Evaluation of models, current trends and problems.

5613* Corporate Financial Planning. Prerequisite: 5053. Financial planning in a systems framework. An integration of existing financial theory and practice. Financial planning systems allowing the manager to acquire an overview of the various functions of the firm; to examine alternative courses of action with speed and thoroughness; to reduce the response time in reacting to change in the environment and to improve future decisions by learning from feedback of previous decisions.


5773* Innovations in Quantitative Finance. Prerequisite: MATH 4513. Techniques for the design, development and implementation of innovative financial instruments and processes to the formulation of creative solutions of problems in finance.

5883* Quantitative Financial Applications. Prerequisites: 5223 and consent of the head of the department. Application of financial solution techniques through directed case work in appropriate business and public sector settings. Simulation, small group instruction and field-based experiences.

6513* Theory of Finance. Prerequisite: 5053. Development of theoretical structure of financial decisions beginning with case of certainty and moving to uncertainty models. Fundamental decisions of investment, financing, and production within the context of economic theory of choice and capital market equilibrium.

6690* Seminar in Finance. 3-6 credits, maximum 12. Prerequisite: consent of instructor. Advanced research with emphasis on theoretical problems and solutions. Selected topics covered.

Fire Protection and Safety Technology (FPST)

1213 Fire Safety Hazards Recognition. "The Fire Problem" Physical, chemical and electrical hazards and their relationship to loss of property and life. Safe storage, transportation and handling practices to eliminate or control the risk of fire in the home, business and industry.

1373 Fire Suppression and Detection Systems. Lab 3. The design, installation, maintenance and utilization of portable fire-extinguishing appliances and pre-engineered systems. Operational capabilities and utilization requirements of fire detection and signaling systems. Fire detection and suppression applied in practical laboratory problems.


2050 Studies in Loss Control. 1-4 credits, maximum 6. Prerequisites: Consent of instructor and advisor. Problems in applied fire protection technology, occupational safety, industrial hygiene or hazardous materials management of particular interest to the loss control specialist.

2153 Fire Protection Management. Applied human relations, technical knowledge and skills for achieving optimum effectiveness from a fire protection organization.

2243 Design and Analysis of Sprinkler Systems. Lab 3. Prerequisites: 1373, 2483, ENGR 1322 or GEN 1153. Detailed current standards for selection, design, installation, operation and maintenance of automatic fire suppression systems. Laboratory problems on applicable technological principles.

2344 Elements of Industrial Hygiene. Prerequisite: MATH 1225. Toxic or irritating substances, physical, biological, ergonomic and other occupational stress factors causing employee illness or discomfort. Environmental pollution sources and controls.

2483 Fire Protection Hydraulics and Water Supply Analysis. Lab 3. Prerequisites: 1373 and MATH 1513. Fluid flow through hoses, pipes, pumps and fire protection appliances. Water supply and distribution analysis using hydraulic calculations. Testing techniques to detect anomalies in design or performance capabilities.

2650 Technical Problems and Projects. 1-4 credits, maximum 6. Special problems or projects assigned by advisers with the approval of the department head. A comprehensive written report or equivalent creative effort.

3013 Industrial Safety Organization. Survey course. Recognition, evaluation and control of occupational health and safety hazards. Accident prevention, accident analysis, training techniques, workman’s compensation insurance, guarding and personal protective equipment.

3113 Advanced Extinguishing Systems Design and Analysis. Prerequisites: 2483, 2243. Automatic fixed fire-extinguishing systems and water supply systems. Emphasis upon computer assistance through use of existing design programs.

3143 Structural Designs for Fire and Life Safety. Lab 3. Prerequisites: 1373, 2243. Building construction standards and codes to assure maximum life and property safety from fires, explosions and natural disaster. Egress design specifications, occupancy and construction classifications and requirements for building construction and materials.

3233 Radiological Safety. Lab 2. Ionizing radiation problems; detection and measurement, shielding and exposure limiting, radiation health aspects, storage, handling and disposal.

3713 Hydraulic Design of Automatic Sprinkler Systems. Prerequisites: 1373, 2483, MATH 1513. Hydraulic calculation techniques for the design and analysis of automatic sprinkler fire extinguishing systems.

3723 Industrial Fire Pump Installations. Prerequisites: 2483, MATH 1513. Applications, design and analysis of industrial fire pump installations. Graphical analysis of fire pump contributions to existing fire protection water supply systems emphasized.

3733 Sprinkler System Design for High Piled and Rack Storage. Prerequisites: 2483, MATH 1513. Specific design techniques for sprinkler system protection of commodities stored in solid piles or racks over 12 feet in height.

4050 Special Problems in Loss Control. 1-4 credits, maximum 6. Prerequisite: consent of department head. Special technical problems in fire protection and safety.

4113 Industrial Hygiene Instrumentation. Lab 3. Prerequisites: 2344, CHEM 1225, PHYS 1114. Description, operation and application of quantitative instruments in general use in industrial hygiene.

4153 Issues in Local Government and Fire Services. Prerequisites: 2153, MGMT 3013. Issues relating to the proper operation of a fire department and the fire department’s role within the structure of local government.

4233 System Safety Analysis. Lab 3. Prerequisites: 2344, 3013, 3143 and STAT 2013 or 4013 or 4033. Fire and safety techniques to anticipate, recognize and control hazards. Fault Tree, HazOp, FMEA and other process safety techniques.

4373 Fire Dynamics. Prerequisites: CHEM 1515 or 1225 and ENSC 2213 or MPT 3433. Fundamental thermodynamics of combustion, fire chemistry and fire behavior. The physical evidence left by fire for investigation. Use of computer models to study fire behavior.

4403 Hazardous Materials Incident Management. Lab 3. Prerequisites: 3013, CHEM 1225. An interdisciplinary approach to hazardous materials incident management. Legislative requirements. Emphasis on comprehensive safety and health program compliance relating to hazardous materials incidents or waste sites. Regulatory code activities, transport-related inspections, incident modeling, and use of environmental safety software for problem solving and documentation.
Forestry (FOR)

1114 Elements of Forestry. Lab 3. Survey of forestry as an art, science and profession including forestry and natural resource management theory, forest resource distribution and ownership, history of forest resource policy development, administration and management of forest resources, forest protection, wildlife interactions, forest recreation, forest ecosystems, process, land and tree measurements, mapping, current issues, and career opportunities. One required two-day field trip.


2003 Forest Mensuration I. Lab 3. Prerequisites: 1123; MATH 1715 (or MATH 1513 and 1613); STAT 2013 (or concurrent). An introduction to the measurements of forests, forest products, standing trees, growth, and the application of mensurational techniques to timber valuation and management. A review of non-timber components of forest resources.

2134 Dendrology. Lab 4. Identification, taxonomy and distribution of forest trees and shrubs of the United States; their environmental requirements and utilization.

3001 Multiple Use and Values of Forest Resources. Lab 3. One-week segment of an eight-week summer field session. Use, values and management of forests and associated natural resources including wildlife, watershed, recreation, range, wilderness, minerals and timber. Visits to natural resource agency lands and projects.

3003 Forest Mensuration II. Lab 8. Prerequisite: 2003. Three-week segment of an eight-week summer field session. Field study emphasis on use and care of measurement equipment, the statistical and computational design of forest sampling methods, and special topics in individual tree and stand-level mensuration.

3011 Logging and Milling Operations. Lab 2.5. Prerequisite: 2002. One-week segment of an eight-week summer field session. Analysis of systems, methodology and linkages of logging and forest products manufacturing operations. Laboratory field practices in surveying and design of forest roads.

3013 Silvics and Field Silviculture. Lab 8. Prerequisites: 2134; BIOL 1403. Three-week segment of an eight-week summer field session. Field study of forest ecological relationships; examination and measurement of site productivity and stand dynamics; natural role and behavior of fire in forest ecosystems; use of fire as a management tool and control of wildfire; concepts of forest watershed management; examination of silvicultural practices in major forest regions of North America.


3213 Forest Ecology. Lab 3. Prerequisites: BIOL 1304 and 1403 or consent of instructor. Study of the forest ecosystem, its structure and function, physical environment, biotic component and change over time and its management implications. Two weekend field trips required.

3223 Silviculture. Lab 3. Prerequisite: 3213. Principles and techniques of natural and artificial regeneration, intermediate cultural treatments, and silvicultural systems applicable in various forest cover types. Two-day field trip may be required.

3643 (N)Forest Environmental Science. Overview and analysis of forests, their related environments, their associated natural resources, and their tangible and intangible values, emphasizing basic principles of scientific forest management, the use of forest resources by society, natural resource administration and policy, and current issues in forestry. No credit for forestry majors.
Forest Biometrics. Lab 2. Prerequisites: 3003; MATH 2103. The application of statistical methods to forestry problems including stand volume estimation, growth measurement, and volume table construction. Introduction to the use and significance of forest yield tables in forest management. Applications of microcomputing to analysis of forestry data.

Aerial Photogrammetry and Information Systems. Lab 3. Prerequisite: MATH 1613. Principles and techniques of aerial photogrammetry, remote sensing, aerial photo interpretation, and geographic information systems. Applications to management of natural resources utilizing photogrammetric instrumentation and geographic information system software. Same course as RLEM 3883.

Forest Economics and Finance. Prerequisites: 3223 or concurrent enrollment, 3663; AGEC 1114; MATH 2103. Economic factors and analytical methods influencing decisions in forest resource management; factors affecting the production of wood products; arithmetic of interest and investment criteria; economics of nonmarket goods.

Mechanical Processes of Wood Products. Prerequisite: 3113. Lumber, veneer, plywood manufacturing and lumber grading rules. Wood as a raw material to produce pulp and paper. Dry and wet type fiber board, particleboard and structural wood composites manufacture and their physical and mechanical properties. Quality control tests of wood products. Two one-day field trips required.

Timber Management. Lab 2. Prerequisites: 3223, 3993. Regulation of forest growing stock to meet management objectives. Land and timber appraisals. Organization of the forest enterprise to meet financial objectives of management. Four-day field trip may be required.

Forest Resource Management: Planning and Decision Making. Lab 2. Prerequisites: 3223, 4223, any computer science course, senior standing or consent of instructor. Integrated problem solving, to apply biological, quantitative, economic, political, and administrative principles in solving forest resource management problems.

Forest Administration and Policy. Prerequisite: senior standing, Forest policy and legislation; personnel matters, organization, supervision and financing of federal, state and private forest enterprises.

International Forestry and Natural Resources. Prerequisite: consent of instructor. Forestry and natural resource management, policy, use, and historical development with an international focus, including an examination of the role of culture, politics and economics in the linkage between people and natural resources. Ten-14 day international travel component.

Forest Problems. 1-3 credits, maximum 3. Prerequisites: upper-division standing, GPA of 2.50 or better and consent of instructor. Selected problems in forestry.

Forest Recreation. An analysis of planning, management, administration and use of forests and related wildlands for recreation, including an overview of public agency and private sector recreation resources, programs, and policy; social foundations of recreation; measurement and evaluation of recreation resource settings, activities, experiences, and use-impact; resource operations and interpretive services; and wilderness management. One required three-day field trip.

Forest Ecophysiology. Prerequisite: BIOL 1403. The growth and response of trees and forests to environmental, cultural and genetic factors. Application of physiological principles in predicting the effects of cultural practices on tree growth.

Contemporary Issues in Forestry and Natural Resources. Prerequisite: senior standing. Exploration and discussion of current issues related to the values, use, and management of forests, natural resources, and the natural environment.


Forest Genetics and Tree Improvement. Prerequisite: 3213, BIOL 3034, or consent of instructor. A review of mechanisms and principles of inheritance, study of natural variation in forest populations, variation patterns, types and uses of variation, and application of this knowledge to forest tree improvement methods and programs as part of forest and nursery management systems.

Forest Hydrology Laboratory. Lab 2. Prerequisite: 4811, prudential or concurrent. Techniques to evaluate the hydrologic processes and characteristics of forest and other wildland water sheds; precipitation, runoff, infiltration, erosion processes, water quality assessment in wildland settings.

Forest Hydrology and Watershed Management. Lab 2. Prerequisite: senior standing. Hydrologic processes and characteristics of forest watersheds; effects of forest practices on water quantity and quality, management techniques for improving and protecting water resources, measurement techniques for obtaining hydrologic data. One required field trip.

Land Use and Water Quality. Lab 2. Prerequisite: senior standing. The effects of land use on basic watershed hydrology, nutrient cycling, soil erosion and nonpoint source pollution on forests, range, agricultural and urban land uses. Discussions of current water quality legislation. Lab focused on water quality monitoring and prediction techniques. One three-day field trip required.

Research and Thesis. 1-6 credits, maximum 6. Open to students working for a Master of Science degree in forest resources.

Productivity of Forest Stands. Lab 2. Prerequisites: 3223, SOIL 2124, STAT 5013 or equivalent. Integrated study of the ecological, and genetic factors controlling the productivity of forest stands. Analysis of natural, economic and social factors influencing silvicultural treatment of forest stands. Tree and stand response to silvicultural manipulation.

Graduate Seminar. 1 credit, maximum 2. Preparation of current and new concepts in forest land management and research techniques for their investigation. Required for the Master of Science degree.

Advanced Forestry Problems. 1-3 credits, maximum 9. Individual problems in advanced forestry subject matter appropriate to students with capability at the master’s level.

Quantitative Forest Management and Biometrics. Prerequisites: 3663 or equivalent; STAT 5013 concurrently or equivalent. Quantitative descriptive techniques and experimental methods used in the dynamics of forest growth, quantitative timber management including applications of linear programming and related techniques for management of forest populations.

Forestry Research Methods. Methods used in forestry research; choice of biological materials and species; experimental design in forestry; analysis of forest data and interpretation of results of integrated forest.

Timber Manufacturing. Mechanical wood processing of logs and lumber and panel products. Relationship between workpiece properties, ties and product quality coupled with equipment, mill design and processing efficiency of solid wood and composites manufacturing.

Advanced Plant Biotechnology Methods. Lab 4. Prerequisites: BIOL 3653, BIOL 3024 or equivalent or consent of instructor. Overview of current theory and principles of biotechnology and laboratory experience with contemporary DNA analysis and techniques used in plant biotechnology, including genome analysis, gene transfer, identification and isolation of genes and their products, and regulation of gene expression in plants.

Research and Thesis. 1-9 credits, maximum 30. Prerequisites: admission to program and consent of major professor. Research and preparation of thesis. Maximum 9. Individual problems in advanced forestry subject matter appropriate to students for the Ph.D. in crop science, environmental science, plant science or associated Ph.D. programs.

French (FREN)

Elementary French I. Lab 1 1/2. Main elements of grammar and pronunciation, with work on the four basic skills of listening comprehension, speaking, reading and writing.

Elementary French II. Lab 1 1/2. Prerequisite: 1115 or equivalent. Continuation of 1115.

Intermediate Reading and Conversation I. Lab 1. Prerequisite: 1225 or equivalent competence of forest stands. (May have been gained in high school.) Reading and discussion of simpler French texts, mostly cultural. May be taken concurrently with other 2000-level French courses.
2113
(I)Intermediate French I. Lab 1. Prerequisite: 1225 or equivalent competence. (May have been gained in high school.) Review and further presentation of grammar and pronunciation; consolidation of basic skills, with additional emphasis on writing. May be taken concurrently with other 2000-level French courses.

2232
(I)Intermediate Reading and Conversation II. Lab 1. Prerequisite: 2112 or equivalent competence. (May have been gained in high school.) Reading and discussion of more advanced French texts, mostly literary. May be taken concurrently with other 2000-level French courses.

2233
(I)Intermediate French II. Lab 1. Prerequisite: 2113 or equivalent competence. (May have been gained in high school.) Continuation of 2113. May be taken concurrently with other 2000-level French courses.

3072
(I)French Conversation. Prerequisite: 2232 and 2233 or equivalent. Colloquial speech, with discussion of French newspapers and magazines. Practice in brief public address in French.

3203
(I)Advanced Written Expression. Prerequisite: 20 hours of French or equivalent. Practice in composition and stylistics, designed to bring students up to a high level of proficiency in writing.

3213
(I)Advanced Grammar. Conceptual framework and presentation of the finer points of French grammar.

3343
(I)Business French. Prerequisite: 2232 and 2233 or equivalent. Applied French for students in commercial and technical fields. Overview and strategies of business and economic climate in France.

3463
(I)Advanced Diction and Phonetics. Lab 1. Prerequisite course for teacher certification. French speech sounds and intonation patterns, with practice to improve the student’s pronunciation.

3853
(H)Introduction to Analysis of French Literature. Prerequisite: 2232 and 2233 or equivalent. Close reading of shorter texts in a variety of literary genres, with presentation of French versification and literary terminology.

4153
(H)History of French Literature I. Prerequisite: 20 credit hours of French or equivalent. Historical survey of French literature before 1700, with reading of representative texts.

4163
(H)History of French Literature II. Prerequisite: 20 credit hours of French or equivalent. Historical survey of French literature of the eighteenth century, with reading of representative texts.

4173
(H)History of French Literature III. Prerequisite: 20 credit hours of French or equivalent. Historical survey of French literature of the nineteenth century, with reading of representative texts.

4183
(H)History of French Literature IV. Prerequisite: 20 credit hours of French or equivalent. Historical survey of French literature of the twentieth century, with reading of representative texts.

4333
(H,I)Background of Modern French Civilization. Prerequisite: 20 credit hours of French or equivalent. General overview of French history, geography, and culture, with emphasis on art, music, and intellectual movements. Capstone course.

4550
(I)Directed Studies in French. 1-3 credits, maximum 9. Lab 1-2. Prerequisite: 20 credit hours of French or equivalent. Individual or group study of French language or literature.

4573
(H,I)Modern French Theater. Prerequisite: 20 credit hours of French or equivalent. Analysis of French plays from the 19th and 20th centuries.

5110
Advanced Studies in French. 1-3 credits, maximum 9. Prerequisite: 15 credit hours of upper-division French. Discussion or research in specialized topics.

General Engineering (GENG)

4010
Senior Design Project. 2-4 credits, maximum 4. Prerequisite: senior standing in general engineering. Capstone design project through independent application of engineering principles and concepts from the disciplines covered in earlier course work.

5000
Thesis. 1-6 credits, maximum 6. Prerequisite: approval of major professor. Thesis or report.

5030
Engineering Practice. 1-12 credits, maximum 12. Professionally supervised engineering problem involving authentic projects for which the student assumes a degree of professional responsibility. Activities must be approved in advance by the student’s advisor and may consist of engineering experience on-campus or off-campus or both. Periodic reports both oral and written required as specified by the advisor.

5110
Seminar. 1-6 credits, maximum 6. Prerequisite: approval of major professor. Independent or guided study in a topic area selected to enhance a student’s program.

6000
Research and Thesis. 1-30 credits, maximum 30. Prerequisites: consent of graduate committee and approval of student’s advisory committee. Independent research under the supervision of a member of the graduate faculty for students pursuing work beyond the master’s level.

6110
Advanced Study. 1-12 credits, maximum 12. Prerequisite: approval of the student’s advisory committee. Advanced study and investigation supervised by the student’s advisory committee. Independent study and investigation for students assuming independent responsibility for their work.

Genetics (GENE)

5102
Molecular Genetics. Prerequisites: BIOL 3653 or BIOL 3014 and one course in genetics or consent of instructor. An introduction to molecular genetics on the graduate level.

General Technology (GENT)

1153
Engineering Graphics. Lab 6. Sketching, manual drafting and CAD generation of engineering drawings to ANSI standards. Interpretation of typical industrial drawings. Students with two years high school or one year practical ANSI drafting/CAD may substitute an advanced course in mechanical engineering technology with consent of their advisers.

1223
Manufacturing Processes. Basic methods and processes of fabrication with emphasis on manufacturing operations, metrology and conventional machining.

2000
Advanced Technological Problems. 1-4 credits, maximum 6. Prerequisites: consent of instructor and adviser. Problems in applied engineering science that are of particular interest to the engineering technician.

2323
Statics. Prerequisites: MATH 2163, 2123 and PHYS 1114. Forces acting on bodies at rest; forces, moments of force, distributed forces, reactions, free-body diagrams, friction, internal forces and moments of inertia. Applications.

2650
Technical Projects. 1-4 credits, maximum 4. Prerequisite: completion of three semesters’ work in a technical institute curriculum. Special projects assigned by advisers with the approval of the director. A comprehensive written report must be prepared and an oral examination may also be required.

3113
Principles of Supervision. Prerequisite: junior standing. A study of the fundamental principles of organizing, planning, staffing, controlling and directing as applied to first-line supervisory roles in industry.

3123
Applied Analysis for Technology. Prerequisite: MATH 2133 or equivalent. Applications of elements of matrix algebra, ordinary differential equations, and infinite series to problems in engineering technology.

3323
Strength of Materials. Prerequisites: GENG 2323 and MATH 2123. Stress and strain and their relation to loads. Axial, torsional and bending loads, beam deflection, columns and combined stresses. Applications emphasized.

3433
Basic Thermodynamics. Prerequisite: MATH 2123. Basic scientific principles of energy and the behavior of substances as related to engines and systems. Gas laws, vapors and engine cycles.

4433

269
Hawaiians. Spatial interaction of federal policy and cultural landscape. Systematic diffusion, migration, environmental perception and social space, density, crowding, territoriality, (S)Cultural Geography change as well as to steady states. Attention given to processes of the spatial structure of economic systems. The world’s major culture regions, with emphasis on geographic aspects of contemporary economic, social and political relationships with the physical environment.

Introduction to Geographic Information Systems. Lab 2. Survey of a variety of resource management and socioeconomic applications using geographic information systems (GIS) technology.

(N)Climatology. Characteristics and distribution of world’s climate. Patterns and associations of temperature, precipitation, pressure and winds. Regional climates of Earth. Climate change.

(Meteorology. A non-quantitative introduction to weather. Physical elements that cause and influence weather. Interpretation of weather maps and satellite imagery.

(S)Urban Geography. Locational aspects of urbanization; functions of and relations among cities and between cities and rural areas; internal structure of urban areas.

(Political Geography. Political structures, relationships and geopolitical implications of location, boundaries, culture and the natural environment of nations and states. Global patterns of political behavior, political history, international law and geostrategy.

(Conservation of Natural Resources. Problems and corrective methods of conservation of land, water, forests, wildlife, minerals and people.

(Economic Geography. Processes significant to the spatial structure of economic systems. Production, consumption and exchange activities examined in regard to location, distribution, spatial differentiation and spatial interaction patterns. Attention given to processes of change as well as to steady states.

(Cultural Geography. Geographical impact of human culture. Emphasis on concepts and social space, density, crowding, territoriality, diffusion, migration, environmental perception and cultural landscape.

(Geography of Indian Country. Systematic analysis of geographic patterns, processes, and issues peculiar to the lands of the indigenous peoples of the United States including American Indians, Alaska Natives, and Native Hawaiians. Spatial interaction of federal policy and indigenous sovereignties.

Spatial Analysis. Prerequisite: STAT 2013. The utility and application of modeling and statistical spatial problem solving. The role of quantitative methods in geographic research.

Geography of Oklahoma. Geographic interpretation of physical, economic, historical and scenic features.

Geography of the United States and Canada. A regional analysis of the United States and Canada, including physical and cultural landscapes, population and migration trends, regional development, natural resources, US-Canada relations and global relations.

Geography of Europe. Analysis of the physical and human geography of Europe, including the distribution of physical features and natural resources, patterns of population change, and the geographic background to Europe’s major contemporary social, political, economic, and environmental problems.

Geography of Russia and its Neighbors. A regional analysis encompassing cultural, economic and physical features.

Geography of South America. Areal distribution and analysis of physical, cultural and economic features of South America.

Geography of Asia. Systematic interpretation of significant spatial patterns of man and natural environment. (Exclusive of the USSR.)

Geography of Africa. General patterns and impact of population, cultural heritage, and natural resources in Africa. Historic and contemporary relationships between Africa and Western civilization. Divergent perspectives (debate) on development, government and conflict in Africa.

Mexico, Central America and the Caribbean. A real distribution and analysis of physical, cultural, and economic features of Mexico, Central America and the Caribbean.

Geography of the Middle East and Southwest Asia. A regional analysis of the Arab, Persian and Turkic areas, including the biophysical environment, agriculture, resource use, cultural patterns, urbanization, economic development, hydropolitics and conflict.

Geography of Australia and the Pacific Realm. Systematic survey of Australia, New Zealand, and the island regions of Micronesia, Melanesia, and Polynesia including a study of human and environmental relations, factors affecting the spatial distribution of human groups and the activities, cultural diversity, and the way in which external involvement, both in the past and present, has shaped this region.

Applied Geographical Topics. 1-3 credits, maximum 6. Specialized physical, human, regional, or technical issues and trends in geography.

Geography of Arid Lands. Analysis of the physical process shaping the landscapes of deserts and areas around them, emphasizing the causes and effects of climatic change and human activities.

Applied Climatology. Prerequisite: 3023, 3033 or consent of instructor. Applications of atmospheric knowledge to human endeavors such as agriculture, water management, and architecture. Use of real-time atmospheric data to solve problems.

Geography of Biotic Resources. Prerequisites: 1114 or BIOL 1404, 1604. Distribution of plants and animals and processes causing distribution. Human impact on biotic resources considered along with policy and management practices.

Historical Geography of the United States. Examination of the spatial dynamics of frontier encounter and settlement, regional development, and cultural landscape evolution in the United States from pre-European to modern times.

Cultural Ecology. Prerequisite: junior or senior standing or consent of instructor. A study in human-environment interaction addressing the processes and patterns of human coping behavior from prehistoric to contemporary periods. Framework for understanding the transformation of cultural and natural landscapes by systematically exploring how culture works to socially and technologically adapt to environmental opportunities and limitations in arctic, alpine, grassland, arid, and tropical environments.

Geographic Aspects of Urban Planning. Prerequisite: 3123. Spatial aspects of urban planning: development of planning theory, various planning tools, and specific problem areas such as urban renewal and urban transportation.

Land and Resource Regulation. Private and public land use controls, water law, mineral law, public land law and legal issues related to resource development.

Geography of Travel and Tourism. A systematic and comprehensive analysis of the geographical dimensions of tourism planning, development, and management. Economic, social, and environmental impact of both domestic and international tourism considered.

Geography of Outdoor Recreation. Analysis of patterns of outdoor recreation with an emphasis on land-use planning in park and wildlife areas. Demand forecasting methods, the analysis of the socioeconomic and spatial impacts of recreation facilities provision and visitor management practices.


Geography of Music. Geographical and historical analysis of music as a cultural trait. The cultural significance of music and how it varies from place to place as well as how it helps shape the character of a place.
4243  

4313*  
Field Techniques and Geodata Collection. Modern concepts and techniques for geographical analysis and research including data acquisition and manipulation from field and secondary sources. Field trips.

4323*  
Computer Cartography. Lab 2. Fundamentals of map compilation and design using computers. Theoretical aspects of both socioeconomic and natural resource information. Discussion and application of various map input techniques involving digitizers, scanners, and global positioning system receivers. 2-D and 3-D terrain representation.

4333*  
Remote Sensing. Lab 2. Prerequisite: junior standing. Use of several types of sensors and imagery in solving problems. LANDSAT imagery use. Uses and limitations of data extraction techniques, manual and computer-assisted. Applications to a variety of specific problems.

4343*  
Geographic Information Systems: Resource Management. Lab 2. Prerequisite: 2343 or 4333 or consent of instructor. Theory and principles of geographic information systems (GIS) applied to resource management problems using both raster and vector data structures. GIS and remote sensing integration.

4353*  
Geographic Information Systems: Socioeconomic Applications. Lab 2. Prerequisite: 2343 or 4323 or consent of instructor. Theory and principles of geographic information systems (GIS) applied to socioeconomic problems including location-allocation, market area determination, network analysis, and analysis of demographic characteristics.

4413  
History and Philosophy of Geography. Historical research questions and techniques, the structure of contemporary geography and its relations to other fields of study, and future prospects of geography.

4510  
Senior Project. 1-3 credits, maximum 3. Lab 1-3. Prerequisites: senior standing and consent of instructor. Individually designed projects involving laboratory work, field work, library research, or a combination of these.

4700*  
Geographic Regions. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Specialized study of specific local and foreign regions.

4901*  
Topics in Geography. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Specialized physical, social and methodological topics in geography.

4902*  
Readings in Geography. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Directed readings on selected topics, regions or methods in geography.

4903  
Undergraduate Cooperative Education Internship. 1-3 credits, maximum 3. Prerequisites: consent of departmental adviser and consent of instructor. Practical experience in applying geography to societal problems. Students work with both agency representatives and faculty members.

4993  
Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a senior faculty member, with second faculty reader, both of whom will be present at an oral defense of the thesis. Required for graduation with honors in geography.

5000*  
Thesis. 1-6 credits, maximum 6. Prerequisite: consent of adviser or major professor. Open only to students working on the master’s degree in geography.

5023*  
Geography of Arid Lands. Analysis of the physical processes shaping the landscapes of deserts and areas around them, emphasizing the causes and effects of climatic change and human activities and including research and writing components.

5113*  
Landscape Ecology. Prerequisite: graduate standing and BIOL 3034 or consent of instructor. Principles of landscape ecology, including structure and function of landscape elements such as patch, corridor, boundary, and matrix. Role of geographic processes, climate, biota, disturbance, and human influences in landscape structure and function. Interaction among landscape elements and role of the thesis. Applications of landscape structure in ecosystem and landscape dynamics. Applications of landscape ecology to biodiversity conservation, wildlife management, and landscape planning. Survey of quantitative methods used in landscape ecology.

5123*  
International Resource Management. Prerequisite: graduate standing. Spatial perspectives on the assessment and management of natural resources. The role of resources in world trade, security and international environmental concerns.

5140*  
Cultural and Historical Geography Seminar. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Development and critical analysis of research and theory in cultural and historical geography.

5150*  
Geography of Sport, Recreation and Leisure Seminar. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Spatial perspectives of topics selected in sport, recreation and leisure geography.

5243*  
Geography of the World’s Indigenous Peoples. Prerequisites: graduate standing and consent of instructor. A regional survey of indigenous assertions of cultural, political and economic self-determination outside the United States. Native land claims, impact of regional development and environmental issues upon indigenous communities, and their efforts to establish geo-political autonomy.

5313*  
Geographical Analysis. Prerequisite: one course in statistics. Application of models and statistics to geographic problem solving.

5343*  
Advanced Geographic Information Systems. Lab 3. Prerequisite: 4343 or 4353. Theory and methods of design, development, implementation, and applications of geographic information systems.

5403*  
Current Geographic Research. Prerequisite: graduate standing in geography. Review of recent literature in light of current human and physical geography research themes.

5413*  
History and Philosophy of Geography. Prerequisite: graduate standing in geography. Identification and evaluation of major themes in geographical research and teaching.

5433*  
Geographic Education. For both prospective and experienced teachers of geography. Geography’s role in the social and behavioral sciences; analysis of geography curricula, comparison of various instructional approaches (traditional and experimental); and examination of current research in geographic education.

5450*  
Seminar in Geography. 1-3 credits, maximum 7. Prerequisite: graduate standing in geography or consent of instructor. Specialized topics in geography.

5510*  
Research Problems in Geography. 1-3 credits, maximum 6. Prerequisite: consent of instructor.

5940*  
Graduate Cooperative Education Internship. 1-6 credits, maximum 6. Prerequisites: consent of departmental adviser and consent of instructor. Practical experience in applying geographical concepts to societal problems. Emphasis on programs in planning and geographic education.

6000*  
Doctoral Dissertation Research. 1-12 credits, maximum 30. Prerequisites: admission to candidacy and consent of major professor.

Geology (GEOL)

1014  

1114  
(L,N)Physical Geology. Lab 2. Composition and structure of the earth and the modification of its surface by internal and external processes. Mineral resources, sources of energy, and environmental aspects of geology. A background in precollege science and math is recommended. Field trip required.

1224  
(L,N)Prehistoric Life and Development of the Continents. Lab 2. Earth formation and the development of continents and oceans through time including the origin and evolution of life. Field trips required.

1613  

2031  
Geologic Field Investigation. Prerequisite: introductory geology. One week of required field study at sites of geological interest and significance.
2253  Practical Mineralogy. Lab 3. Prerequisite: 1014 or 1114. Hand-specimen identification of minerals. Society’s dependence on and utilization of mineral resources. Field trips required.


3004  Earth Science for Teachers. Prerequisite: 1114. Teaching natural earth systems and their environmental impact. Use of an adaptation approach in organizing, presenting, and evaluating earth science concepts in the curriculum.

3014  Structural Geology. Lab 3. Prerequisites: 1224, PHYS 1114 or consent of instructor. Behavior of earth materials during various deformational processes and analysis of the resulting structural features such as folds, faults and fractures. Field trips required.

3034* Principles of Stratigraphy and Sedimentology. Lab 3. Prerequisites: 1224. Principles of stratigraphy and their applications. Laboratory emphasizes realistic practical problems undertaken in the field and in the laboratory. Field trips required. Nonmajors may receive graduate credit.

3043  (N)Scenic Geologic Regions. Prerequisite: 1014 or equivalent recommended. The geologic characteristics of national parks and scenic regions in North America and throughout the world.

3073* Geomorphology. Lab 2. Prerequisite: 1114 or consent of instructor. Study of land forms and the processes that form them, using topographic maps, aerial photographs, soils maps and field techniques. Field trips required.

3103  (N)Paleontology. Lab 3. Prerequisite: 1224 or consent of instructor. Basic principles of paleontology involving invertebrates, vertebrates and plants. Lab focused on the morphology, identification, paleoecology and biostratigraphy of marine invertebrates. Field trips required.


3503* Environmental Geology. Prerequisite: 1114 or consent of instructor. Application of geologic principles to environmental issues, including human use of the surface and subsurface of the earth and human interaction with extreme natural events such as earthquakes, floods and landslides. Field trip is required.

3546* Field Geology. Lab 6. Prerequisites: 2364, 3014, 3033, 3073. Six weeks of field methods in geology. Required of all geology majors. Transportation and room and board fees required.

4023* Petroleum Geology. Prerequisites: 3014 and 3033. Origin, migration and accumulation of petroleum; requirements for source rock, reservoir rock and traps. Structure and stratigraphy of selected oil fields. Field trips required.

4213* Plate Tectonics. Prerequisite: 1114. Principles and mechanisms of plate tectonics, the unifying theory of earth sciences. Geology and plate tectonics evolution of the major mountain chains of North America; Ouachitas, Appalachians, and Cordillerans. Field trip required.

4403* Geochemistry. Prerequisite: general chemistry. Application of chemical principles to geologic processes. Processes affecting the composition of surface and ground waters.

4453* Hydrogeology. I. The water cycle and ground-water systems as well as general problems related to ground-water occurrence, quantity, quality and pollution. Field trip required.

4463* Hydrogeology II. Lab 3. Prerequisite: 4453 or consent of instructor. Physical ground-water systems. Realistic problems to acquaint student with ground-water occurrence and movement. Geologic, geophysical, hydraulic testing and modeling techniques used to define an actual ground-water system. Ground-water regulations. Field trips required.

4563* Sedimentology. Lab 3. Prerequisites: 3546, senior standing, Sediments, sedimentary processes and sedimentary environments, geometry and internal features of sediments. Field trips required.

4663* (I)Global Geologic Resources. Distribution and analysis of global mineral, energy and water resources. Economic, environmental, social and political impact of selected resources on local to global scales.

4990* Special Problems in Earth Science. 1-8 credits, maximum 8. Prerequisites: 25 hours of geology and permission of instructor. Individually designed study projects involving assigned reading, library work, field work, laboratory work or a combination of these. Field trips may be required.

4995 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a senior faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in geology.

5000* Thesis. 1-6 credits, maximum 6. Prerequisite: approval of graduate committee. Work toward master’s thesis in geology.

5050* Problems in Economic Geology. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Individual or individually-designed problems in economic geology. Field trips may be required.

5073* Fluvial Geomorphology. Prerequisite: 3073 or consent of instructor. Landforms and processes related to the action of running water in stream channels and on hilltops. Field trips required.

5100* Problems in Hydrogeology. 1-4 credits, maximum 8. Prerequisite: 4453. Advanced problems in hydrogeology with emphasis on quantitative methods. Field trips may be required.

5150* Problems in Engineering Geophysics. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Advanced problems in engineering geophysics with emphasis on problem solving. Field trips may be required.

5183* Advanced Paleontology. Lab 3. Prerequisite: 3103 or equivalent. In depth study of selected fossil groups with emphasis on marine micro-paleontology. Student projects on assigned fossil groups with presentation of results both orally and in writing. Field trips required.

5203* Advanced Structural Geology. Lab 3. Prerequisite: 3014. The theoretical, experimental and descriptive approach to structural geology: formation and analysis of rock fractures, and structural geometry. Field trips required.

5223* Advanced Methods in Structural Geology. Lab 3. Prerequisite: 3014. Advanced geometric techniques and analysis of complex structural terrains. Elucidation of geometry and history of geological structures by interpreting seismic reflection profiles and constructing balanced cross-sections. Field trips required.

5233* Trace Elements in Hydrogeology. Lab 2. Prerequisite: CHEM 1515. Examination of the behavior of various trace elements in the aqueous environment. Availability and mobility of selected trace elements, the characterization of geochemical environments, p–pH stability fields, adsorption and other parameters that affect mobility. Introduction to thermodynamic water-equilibrium computer programs.


5283* Subsurface Geologic Methods. Lab 3. Prerequisite: 3014, 3033. Use of subsurface geologic information from cores and well logs to prepare maps and identify oil and gas prospects. Field trips required.


5353* Advanced Well Log Analysis. Lab 3. Prerequisite: 3033. The geologic interpretation of a variety of well logs, emphasized as well as quantitative methods. Some exercises involve concurrent interpretation of well logs and core samples, or well logs and bit cuttings.


5383* Sequence Stratigraphy. Lab 2. Prerequisites: 5253, 5353, 5363. Principles of sequence stratigraphy including carbonate and siliciclastic dominated intracratonic basins. Integration of surface and subsurface data in projects. Field trips required.
5443* Engineering Geophysics. Lab 3. Prerequisites: 1114 or 3324; PHY1 1214 or equivalent. Geologic aspects of problems associated with environmental engineering, ground-water pollution and regional and urban planning. Problem assessment and field methods. Two required field projects include geophysical surveys using resistivity and seismic refraction methods. Field trip required.

5453* Advanced Hydrogeology. Lab 3. Prerequisites: 4453, CS 2113 or equivalent. MAT1 2145 and 2155 or equivalent. Advanced qualitative techniques used to address ground-water management and pollution. Advanced field and laboratory techniques as well as management and chemical transport models applied to actual field problems and case studies. Field trips required.

5503* Advanced Environmental Geology. Prerequisite: 5503 or consent of instructor. Utilization of geologic principles to resolve environmental issues in land use, land management and development. Methods of acquiring, compiling, and applying geologic information for site assessment and environmental impact. Application of these methods to an interdisciplinary project. Field trips required.

5523* Organic Geochemistry. Lab 3. Prerequisite: introductory chemistry. Introduction to some environmental aspects of organic geochemistry. Solids and sediments as pollutant receptors, sources of pollutants and selected aspects of environmental health.


5603* Basin Analysis. Lab 1. Prerequisites: 3546, 5203, 5223, 5253, 5363. Team-taught course. Interpretations of the evolution of selected sedimentary basins. Emphasis on facies analysis, petrography, diagenesis, and structural evolution. Field trips required.

5710* Advanced Studies in Geology. 1-4 credits, maximum 8. Prerequisite: consent of instructor. Individual library, laboratory and/or field projects on facets of geology not covered by existing courses. Field trips may be required.

2222 (I) Intermediate Conversation and Composition I. Lab 1. Prerequisite: 2212 or equivalent competence. (May have been gained in high school.) Continuation of 2212, with further work in composition, conversation and grammar. May be taken concurrently with other 2000-level German courses.

2223 (I) Introduction to German Literature. Prerequisite: 1225 or equivalent competence. (May have been gained in high school.) Reading and analysis of prose, drama and poetry; literary appreciation. May be taken concurrently with other 2000-level German courses.

3013 (I) German for Reading Requirements I. Reading in the humanities and the sciences. Translation from German to English.

3022 (I) German for Reading Requirements II. Prerequisite: 3013 or equivalent. Intermediate and advanced reading in the humanities and sciences. Translation from German to English.

3333 (H) Modern Germany. Prerequisites: 20 credit hours of German or equivalent. The major cultural, social and political forces that have shaped the Germany of today.

3343 (H) Business German. Lab 1. Prerequisite: 2222 and 2223 or equivalent. Introduction to business practices and economic environment in Germany. Study of specialized vocabulary.

3463 (I) Advanced Diction and Phonetics. Lab 1. Prerequisite: 20 credit hours of German or equivalent. German speech sounds and intonation patterns. Practice to improve the student’s pronunciation. Required course for teacher certification.

3803 (I) Advanced Conversation. Lab 1. Prerequisite: 2222 and 2223 or equivalent. Colloquial speech forms and sentence structure. Practice in brief public address in German.

3902 (I) Advanced Grammar and Composition. Lab 1. Prerequisite: 2222 and 2223 or equivalent. Practice in original composition in German. Problematic points of German grammar and stylistics.

4513 (H) The Age of Goethe. Prerequisite: 20 credit hours of German or equivalent. Principal figures of German Classicism and Romanticism.

4523 (H) 19th Century German Literature. Prose, lyric and drama from Romanticism to Naturalism.

4543 (H) 20th Century German Literature. Prerequisite: 20 credit hours of German or equivalent. Main currents in German literature from Naturalism until present day.

4550 (I) Studies in German. 1-3 credits, maximum 9. Prerequisite: 20 credit hours of German or equivalent competence. Reading and discussion of vital subjects in German.

Graduate (GRAD)

5880* Graduate Traveling Scholar. 1-24 credits, maximum 24. Prerequisite: graduate degree candidate. Credit will vary depending on the program of each traveling scholar. Enrollment of graduate traveling scholars in academic or research courses.

5883* Orientation to Gerontology. Prerequisite: graduate standing. Interdisciplinary introduction to the field of gerontology with particular focus on biological, psychological and sociological theories of aging.

5990* Graduate Research and Teaching Practicum. 1-6 credits, maximum 12. Prerequisite: graduate standing. Graduate-level instructional program in research and teaching techniques and procedures. Graded on pass-fail basis.

6010* Research or Intern Practicum. 1-9 credits, maximum 12. Prerequisite: graduate standing. Graduate-level internship program for public administration, service or research. Blends the theoretical and absolute phase of the academic with practical on-the-job experience.

Greek (GREK)

1113 Elementary Classical Greek I. Grammar and vocabulary of ancient Greek.

1223 Elementary Classical Greek II. Prerequisite: 1113 or equivalent. A continuation of 1113. Grammar and readings of classical Greek authors.

2113 Elementary Classical Greek III. Prerequisite: 1223 or equivalent. A continuation of 1223. Grammar and readings of classical Greek authors.

2213 Intermediate Readings. Prerequisite: 2113 or equivalent. An introduction to a variety of classical authors to increase reading facility and grammatical comprehension.

3330 Advanced Readings. 1-6 credits, maximum 9. Prerequisite: 2213. Prose authors, epic poetry, drama, Koine Greek and religious texts.
Health and Human Performance (HHP)

1753 Introduction to Physical Education. The nature, scope and significance of physical education. Historical and philosophical foundations, major sub-disciplines and their interrelationships, and career opportunities.

1812 Pedagogy of Outdoor Activities. Prerequisite: HHP and LEIS majors and minors only. Introduction of selected motor skills, activities, methods and theories within outdoor activities. Analysis of skills concepts, terms, safety issues, teaching strategies and developmental appropriateness.

1932 Pedagogy of Rhythm and Movement. Prerequisites: HHP and LEIS majors and minors only. Introduction of basic fundamentals and methods of movement skills for rhythms including social, creative, developmental, and multicultural dance and activities. Analysis of skills, concepts, terms, safety issues, teaching strategies and developmental appropriateness.

2653 Symptoms of common athletic injuries. Prerequisite: HHP and LEIS majors and minors only. Fundamental aspects of motor development for infants, children, youth and adults.

3010 Health and Human Performance Workshop. 1-3 credits, maximum 6. Concentrated study of selected areas of health and human performance, including problems in instruction and administration not usually addressed in the undergraduate curriculum.

3114 Physiology of Exercise. Lab 2. Prerequisite: MA 1513. A study of the various bodily systems, including major organs and tissues, and how they respond to acute and chronic exercise of varying intensity, duration and frequency.


3430 Early Laboratory and Clinical Experiences in Physical Education. 1-2 credits, maximum 4. Prerequisites: 1753 and declaration of intention to pursue a program in Teacher Education. The initial preprofessional clinical experiences for schools, kindergarten through grade twelve with primary duties including instruction in physical education. Required for full admission to Teacher Education. Graded on a pass-fail basis.

3450 Clinical Experience in Health and Human Performance II. 2-4 credits, maximum 8. Prerequisite: 2603. Directed observation in supervised intermediate laboratory and clinical experiences in appropriate health and human performance areas.

3613 Community Health. A survey of issue impacting the health of populations from a community health perspective.

3623 School Health Programs. Prerequisite: 2603. The identity and relationships of school health instruction, services and environments.

3653 Advanced Assessment of Athletic Injuries. Prerequisite: 2653. Advanced knowledge and skills related to the recognition, assessment and appropriate medical referral of athletic injuries to the spine, upper and lower extremities.

3663 Biomechanics. Prerequisite: 2653. The study of anatomical mechanical phenomena underlying human motion. Application of biomechanical concepts to a wide variety of exercise, fundamental movement, sport and physical activity.


3713 Principles of Epidemiology. Prerequisites: 2213, 2603. Survey of epidemiological principles as they relate to the planning of both community and consumer-focused health promotion and disease prevention programs.

3753 Methods in Teaching Elementary Physical Education. Prerequisites: 1753, 2712, 3430 and any two of 1812, 1822, 1832, 1842. Theory and practical experience of physical education in the elementary school. Teaching styles and activities needed to meet the needs of children from kindergarten through grade five.

3763 Health and Physical Education for Elementary Age Children. Methods of teaching health and physical education to elementary age children. Theory and practical experience of health behaviors, movement skills and physical fitness.

3773 Methods in Teaching Secondary Physical Education. Lab 2. Prerequisites: 1753, 3430 and any two of 1812, 1822, 1832, 1842. Instructional styles, implementation of behavioral goals and objectives through unit and lesson preparation, teaching methods, and classroom management.

3903 Therapeutic Modalities for Athletic Injuries. Lab 1. Prerequisite: 2663. Discussion and application of common electronic and physiologic devices used in the treatment of acute and chronic athletic injuries to the musculoskeletal systems.

3923 Rehabilitation of Athletic Injuries. Lab 1. Prerequisite: 2663. Scientific methods used in therapeutic exercise and rehabilitation of injured athletes. Investigation of mechanisms of injury and anatomical structures involved and methodological approach in designing rehabilitative programs.

4010 Directed Study. 1-3 credits, maximum 6. Prerequisite: written approval by department head. Supervised readings, research or independent study of trends and issues related to the area of health, physical education or leisure services.

4033 Alcohol and Drug Education. Prerequisites: 2603, junior standing or consent of instructor. Examination of pathological and socio-behavioral aspects of drug use, misuse and abuse across an array of populations and social contexts.

4433 Program Design in Health Promotion. Prerequisites: 3663, 3613. A turnkey program design including theoretical foundations, planning, marketing, delivering and evaluating.

4450 Clinical Experience in Health and Human Performance III. 2-4 credits, maximum 4. Prerequisite: 3450. Directed observation and supervised advanced laboratory and clinical experiences in appropriate health and human performance areas.

4480 Internship in Health and Human Performance. 1-12 credits, maximum 12. Prerequisites: last semester senior standing with cumulative GPA of 2.50. Supervised experience in school (physical education and health), community, worksite or athletic training settings in order to qualify or prepare for appropriate teaching and professional certification. Graded on a pass-fail basis.

4503 Applied Health Behavior. Prerequisite: senior standing or consent of instructor. Health assessment and intervention strategies with focus on diet, weight management, stress, substance abuse, consumer health and other current health issues.
4533 Psychosocial Issues in Health Promotion. Prerequisites: 2213, 2603. Survey of psychosocial issues as they relate to the practice of health promotion.

4643 Methods in School and Community Health Education. Prerequisites: 3623; full admission to Teacher Education. Conceptual approach to health education through a variety of teaching methodologies.

4702 Pre-internship Seminar. Prerequisite: junior standing. Capstone course for the health promotion by developing preparation for the health internship experience.

4723 Measurement and Evaluation in Health and Physical Education. Prerequisite: full admission to teacher education. Evaluation techniques commonly used by physical educators and health professionals to measure knowledge, attitudes, sport skill proficiency, and physical fitness.

4733 Administration and Program Design in Physical Education and Athletics. Prerequisites: 3753, 3773 or concurrent enrollment; full admission to teacher education. Design and management of physical education (K-12) and athletic programs.

4773 Principles of Exercise Testing and Prescription. Prerequisite: 3114. Study of principles of exercise testing including submaximal and maximal tests, exercise and basic electrocardiography, and guidelines for recommending exercise as related to health promotion and exercise science.

4783 Health Issues in Gerontology. Prerequisite: 2603, or consent of instructor. An in-depth study of physiological aspects, special health concerns, chronic illnesses and services as applied to gerontology.

4793 Adapted Physical Education. Prerequisites: 3753, 3773, full admission to Professional Education. Cognitive and psychomotor characteristics of disabling conditions, needs and challenges of educating the exceptional learner in the regular physical education program.

4863 Theory of Coaching. Prerequisite: junior standing or 45 hours with 3.25 GPA. The role of coaching, including practical aspects of performance, management and relationships, and management concerns such as drug abuse, stress, academic requirements and legal issues.

4933 Administration and Organization of Athletic Training Programs. Prerequisites: 3653, 4902, 4922. The administration and organization of athletic training programs including planning and implementation, certification procedures, code of professional practice, safety standards, and resource management.

4983 Current Issues in Athletic Training. Prerequisites: 3663 and admission to athletic training program. Development of competencies set by the National Athletic Trainers Association Board of Certification. Current issues facing athletic trainers and the role in today’s health care systems.

4993 Health and Human Sexuality. Prerequisite: 2603 or consent of instructor. The study of human sexuality as it relates to the health and well-being of individuals in the community, worksite, college and school setting.

5000 Master’s Thesis. 1-6 credits, maximum 6. Independent research required of candidates for master’s degree. Credit awarded upon completion of thesis.

5010 Seminar. 1-2 credits, maximum 4. Selected topics from the profession not covered in other courses. Presentation and critique of research proposals and results.

5020 Health and Human Performance Workshop. 1-3 credits, maximum 6. Workshop in selected areas of health and human performance.

5023 Legal Aspects of Health, Physical Education and Leisure Sciences. The law: its application and interpretation as it applies to teachers, coaches and administrators of health, physical education and leisure sciences programs.

5030 Field Problems in Health and Human Performance. 1-3 credits, maximum 6. Individual investigations of issues in the areas of health and human performance.

5073 Sport: Psychological Aspects. Psychological foundations of sport emphasizing performance enhancement by athletes through psychological training techniques.

5143 Health Promotion Program Implementation and Evaluation. Prerequisite: 4433 or consent of instructor. An intensive overview of principles of health promotion program planning, implementation, and evaluation, with special emphasis on application.

5523 Current Readings in Health. Contemporary research, literature, projections and views as applied to total health and well-being.

5553 Psychomotor Development and Assessment. Analysis and assessment of typical and atypical psychomotor development. Theoretical knowledge and practical experience in understanding and assessing psychomotor development and function.

5593 Human Electrocardiographic Interpretation. Prerequisites: 3114 and 4773 or consent of instructor. Knowledge concerning the collection and interpretation of the electrocardiogram (EKG) and its relationship to heart anatomy, physiology and electrophysiology.

5613 Cardiac Rehabilitation. Prerequisites: 2653 and 3114 or equivalent. Factors involved in cardiovascular disease. History, implementation and administration of cardiac rehabilitation programs.

5663 Physical Education for Students with Learning Disabilities. Character development and functioning of students with learning disabilities. Knowledge base and practicum experience for providing assessment, prescription and programming services for exceptional learners.

5733 Motor Learning. Research in psychology and physical education relevant to the understanding of the nature and basis of motor skill learning.

5773 Physical Education for Students with Physical Disabilities. Characteristics, psychomotor development and functioning of students with physical disabilities. Knowledge base and practicum experience for providing assessment, prescription and programming services for learners with physical disabilities.

5793 Mechanical Analysis of Physical Education. Application of physical laws to physical education activities.

5823 Advanced Applied Anatomy. Prerequisite: 2653. Structure and movement of the human body with emphasis on the relationship of physical activity to musculoskeletal and neurological factors.

5833 Methods in Physical Education. Prerequisites: 3753 and 3773. Differentiation between teaching methods in physical education; advantages of the application of the individual methods to particular situations in teaching physical education.

5843 Quantitative Biomechanics and Kinesiology. Prerequisite: 5823. Analytical approach to the study of human motion as applied to kinesiological description and kinematic and kinetic evaluation.


5853 Stress Testing and Exercise Prescription II. Prerequisite: 5853. Theoretical aspects of evaluating functional capacity through stress testing with the development of exercise prescription for special populations with physiological limitations imposed by age, disease, heredity and environment.

5873 Human Bioenergetics. Prerequisite: 3114. Human energy production, utilization and storage in response to exercise.

5883 Program Development for Adapted Physical Education. Strategies for designing and implementing adapted physical education programs in public schools. Inclusion of students with disabilities into the regular physical education program.


6010 Independent Study in Health and Human Performance. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Supervised readings, research or independent study of trends and issues related to the areas of health and human performance.

6013 Professional Issues in Health and Human Performance. Introduction of doctoral students to the major areas of higher education relevant to professional preparation in health and human performance curricula. Issues of higher education, roles of the educator, curriculum development, implementation and management, instructional strategies and accreditation.

6020 Research Colloquium. 1-3 credits, maximum 3. Exploration and presentation of selected topics and research in health and human performance.
6023* 
Special Topics in Health and Human Performance. Prerequisite: admission to the Graduate College. Special topics related to health and human performance. Investigation, discussion and analysis of contemporary topics.

6043* 
Ethical Issues in Health, Leisure and Human Performance. Prerequisite: admission to the Graduate College. A survey of ethical issues with specific emphasis on health, leisure and human performance.

6053* 
Advanced Research in Health and Human Performance. Prerequisite: Graduate elementary statistical methods course. Indepth study of selected surveys and experimental research in HHP, including questionnaire development, survey methodology and analysis of data.

6060* 
Statistical Computing and Proposal Writing. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Instruction in the use of SPSS using a personal computer. Preparation of research proposals.

6723* 
Curriculum Development in Health, Leisure and Human Performance. Prerequisite: admission to the Graduate College. Identification and analysis of curriculum theories with emphasis on traditional and innovative approaches to curriculum design for programs in health, leisure and human performance.

History (HIST)

1010 
Studies in American History. 1-2 credits, maximum 2. Special study in American history to allow transfer students to fulfill general education requirements as established by Regents' policy.

1103 
Survey of American History. Meaning, vitality, and uniqueness of United States history since 1492 through a thematic examination of the nation's past. Satisfies, with POLS 1113, the State Regents requirement of six credit hours of American history and American government before graduation. No credit for students with prior credit in HIST 1483 or 1493.

1483 
American History to 1865. From European background through the Civil War. Satisfies, with POLS 1113, State Regents requirement of six credit hours of American history and American government before graduation. No credit for students with credit in HIST 1103.

1493 
American History Since 1865. May be taken independently of HIST 1483. Development of the United States including the growth of industry and its impact on society and foreign affairs. Satisfies, with POLS 1113, State Regents requirement of six credit hours of American history and American government before graduation. No credit for students with credit in HIST 1103.

1613 
(H)Western Civilization to 1500. Lab 1. History of western civilization from ancient world to Reformation. Laboratory discussion sessions on interpretation of primary sources in translation.

1623 
(H)Western Civilization After 1500. Lab 1. History of western civilization from Reformation to present. Laboratory discussion sessions on interpretation of primary sources in translation.

1713 
(H)Survey of Eastern Civilization. History of three eastern civilizations (East Asia, South Asia and West Asia) from pre-history to the 18th century. Special attention to their origins, development, and contributions to the evolution of world civilization.

2323 
Oklahoma History. Early exploration and establishment of Indian Territory; the rise and demise of the Five Indian Nations; and the organization and development of the 41st state to the present. Required of all candidates for teacher's licensure/certification in social studies.

3003 
(I,S)Soviet Union: History, Society and Culture. A comprehensive view of the Soviet Union, stressing those issues in the political economic, technological, geographical and cultural spheres which are most relevant to the current situation. Accessible to beginning undergraduates. Same course as POLS 3003 and RUSS 3003.

3013 
(H)Ancient Near East. The ancient world from the beginnings of recorded history through the Egyptian, Mesopotamian, Hebrew and Persian civilizations, in addition to the minor civilizations of the area.

3023 
(H)Ancient Greece. The Greek world from the Bronze Age through Alexander the Great with special emphasis on politics, culture and institutions of Classical Greece.

3033 
(H)Ancient Rome. Political, social, economic and cultural history of the Roman Republic and Empire.

3053 
(I)Introduction to Central Asian Studies. A comprehensive view of newly-emerged Central Asian states examining the history, politics, economics, geography, and culture of Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan as reflected in their thoughts, religion, literature, and architecture, in the past, and the strategic importance of their natural wealth for the present and future. Same course as POLS 3053 and RUSS 3053.

3113 
(I,S)Germany Since 1815. Creation of a centralized state in Germany; impact of World War I and the subsequent failure of the Weimar Republic; rise of national socialism, totalitarianism, and the Third Reich; German experience in WWII, repression of minorities, and the Holocaust; post-war Germany and modern reunification.

3153 
(H)Russia to 1861. Political, institutional, social, and economic development of Russia from the Kievan period to the Great Reforms.

3163 
(H,I)Russia Since 1861. Modernizations of Russia in the 19th and 20th centuries. Great reforms and their effects and the 1917 revolutions and their consequences.

3173 
(H)Eastern Europe, 1000-1800. Formation of the eastern European nations and the influence of Rome, Byzantium, the Ottoman Empire, Russia, Austria and Prussia on them.

3183 
(H,I)Eastern Europe Since 1800. Formation and impact of nationalism, industrialization, and power politics on the peoples of eastern Europe.

3203 
(H)Early Middle Ages, 325-1000. Economic, social, cultural and religious developments in Byzantium, Islam, and the Germanic West, which succeeded imperial Rome.

3233 
(H)Medieval Europe, 1000-1350. High and Late Middle Ages in the West with emphasis on political, social, economic and intellectual development.

3243 
(H)Renaissance and Reformation, 1350-1618. Social, cultural, intellectual, political, economic and religious developments which led to the flowering of modern western civilization.

3253 
(H)Early Modern Europe, 1618-1815. Economic, social, political, cultural, intellectual and religious transformation of Europe from the opening of the Thirty Years War to the Congress of Vienna.

3263 
(H)Modern Europe, 1815-1914. Impact of modernization on the character of European society. Factors that transformed the Continent into a battle ground in the 20th century.

3273 
(H)Modern Europe Since 1914. Origins, character and impact of the first World War; emergence and consequences of the totalitarian state; nature of political and intellectual terrorism. Effects of worldwide economic depression; dilemmas of modern democracies; political collapse of Europe as a consequence of World War II.

3313 

3323 
(H)Modern France, 1815-Present. French politics, economy, society, and culture from the defeat of Napoleon to France's post-War World II 'rebirth.'

3333 
(I,S)History of the Second World War. Problems leading to World War II with their international implications and consideration of the war years.

3343 
(H)World War I in Modern European Culture. Analysis of the war as the principal event determining the course of twentieth century European history: battles, home fronts, personal, literary, and artistic expression.

3353 
(H)Imperial Spain, 1450-1800. The rise and fall of the world's first modern imperial power, from Spain's emergence under the "Catholic kings" to its rejuvenation under the Bourbons, with topics on political, artistic, and cultural history.

3373 
(S)Medieval England: 55 B.C.-1485 A.D. English History from Roman Britain to the beginning of the Tudor period. Development of the English constitution from the early Germanic state through feudalism to the New Monarchy.

3383 
Middle Ages as well as diversity of Islamic and economic institutions established in the Asia and Europe. Nature of Islamic civilization in Arabia and subsequent spread to Africa, 3473 revolutions of the 20th century. U.S. involvement and the recent social revolution movements.

Modern Latin America 3463 structure, 18th century reforms, and independence movements.

Modern Latin America 3433 Response of China to the European nations from the 17th century to the politics, economy, and general culture of European thought and experience as influences on the European and United States. America's rise to world power, the Progressive movement and World War I.

United States History, 1919-45. The political, economic, social and cultural changes in the United States since 1919 to 1945, the 1920s, the Depression, the New Deal, WWII, and domestic impact of the war.


American Social and Intellectual History to 1865. American society in nonpolitical aspects: sections, classes, national culture and social structure, immigration, education, religion, reform, world influences; ends with Civil War.

American Social and Intellectual History Since 1865. Continuation of 4463; may be taken independently. Emphasis on nonpolitical aspects of American society and thought and on world influences.

American Urban History. Impact of urbanization upon American communities from 1865 to the present. Evolving political and social institutions, social change, technological innovations and planning theories.

American Economic History. Economic development and economic forces in American history; emphasis upon industrialization and its impact upon our economic society since the Civil War. Same course as ECON 3823.

American Environmental History. Examination of the changing ways society (from Native American to post-industrial) has defined, interpreted, valued, and used nature.

American Environmental History. Achievements of blacks in America and their participation in the development of the United States.


Women in Western Civilization. Women in the development of Western Civilization from the earliest times to the present.
4980* Topics in History. 1-3 credits, maximum 9. For students interested in pursuing either a research or a reading project. Open to honors students in history and to others by permission of the department head.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research project ending with an honors thesis under the direction of a faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in history.

5000* Thesis. 1-6 credits, maximum 6.

5023* Historical Methods. Methods of historical research and the writing of history.

5030* Applied History Internship. 3-6 credits, maximum 6. Prerequisite: consent of graduate committee. Supervised practical experience in applied history.

5120* Reading Seminar in American History. 3 credits, maximum 15. Historiographical and bibliographical study of special areas of American history.

5140* Reading Seminar in European and World History. 3 credits, maximum 15. Historiographical and bibliographical study of special areas of European and World history.

5220* Research Seminar in American History. 3 credits, maximum 15. Research in selected problems in American history.

5240* Research Seminar in European and World History. 3 credits, maximum 15. Research in selected problems in European and World history.

6000* Doctoral Dissertation. 1-19 credits, maximum 30. Prerequisite: admission to candidacy. Advanced research in history.

6023* Historiography. Major writers of history, historical schools and patterns of developments in historical interpretation from the earliest times to present.

6120* Special Studies in History. 1-3 credits, maximum 36. The meaning and operation of the historical processes and develop capabilities for clarity of statement, investigation, and creative, critical attitude. Areas studied vary from semester to semester.

Honors College (HONR)

1000 Introductory Honors Topics. 1-3 credits, maximum 6. Prerequisite: Honors Program participation. Introduction to topics in various disciplines by faculty from the undergraduate colleges for freshman and sophomore students in the University Honors Program.

1013 (H)The Ancient World. Prerequisite: Honors Program participation. Interdisciplinary study of art, history, philosophy and literature from ancient Greece and Rome as well as the religious ideas central to Judaism and Christianity. Team-taught by faculty from appropriate disciplines in a lecture and discussion format. For the Honors student. No credit for students with prior credit in HONR 2113.

1023 (H)The Middle Ages and Renaissance. Prerequisite: Honors Program participation. Interdisciplinary study of art, history, philosophy and literature from the Middle Ages to the early Renaissance. Team-taught by faculty from appropriate disciplines in a lecture and discussion format. For the Honors student. No credit for students with prior credit in HONR 2113.

1033 (H)The Early Modern World. Prerequisite: Honors Program participation. Interdisciplinary study of art, history, philosophy and literature from the late Renaissance to the mid-19th century. Team-taught by faculty from appropriate disciplines in a lecture and discussion format. For the Honors student. No credit for students with prior credit in HONR 2223.

1043 (H)The Twentieth Century. Prerequisite: Honors Program participation. Interdisciplinary study of art, history, philosophy and literature from the late 19th century to the present. Team-taught by faculty from appropriate disciplines in a lecture and discussion format. For the Honors student. No credit for students with prior credit in HONR 2223.

1083 Patterns and Symmetry in Mathematics. Prerequisite: Honors Program participation. Tessellations, or repetitive patterns in the plane and in space, and the symmetries, or rigid motions, that preserve them. Illustrations from art, architecture, science, and nature. For the Honors student.

2013 (S)Honors Law and Legal Institutions. Prerequisite: Honors Program participation. An introduction to law in American society with reference to its European origins; its political, economic, psychological, and sociological dimensions; and the substantive law in selected areas. Introduction to legal reasoning and legal research techniques. For the Honors student.

2083 (H)Ethical Issues Across Cultural Perspectives. Prerequisite: Honors Program participation. An introduction to reasoned methods of evaluating ideas and arguments as they pertain to ethical issues from a global perspective. Concepts including obligation, justice, and ethnicity from Lao Tzu, Maimonides, Kant, and Indian wisdom stories. Environmentalism, technology, and cultural knowledge. Team-taught by faculty from appropriate disciplines in a lecture and discussion format. For the Honors student.

2514 (L,N)Honors Scientific Inquiry. Lab 2. Prerequisite: Honors Program participation. A team-taught interdisciplinary course dealing with philosophy of science and the application of the scientific method in the natural and social sciences. Selected topics that involve interdisciplinary scientific inquiry. For the Honors student.

3000 Advanced Honors Topics. 1-3 credits, maximum 6. Prerequisites: Honors Program participation, junior standing. Topics in various disciplines taught by faculty from the undergraduate colleges for junior and senior students in the University Honors Program.

3013 (H)Holocaust Studies Seminar. Prerequisites: Junior standing, Honors Program participation. An interdisciplinary study of one of the problem events of human history—the Holocaust. Addresses questions of good and evil, divinity and humanity, and the responsibility that arises from this event. For the Honors student.

4993 Honors Creative Component. Prerequisites: Honors Program participation, senior standing. A guided creative component for students completing the requirements for college or departmental honors awards leading to an honors thesis, project or report under the direction of a faculty member from one of the graduate colleges, with a second faculty reader and oral examination.

Horticulture (HORT)

1008 Home Horticulture. Offered by correspondence only. An introduction to horticultural practices for the home gardener. Planning and care of home gardens, home orchards and vegetable gardens: selection, use and care of indoor plants. Non-majors only. Credit will not substitute for required courses.

1013 (N)Principles of Horticultural Science. Lab 2. Basic physical and physiological processes responsible for plant dormancy, growth, flowering, fruiting, and senescence with respect to the science and art of production, cultivation, utilization, and/or storage of horticultural plants. Current research associated with various horticultural commodity groups.

2010 Internship in Horticulture. 1-6 credits, maximum 6. Prerequisites: 24 credit hours and consent of advisor. Supervised work experience with approved public and private employers in horticulture and related fields. Credit will not substitute for required courses. Graded on a pass-fail basis.

2112 Indoor Plants and Interior Plantscaping. Lab 2. Identification, cultural requirements and use of ornamental foliage and flowering plants for indoor gardens.

2212 Herbaceous Ornamental Plants. Lab 2. Identification, cultural requirements and landscape value of ornamental flowering herbaceous plants. Discussions of design and installation of herbaceous beds and borders.

2313 Landscape Plant Materials I. Lab 2. Prerequisite: BIOL 1114 or 1403. Identification, adaptation, tolerance and use of deciduous trees, shrubs, vines and ground covers in the landscape.

2413 Landscape Plant Materials II. Lab 2. Prerequisites: 2313. Identification, adaptation, tolerance and use of evergreen trees, shrubs, vines and ground covers in the landscape.

2652 Basic Floral Design. Lab 2. Fundamentals of floral arrangement and design for the home and the retail shop; basic skills useful to flower shop employment and operation.

2014 Business and Practice of Arboriculture. Lab 2. Prerequisites: 2313 and 2413 or FOR 2134, and SOIL 2124. Theory and practice of selecting, planting and maintaining trees, shrubs and vines. Basics of the landscape management business, including estimates for labor, equipment and plant materials; bidding; costs and record keeping; and employee safety.

Greenhouse Management. Lab 3. Prerequisites: 1013, BIOL 1404, MATH 1483 or 1513 or above. Commercial greenhouse operation with emphasis on floricultural plant production aspects; environment, growing media, fertilizers and application methods, watering, pest and disease control, chemical growth regulators, production costs.

Turf Management. Prerequisites: 1013, SOIL 2124 and 2 hours plant science. Selection, establishment and maintenance of grass species and other plant materials for special use areas.

Flower and Nut Production. Prerequisite: BIOL 1403. Commercial production of fruits and nuts, with emphasis on pecan, apple, peach, strawberry, blackberry and blueberry. A two-day field trip is required.

Commercial Vegetable Production. Prerequisites: 1013, SOIL 2124 and BIOL 1403. Commercial production and marketing of vegetable crops.

Nursery Production. Lab 2. Prerequisites: 2131, 2143, and SOIL 2124. The propagation, production, management and marketing of commercial nursery stock.

Advanced Floral Design and Marketing. Lab 2. Prerequisite: 2652. Preparation, arrangement, care and marketing of floral products in the retail shop, advanced designing, pricing, wholesale purchasing and retail selling.


Public Garden Management. Lab 4. Prerequisite: 1013. Issues and methods in public garden management including database management of collections, conservation of native species, grant writing, volunteer coordination, computerized mapping systems, master planning, and other topics pertaining to a career in public horticulture. Field trips required.

Applied Landscape Planning. Lab 3. Prerequisite: 2313 or 2413. Concepts of landscape contracting, design and planning. Preparation of plans, and cost estimates with an emphasis on residential landscapes and use of plant materials. No credit for students in the landscape architecture or landscape contracting programs.

Horticultural Problems. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Problems related to pomology, olericulture, nursery production, landscape design, or the culture, sales and arrangement of flowers.


Advanced Horticultural Problems. 1-12 credits, maximum 20. Selected research problems in horticulture, floriculture, landscape design; nursery production, olericulture, and pomology.

Advances in Horticultural Science. The latest advances in horticultural science and technology affecting the vegetable, fruit and nut, turfgrass, nursery, and floriculture commodity areas. Areas of production systems, postharvest preservation, plant responses to the environment, and sound environmental practices.

Temperature Stress Physiology. Prerequisite: BIOL 3653, BOT 3463 or consent of instructor. Effects of heat, chilling and freezing stress on plants. Responses to temperature extremes at the molecular to whole plant levels, with emphasis on mechanisms of injury and resistance.

Experimental Horticulture. Methods of conducting research with horticultural crops including organization and plans, field plot techniques and analysis of data.

Mineral Nutrition in Horticultural Crops. Prerequisites: BOT 3463, SOIL 4234. Fertilizer use and plant response in horticultural crops.

Flowering and Fruiting in Horticultural Crops. Prerequisite: BOT 3463. Environmental, chemical and cultural factors affecting the flowering and fruiting of horticultural crops.

Postharvest Physiology. Prerequisites: BOT 3463 and 3460. Physiological causes for postharvest changes in horticultural crops (ripening and senescence) and the basis for certain postharvest treatments (precooling at harvest, controlled atmosphere storage, refrigeration, and packaging techniques). Commodity-specific postharvest phenomena.


Introduction to Hotels, Restaurants, and Tourism Around The World. Study of hotels, restaurants, tourism and the hospitality industry around the world. The scope of the industry, development and history of the hospitality industry on an international basis, ethical issues, and career opportunities.

Introduction to Professional Food Preparation and Sanitation. Utah 3. Techniques and theories of food preparation and sanitation including use and selection of equipment, quality control, presentation, and nutrient relationships based on food preparation systems. The theory and practice of food safety and sanitation.

Service Management in Hospitality Operations. Lab 4. Analysis and development of service management skills for the hospitality industry, including leadership behavior, motivation; communication training, staffing and professionalism with an emphasis on fine dining.

Hospitality Industry Financial Analysis. Prerequisite: ACCT 2103. Financial analysis theory and practice in the hospitality industry including planning and control of revenue and expenses and analysis financial reports, concepts, examples, and case studies specific to the hospitality industry.

Hospitality Information Technology. Overview of computer system components, file structure, operating systems, word processing, spreadsheets, and databases utilized in the hospitality industry. The interaction between technology, oral, and written communication at all levels of hospitality organizations.

Hospitality Industry Speakers Colloquium. 1-3 credits, maximum 6. Study of specific issues or topics in hotel and restaurant administration.

Hospitality Training Program Development. Study of the design, delivery and evaluation of training programs for hospitality and tourism organizations. Needs assessment, performance objectives, instructional design, and a variety of presentation methods. Organizational and individual development.

Hospitality Management and Organizations. Functions and methods of management as related to the hospitality industry including management principles and analysis and decision making skills as applied to hospitality management system organizations, interpersonal relationships, and production systems.

International Travel and Tourism. The study of international travel and tourism for business and pleasure. The management of travel and tourism concepts in the hospitality industry and related businesses around the world. International travel industry financial management, technology, economic planning and policy formulation.

On-campus Internship. 1-3 credits, maximum 6. Prerequisites: HRAD 2125, 3213 or consent of instructor. Supervised experience in an approved on campus work situation related to a future career in the hospitality industry. Human resource, customer service, management or supervisory experience in multiple aspects of the department.

Lodging Front Office Systems. Lab 2. Prerequisites: 3213, ACCT 2103. The organization, duties and administration of a hotel front office. The various jobs in the lodging front office, and procedures for registering, accounting for, and checking out guests. Additional focus on the organization duties, and administration of a hotel reservations, night audit, and uniformed services departments.

Lodging Services Management. The organization and management of guest services in lodging properties. Examination of the principles of concierge, bell staff, retail outlets, and business services.
to improve unit operations.

4900 Honors Creative Component. 1-3 credits, maximum 3. Prerequisite: College of Human Environmental Sciences Honors Program participation, senior standing. Guided creative component for students completing requirements for College Honors in College of Human Environmental Sciences. Thesis, creative project or report under the direction of a faculty member in the major area, with second faculty reader and oral examination.

4983* Conference and Meeting Planning. Prerequisite: junior standing. Planning and implementing conferences, teleconferences, conventions, special events, seminars and symposia. Designing, promoting, managing and evaluating educational events, contract management.

5000* Master's Thesis. 1-6 credits, maximum 6. Prerequisites: graduate standing and consent of adviser. Individual research interests in hospitality administration fulfilling the requirements for the M.S. degree.

5030* Master's Creative Component and Independent Study. 1-3 credits, maximum 3. Prerequisites: graduate standing and consent of instructor. Research and study having relevance to the hospitality field and a positive impact on the hospitality industry.

5213* Hospitality Technology Applications. Conceptual analysis of the different systems used in the hospitality industry: food, beverage, catering, banquets, marketing, accounting, housekeeping, sales, property management, front office, and human resources. Investigation of technology applications, ethical implications of technology and system development and practices.

5223* Hospitality Procurement Administration. Principles related to the procurement of food and nonfood products in the hospitality industry. Administrative functions, cost controls, inventory, specifications, price, quality and quantity issues applied to foods.

5243* Retailing and Franchising in the Hospitality Industry. Entrepreneurial perspective of growth and performance of commercial and noncommercial food service and health care organizations. Challenges relative to operations management, convenience stores, quick service operations, procurement, price analysis, communication, efficient customer response, capital and human resources, competition, governmental influence, and decision making process.

5413* Leadership in a Diverse Society. Comparing and critiquing leadership and diversity research, theories and practices in multiple aspects of society using an historical perspective. Utilization of case studies, focus groups, and experts from government, education, volunteerism, and the workplace to facilitate the development of models for future professional practice that integrate leadership and diversity principles.

5453* Total Quality in Hospitality Management. Study of contemporary management principles in the hospitality industry. Service improvement and customer satisfaction in the hospitality industry through the use of total quality management. How service industries such as hospitality can use business techniques such as continuous improvement, employee involvement, measurement and organizational change to improve unit operations.

5513* Hospitality Customer Development Strategies. Examination of the role of the customer in developing and managing customer relationships. The concepts and strategies of hospitality customer development.

5523* Critical Issues in Hospitality Administration. Prerequisite: graduate standing. Major issues confronting the hospitality and tourism industry. Solutions, decision-making skills, and interpretation of impact on the environment, functional groups and organizations within the industry. Synthesis of information.


5813* Research Methods in Hospitality Administration. Use of scientific methods and current research methodologies as applied to problems in hospitality administration. Development of knowledge within hospitality research, problem identification, proposal planning, experimental design, statistical use and interpretation, and research reporting.

5850* Special Topics in the Hospitality Industry. 1-3 credits, maximum 9. Special topics related to the hospitality industry. A problemsolving technique to design the research model and investigative procedures. Presentations to faculty, students and industry professionals at specialized workshops with research, instructional and industry project components.

5870* PY-IEs in the Hospitality Industry. 1-3 credits, maximum 9. Special recurring problems in the hospitality industry. Broad perspective of these issues and their application to the industry. Critical thinking skills to solve operational dilemmas.

6000* Doctoral Thesis. 1-12 credits, maximum 30. Prerequisite: consent of major professor. Research in hospitality administration for the Ph.D. degree.

6123* Tourism Policy and Planning. Overview and examination of current international and national tourism policies and an examination of the tourism industry for its influence on the tourism and hospitality development perspective. The economic impact of policy and planning issues to the tourism and hospitality industry.

6433* Employee Development Issues in the Hospitality Industry. Prerequisites: two years hospitality work experience and a course in human resources or personnel management. Developing and maintaining a productive workforce in the hospitality industry. Recent theories and research of training, development of internal customers, and the labor issues affecting the hiring and development process.

Human Environmental Sciences (HES)

1001 Seminar in Human Environmental Sciences. Mission of the College as a basis for value exploration and problem solving. Investigation of the integrative nature of the profession and general education. Required of all students in the College of Human Environmental Sciences.

1111 Discover Human Environmental Sciences. A survey of the majors and career opportunities in the various human environmental sciences departments. Transition from high school to university life, awareness of campus and college resources, and enhancement of study skills and attitudes that contribute to academic success. Required of all first semester freshmen in the College of Human Environmental Sciences. Graded on a pass-fail basis.

1511 Introduction to Leadership in Human Environmental Sciences. Prerequisite: consent of associate dean. An introduction to the major leadership theories. Development of leadership, communication skills, and self-esteem. Collaborative learning projects. Open to freshmen in the College of Human Environmental Sciences Scholar Leader Program.

2110 Career Exploration in Human Environmental Sciences. 1-3 credits, maximum 3. Acquisition of career information critical to introduce students to the world of work. Career searches, processes for interviewing and acquiring careers.

2511 Dynamics of Leadership in Human Environmental Sciences. Prerequisite: consent of associate dean. Major topics related to personal and professional development, including developing and utilizing leadership skills, teamwork and team building, total quality management, ethics, public speaking, and business and social etiquette. Open to sophomores in the College of Human Environmental Sciences who have been accepted in the Ambassadors.

3002 Contemporary Issues in Human Environmental Sciences. Exploration of the mission of the College of Human Environmental Sciences and subject matter interrelationships, ethical issues and professionalism in the field; effect of global interdependence and public policy on individuals, families and professionals. Required of all students in the College of Human Environmental Sciences.

3080 International Experience. 1-18 credits, maximum 36. Prerequisite: consent of associate dean. Participation in a formal or informal educational experience outside of the USA.

3090 Study Abroad. 1-18 credits, maximum 36. Prerequisites: consent of the Office of the Study Abroad and associate dean of the College of Human Environmental Sciences. Participation in an OSU reciprocal exchange program.

3111 Directions in Human Environmental Sciences. An exploration of the career opportunities and curriculum in the various human environmental sciences departments. Transition to university life at OSU, awareness of campus and CHES resources; and enhancement of skills and attitudes that contribute to academic success. Required of all first semester transfer students in the College of Human Environmental Sciences (CHES). Graded on a pass-fail basis.

5000* Thesis or Report. 2-10 credits, maximum 10. Students studying for a master’s degree may enroll in this course for a total of two credits if they write a report or six hours if they write a thesis. Students working on a specialist’s degree may earn a maximum of 10 hours credit.

5010 Seminar. 1-3 credits, maximum 6. Graduate student seminars focusing on current and critical issues and common problems relevant to occupational and adult education.

5123* Program Evaluation in Human Resources and Adult Education. The purpose of evaluation in occupational and adult education programs with specific attention given to the evaluation of program development in laboratory and shop instruction.

5203* Foundations of Adult and Continuing Education. Societal trends, issues and institutions which have influenced the development and current status of adult and continuing education. Analyses and critiques of contemporary adult and continuing education activities, materials and clientele groups served, and their implications for new and existing programs in the field.

5213* Characteristics of Adult Learners. Learning patterns, interests and participation patterns among adults in a variety of educational settings. Theories of learning and behavior modification for adults, with implications for adult and continuing education programs. Particular attention given to learners in occupational, adult basic, community junior college, extension and proprietary program settings.


5233* Needs Analysis. Techniques of conducting organizational analyses of human performance problems, including surveys, interviews, records analysis, group interaction, and task analysis.

5243* Advanced Project in Needs Analysis. Prerequisite: 5233. The conduct of an analysis of human performance problems in an organizational setting, including need or problem identification, investigation, clarification and resolution, and the development of a formal report and a presentation to management.

5253* Instructional Strategies for Adults. Prerequisite: graduate standing. An analysis and application of the various techniques and materials available to facilitate the learning process for adults. Concentration on the process of designing effective learning experiences for adults and developing competencies of the facilitators of group and self-directed learning.

5340* Special Problems. 1-6 credits, maximum 6. Directed independent study of special topics involving assigned readings, library research, field work or a combination of these.

5433* Instructional Design for Training. Design and development of training to address performance problems in organizations, business and industry. In-depth study of a systematic approach to training for performance.

5533* Human Resource Development. Introduction to training and development, including history and nature of the field, role definition, needs analysis, program development, evaluation, and techniques of conducting training.

5720* Workshop. 1-3 credits, maximum 10. Professional workshops of various topics and lengths. Each workshop designed to meet unique or special needs of individuals concerned with adult education and human resource development.

5730* Special Topics in Human Resource Development. 1-3 credits, maximum 6. The practice, theory and research related to a current topic in human resource development.

5833* Global Consulting. The consulting process, including contract, entry, diagnosis, response, disengagement, closure and ethical considerations. The competencies of successful consultants and trainers in the international environment, including cultural adaptations of self and of training materials.

5880* Internship. 3-6 credits, maximum 6. Supervised experience working in business, industry, human service, or education settings.

5912* Organization and Administration of Adult Education Programs. Organizing and administering adult basic education for occupational programs.

6000* Doctoral Dissertation. 2-10 credits, maximum 15. Required of all candidates for the Doctor of Education degree in adult education and human resource development.

6110* Graduate Readings in Adult Education and Human Resource Development. 1-6 credits, maximum 6. Prerequisite: consent of supervising professor. Supervised readings of significant literature not included in regularly scheduled courses.

6203* Managing Adult Education Research. Analysis and application of techniques necessary for managing research projects in diverse agencies with adult learners. Practice with computer-based programs. Data sets from adult education research projects.
**Required for HRAE doctoral candidates.**

the required tentative proposal for dissertation

[40x742] 6340*

vides opportunities for an individual to put into

to the participant's area of concentration. Pro-

[40x586] 6871*

zation, process and individual performance.

Emergence of the field, diagnosis, performance,

[40x698] 6533*

dents involved in a research-based project.

9. Directed independent study for doctoral stu-

[40x340] 2903

gineering economy. Laboratory sessions pro-

[40x364] 3523

and techniques in production control, quality

[40x395] 4013*

Industrial Engineering Projects

1-3 cred-

[40x22] 283

Industrial Ergonomics

[30x237] 4823*

Industrial Organization Management

[30x282] 4073

Senior Design Projects

Lab 6. Prerequi-

[55x474] 4913*  
**System Simulation.** Prerequisites: 4014, STAT 4033. Simulation of discrete-event systems. Problem formulation, translation to a computer model, and use of a model for problem solution. Simulation concepts and theory including random variable selection and generation, model validation and statistical analyses of results. Use of GPSS and survey of other languages and related simulation tools.

4723*  
**Information Systems for Management De-

[30x153] 4091

Senior Design Projects

Lab 6. Prerequi-

[30x230] 4013*

**Industrial Ergonomics.** Lab 3. Prerequisite: 3813. Characteristics of humans, equipment, and work environment examined using a sys-

[30x458] 4033

- and analytical procedures for locating and de-

[30x153] 4091  
lab 4913. Introduction to basic computer-aided design and computer-aided manufacturing (CAD/CAM).

4413*  
**Industrial Organization Management.** Is-

[30x161] 4823*  
lab 4913. Introduction to basic computer-aided design and computer-aided manufacturing (CAD/CAM).

4413*  
**Industrial Organization Management.** Is-

[30x245] 4823

and related simulation tools.

4723*  
**Information Systems for Management De-

[30x282] 4073

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[30x458] 4033

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[30x153] 4091  
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**Industrial Organization Management.** Is-

[30x245] 4823

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[30x282] 4073

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[30x153] 4091  
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4413*  
**Industrial Organization Management.** Is-

[30x161] 4823*  
lab 4913. Introduction to basic computer-aided design and computer-aided manufacturing (CAD/CAM).

4413*  
**Industrial Organization Management.** Is-

[30x245] 4823
5033* Dynamic Programming. Prerequisites: 5013, STAT 4213 or equivalent. An introduction to dynamic programming problems, computational techniques, control problems, and Markov decision problems, with applications to production control, transportation, inventory theory, and other areas.

5103* Advanced Industrial Quality Control. Prerequisites: 4103, STAT 4033. Modern quality philosophy and application. Theory and application of traditional and nontraditional control charting techniques. Special emphasis on underlying assumptions such as normality and error-free inspection. Oriented toward economically-based statistical monitoring of processes, including optimization of decision variables such as sample size, frequency, and control limit spread.

5113 Total Quality Management. Prerequisite: graduate standing. Major categories of criteria for the Malcolm Baldrige National Quality Award, including leadership, information and analysis, strategic planning and resource utilization, quality assurance, results, and customer satisfaction. Key concepts and tools; customer requirements determination, customer satisfaction measurement, cost of quality, quality planning, supplier relations, product improvement strategy, causes of variation, process stability and control, process capability, the use of SPC tools, and measuring performance. Emphasis on those activities that outstanding companies do well.

5133 Stochastic Processes. Prerequisites: MATH 2233, MATH 3013, STAT 4113. Definition of stochastic processes, probability structure, mean and covariance function, the set of sample functions. Renewal processes, counting processes, Markov chains, birth and death processes, stationary processes and their spectral analyses. Same course as STAT 5133 and MATH 5133.

5203* Advanced Facility Location and Layout and Material Handling Systems. Prerequisites: 3503, 4014, 4203. A continuation and expansion of topics covered in 4203 with an emphasis upon model development for predicting and evaluating the effectiveness of production and/or service systems. Advanced analytical and computer techniques.

5303* Computer Integrated Manufacturing. Prerequisite: 4323. Focus on the design, development, implementation and operation of modern manufacturing systems. Understanding the sequence of engineering-related activities over the product life-cycle. Integration of product and process design, compatibility and exchange of data and information, use of computer-aided (CAx) tools, design for (DFx) approaches, manufacturing philosophies, and volume dependent product cost.

5313* Robotics Application Issues. Lab 3. Prerequisite: graduate standing in engineering or consent of instructor. Role of robotics in modern manufacturing system. Design and selection of appropriate end effectors and sensors to produce a reliable cost effective robotic application. Comparison of commercial and customer designs of end effectors and a study of industrial applications. Field trips to industry and work in the IES&M/CAM/Robotics laboratory.
Hazardous Material and Waste

Significant case study or term paper required.


5743* Information Systems and Technology. Prerequisite: graduate standing or consent of instructor. For current and potential engineers and technology managers. Knowledge of information systems and technology to lead the specification, selection, implementation, and integration of information technology in manufacturing and service organizations. Management issues involved in the use of information technology in organizations.

5803* Human Factors Engineering. Prerequisites: 4923, 4113 or equivalent. Basic consideration of the human factors in engineering systems with emphasis on the interface of man-machine systems. Development of human abilities and limitations in relation to equipment designs and work environments.

5813* Productivity Measurement and Improvement. Prerequisites: 3813 and 4413 concurrently. Productivity issues, concepts, theories and insights focusing on job and organizational design are explained, illustrated and discussed. Understanding the productivity improvement process. Development of productivity measurement systems. Designing organizational processes which improve productivity.

5913* Decision-making Models for Multi-objective Analysis. Prerequisite: 4014. Quantitative and qualitative aspects of multiple-criteria decision making. Dynamics of the decision process are examined and the multi-objective nature of most managerial decision problems is illustrated. General concepts and solution methodologies of the multi-objective problem. Multi-objective linear programming, goal programming, and compromise programming. Attribute importance, risk measurement, and utility measurement.

5923* Advanced Energy and Water Management. Prerequisite: 4923. Continuation of material covered in 4923 with an emphasis on modern management techniques. Cogeneration, energy management control systems, private purchases of gas, energy accounting. Significant case study or term paper required.

5943* Hazardous Material and Waste. Prerequisites: 3503 or equivalent, CHEM 1515. Management of hazardous materials and waste by the generator to reduce operating costs and protect employees. Emphasis on hazard communication program, reducing volume and toxicity, and management activities.

6000* Research and Thesis. 1-15 credits, maximum 30. Prerequisites: approval of major advisor or advisory committee. Independent research for Ph.D. dissertation requirement under direction of a member of the Graduate Faculty.

6023* Nonlinear and Integer Optimization. Prerequisites: 4014 or 3013; FORTRAN or PASCAL. Theoretical and practical aspects of nonlinear and integer optimization. Development and application of nonlinear optimization techniques for unconstrained and constrained problems; sequential search, gradient, penalty and barrier, and projection methods. Development and application of integer and mixed integer techniques for unconstrained and constrained problems; implicit enumeration, branch and bound, and cutting methods. Same course as CS 6023.

6110* Special Problems in Industrial Engineering. 1-6 credits, maximum 12. Prerequisite: consent of school Head and approval of major adviser. Special problems in industrial engineering and management under supervision of a member of the Graduate Faculty.

6113* Reliability and Maintainability. Prerequisites: 5003; STAT 4033; FORTRAN. Probabilistic failure models of components and systems. Detailed study of reliability measures, and statistical reliability and dynamic reliability models. Classical and Bayesian reliability testing for point and interval estimation of exponential and Weibull failures. Reliability optimization through allocation and redundancy. Fundamentals of maintainability.


6423* Engineering and Technical Consulting. Prerequisite: 5413 or consent of instructor. Theory and practice of internal and external engineering and technical consulting. Investigation of the engineering and technical client interface, effective engineer consultations in relationship to existing organizational cultures and practice, and the engineering and technical practitioner’s impact on organizational improvement.

6513* International Studies Practicum. 1-6 credits, maximum 6. Prerequisite: graduate standing. Study of contemporary international issues including news reports, speeches from foreign dignitaries, political leaders and experts in selected international fields.

6713* Advanced Systems Modeling. Prerequisites: 4014; 5003; 4713 or 5703; FORTRAN 77, Pascal or C. Methodologies for the modeling, analysis, and optimization of large, complex systems. Modeling and performance analysis using Petri nets, object-oriented modeling, optimization using simulation, and continuous systems simulation.

International Studies (INTL)

5000* Thesis. 1-6 credits, maximum 6. Prerequisite: graduate standing and consent of adviser. For students studying for a master’s degree in international studies under the thesis option.

5010* Contemporary Issues in International Studies. 1-6 credits, maximum 6. Prerequisite: graduate standing. Study of contemporary international issues including news reports, speeches from foreign dignitaries, political leaders and experts in selected international fields.

5110* International Studies Practicum. 1-6 credits, maximum 6. Prerequisite: graduate standing and consent of adviser. For students studying for a master’s degree in international studies under the creative option.

5213* International Relations, Affairs and Policy. Prerequisite: graduate standing. Research on the mechanics and theories of interaction between economic and political phenomena. Same course as POLS 5213.

5223* Culture, History and World Systems. Prerequisite: graduate standing. Study of the impact and influence of culture and history on the development of contemporary world systems with future projections.

5233* Global Competitive Environment. Prerequisite: graduate standing. Development of a global business strategy for the organization. Issues of highly diversified markets and business environments, global competition, financial markets, and complex organizational relationships. Same course as MBA 5233.

Japanese (JAPN)


2115 (I)Intermediate Japanese I. Prerequisite: 1115 or equivalent. Reading, the writing system, culture, grammar, conversation.


2223 (I)Intermediate Japanese III. Prerequisite: 2123 or equivalent proficiency. A continuation of 2123.

3112
(I) Advanced Japanese Conversation II. Designed to increase facility and naturalness of delivery in dialogue. Development of general oral and aural proficiency.

3133
(I) Readings in Japanese I. Development of the student’s competence in reading a wide variety of materials by contemporary Japanese writers. Designed to be taken concurrently with 3223.

3223
(I) Introduction to Business Japanese. Prerequisites: 2223 or equivalent; concurrent enrollment in 3133. Introduction to business vocabulary and writing of correspondence. Japanese business customs and practices.

3333
(I) Readings in Japanese II. Prerequisite: 3133. A continuation of 3133.

Journalism and Broadcasting (JB)

1143
(S) Media and Society. An overview of the characteristics of newspapers, magazines, photojournalism, radio, television, film, advertising, public relations and interactive media, emphasizing the media’s impact and role in American society.

2003
Mass Media Style and Structure. Lab 2. Prerequisites: CS 1002, ENGL 1113 and ENGL 1213 with grade of “C” or better. Elementary writing and editing techniques in print, broadcasting and other media.

2013
Principles of Advertising. Prerequisite: sophomore standing. Elements and purposes of advertising; media functions, economic aspects, budgets, appropriations, rate structures and terminology.

2183
Principles of Public Relations. An introduction to the history, development and current practice of public relations as a process in building relationships between organizations and publics.

3013
Advertising Media and Markets. Analysis and evaluation of mass media for advertising; media and market research; media plans, budgets and sales presentations; advertising law and ethics.

3153
Fundamentals of Audio and Video Production. Lab 2. Prerequisite: 2003. Theory and practice of basic audio and video production techniques leading to later applications in radio, television and multimedia production.

3173
History of Mass Communication. Growth and development of mass communication systems in America, with emphasis upon the economic, social and political interaction of the media.

3263

3283
Public Relations Communications Methods. Prerequisite: 2183. An analysis and application course focused on the communications methods and techniques used in the practice of public relations.

3293
Visual Communication. Use of photographs, charts, graphs and other visual representations in the mass media; the language of pictures; theories of nonverbal communication; visual aids in education and other information systems.

3313
News Editing I. Lab 3. Prerequisite: 3263. Copy editing, design and headline writing for newspapers and magazines.

3383
Public Relations Management and Strategies. The practice and techniques of public relations as a management function in business, industry, agriculture, government, education and other fields. For both majors and non-majors.

3400
Journalism, Advertising and Public Relations Laboratory. 1-3 credits, maximum 3. Prerequisites: junior standing and consent of instructor. Laboratory and/or internship practice for qualified students who wish creative communications experience beyond that available in the classroom.

3553
Broadcast News Writing I. Lab 3. Prerequisites: 3153, 3263. Broadcast news writing and reporting techniques with emphasis on radio coverage. Familiarization with news values, news services, broadcast equipment. Lab work in news reporting and writing.

3603

3623
Internet Communications. Lab 2. Prerequisite: 2003. Theoretical and practical understanding of how the Internet is changing the way mass media and media-related organizations communicate with audiences.

3753
Graphic Communication. Lab 3. Creative and practical aspects of typography, layout and design, and production of printed communication.

3800
Boradcast Operations. 1 credit, maximum 2. Lab 2. Prerequisite: 3553 or 3913. Preparation and participation in the operation and coordination of student managed radio and television facilities.

3823
Photography I. Lab 3. Taking and processing photographs: cameras, lenses, films, printing and developing; essentials of good pictorial composition. For students who want an elementary understanding of photography, or to prepare for advanced work in photography or photojournalism.

3843
Sports Journalism. Lab 2. Prerequisite: 3263 or consent of instructor. Reporting skills to cover the sports beat and an understanding of the history of sports journalism and sports and culture in America. Reporting, feature writing and column writing in sports for print journalism.

3873

3900
Radio-Television Laboratory. 1-2 credits, maximum 2. Prerequisites: 3153 and consent of instructor. Preparation and participation in all phases of radio-television and cable through active internship program.

3913
Video Production. Lab 3. Prerequisite: 3153. Television production techniques, including camera, audio, lighting, staging, producing, graphics and on-camera performance.

3943

4033
Communication Technology. Overview of satellite delivery of print, radio, television and cable program services, data services, computer technology; public relations and advertising uses of the new technologies.

4063
Supervision of High School Publications. Essential journalistic forms for high school publications; organizing and administering high school publications; intended to meet the requirements for the state teacher’s license in language arts.

4163
Mass Communication Law. Statutes and case decisions in print and broadcast law, including government regulation of broadcasting by the FCC and media relations with other regulatory agencies.

4223
Media Sales and Marketing. Sales development, pricing, promotion and other aspects of broadcast sales and sales management.

4253
Programs and Audiences. Audience analysis, proper construction of programs for greatest appeal and use of appeals to attract the desired audience. Program types, rating systems, program selection and audience attention. Design and discussion of programs to reach specific audiences.

4253
(I) International Mass Communications. Examination of the nature and flow of news and information within and among nations, states and societies from a theoretical vantage point grounded in region-specific realities. The political, economic, social, cultural and historical forces determining media practice in a global environment. Meets with MC 5253. No credit for students with credit in MC 5253.

4263
Broadcast Management. Functions, structure and organization of the broadcasting industry; special problems in broadcast station management, including personnel, sales, programming and government regulations.

4313
Public Affairs Reporting. Lab 5. Prerequisite: 3263. Coverage of social problems, people and events in fields of government, business, science, sports and entertainment.

4360
Special Problems in Journalism and Broadcasting. 1-3 credits, maximum 6. Prerequisites: junior standing, a minimum of 3.00 GPA, or consent of instructor. Independent study and project development to fit the student’s major or minor specialization.

4393
Computer-assisted Journalism. Lab 6. Prerequisites: 3263, STAT 2013. Access by news media and communication specialists to electronic sources of information primarily through the Internet. A skills course in understanding and applying ways to obtain and share information through computer access.
4413 Advanced Reporting and Writing, Lab 5. Prerequisite: 4413. Enhancement of writing style and reporting techniques; evaluation of sources and polling practices, and investigative coverage of newsmakers and events.

4423 News Editing II. Lab 6. Prerequisite: 3313. Advanced copy editing; ethics and legal considerations from an editor's viewpoint; design techniques for newspapers and magazines including picture editing, introduction to type, makeup and design practices, and special pages.

4433 Feature Writing for Newspapers and Magazines. Prerequisites: 15 credit hours of English or journalism. Newspaper features and special articles for general circulation magazines, business and trade journals; sources, materials, markets and other factors pertinent to nonfiction writing.

4453 Communications in Agriculture. Lab 2. Fundamentals of news-writing and other communication methods; the role of the news media in agriculture and related fields.

4493 Advanced Public Relations Media. Lab 6. Prerequisites: 3263, 3283. An advanced application course in planning, researching, writing, editing and designing of materials used in public relations communications.

4520 Specialized Public Relations Applications. 3 credits, maximum 6. Prerequisite: 3263. Professional public relations at an advanced level. Public relations study of non-profit, corporate, agency, international and other specialized applications. Course content varies by semester. Meets with MC 5520. No credit for students with credit in MC 5520.

4553 Broadcast News Writing II. Lab 3. Prerequisites: 3153, 3553. Advanced broadcast news writing with emphasis on techniques of feature and in-depth reporting for radio, television and cable television.

4573 Broadcast Documentary. Lab 3. Prerequisites: 3553, 3913. Student-written and produced broadcast and cablecast mini-documentaries; analysis of selected programs.

4603 Integrated Marketing Communications. Prerequisite: 2513 or 2583 or MKTG 3213. Planning and the value of coordinating the various promotional mix elements within a communication campaign to create maximum clarity and impact. Communication elements including advertising, public relations, direct marketing and sales promotion and examine strategies for combining and integrating them into an effective campaign. Theories, models and tools to make better promotional communication decisions. Meets with MC 5603. No credit for students with credit in MC 5603.

4623 Advertising Campaigns. Prerequisite: 3603. Planning, preparation and presentation of comprehensive advertising and marketing campaigns for national or local clients. Student teams produce projects of the campaign, from conception to presentation. Satisfies capstone requirement for advertising majors.

4653 Television and Radio Advertising. Lab 2. Prerequisite: 3603. Functions and characteristics of broadcast advertising; copywriting, scriptwriting, story boards, marketing plan; film and videotape commercial production.

4662 Professional Portfolio. Lab 2. Prerequisite: 2003 or consent of instructor. The advanced design landscape architect to compete in the creative sector of the advertising, graphic or other industry. Advanced theories of design in the construction of professional creative materials, and the elements of effective persuasive communication.

4843 Public Relations Programs. Prerequisite: 3283. Capstone course requiring public relations students to prepare a public relations campaign involving the public relations process; research, planning, communications and evaluation.

4863 Media Management. Basic issues, theoretical concepts and operational procedures associated with managing newspapers, magazines, advertising, public relations, broadcast and cable companies and firms specializing in computer-mediated communications. Meets with MC 5863. No credit for students with credit in MC 5863.

4953 Advanced Production Practices. Lab 3. Prerequisite: 3913 or 4533. Advanced professional television production. Student produced and directed television programs, including "specials," for distribution on cable or other professional media.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing. Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a senior faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in journalism and broadcasting.

Landscape Architecture (LA)

1013 Introduction to Landscape Architecture and Landscape Contracting. An overview of the field of landscape architecture and landscape contracting with emphasis on the role of the landscape architect/contractor, and the need for design and management of outdoor space and structures and the environment.

2213 Landscape Architecture Graphics I. Lab 3. Prerequisite: three hours credit in freehand drawing or drafting. Drafting and illustration techniques for developing and presenting landscape concepts and designs in black and white media. Computer graphics applications including illustration, typesetting, scanning and visualization techniques.

2223 Landscape Architecture Graphics II. Lab 2. Prerequisite: 2213. The application of multimedia color presentation and delineation techniques to more complex plans, drawings and programs.

2323 Computer-Aided Design. Lab 2. Prerequisite: 1013, 2213. Introduction to computer operating systems. Principles of electronic drafting and visual communication techniques related to the landscape for two-dimensional and three-dimensional systems.

3010 Internship in Landscape Architecture and Landscape Contracting. 1-6 credits, maximum 6. Prerequisites: 45 credit hours, consent of internship chairperson. Supervised work experience with approved public and private employers in landscape architecture, landscape contracting or related fields. May not be substituted for other required courses.

3112 Landscape Architecture Seminar I. Prerequisite: 3324. Professional analysis of various aspects of the landscape architecture profession and designed works with guest speakers and in-state or regional field trips to completed works. Required of fourth year students.

3314 Landscape Architectural Design I. Lab 8. Prerequisites: 1013, 1122 and 2233. Introduction to the principles of design, problem solving, site analysis, and the correlation of aesthetic concerns with functional solutions in small-scale landscape architecture design problems and computer-aided design applications.

3324 Landscape Architectural Design II. Lab 8. Prerequisite: 3314. The design of small to medium scale areas with an emphasis on design, problem solving, site analysis and computer-aided design applications.

3673 (H)History and Theory of Landscape Architecture. History and historic styles and approaches to landscape architectural design. Past and present landscape design theory.


3894 Landscape Architectural Construction II. Lab 6. Prerequisite: 3884. Advanced grading, horizontal and vertical roadway alignment, site layout and staking plans, construction documents, cost estimating, overview of soils construction materials and specifications, site utilities, computer applications and calculations.


4112 Landscape Architecture Seminar II. Prerequisite: 4414. Topics in landscape architecture and related fields, career exploration and job placement. Out-of-state field trips to completed landscape architecture projects. Required of fifth year students.

4414* Landscape Architectural Design III. Lab 8. Prerequisites: 3324, 3884. Medium scale site development projects with an emphasis on landforms, structures and computer-aided design applications. Portfolio must be reviewed and approved in Design II for admittance to the professional phase of the program.
4424* Landscape Architectural Design IV. Lab 8. Prerequisite: 4414. Medium-scale complex landscape architectural design projects with emphasis on arrangement and design of landscape elements as they relate to functional and aesthetic qualities. Integration of landscape construction detailing, drawings as part of design presentation, and computer-aided design applications.

4433* Land Use and Community Planning. Lab 3. Prerequisite: 3313. The inventory and analysis of natural and man-made landscape resources and their application to land use and community planning within the framework of a municipality’s comprehensive plan and regulations.

4514* Landscape Architectural Design V. Lab 8. Prerequisites: 4424, 4894. The design of large-scale sites with an emphasis on mixed use developments and computer-aided design applications.

4524* Landscape Architectural Design VI. Lab 10. Prerequisite: 4514. A capstone course with a large scale development project in urban design, recreation or resource planning with computer-aided design applications, summarizing previous planning, design and construction course work.

4534 Landscape Architecture Vertical Design Studio. Lab 8. Prerequisite: 2223. Individual studio projects geared to design, course level. Offered on demand. Can be substituted for one landscape architecture design course (LA 3314, 3324, 4414, 4424, 4514, or 4524).

4573* Recreation Planning. Lab 6. Prerequisite: consent of instructor. Theory and methods for small and large scale area planning with emphasis on natural and cultural resources.

4583* Landscape Environmental Planning. Lab 6. Prerequisite: 3324. Materials and methods of construction, static, retaining wall design, wood structures, landscape lighting, cost estimation, construction documents, methods of detailing, water features, irrigation design, computer applications and calculations.

4680 Landscape Architecture Assembly. 1 credit, maximum 4. Presentations by faculty members and guest speakers dealing with various aspects of landscape architecture or related fields.

4894* Landscape Architectural Construction III. Lab 6. Prerequisite: 3894. Materials and methods of construction, static, retaining wall design, wood structures, landscape lighting, cost estimation, construction documents, methods of detailing, water features, irrigation design, computer applications and calculations.

4990* Landscape Architecture Special Problems. 1-6 credits, maximum 12. Prerequisite: consent of appropriate faculty member. Landscape architectural related problems.

5110* Advanced Special Problems. 1-12 credits, maximum 20. Prerequisite: consent of appropriate faculty member. Specific landscape architectural problems.

Latin (LATN)

1113 Elementary Latin I. The rudiments of beginning Latin; grammar, vocabulary and elementary readings.

1223 Elementary Latin II. Prerequisite: 1113 or equivalent proficiency. Continuation of 1113. Grammar, vocabulary and readings.

2113 Elementary Latin III. Prerequisite: 1223 or equivalent. A continuation of 1223. Grammar and readings of Latin authors.

2213 Intermediate Readings. Prerequisite: 2113 or equivalent proficiency. Readings from Virgil’s Aeneid.

3330 Advanced Readings in Latin. 1-6 credits, maximum 9. Prerequisite: 2213. Prose authors, poetry, and medieval Latin.

Legal Studies in Business (LSB)

1113 Law in Society. Forms and types of law and their evolution, including antitrust, ecology, consumerism and civil rights. Political, social and economic forces affecting legal developments. Legal needs of society and the probable future direction of the law.

3010 Special Topics in Legal Studies in Business. 1-3 credits, maximum 6. Prerequisites: 3213, prior consent of instructor. Analysis of a contemporary topic in business law. Changing social issues and trends in legal studies in business.

3213 Legal and Regulatory Environment of Business. Prerequisite: junior standing. General concepts regarding the nature of the legal system, ethical issues in business decision making, dispute resolution processes, basic constitutional limitations on the power of government to regulate business activity, the nature of government regulation, fundamental principles of tort and contract law.

3323 Law of Commercial Transactions and Debtor-Creditor Relationships. Prerequisite: 3213. Concentrated study of law relating to certain commercial transactions and debtor/creditor relationships. Includes law of sales, negotiable instruments, secured transactions, suretyship and bankruptcy.

4323 State and Federal Regulation of the Employment Relationship. Prerequisite: 3213 or equivalent. Legal foundations of employment in the United States. Contemporary topics relating to the employment environment such as state legislative and judicial limitations on employment at will doctrine, federal legislation relating to equal employment opportunity and affirmative action, fair labor standards, safety in the work place and state workers compensation laws.

4413 Law of Business Organizations. Prerequisite: 3213. General principles of law relating to the formation, operation and termination of various forms of business organizations. Includes a study of the law of agency, partnerships and corporations.

4523* Law of Real Property. Prerequisite: 3213 or equivalent. Nature of real property and of the legal transactions relating thereto. Topics may include deeds and conveyancing, landlord-tenant relationships, mortgages, easements, oil and gas interests, types of estates, joint ownership, and legal descriptions.

4633* (I)Legal Aspects of International Business Transactions. Prerequisite: 3213 or equivalent. Legal aspects of operating a business entity engaged in international commerce. Topics may include: foreign business organizations, U.S. taxation of foreign investors, common clauses in transnational contracts, problems of technology transfer in the international market, anti-trust aspects of international business, and jurisdictional problems in resolving disputes.

5163* Legal Environment of Business. Prerequisite: graduate standing. Legal environment within which business must operate. Nature and source of law, the operation of the judicial system, the operation of administrative agencies, selected Constitutional provisions frequently involved in litigation of business problems, and selected substantive legal areas having a direct relationship with business operation and decision making.

Leisure (LEIS)

1212 Beginning Swimming. Lab 2. Theory and practice of swimming strokes; techniques and basic water safety skills.

1232 Beginning Golf. Lab 2. Theory and practice of basic skills, rules, terminology and etiquette.

1242 Beginning Tennis and Racketball. Lab 2. Theory and practice of tennis and racketball; basic skills, rules, terminology, and game strategy for singles and doubles play. No credit for students with credit in 1252.

1252 Beginning Tennis. Lab 2. Theory and practice of basic skills, rules, terminology, and game strategy for singles and doubles play. No credit for students with credit in 1242.


1312 Archery and Riffelry. Lab 2. Theory and practice of archery and riflery; basic skills of target shooting, scoring, care and selection of equipment, and safety rules.

1322 Bowling. Lab 2. Theory and practice of approach, deliveries, releases and mechanical principles involved in aiming and follow through.

1342 Physical Fitness. Lab 2. Theory and practice of aerobic and weight training activities with learning experiences designed to promote physical fitness.

1352 Weight Training. Lab 2. Improvement of muscular strength and endurance in the major muscle groups of the body through progressive resistive exercise. Fundamental anatomy, physiology, mechanical principles, methods and techniques as applied to weight training programs.
1362 Self Defense. Lab 2. Theory and practice of self defense; scientific principles of gravity and body control over opposing forces, and principles of contest judo.

2112 Rock Climbing. Lab 2. Theory and practice in the basics of technical rock climbing, bouldering and spelunking.

2122 Backpacking and Hiking. Lab 2. Theory and practice of outdoor skills and leadership techniques for executing and evaluating a wilderness activity.


2222 Intermediate Tennis. Lab 2. Prerequisite: 1252. Theory and practice of advanced serves and strokes; strategy for singles and doubles play; rules and competitive tennis.

2252 Dance Production. Lab 2. Prerequisite: 2312 or consent of instructor. Advanced technique, composition and staging.

2272 Modern Ballet. Lab 2. Theory and practice of fundamental skills and techniques of ballet through the use of modern themes.

2292 Beginning Jazz and Tap Dance. Lab 2. Theory and practice of fundamental skills and techniques for jazz and tap dancing.

2312 Modern Dance. Lab 2. Theory and practice of basic skills and knowledge relating to the creative and technical aspects of modern dance.

2322 Recreational Dance. Lab 2. Theory and practice of traditional social dances and a variety of "free style" dance forms.


2413 Introduction to Leisure Services. The nature, scope and significance of leisure and recreation. Delivery systems for leisure services, major program areas and the interrelationship of special agencies and institutions serving the recreation needs of society.

2433 Introduction to Therapeutic Recreation. Theory and application of therapeutic recreation with emphasis on types of illnesses and disabilities, delivery systems, programming and services.

2443 Diversity in Leisure Services. An exploration of the primary and secondary dimensions of diversity and their impact on leisure. Responses of the leisure services profession to cultural diversity.

2462 Laboratory in Leisure Services. Lecture, discussion and experiential learning of recreation and leisure activity. Adapted activities, small and large group games, sports, arts and crafts, music, drama and cultural events. Fee required.

2473 Foundation of Leisure Service Leadership. Lab 2. Introduction to the principles and practical applications of group leadership techniques, problem solving, supervision and evaluation of personnel.

3010 Leisure Services Workshop. 1-3 credits, maximum 6. Intensive training program on a specialized topic in leisure services.


3333 Outdoor Pursuits. Lab 1. Field based course to understand origins and components of involvement in outdoor pursuits. Numerous skills applied to various outdoor settings.

3430 Practicum in Leisure Services. 1-3 credits, maximum 3. Prerequisites: 2413. Supervised practical experience with leadership responsibilities for planning, conducting and evaluating activities and programs. Graded on a pass-fail basis.

3453 Advanced Practices in Leisure Services Leadership. Prerequisite: 2423. Advanced techniques in principles and practices of group leadership; problem solving; supervision and evaluation of personnel.

3463 Program Design in Leisure Services. Emphasis on organization, supervision, promotion and evaluation of programs.

3473 Evaluation of Leisure Services. Prerequisite: 2413, 2463 or consent of instructor. Methods, techniques and application of the evaluation process related to a wide variety of leisure service functions: clientele, programs, personnel, facilities and organization.

3483 Principles and Clinical Practices in Therapeutic Recreation. Prerequisite: 2433 or consent of instructor. Clinical intervention techniques and strategies, including treatment techniques, leisure education and role of recreation in the treatment process.

3491 Pre-Internship in Leisure Services. Preparation for internship in therapeutic recreation and leisure services management.

4010 Directed Studies in Leisure. 1-3 credits, maximum 6. Prerequisites: consent of instructor and program head. Supervised readings, research or study of trends and issues related to leisure studies.

4213 Water Safety Instructorship. Lab 1. Methods of teaching swimming and aquatic safety with practical application of knowledge, principles and analysis of skills. May obtain American Red Cross Water Safety Instructor's Certification (WSI).

4453* Outdoor Education. Development of a holistic approach to teaching and learning in the outdoors. Learning in, about and for, the out-of-doors as a process for acquiring skills with which to enjoy outdoor pursuits.

4463* Areas and Facilities in Leisure Services. Prerequisites: 3463 or consent of instructor. Planning, design and development of areas and facilities in leisure service delivery systems.

4473* Outdoor Recreation. Theory and practical application of outdoor recreation concepts with emphasis on philosophies, principles, policies, economics, trends and problems.

4480 Internship in Leisure Services. 1-12 credits, maximum 12. Prerequisite: last semester senior year with cumulative GPA of 2.50. Supervised field work experience in leisure services management or therapeutic recreation. Graded on a pass-fail basis.

4482 Senior Seminar in Leisure Services. Prerequisite: LEIS major. Culmination of coursework work in leisure studies. Examination of current issues, professional practices and personal philosophy of leisure.

4493 Administration of Leisure Services. Decision making, problem solving, personnel policies, legal issues, fiscal policies and budget procedures related to the delivery of leisure services.

4513* Facilitating Techniques in Leisure Counseling. Prerequisite: 3463 or consent of instructor. Philosophy, history, trends, models, legal aspects and basic methods of leisure counseling and leisure education.

4523* Program Design in Therapeutic Recreation. Prerequisite: 2413 or consent of instructor. Systematic approach to the development, design and evaluation of therapeutic recreation programs.

4563* Entrepreneurial Leisure Services. Prerequisite: 3463 or consent of instructor. Introduction to the scope, characteristics and management aspects of the commercial recreation industry from an entrepreneurial perspective.

4573* Leadership in Experiential Education. An investigation of leadership styles and management models with an application to adventure based education.

4580* Technical Management in the Wilderness. 1-6 credits, maximum 6. Developing technical competencies in back country navigation, emergency medical care and evaluation, winter Nordic mountaineering, technical rock climbing, hazard analysis and expedition planning.

459* Grantwriting and Fund-raising in Non-profit Agencies. Methods, techniques and direct experience in acquiring funds and kind resources necessary for the operation of philanthropic agencies.

4913* Managing Non-profit Agencies. Management skills necessary for the development and on-going operation of a non-profit agency.

492* Natural Resource-based Tourism. Examination of the link between tourism and the natural environment. Analysis of travel motives, impacts, sustainability, and supply and demand.
4933* Advanced Methods in Therapeutic Recreation. Prerequisites: 3483 and consent of instructor. Theoretical and practical examination of contemporary implementation procedures used in therapeutic recreation practice.

5000* Master’s Thesis. 1.6 credits, maximum 6. Prerequisite: consent of major professor. Research in leisure studies for master’s degree.

5020* Workshop in Leisure Studies. 1.6 credits, maximum 6. Prerequisite: consent of instructor. Advanced instruction on specialized topic area in leisure studies.

5030* Field Problems in Leisure Studies. 1.6 credits, maximum 6. Prerequisite: consent of instructor. Applied research within the practice of leisure studies.

5053* Research Design in Leisure, Health and Human Performance. Prerequisite: PSYC 5303 or STAT 5013 or equivalent. Research design with applicability toward leisure, health and human performance. Conceptual understanding of theory, tools and processes involved in designing research.

5403* Interpretation in Leisure Services. Organization and administration of visitor centers and interpretive naturalist programs, philosophic approaches, and methods for interpreting the natural and cultural history of public parks and recreation areas.

5413* Organization and Administration of Leisure Services. Systematic approach to problem solving and decision making for structure, personnel management, finance and program development for leisure service delivery systems.

5443* History and Philosophy of Leisure. Contributions of recreation and leisure and its effect on humans throughout history. Additional philosophic foundations in relation to current times.

5453* Social Psychology of Leisure. Inquiry into the understanding of human behaviors, thoughts and attitudes related to leisure, and the understanding of complex issues related to the social psychology of leisure.

5463* Issues in Therapeutic Recreation. Prerequisite: LEIS 2433 or professional experience in therapeutic recreation. Current issues in therapeutic recreation with emphasis on accreditation, certification, licensure, quality assurance and ethics.

5473* Leisure and Aging. Prerequisite: 2433 or consent of instructor. Overview of the leisure needs and services for older adults, with emphasis upon the delivery system and leisure interventions.

5483* Therapeutic Recreation for Persons with Physical Disabilities. Prerequisite: 3483 or consent of instructor. Role of therapeutic recreation in the treatment and rehabilitation of individuals with physical disabilities, with emphasis on terminology, prognosis, etiology of specific disabilities, program development and assessment.

5493* Therapeutic Recreation in Mental Health and Mental Retardation. Prerequisite: 3483 or consent of instructor. Role of therapeutic recreation in mental health with emphasis upon client prognosis and methodologies of treatment programs.

6000* Doctoral Dissertation. 1.2-5 credits, maximum 25. Required of all candidates for the Doctor of Philosophy degree. Credit is given upon completion of the dissertation.

6010* Independent Study in Leisure Studies. 1.6 credits, maximum 6. Prerequisite: consent of instructor. Supervised readings, research or study of trends and issues related to leisure studies.

6013* Professional Issues in Leisure Studies. Prerequisite: admission to the Graduate College. Introduction to higher education issues relevant to professional preparation in leisure studies curricula, including roles of the educator, curriculum development, implementation and management, instructional strategies, and accreditation.

6020* Leisure Research Colloquium. 1-3 credits, maximum 6. Prerequisite: doctoral standing. Exploration and presentation of selected topics and research in leisure studies.

6023 Special Topics in Leisure Studies. Prerequisite: admission to the Graduate College. Special topics related to recreation, parks and leisure studies. Investigation, discussion and analysis of contemporary topics.


Library Science (LBSC)

1011 Library and Internet Information Competencies. Introduction to the organization, retrieval and evaluation of information found in research libraries and on the Internet. Development of information-seeking competencies using both print resources and electronic databases.

3050 The School Library and Learning Resources Center in the Curriculum. 2-5 credits, maximum 5. Lab 1-3. Designed for teachers. Importance and effective utilization of the centralized school library media center in the teaching-learning process, evaluative selection tools of print and nonprint media, and reading and reading guidance tools. Initial course is 2 credit hours. In addition, storytelling and field experience credits are available for 1-3 credit hours.

4113* Reference Materials. Selection, evaluation and use of basic reference materials most commonly used in all types of libraries; the organization of reference service; interpretation of reference questions.

4313* Young Adult Literature. Survey of print and non-print materials, including multicultural and multi-ethnic materials, for young adults from middle school through high school. History, criticism, selection and evaluation of young adult literature and exploration of its relation to the needs and interests of young people. Same course as CIED 4313.

4414* Introduction to Cataloging and Classification. Basic principles of cataloging, with practice based on functional application of current codes and manuals recognized by the profession.

Management (MGMT)

3013 Fundamentals of Management. Management principles and practices of analysis, decision making as applied to management systems, organizations, interpersonal relationships and production. Does not apply to a College of Business Administration major.

3123 Managing Behavior and Organizations. Prerequisites: STAT 2023 or equivalent; junior standing. Managing behavior and organizations with an emphasis on performance. Process differences and performance expectations at the individual, team and organizational levels. Understanding of the components and dynamics of managerial and organizational behavior with the emphasis on management applications.

3133 Management Performance Development. Prerequisite: 3123. The study of personal, interpersonal and group factors relating to managerial performance. An integration of the theory and practice of management.

3313 Human Resource Management. Prerequisite: admission to the Graduate College. Supervised readings, research or study of trends and issues related to human resource management. Focuses upon the functions of a human resource management department.

4123 Labor Management Relations. Prerequisite: 3013. Labor relations and collective bargaining. Negotiation and administration of labor agreements and employee relations in nonunion organizations. Modes of impasse resolution.

4133* Compensation Administration. Prerequisites: 3313; STAT 2023. Introductory course. Fundamentals of compensation such as the legislative environment, compensation theories, job analysis, job evaluation, wage structures and indirect compensation programs.

4213* Managing Diversity in the Workplace. Diversity in the workplace as a business issue that affects performance. Companies’ adaptation and alignment with the population they serve or represent. The development of a cohesive workforce made up of individuals who differ in gender, age, race and national origin.

4313* Organization Theory and Development. Prerequisite: 3123. The design of formal organizations with an emphasis on topics related to organizational and managerial effectiveness. Focus on what is known about managerial and organizational effectiveness and how this knowledge may be applied.
4413 Change Management. Prerequisite: 4313 or equivalent. Managing organizational change and redesign. The study of organizational change processes and the enhancement of performance through change management. Study of the body of knowledge and applications in this branch of organizational science.

4533* Managing the Electronic Commerce Enterprise. Prerequisites: 5113 and admission to the MBA, MSM, or MS in MIS/IS/IAS program or consent of instructor. Organizational issues faced by nascent internal electronic commerce enterprises and traditional "brick & mortar" organizations as they navigate their worlds as internet pure-plays or evolve into "click & mortar" organizations. Strategic alliances, experiential organizational forms, and organization of human resource systems.

4613 International Management. Prerequisite: 3013 or equivalent. Human resource management of international operations of business firms. Exploration of major cultural, economic and political systems, and their effects on the management function.

4713* Conflict Resolution in Industry. Prerequisite: 3013. An integrated and interdisciplinary approach to the issues of industrial conflict and conflict resolution. An analytical development stressing both theory and empirical research. Models of conflict; conflict between the individual, the group and the organization; economic conflict and industrial conflict.

4813* Advanced Human Resource Management. Prerequisite: 3313. Management of human resources at the organization level including employee relations law and human resource planning.

5113* Management and Organization Theory. Prerequisite: admission to MBA program or consent of MBA director. Contemporary theories of organization, structure and dynamics of organizational goals and environments.

5123* Organizational Design and Research. Prerequisite: admission to MBA program or consent of MBA director. An analysis of research which introduces the management of organizations. Reviews empirical research findings and stresses methods of organizational analysis; design and modification of organizations.

5213* Seminar in Organizational Behavior. Prerequisite: admission to MBA program or consent of MBA director. Current research on group behavior in organizations. Group processes and structural factors affecting the interaction process and intra- and intergroup performance characteristics. Laboratory simulation and team research projects used to pursue advanced topics.

5223* Seminar in Human Resource Management. Prerequisite: 5113 or consent of instructor. Principles, theories and methods of human resource management applied to various types of organizations. Human resource functions of planning, staffing, training and development, performance management, compensation and benefits, safety and health, and labor relations.

5333* Structural Equation Modeling Applications in Business. Prerequisites: doctoral student standing and consent of instructor. Conceptual and statistical underpinnings of structural equation modeling and application to organizational and business research including measurement development and model testing. Recent advances in this technique. Hands-on experience with structural equation modeling software.

5553* Management of Technology and Innovation. Prerequisite: MBA core courses or consent of instructor. Business applications of research, practice, and theory in the management of technology and innovation. To improve the effectiveness by which technologies are developed, implemented, and institutionalized. Emphasizes both management with advanced technologies and strategic management of technology.

5713* Labor Relations and Collective Bargaining. Prerequisite: admission to MBA program or consent of MBA director. A first course in labor relations. The industrial relations system, collective bargaining, labor legislation, the economic effects of unionization and other contemporary labor relations issues.

6313* Advanced Organizational Behavior. Prerequisites: doctoral standing and consent of instructor. Theory and research focusing on individual and group behavior in organizations. Both classic and contemporary topics in organizational behavior, including work attitudes, motivation, job design, leadership, group processes, power and politics, and individual differences.

6323* Advanced Strategic Management. Prerequisite: doctoral student standing and consent of instructor. Research concerning the content of organizational strategy and the process through which it is formulated and implemented.

6333* Meso Organization Studies. Prerequisites: doctoral student standing and consent of instructor. Research concerning the content of organizational strategy and the process through which it is formulated and implemented.

6343* Contemporary Research in Management. Prerequisites: doctoral student standing and consent of instructor. Specialized contemporary topics in management for doctoral students.

6353* Advanced Methods in Management Research. Prerequisites: doctoral student status and consent of instructor. Course examines issues in theory building and development, strategies for collecting behavioral research. At conclusion of course, student should be able to: develop research questions, develop appropriate measures for constructs to be tested, and design research study using various methodologies.

Management Science and Information Systems (MSIS)

2103 Business Computer Concepts and Applications. Prerequisites: 30 credit hours and MATH 1513. Computer concepts, terminology, and software applications. Overview of hardware and software components, file structures, management information systems, futuristic trends, database management systems, systems analysis and design, and data communications. Introduction to database management, spreadsheet, and word processing software application packages and application programming.

2203 Computer Programming for Business. Prerequisite: 2103 or CS 2113 or equivalent. Computer programs for business applications using the COBOL language. File structures, file updating techniques, sorting, report writing, magnetic tape and disk file handling.

3103 Management Information Systems. Prerequisite: 2103 or equivalent. Information technology (IT) management and the development and use of management information systems in today's business organizations. Use of global IT tools including on-line communication tools, software for data use and integration, and user interface and presentation tools.

3203 Advanced Computer Programming for Business. Prerequisite: 2203. Advanced programming features are examined with an emphasis on the development of computer programs for business application. File processing including magnetic tape sequential files, disk-indexed sequential files, and virtual storage applications are an integral part of the course. Subjects and techniques such as TSO, segmentation, debugging tools and procedures, and pertinent JCL are also studied and applied.

3223* Production and Operations Management. Prerequisite: 2203. Advanced operations research techniques applied to the resource allocation and operational problems encountered in accounting, marketing, finance, economics and management. Linear programming and network models.
3243 Managerial Decision Theory. Prerequisite: 3223. Decision processes under risk and uncertainty. The use of models in business decision making with outcomes governed by probability distributions. Bayesian decision analysis, utility measurements, game theory, Markov chains, correlation and causality, decision trees, and dynamic programming.

3303 Business Systems Analysis. Prerequisites: 2103, 2203, ACCT 2203. Systems analysis as a profession and role of the systems analyst in the analysis, design, and implementation of computer-based business information systems. Current system documentation through use of classical and storage methodologies and approaches and of file management methodologies for businesses.

4013* Data Base Management. Prerequisite: 2103 or equivalent. Theoretical aspects and management of file and data management methodologies for business enterprises.

4113* Systems Design and Development. Prerequisite: 3303, 4013. Business information system design and development with coverage of essential systems analysis techniques. Theory and application of prototyping. Computer-aided software engineering (CASE) and fourth-generation language tools used to develop a functioning business information system. Project management and additional analysis, design and development topics.

4133 Information Technologies for Electronic Commerce. Prerequisites: 3363 and 4013 or consent of instructor. The technologies, systems, and applications that allow organizations to overcome the barriers of time and distance in commerce. Overview of electronic-commerce, security issues including firewall technology, web-based tools for design and implementation, electronic payment methods, the Internet, intranets, and extranets. Applications using current technologies.

4263 Applied Artificial Intelligence. Prerequisite: 2103 or equivalent. Managerial applications of artificial intelligence. Topics include an overview and survey of the major topics in artificial intelligence, such as neural networks, natural language processing, robotics, and vision; expert system concepts and strategies; evaluating tools and techniques; knowledge engineering methodology; building expert systems; project management for expert systems.

4363* Advanced Topics in Systems Development. Prerequisite: 4113. Advanced topics in management information systems development methodologies such as analysis and design of web-based information systems, development and administration of groupware systems, and advanced object-oriented system development methodologies.

4373* Advanced Topics in Management Information Systems. Prerequisite: 2103 or equivalent. Advanced topics such as advanced network management, electronic commerce, international management information systems, and legal and regulatory issues in telecommunications.

4443* Computer-based Simulation Systems. Prerequisites: 3223, completion of lower-division mathematics requirements and a course in a scientific programming language such as FORTRAN, PL/I, or PASCAL. Discrete computer simulation systems using languages such as GPSS, GASP, or SLAM. Cases include queueing, layout planning and evaluation, and financial modeling.

4523* Data Communication Systems. Prerequisite: 3303. Management orientation to decisions necessary in the design, implementation and control of data communications. Transmission service and equipment characteristics, network design principles, data communication software and federal regulatory policy affecting data communication.

5123 Enterprise Resource Planning. Prerequisites: graduate standing and ACCT 5103, ACCT 5113, MSIS 5643, or consent of director of MIS/AIS. Resource planning for today’s global business organizations. Integrated data flow and computer software for enterprise resource planning. Integration of transactional analysis, fundamental accounting practice, financial planning, and supply chain analysis forming the basis for study in this integrated approach to enterprise resource planning. Same course as ACCT 5123.

5133* Advanced Information Technologies for Electronic Commerce. Prerequisites: admission to MBA, MSTM, or MS in MIS/AIS program or consent of instructor. Information technologies that enable electronic commerce, including data base and web technologies and infrastructure, web software, transaction security, business web models, and applications.

5223* Object-oriented Programming Applications for Business. Prerequisites: 5643, graduate standing and computer programming proficiency, or consent of director of MIS/AIS. Object-oriented programming concepts and applications for business in a global environment. Implementation through an appropriate object-oriented programming language.

5303* Quantitative Methods in Business. Prerequisites: admission to the MBA program or consent of MBA director; demonstrated calculus proficiency. Application of quantitative techniques to business problems. Linear programming, transportation and assignment models, goal programming, integer programming, and networks.

5313* Production Operations Management. Prerequisites: admission to MBA program or consent of MBA director. The management of operations in manufacturing and service organizations. Production planning, facility location and layout. Inventory control, waiting line problems and simulation. Project management and quality control. Emphasis is on a management science approach.

5333* Advanced Decision Theory for Management. Prerequisite: admission to MBA program or consent of MBA director. Case studies and examples involving decision analysis. Studies taken from current literature.

5413* Advanced Management Science. Prerequisite: consent of director of MBA program. Advanced management science methods, with computer applications. Mathematical programming, simulation, forecasting, queuing, and Markov processes.

5543* Advanced File and Data Management for Business. Prerequisites: 5223, or consent of director of M.S. in MIS/AIS program. A design perspective of business data storage methodologies and approaches and of file management techniques for business enterprises.

5600* Special Projects in Business Information Systems. 1-3 credits, maximum 3. Prerequisite: consent of the director of the M.S. in MIS/AIS program. Study of advanced topics not covered directly in other classes or directed study under the supervision of a faculty member.

5613* Advanced Production and Operations Management. Prerequisite: 5313 or equivalent. Advanced topics in systems analysis and design. Production system, including a synthesis of production and management techniques used by operations managers. A computerized management simulation game provides decision-making experience.

5623* Advanced Applications in Management Information Systems. Prerequisite: 5643 or consent of director of MIS/AIS program. Design and use of management information systems in businesses and other organizations. Model building, information resource management and decision support systems.

5633* Decision Support and Expert Systems. Prerequisite: BADM 5003 or equivalent. Technical and managerial issues involved in the evaluation, acquisition and implementation of advanced technologies, such as decision support systems, expert systems, artificial intelligence, executive information systems, neural networks and others.

5643* Advanced Data Base Management. Prerequisite: admission to the MBA, MSTM or MS in MIS/AIS programs or consent of director. Advanced theoretical and practical foundations. Brief review of classical issues surrounding design, analysis, and implementation of data bases, both from a micro and a mainframe perspective. Current and emerging issues in the data base field. Analysis, design, and implementation of distributed data bases, the object oriented data model paradigm, the use and management of automated design and support tools (e.g., CASE) from a data base perspective, and data security.
Marketing (MKTG)

3213 Marketing. Marketing strategy and decision-making. Consumer behavior, marketing institutions, competition and the law.

3323 Consumer and Market Behavior. Prerequisite: 3213. Qualitative and quantitative analysis of the behavior of consumers; a marketing consideration of the contributions of economics and the behavioral disciplines to consumer behavior.

3433 Promotional Strategy. Prerequisite: 3213. Promotional policies and techniques and their application to selling problems of the firm.

3473 Professional Selling. Prerequisites: 3213, 3323, 3433. Skills to understanding the professional personal selling process. Strong emphasis on the communications function of personal selling. Lecture sessions combined with experiential exercises and role playing.

3513 Sales Management. Prerequisite: 3213. Sales planning and control, organization of the sales department, developing territories, motivating salespersons and control over sales operations.

3613 Retailing Management. Prerequisite: 3213. Applied research in retailing and marketing and creating a successful new product. Qualitative and quantitative methods will analyze data collected from focus groups, including surveys to test a new product concept.

4113* Marketing Decision Analysis. Prerequisite: 3213. Decision making in a variety of marketing applications to include model building, analysis of courses of action, and development of online information systems. Applications with microcomputers to focus on decision areas such as sales forecasting, media selection, sales force allocation and site location.

4223 Business Logistics and Channel Management. Prerequisites: 3213 and MGMT 3223. An economic and operational analysis of the physical flow of goods and materials. A system interpretation of marketing channels.

4333* Marketing Research. Prerequisite: 3213. Basic research concepts and methods. Qualitative and quantitative tools of the market researcher.

4443* Social Issues in the Marketing Environment. Prerequisite: 3213. Social and legislative considerations as they relate to the marketplace.

4550 Problems in Marketing. 1-9 credits, maximum 9. Prerequisite: 3213. Problems in marketing. Specific topics vary from semester to semester.

4553* (I) International Marketing. Prerequisite: 3213. The conceptual framework for marketing into and from foreign countries. The development of action-oriented strategies with emphasis on the uncontrollable factors that affect marketing decisions in an international setting.

4683 Managerial Strategies in Marketing. Prerequisite: 90 credit hours including 9 credit hours of marketing. Analysis of the marketing management decision process; market opportunity analysis, strategy development, planning and integration with corporate strategy.

4773 Services Marketing. Prerequisite: 3213. Conceptual and managerial tools for students who intend to be involved with the marketing of services. Characteristics of services, listening to customers, managing customer expectations, conceiving and creating service breakthroughs, service quality, positioning of services, managing demand and supply, creating a strategic service vision and designing a customer focused organization to create and retain customers.

4850 Applied Marketing Studies. 1-6 credits, maximum 6. Prerequisites: 12 credit hours of marketing and consent of instructor. Structured internship or field project with supporting academic study.

4973 New Product Development. Prerequisites: 3213, 3433. The entire involved in creating and marketing a successful new product. Qualitative and quantitative methods will analyze data collected from focus groups, including surveys to test a new product concept.

4983 Data Base Marketing. Prerequisites: 3213, 4333, MIS 2103 or consent of instructor. An information-driven process managed by database technology that enables marketers to develop, test, implement, measure, and adopt customized marketing programs and strategies. Mechanisms to manage data (data base technology), techniques for converting data to information (interpretation and summarization), and tools to use for data decision making (statistical as well as artificial neural-based models to make forecasts and do "what if" analyses).

4993 Electronic Commerce and Interactive Marketing. Prerequisite: 5133 or consent of instructor. Digital interactive tools changing the management of markets. The development and impact of electronic interactive marketing for building one-to-one relationships with customers.

5133* Marketing Management. Prerequisite: admission to MBA program. Consideration at an advanced level of the major elements of marketing from the point of view of the marketing executive. Emphasis on problem solving and decision making; using an interdisciplinary approach. Development of an integrated, comprehensive marketing strategy.
6513* Seminar in Marketing Theory. Prerequisite: 5133 or consent of instructor. Development of an evaluation of marketing theory.

6683* Seminar in Marketing Strategy. Prerequisite: 5133 or consent of instructor. Examination of a broad range of marketing management topics from a strategic perspective. Understanding of content, theory and research methods involved in the development of strategic marketing knowledge.

6913* Measurement and Experimental Design. An analysis of measurement issues from both psychometric and marketing perspectives. Scale construction and validation. The design, analysis, and evaluation of marketing experiments.

Mass Communications (MC)

5000* Thesis. 1-6 credits, maximum 6. For mass communication graduate students who are candidates for the master’s degree.

5010* Capstone Project or Creative Component. 1-3 credits, maximum 3. Capstone research project or creative activity for a mass communication graduate student electing not to write a thesis to complete a master’s degree.

5020* Advanced Practicum or Internship in Mass Communication. 1-3 credits, maximum 3. Prerequisites: one semester of graduate course work and consent of instructor. Applied training allowing students to relate theoretical principles to situations in professional settings. Required for students without mass media backgrounds.

5030* Independent Study in Mass Communication. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Independent study, directed readings or project development in mass communications to fit the student’s academic and professional interests.

5113* Methods of Research in Mass Communication. Principles and techniques of research; research planning, design and measurement in mass communication.

5223* Mass Communication Research Analysis and Interpretation. Prerequisite: 5113. Single- and multi-variate analysis, interpretation and reporting of mass communication research data. Use of computers in research analysis.

5253* International Mass Communications. Prerequisite: graduate standing. Examination of the nature and flow of news and information within and among nations, states, and societies from a theoretical vantage point grounded in region-specific realities. The political, economic, social, cultural and historical forces determining media practice in a global environment. Meets with JB 4253. No credit for students with credit in JB 4253.

5333* Process and Effects of Mass Communication. Mediating factors that affect interaction of ingredients in the communications process, and how these factors can affect the fidelity of information conveyed.

5520* Specialized Public Relations Applications. 3 credits, maximum 6. Prerequisites: JB 3263 and graduate standing. Professional public relations at an advanced level. Non-profit, corporate, agency, international and other specialized applications. Course content varies by semester. Meets with JB 4520. No credit for students with credit in JB 4520.

5603* Integrated Marketing Communications. Prerequisite: JB 2183 or JB 2013 or MKTG 3213. Concept of planning that recognizes the value of coordinating the various promotional mix elements within a communication campaign to create maximum clarity and impact. Examination of each of these communication elements in depth, including advertising, public relations, direct marketing and sales promotion and examination of strategies for combining and integrating them into an effective campaign. Introduction to computerized communication tools to make better promotional communication decisions. Meets with JB 4603. No credit for students with credit in JB 4603.

5651* Introduction to Graduate Study in Mass Communications. Prerequisite: graduate standing. Orientation to skills necessary for successful completion of graduate work. Training in library research, academic writing and preparation of research reports, familiarization with theoretical concepts and issues associated with mass communication. Required of all mass communication M.S. candidates, and prerequisite to M.S. candidates enrolling in mass communication seminars.

5663* Public, Educational and Instructional Television. Uses of non-commercial television in public, educational and instructional applications. Analysis of program types and content.

5733* Responsibility in Mass Communication. Interaction between media and society, with emphasis upon the communicator’s ethics and responsibilities.

5770* Seminar in Communication Media. 1-3 credits, maximum 3. Prerequisite: graduate standing. International communication, media history, legal research, new technology, women and the media, television and children, industrial television, and communication research.

5863* Media Management. Basic issues, theoretical concepts and operational procedures associated with managing newspapers, magazines, advertising public relations, broadcast and cable companies, and firms specializing in computer-mediated communication. Meets with JB 4863. No credit for students with credit in JB 4863.

5883* Advanced Media Management. Prerequisite: graduate standing. Management concerns in four areas of mass communication practice: public relations, advertising, broadcasting and print journalism. Different emphases offered according to student demand or need.

5913* General Semantics in Mass Communication. Prerequisite: graduate standing. Language as it affects thought and action, with special emphasis on writings of Johnson, Korzybski, Hayakawa, Chase and Lee in relation to communication media.

6513* Seminar in Marketing Theory. Prerequisite: 5133 or consent of instructor. Development of an evaluation of marketing theory.

6683* Seminar in Marketing Strategy. Prerequisite: 5133 or consent of instructor. Examination of a broad range of marketing management topics from a strategic perspective. Understanding of content, theory and research methods involved in the development of strategic marketing knowledge.

6913* Measurement and Experimental Design. An analysis of measurement issues from both psychometric and marketing perspectives. Scale construction and validation. The design, analysis, and evaluation of marketing experiments.

Master of Business Administration (MBA)

5010* Independent Study. 3-6 credits, maximum 6. Prerequisite: admission to MBA program or consent of MBA director. Investigation of advanced research topics or directed study under the supervision of a faculty member. Consent of MBA Graduate Studies Committee required.

5011* Financial Tools: An Overview for Managers. Prerequisite: admission to MBA program. Introduction for managers to fundamental microcomputer tools and concepts. Work group support systems such as spreadsheets, word processing and electronic mail.

5021* Personal Computer Tools: An Overview for Managers. Prerequisite: admission to MBA program. Introduction for managers to fundamental microcomputer tools and concepts. Work group support systems such as spreadsheets, word processing and electronic mail.

5031* Quantitative Tools: An Overview for Managers. Prerequisite: admission to MBA program. Introduction for managers to quantitative tools used in business decision making.

5112* Informing Systems Technologies for Managers. Prerequisite: 5021. Use of various information systems resources available to managers. Database management systems, Internet and telecommunication networks.

5112* Managing Individual and Group Performance. Prerequisite: admission to MBA program or consent of MBA director. Exploration of marketing role in organizations through an examination of the significant marketing decisions required of managers. Management of individuals and small groups in an organizational context. Motivation, goal setting and rewards, leadership styles, conflict resolution, and team building.

5122* Marketing Decisions for Management. Prerequisite: admission to MBA program or consent of MBA director. Exploration of marketing role in organizations through an examination of the significant marketing decisions required of managers. Management of individuals and small groups in an organizational context. Motivation, goal setting and rewards, leadership styles, conflict resolution, and team building.

5122* Marketing Decisions for Management. Prerequisite: admission to MBA program or consent of MBA director. Investigation of advanced marketing management topics through an examination of the significant marketing decisions required of managers. Management of individuals and small groups in an organizational context. Motivation, goal setting and rewards, leadership styles, conflict resolution, and team building.

5132* Internal and External Accounting Information for Decision Making. Prerequisite: 5011. Development of the ability to read and analyze internal and external financial statements and other financial reports. Use of accounting information to make business decisions.

5142* Economic Perspectives for Managers. Prerequisite: 5011. Application of microeconomic theory to managerial decision making. Understanding of government’s role in the regulation of business and industry.


5161* Managing Information Systems. Prerequisite: 5133 or consent of MBA director. Examination of the role of information systems in decision making. Understanding of the uses and management of information systems for organizational use. Decision support systems, executive information systems, and expert systems and their uses. Organizational issues concerning information systems design and development.
5172* Research Methods for Business Decision Making. Prerequisites: 5021, 5031. Application of analytical techniques to business research and decision making. Methods to summarize, analyze, and make inferences from business and industry data.

5182* Quantitative Modeling for Decision Support. Prerequisites: 5021, 5031. Use of modeling techniques to assist managers with decision making. Models illustrated through application to real-world business problems. Understanding advantages and limitations of the methods.


5211* Business Ethics and Social Responsibility. Prerequisite: admission to MBA program or consent of MBA director. Introduction to ethical theory and its relationship to business practices. Meaning and implementation of socially responsible business actions. Provides mid-level managers with an understanding of ethical perspectives adopted by others. Development of tools needed to make ethical decisions.

5221* Public Environment of Business. Prerequisite: admission to MBA program or consent of MBA director. Survey of the external forces that influence and shape the organizational environment. Strategies for forecasting, responding to, and influencing these forces.

5233* Global Competitive Environment. Prerequisite: admission to the MBA program or consent of the director. Development of a global business strategy for the organization. Issues of highly diversified markets and business environments, global competition, financial markets, and complex organizational relationships. Same course as IS 5233.

5240* Managerial Communication Skills. 1-2 credits. Prerequisite: admission to MBA program or consent of MBA director. Identification and analysis of interactive corporate communications: oral, written and interpersonal. Application of communication theories to business situations with the goal of behavior and skill development.

5251* Strategic Concepts. Prerequisite: admission to MBA program or consent of MBA director. Examination of corporate strategy formulation and environmental influences on strategy. Concepts used for analysis and development of corporate strategy. Interplay between strategy and the organization.

5261* Legal Issues in Business. Prerequisite: admission to MBA program or consent of MBA director. Analysis of the basic concepts of public and private law related to business decisions. Overview of the laws affecting private business relationships including employment law, agency laws, and various forms of business organizations.

5303* Corporate and Business Strategy. Prerequisite: admission to MBA program or consent of the director. Key issues in formulating and implementing business and corporate strategies. The orientation of top management and diagnosis of what is critical in complex business situations and realistic solutions to strategic and organizational problems.

5310* Integrative Decision Making II: Cross-Organizational Boundaries. 2-6 credits, maximum 6. Prerequisites: consent of MBA director and completion of minimum of 24 MBA credit hours. Identification and analysis of environmental forces affecting an organization’s ability to compete and survive. Interaction among all corporate functional units. Development of a comprehensive, integrated plan of action for the firm.

5313* Business Systems Integration. Prerequisite: admission to the MBA program or consent of the director. The structure and processes by which businesses apply and integrate functional expertise to meet business opportunities. Utilization of people, operations, management technology, and information systems to preserve and continue viable organizations.

5400* Business Practicum. 1-3 credits, maximum 3. Prerequisites: consent of MBA director and completion of 18 MBA credit hours. Application of knowledge and skills developed in MBA functional courses in an organizational environment. Integration of functional concepts, allowing students to experience the adaptation of concepts to fit organizational reality, and assisting students in understanding ways in which their academic training can help organizations.

5500* Interdisciplinary Inquiry in Business Administration. 1-3 credits, maximum 9. Prerequisite: consent of MBA director. Investigation of various business problems using an interdisciplinary approach. Courses team taught to ensure problems viewed from varying functional perspectives.

5590* MBA Applied Business Report. 3-6 credits, maximum 6. Prerequisite: admission to MBA program or consent of MBA director. Independent investigation of a business problem under the direction of a supervising professor.

Mathematics (MATH)

1023 Intermediate Algebra. Prerequisite: one year of high school algebra or equivalent. Review of fundamental operations of algebra, rational expressions, exponents and radicals, linear and quadratic equations, inequalities, introduction to analytic geometry. Does not count for college credit. Graded on a satisfactory-unsatisfactory basis.

1483 (A) Mathematical Functions and Their Uses. Prerequisite: 0123 or placement into 1513. Analysis of functions and their graphs from the viewpoint of rates of change. Linear, exponential, logarithmic and other functions. Applications to the natural sciences, agriculture, business and the social sciences.

1493 (A) Applications of Modern Mathematics. Prerequisite: 0123 or placement into 1513. Introduction to contemporary applications of discrete mathematics. Topics from management science, statistics, coding and information theory, social choice and decision making, geometry and growth.

1513 (A) College Algebra. Prerequisite: two years of high school algebra or 0123. Quadratic equations, functions and graphs, inequalities, systems of equations, exponential and logarithmic functions, theory of equations, sequences, permutations and combinations. No credit for those with prior credit in 1715 or any mathematics course for which 1513 is a prerequisite.

1613 (A) Trigonometry. Prerequisites: 1513 or equivalent, or concurrent enrollment. Trigonometric functions, logarithms, solution of triangles and applications to physical sciences. No credit for those with prior credit in 1715 or any course for which 1613 is a prerequisite.

1715 (A) College Algebra and Trigonometry. Prerequisite: admission to the MBA program or consent of the director. Survey of the external forces that influence and shape the organizational environment. Strategies for forecasting, responding to, and influencing these forces.

2102 (A) Elementary Calculus. Prerequisite: 1513. An introduction to differential and integral calculus. For students of business and social sciences.

2123 (A) Calculus for Technology Programs I. Prerequisites: 1715 or 1513 and 1613. First semester of a terminal sequence in calculus for students in the School of Technology. Calculus of trigonometric, exponential and logarithmic functions and applications to physical problems.

2145 (A) Calculus I. Prerequisites: 1715, or 1513 and 1613. An introduction to derivatives, integrals and their applications, including introductory analytic geometry. Satisfies the six hour general education Analytical and Quantitative Thought area requirement.

2155 (A) Calculus II. Prerequisite: 2145. A continuation of 2145 including multivariate calculus, series and applications. Satisfies the six hour general education Analytical and Quantitative Thought area requirement.


2653 Discrete Mathematics I. Prerequisite: 1513 or 1715. Logic, set theory proof techniques, probability and combinatorics, relations and functions, matrix algebra graphs, Boolean algebra and lattices.

2910 Special Studies. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Special subjects in mathematics.

2951 Introduction to Problem Solving. Prerequisite: 2145. An introduction to techniques of problem solving with problems drawn from throughout mathematics.
3013* Linear Algebra. Prerequisite: 2145. Algebra and geometry of finite-dimensional linear spaces, linear transformations, algebra of matrices, eigenvalues and eigenvectors.

3263* Linear Algebra and Differential Equations. Prerequisite: 2155. An integrated treatment of linear algebra and differential equations. No credit for those with credit in 2233 or 3013.

3403* Introduction to Modern Algebra. Prerequisite: 1483, 1493 or 1513. Foundations of number theory, algebraic structures, fields and groups.

3603* Introduction to Modern Algebra. Prerequisite: 1463 or 1513. An axiomatic development of Euclidean and non-Euclidean geometries.

3653 Advanced Calculus I. Prerequisite: 2653 or 3613. Algebraic structures, coding theory, finite state machines, machine decomposition, computability, formal language theory.

4003* Mathematical Logic and Computability. Prerequisites: 3613 or PHIL 3000 or 3003 or consent of instructor. An introduction to logic, elementary properties of rings, integral domains, fields and groups.

4013* Calculus of Several Variables. Prerequisites: 2155 and 3013. Differential and integral calculus in functions of several variables, vector analysis, Stokes’ Theorem, Green’s Theorem and applications.

4023* Introduction to Modern Analysis. Prerequisite: 2153, recommended 3613. An introduction to the theory of sets, numerical and the real number system, number theory, algebraic systems, functions and applications, and probability.

4024* Complex Variables. Prerequisite: 4013. Analytic functions, power series, residues and poles, conformal mapping, and applications.

4034* Geometry. Prerequisite: 3013, recommended 3613. An axiomatic development of Euclidean and non-Euclidean geometries.

4143* Advanced Calculus II. Prerequisite: 4143. Continuation of 4143. A rigorous treatment of sequences and series of functions, uniform convergence, differentiation and integration of vector-valued functions, and differential forms.


4513* Real Analysis I. Prerequisite: 4013 or 4023. A rigorous treatment of vector spaces, linear transformations, determinants, orthogonal and unitary transformations, canonical forms, bilinear and hermitian forms, and dual spaces.

4523* Advanced Linear Algebra. Prerequisite: 3013. A rigorous treatment of vector spaces, linear transformations, determinants, orthogonal and unitary transformations, canonical forms, bilinear and hermitian forms, and dual spaces.

5113* Intermediate Probability Theory. Prerequisites: 2233, 3013 and STAT 4113. Definition of stochastic processes, probability structure, mean and covariance function, the set of sample functions, stationary processes and their spectral analysis, renewal processes, counting analysis, renewal processes, counting processes, discrete and continuous Markov chains, birth and death processes, exponential model, queuing theory. Same course as STAT 5113.

5133* Computational Mathematics. Prerequisites: 2233, 3013 and STAT 4113. Definition of stochastic processes, probability structure, mean and covariance function, the set of sample functions, stationary processes and their spectral analysis, renewal processes, counting analysis, renewal processes, counting processes, discrete and continuous Markov chains, birth and death processes, exponential model, queuing theory. Same course as STAT 5113.
5283* Complex Analysis I. Prerequisite: 4143. Basic topology of the plane, functions of a complex variable, analytic functions, transformation, infinite series, integration and conformal mapping.

5293* Complex Analysis II. Prerequisite: 5283. Riemann Mapping Theorem, meromorphic functions, analytic continuation, Dirichlet problem, and entire functions.

5303* General Topology. Prerequisite: 4143 or consent of instructor. Basic properties of topological spaces and continuous functions, including connectedness, compactness, and separation and countability axioms. Metric, product, and quotient spaces, Urysohn lemma, and Tietze extension theorem.

5313* Geometric Topology. Prerequisites: 4613, 5303. Manifolds, complexes, the fundamental group, covering spaces, combinatorial group theory, the Seifert-Van Kampen theorem, and related topics.

5413* Differential Geometry. Prerequisite: 4013 or 4143. Differential manifolds, vector fields, differential forms, connections, Riemannian metrics, geodesics, completeness, curvature, and related topics.

5523* The Calculus of Variations and Optimal Control. Prerequisite: 4023 or 4143. Extrema of integrals depending on unknown functions. Euler conditions, Hamilton-Jacobi equations, Weierstrass E-function, Pontryagin maximum principle, bang-bang controls, feedback, stochastic problems and Kalman-Bucy filter.

5543* Numerical Analysis for Differential Equations. Prerequisites: 4513 or CS 4513, and 4233. Advanced machine computing, algorithms, analysis of truncation and rounding errors, convergence and stability applied to discrete variables, finite elements, and spectral methods in ordinary and partial differential equations. Same course as CS 5543.

5553* Numerical Analysis for Linear Algebra. Prerequisites: 3013, and 4513 or CS 4513. Advanced machine computing algorithms, analysis of rounding errors, condition, convergence, and stability applied to direct and iterative solution of linear systems of equations, linear least squares problems, and algebraic eigenvalue problems, including LU and QR factorization, conjugate gradients, QR algorithm, and Lanczos methods. Same course as CS 5553.


5613* Algebra I. Prerequisite: 4613. A rigorous treatment of classical results in group theory and ring theory.

5623* Algebra II. Prerequisite: 5613. A rigorous treatment of classical results in module theory and field theory.

5653* Automata and Finite State Machines. Prerequisites: 413 or CS 5513 or CS 5113 and CS 5213. Finite state model, state diagrams and flow tables, equivalent states and equivalent machines. Formal grammars, context-free languages and their relation to automata. Turing machines, and recursive function. Same course as CS 5653.

5663* Computability and Decidability. Effectiveness, primitive recursive, general recursibility, recursive functions, equivalence of computability, definitions, decidability, recursive algorithms. Same course as CS 5663.

5902 Seminar and Practicum in the Teaching of College Mathematics. Prerequisite: graduate standing in mathematics or consent of instructor. Topics in college mathematics teaching and learning, including assessment, grading, and exam preparation. Adapt to classroom activities to better serve different types of learners. Current trends in mathematics education such as calculus reform, cooperative learning, and technology in the classroom.


6101* Advanced Seminar in Mathematics. 1-3 credits, maximum 12. Prerequisites: consent of instructor and student's advisory committee. Directed reading on advanced topics in mathematics.


6143* Functional Analysis I. Prerequisites: 4613 or 5023, 5153, 5503. Theory of topological vector spaces including metrizability, convergence of completeness, Banach spaces, weak topologies, and convexity.

6153* Functional Analysis II. Prerequisite: 6143 or consent of instructor. Introduction to and basic results in several subfields of analysis which employ functional analytic methods. Topics from bounded and unbounded operator theory, Banach algebras, distributions, Fourier analysis, and representation theory.

6213* Harmonic Analysis. Prerequisites: 5153, 5283. Classical results giving connections among the size of a harmonic or analytic function on a complex domain, the existence and smoothness of its boundary values, and behavior of the Fourier series; selected extensions, related topics and applications.


6283* Several Complex Variables. Prerequisite: 5283. Elements of function theory of several complex variables, including extension phenomena, domains of holomorphy, notions of convexity, holomorphic maps, and complex analytic varieties.

6290* Topics in Analysis. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in analysis.

6293* Algebraic Topology I. Prerequisite: 5313. Chain complexes, homology and cohomology groups, the Eilenberg-Steenrod axioms, Mayer-Vietoris sequences, universal coefficient theorems, the Eilenberg-Zilber theorem and Künneth formulas, cup and cap products, and duality in manifolds.

6333* Algebraic Topology II. Prerequisite: 6293. Homotopy groups, the Hurewicz and Whitehead theorems, Eilenberg-MacLane spaces, obstruction theory, fibrations, spectral sequences, and related topics.

6390* Topics in Topology. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in topology.

6433* Algebraic Geometry. Prerequisite: 5623. Affine and projective varieties, dimension, algebraic curves, divisors, and Riemann-Roch theorem for curves.

6453* Combinatorics and Graph Theory. Prerequisite: 5283. Combinatorial problems, generating functions, recurrence relations, graph theory, and related topics.

6490* Topics in Geometry. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in geometry.

6513* Theoretical Numerical Analysis. Prerequisites: 5153, 5543 or CS 5543, and 5553 or CS 5553. Advanced theoretical treatment based on function spaces and operator theory of algorithms for machine computing and analysis of errors.

6590 Topics in Applied Mathematics. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in applied mathematics.

6613* Communicative Algebra. Prerequisite: 5623. Commutative rings, exactness properties of modules, tensor products, integral dependence, chain conditions, completions, filtrations, local rings, dimension theory, and flatness.

6623* Homological Algebra. Prerequisite: 5623. Closed and projective classes, resolution and derived functors, adjoint theorem, construction of projective classes in the categories of groups, rings and modules; categories, Abelian categories.
6713* Analytic Number Theory. Prerequisite: 4283 or 5283. Arithmetic functions, Zeta and L functions, distribution of primes and introduction to modular forms.

6723* Algebraic Number Theory. Prerequisite: 5013 or 5623. Number fields, ideal theory, units, decomposition of primes, quadratic and cyclotomic fields, introduction to local fields.

6790* Topics in Number Theory. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in number theory.

6813* Lie Groups and Representations. Prerequisites: 4153, 4613, 5303. Differentiable manifolds, vector spaces, Lie groups, exponential map, homogeneous spaces, representations of compact Lie groups, and maximal tori.


6890* Topics in Representation Theory. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in representation theory.

6990* Topics in Collegiate Mathematics Education. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Advanced topics in collegiate mathematics education.

3033 Engineering Design. Lab 2. Prerequisite: ENGR 1322; corequisite: IEM 3503. Design methodology and practice. Design process, with emphasis on the broad range of technical, economic, and societal factors considered in design decision making. Designing and building a machine to participate in a design competition.

3043 Mechanics of Machinery. Prerequisites: ENSC 2122, MATH 2233. The kinematics and kinetics of rigid bodies sub-jected to planar and spatial loads. Analysis of mechanical components such as gears, bearings, and shafts. Euler's equations to examine gyroscopic motion. The design of gears and gear trains; Analytical design of cam profiles. Multi-degree of freedom machine systems through the application of the Lagrange equation.

3113 Measurements and Instrumentation. Lab 3. Corequisites: 3403, 5723. Application of basic economic laboratory measurement equipment. Selection and testing of transducers for measurement of displacement, time frequency, velocity, pressure, force, temperature, flow-rate, and vibration, for machine design applications. Considerations of accuracy, uncertainty and repeatability. Design projects involving the use of analog and digital integrated circuits and construction of prototype sensors. Practice in the use of signal processing including digital filtering and applications of Fast Fourier Transform theory. Practice in the use of computer-based data acquisition systems. Preparation of formal reports, including the presentation of plots, figures and tables.

3123 Manufacturing Processes. Prerequisites: ENSC 2142 and ENSC 3313 or equivalent. An introduction to manufacturing processes including the fundamental processes of casting, forging, rolling, extrusion, drawing and metal cutting. Quantitative relationships to identify important parameters which influence a given process.

3223 Thermodynamics II. Prerequisite: ENSC 2213. A continuation of ENSC 2213. Irreversibility and availability, power cycles, refrigeration cycles, mixtures and solutions, chemical reactions, phase and chemical equilibrium, and introduction to compressible flow.


3293 Compressible Fluid Flow. Prerequisites: ENSC 2213, 3233, MATH 2233. Gas flows in one and two dimensions. Basic thermodynamic and dynamic equations. Nozzle and duct flows, choking, plane and oblique shock waves, Prandtl-Meyer expansions, rocket propulsion, frictional high-velocity flows and heat addition effects. Two-dimensional ideal fluid flow, stream function, velocity potential, linearized flows and method of characteristics.

3323 Mechanical Design I. Prerequisites: ENSC 2116, ENSC 2216. Introduction to the design process. Consideration of reliability, factors of safety, product liability, and economics. Use of codes, standards, and other design resources. Design stress, fatigue, failure theories for mechanical components such as beams, rings, cylinders, and shafts. Analysis of stiffness and deflection of straight and curved beams, columns, and links. Consideration of stress, failure theories for various types of engineering materials. Application of fatigue analyses in the design process.


3723 Systems I. Prerequisites: ENSC 2122, 2613 and MATH 2233. Physical and mathematical modeling of electrical and mechanical dynamic systems. Transient response of first- and second-order systems. Laplace transform technique for solving differential equations; transfer functions, frequency response and resonance. Same course as ECEN 3723.

4010* Mechanical Engineering Projects. 1-6 credits, maximum 6. Lab variable. Prerequisite: consent of instructor. Special projects and independent study in mechanical engineering.

4053* Automatic Control Systems. Prerequisite: 3113. Properties of feedback control systems, mathematical models of dynamic components, state-variable models of feedback systems, design specifications of control systems, time-domain analysis, stability, stability robustness, transformation of analyses, root-locus design of single-input-single-output systems and compensation techniques for engineering systems. Same course as ECEN 4413.


4223* Aerospace Engineering Laboratory. Lab 3. Prerequisites: 3113, 3253, 4283. Experimental study of aerospace principles including topics in aerodynamics and flight mechanics, state-of-the-art instrumentation, diagnostics, and computerized data acquisition equipment and techniques applied to experiments including application of low speed wind tunnel testing techniques, rocket propulsion and control-flight experiments, fundamentals of supersonic nozzle flows, and flight test evaluation of performance, stability, control, and handling qualities of a propeller-driven airplane.

4243* Gas Power Systems. Prerequisites: 3223 and ENSC 3233. Power and propulsion engines utilizing a gas as the working fluid. Thermodynamic and dynamic equations of one-dimensional compressible flow, including shock waves. Design and analysis of overall aircraft engine systems and individual components of the aircraft engine, as well as engine component matching, using design software packages. Centrifugal and axial flow turbines and compressors.

4263* Vapor Power Systems. Prerequisites: 3223, 3253. Vapor power cycles, combustion processes applied to power production, power plants, and auxiliary systems associated with power plants. Overall design of power plants as well as component design. Power system economics and loan analysis. Extensive use of software design and analysis packages.

4273* Experimental Fluid Dynamics. Lab 3. Prerequisites: 3113 and ENSC 3323. Experimental study of basic and applied fluid dynamics systems with comparisons to analytical predictions. Fluid dynamics instrumentation, digital data acquisition and processing, design of facilities and experiments, technical report writing and design project with experimental verification.

4323* Design for Manufacturing. Lab 3. Prerequisite: 3123. Integration of concepts of product design with principles of engineering; behavior and properties of material, stress analysis, heat transfer and lubrication. Processing techniques and economics. Emphasis on analysis requirements and applications of processing parameters and design variables, in CAD/CAM.

4333* Mechanical Metallurgy. Lab 2. Prerequisite: ENSC 3313. Mechanical deformation processes and strengthening mechanisms in engineering materials. Material failure modes including creep, fatigue, stress corrosion, ductile and brittle fractures.

4344* Design Projects. Lab 4. Prerequisites: 3033, 3113, 3323. Students work in small teams on a semester-long design project sponsored by a company, agency, or individual. Team members work with mentors from sponsors and with faculty members in fields related to their topics. Presentations on safety, patent law, product liability, report writing, oral presentations, scheduling and ideation. Oral presentations, progress reports, and a professional log book documenting personal activity and contributions.

4353* Mechanical Design II. Prerequisites: 3033, 3123 or 4333, 3323. Design of power transmission systems, including belts, chains and gears. Selection and application of hydraulic and pneumatic components in machine design applications. Selection of electric motors, actuators, encoders, and related electronic components. Design practice in the form of short projects integrating segments of the course.

4363* Experimental Methods in Design. Lab 6. Prerequisites: 3131 and 3323. Laboratory techniques for the experimental analysis of vibrate, stress, force and motion. Projects involve the use of strain gages, brittle lacquer techniques, reflection and transmission polariscopes, load cells and accelerometers.

4374* Aerospace Systems Design. Lab 4. Prerequisites: For aerospace engineering: 4243, 4283, MAF 4513. Design of power transmission systems, same as 4344. For all others, consent of instructor. Multidisciplinary design of aerospace vehicles. Multidisciplinary teams that work on a semester-long project that includes the design, construction, and flight test of an aerospace vehicle optimized for a given set of requirements. Teamwork, leadership and presentation skills emphasized. Students from all appropriate fields are encouraged to enroll.

4401 Seminar. Prerequisite: senior standing. Group discussions on professional aspects of engineering including ethics and legal concerns. Preparation of written and oral reports on selected and assigned topics.

4513* Aerospace Structures I. Prerequisite: 3323. Design and analysis of flight structures. Topics from two of the following: three-dimensional elasticity, behavior of composite materials. Stress and deformation analysis of thin-skinned stiffened structures. Introduction to the finite element method and its applicability in the design process.

4703* Design of Indoor Environmental Systems. Prerequisites: 3223, 3233. Design of heating, ventilating and air conditioning systems. Calculation of heating and cooling loads.

4713* Thermal Systems Design, Simulation and Optimization. Prerequisites: 3233, 3223; ENSC 3550 co-requisite MAF 3403. Design, modeling, simulation and optimization of thermal systems. Analysis and modeling of components such as fans, pumps, ducts, pipes, fittings, heat exchangers, compressors, thermal storage equipment.

4733* Dynamic Systems Design. Prerequisites: 3033, 3113. Design of dynamic engineering systems, formulation of design specifications, characterization and selection of development for dynamic engineering systems including sensors and actuator elements, considerations of passive, active, open-loop and closed-loop solutions; use of components and microcontrollers as part of dynamic engineering systems, design practice with open-ended design projects integrating the various components of the course.

5000* Thesis. 1-6 credits, maximum 6. A student studying for a master’s degree who elects to write a thesis must enroll in this course.

5010* Mechanical Engineering Projects. 1-12 credits, maximum 12. Project in research or design selected by the student, or assigned by the instructor. A student who wishes to complete a master’s degree under Plan III must enroll in this course.

5030* Engineering Practice. 1-12 credits, maximum 12. Prerequisites: senior or graduate standing and consent of instructor. Solution of real-life engineering design and development problems in an actual or simulated industrial environment. Activities include application of design and testing procedures, economic evaluation and presentation of oral and written reporting on one or more assigned problems. Activities must be approved in advance by the adviser.

5043* Advanced Dynamics. Prerequisites: 3043, MATH 3013. Advanced treatment of analytical methods for rigid body motion with emphasis on multi-dimensional motion. Newtonian formulations, Lagrange’s equations, Euler’s equations, the Poinscott construction, Hamilton’s equations, Canonical transformations, spin stabilization, the rotation matrix, and Kane’s formulations. Applications to engineering problems.

5073* Advanced Mechanical Vibrations. Prerequisite: 4083. Knowledge of instructor. Analysis of nonlinear vibrations, classical analysis of continuous systems and numerical methods.

5083* Engineering Acoustics. Acoustical analysis and measuring techniques, with emphasis on design applications for noise and vibration control in machinery and in buildings.

5093* Numerical Engineering Analysis. Prerequisites: basic FORTRAN programming. Practical digital methods for obtaining steady-state and transient solutions to lumped and distributed mechanical, fluid and thermal problems.

5123* Metal Cutting. Prerequisite: ENSC 3313. Understanding the fundamental principles and practice (mechanics and material aspects) of machining and grinding of materials. Historical aspects, physics of metal cutting, mechanics of machining (orthogonal and oblique), shear stress and shear strain in machining, dendrometry; tool materials, tool wear, tool life, and machinability; vibrations in machining; thermal aspects of machining; tool wear; tool materials; surface finish accuracy and surface integrity, and grinding.

5133* Mechanical Behavior of Materials. Prerequisite: ENSC 3313 or equivalent. A unified approach to the behavior and response of engineering materials to applied loads. Mechanical and metallurgical fundamentals of deformation processes. Spatial scales of atomic physics, micromechanics and continuum mechanics.

5143* Tribology. The principles of tribology. Definition of tribology, contact of solids, surface topography, real area of contact, friction of various materials, basic mechanisms of friction, mechanisms of wear (adhesion, abrasion, fatigue, erosion, and fretting), hardness of solids, frictional heating and surface temperatures, material properties that influence surface interactions, surface roughness measurement, surface integrity - residual stresses and subsurface deformation, application of tribology to manufacturing, wear resistant materials, wear resistant coatings, experimental methods in tribology, surface analytical tools in tribology, scanning tunneling microscopy/atomic force microscopy, wear monitoring and wear predictions, and systems approach to tribology.

5153* Precision Engineering I. Prerequisite: graduate standing or consent of instructor. An integrated approach to underlying engineering principles, experimental product and process designs requiring accuracies typically better than 1 part in 10^6. Design and control of precision machines and instruments, dimensional and surface metrology, scanning probe microscopy, ultra-precision machining and grinding, and precision assembly.


5323* Plasticity and Metal Forming. Prerequisite: ENSC 2114 or equivalent. Basic theory of plasticity and application of plastic forming processes. Application of computer-aided design (CAD) and computer-aided manufacturing (CAM) techniques in part and tool design and manufacture.

5373* Instrumentation. Lab 2. Analysis and design of instrumentation systems, laboratory experiences with electronic instrumentation and transducers, application of digital and analog integrated circuit components to measurement problems.

5403* Computer-aided Analysis and Design. Prerequisite: basic FORTRAN programming. Theory, application and implementation of digital-computer-oriented algorithms for the synthesis, simulation, analysis and design of engineering systems. Advanced FORTRAN methods for optimization, simulation and data analysis. Implementation of these methods uses program libraries, batch processing, remote terminals and graphic display units.


5463* Nonlinear System Analysis and Control. Prerequisite: 4053 or ECEN 4413. Failure of superposition effects; phase-plane analysis; limit-cycles; Lyapunov stability; hyperstability and input-output stability; controllability and observability of nonlinear systems; feedback linearization; robust nonlinear control system design. Same course as ECEN 5463.


5483* Digital Data Acquisition and Control. Prerequisite: 4053 or ECEN 4413. Use of microcomputers operating in real-time applied to engineering systems for data acquisition and control, use of analog to digital, digital to analog, and digital input/output, synchronous and asynchronous programming. Competence in the engineering use of microcomputers through lectures and laboratory applications. Same course as ECEN 5483.

5493* Software Design for Real-time Distributed Systems. Prerequisite: 4053 or ECEN 4483 or consent of instructor. Fundamental concepts associated with the design of software for implementation on distributed computer systems using real-time operating systems. Parallel computing in a real-time environment and control algorithm design. State-of-the-art boards including analog-to-digital and digital-to-analog equipment and newest computer-aided software engineering tools. Same course as ECEN 5493.

5513* Stochastic Systems. Prerequisites: ECEN 3513 and 4503 or STAT 4033 or MAE 4033 or consent of instructor. Theory and applications involving probability, random variables, functions of random variables, and stochastic processes, including Gaussian and Markov processes. Correlation, power spectral density, and nonstationary random processes. Response of linear systems to stochastic processes. State-space formulation and covariance analysis. Same course as ECEN 5513.

5523* Estimation Theory. Prerequisite: 5513 or ECEN 5513. Stochastic model development, parameter estimation and state estimation. The linear model, model order determination, least squares estimation, maximum likelihood estimation, Bayesian estimation. Gaussian random vectors, estimation in linear and Gaussian models, state estimation, the Kalman filter, prediction and smoothing. Same course as ECEN 5523.

5533* Analysis of Structural Systems. Prerequisite: 3233. Computer-oriented matrix methods in the analysis of linear structural systems; static energy principles; matrix equations for static and dynamic analyses of elastic systems; stability.


5553* Fatigue and Fracture Mechanics. Prerequisite: 4333 or consent of instructor. Fracture processes in engineering materials including design considerations, failure avoidance and predictability. Fatigue processes and high-strength, toughness-limited materials. Same course as CIV 5553.


5583* Corrosion Engineering. Lab 2. Prerequisite: ENSC 3153. Modern theory of corrosion and its applications in preventing or controlling corrosion damage economically and safely in service.

5593* Theory of Viscoelasticity. Prerequisite: consent of instructor. Advanced stress analysis in solids exhibiting time-dependent behavior. Material characterization and thermodynamic foundations of the constitutive behavior of time-dependent materials such as polymers, solid propellants and metals near their melting points; time-temperature; superposition principle for thermo-rheologically simple materials; correspondence principle for linearly viscoelastic and associated linearly elastic solutions; integral formulation for quasistatic boundary value problems; treatment of time-varying boundary conditions such as moving boundaries and moving loads; linearly viscoelastic stress waves and approximate methods of linearly viscoelastic stress analysis.

5633* Advanced Thermal Systems. Prerequisites: 3223, 3233, ENSC 3233. Analysis, design, simulation and optimization of thermal systems. Engineering applications to HVAC systems, refrigeration systems, ground-source heat pump systems.

5703* Optimization Applications. Prerequisite: graduate standing. A survey of various methods of unconstrained and constrained linear and non-linear optimization. Applications of these methodologies using hand-worked examples and available software packages. Intended for engineering and science students. Same course as CHE 5703, ECEN 5703 and IEM 5023.

5713* Linear Systems. Prerequisite: graduate standing or consent of instructor. Introduction to the fundamental theory of finite-dimensional linear systems with emphasis on the state-space representation of systems; linear dynamic solutions; controllability, observability, and stability; linearization and realization theory; and state feedback and state observation. Same course as CHE 5713.

5723* Neural Networks. Prerequisite: graduate standing. Introduction to mathematical analysis of networks and learning rules, and on the application of neural networks to certain engineering problems image and signal processing and control systems. Same course as CHE 5753 and ECEN 5733.


5773* Intelligent Systems. Prerequisite: 5733 or ECEN 5733. Introduction to the state-of-the-art in intelligent control and system successfully deployed to industrial and defense applications. Emerging intelligent algorithms (e.g., bottom-up, top-down, semi-recursion); reinforcement learning and hybrid systems; and case studies and design projects. Same course as ECEN 5773.

5803* Advanced Thermodynamics I. Prerequisite: 3233. A rigorous examination of the fundamental principles of engineering thermodynamics, including the First Law of Thermodynamics, maximum work, Carnot cycle and related processes in problems of practical interest. A general-purpose computer program used to demonstrate the capabilities of the numerical method through a wide variety of engineering problems.

5873* Advanced Indoor Environmental System. Prerequisite: 4703. Heating, air-conditioning, ventilation and refrigeration systems. System and component analysis, design and simulation.

5913* Ideal-fluid Aerodynamics. Prerequisite: ENSC 3233 or equivalent. Principles of inviscid, incompressible flow. Small disturbance theory for flow about airfoils and wings. Two and three dimensional panel methods. Introduction to unsteady and compressibility effects.

5923* Guidance and Control of Aerospace Vehicles. Prerequisite: 4053 or ECEN 4413 or equivalent. Navigation, guidance and attitude control of aircraft, launch vehicles and spacecraft. Inertial navigation mechanisms and error analysis. Stability augmentation systems.

5933* Aeroelasticity. Prerequisite: graduate standing or consent of instructor. Interaction between fluid dynamic, inertial and elastic forces. Development of analytical and computational methods for analysis. Application to a broad range of problems in engineering.

6000* Research and Thesis. 1-15 credits, maximum 30. Prerequisites: consent of the head or the graduate committee of the School and approval by the student’s advisory committee. Independent research under the direct supervision of a member of the graduate faculty. For students pursuing study beyond the level of the M.S. degree.

6010* Advanced Study. 1-12 credits. Prerequisite: approval of the student’s advisory committee. Study and investigation under the supervision of a member of the faculty along lines of interest well advanced of and supported by the 5000-series courses.

6123* Non-traditional Machining. Prerequisite: consent of instructor. Rationale for non-traditional machining; various non-traditional machining processes including electro-discharge machining, electro-chemical machining, plasma arc, microwave, and laser assisted processing, waterjet (abrasive) cutting, ultrasonic machining, chemical machining, thermal assisted processing, and electron beam machining.

6133* Surface Mechanics. Prerequisite: consent of instructor. Models and solutions basic to surface studies. Equations of continuum mechanics, thermodynamic formulations, sliding interface, elasticity, plasticity. Applications of solution techniques to surface, surface layer and interface phenomena.

6143* Thermal Analysis of Manufacturing Processes. Prerequisites: graduate standing and consent of instructor. Thermal analysis of various moving heat source problems encountered in a variety of manufacturing processes including machining, grinding, polishing, casting, welding, energy beam cutting and other tribological applications such as meshing of gears, cams, bearings. Analysis of both transient and steady state conditions.

6233* Turbulent Fluid Dynamics. Prerequisite: 5233. Isotropic turbulence, turbulent wakes and jets, boundary layer shear flows, transition, hydrodynamic stability and integral calculation methods for turbulent boundary layers.

6263* Computational Fluid Dynamics. Prerequisite: 5233. Steam function-vorticity and pressure-velocity simulations of incompressible and compressible flows. Temperature and concentration solutions. Applications to various external and internal flow problems.

6423* A System Identification. Prerequisites: 5473 or 5713 or ECEN 5473 or ECEN 5713. Linear and nonlinear system modeling of random systems. Models of linear time-invariant systems, non-linear systems (both input/output and state-space), linear model identification, asymptotic distributions of parameter estimates, nonlinear modeling. Same course as ECEN 6423.

6453* Adaptive Control. Prerequisite: 5473 or ECEN 5473 or ECEN 5713 or MÆ 5713. Analysis and design of control techniques which modify their performance to adapt to changes in system operation. Review of systems analysis techniques, including state variable representations, linearization, discretization, covariance analysis, stability, and linear quadratic gaussian design. Off-line parameter estimation, model reference adaptive systems, self-tuning regulators, stable adaptive systems. Same course as ECEN 6453.

6483* Robust Multivariable Control Systems. Prerequisite: 5713 or ECEN 5713. Introduction to multivariable systems: SISO robustness vs. MIMO robustness; multivariable system poles and zeros; MIMO transfer functions; multivariable frequency response analysis; multivariable Nyquist theorem; performance specifications; stability of feedback systems; linear fractional transformations (LFTs); parameterization of all stabilizing controllers; structured singular value; algebraic riccati equations; H₂ optimal control; H∞/infinity controller design. Same course as ECEN 6483.

6563* Advanced Solid Mechanics. General non-linear problems of elasticity including thermal, dynamic and anisotropy effects; stress wave propagation; consideration of plasticity.

6843* Convection heat transfer. Prerequisite: 5233 or equivalent. Advanced convective heat transfer in laminar and turbulent flows over external surfaces and inside channels. Heat transfer at high velocities, free convection boundary layers, and mass transfer.

Mechanical Engineering Technology (MET)

1103* Introduction to Mechanical Engineering Technology. Lab 2. Introduction to mechanical engineering technology, analytical techniques, and data presentation. Orientation to the mechanical engineering technologist’s profession.


2103* Industrial Materials. Lab 3. Prerequisite: CHEM 1314. A survey of the properties, characteristics and applications of metals, polymers, ceramics and other industrial materials. Terminology, concepts and principles involved in material selection, specification and processing. Laboratory activities include data collection and report generation, determination of material properties, and evaluation of material characteristics.


2233* Fundamentals of Hydraulic Fluid Power. Lab 2. Prerequisites: EET 1003 or CS 2103 or EET 1003 or ENGR 1412. Basic fluid power concepts. Standard hydraulic symbols, component design and application, fluid power systems considerations, design and operation.

3003* Dynamics. Prerequisites: GENT 2323 and MATH 2123. Plane motion of particles and rigid bodies. Force-acceleration, work-energy, and impulse-momentum principles. Graphical analysis, mechanisms and vibrations.

3113* Basic Instrumentation. Lab 2. Prerequisites: GENT 3323, MATH 2123 and PHYS 1214. Data analysis. Theory, operational characteristics and application of transducers for measurement of strain, force, velocity, acceleration, displacement, time, frequency, temperature, pressure, fluid flow.

3313* Applied Fluid Mechanics. Prerequisites: 2313, MATH 2123. Fluid mechanical principles applied to fluid power systems and general fluid systems. Fluid system analysis using Bernoulli and energy equations. Laminar and turbulent flows, flow and pressure measurement, flow forces, lift and drag.
3333 Thermodynamics and Heat Transfer for Electronics. Lab 3. Prerequisites: MATH 2133 and junior standing. Principles of thermodynamics and heat transfer important to the design, construction and operation of electronic systems. Basic heat transfer by conduction, convection and radiation, electronic systems by heat-sinking, forced-air convection, forced-air convection and combination, identification of specific overheating problems in electronic systems and the design of appropriate heat removal techniques.

3343 Physical Metallurgy. Lab 3. Prerequisite: 2103. Analysis and evaluation of the properties of metals commonly used in product design. Property change caused by hot and cold working, and by heat treatment. Laboratory activities including metallurgical specimen preparation, inspection and testing; and standard tests of tensile properties, hardness and toughness.

3413 Fundamentals of Pneumatic Fluid Power. Lab 2. Prerequisites: 2313, ECT 1003, MATH 1513. Basic pneumatics concepts, gas laws, component design and application, system design considerations. Air logic.

3503 Gas Turbines for Non-majors. Lab 2. Prerequisite: 1910 or MATH 1715. Non-analytical, descriptive treatment of the operation of gas turbine engines including accessories and systems. Lab requires student participation in engine disassembly, inspection and reassembly. Field trips to engine overhaul and repair facilities.

3573 Advanced Production Processes. Lab 3. Prerequisites: 1223, 2103, GENT 1153, MATH 1513. Advanced topics in manufacturing and production processes including polymers and plastics, powder metallurgy, foundry, welding and metal forming. Design for assembly (DFA) and design for manufacture (DFM).

4003 Machine Design I. Prerequisites: GENT 3323, CS 2103 or EET 1003 or ENGR 1412 and MATH 2133. Application of statics and strength to the design of machine components. Problems of choosing materials, impact and fatigue loading.


4050 Advanced Mechanical Design. 1-3 credits, maximum 6. Lab 0-2. Prerequisites: junior standing and consent of instructor. Special problems in mechanical engineering technology.

4123 Senior Design Projects. Lab 4. Prerequisites: 1223, 4003 and ENGL 3323. Selected problems in design integrating principles of drafting, analysis, materials and manufacturing. Design projects are typically supplied by industry.

4203 Machine Design II. Lab 6. Prerequisites: GENT 3323, CS 2103 or EET 1003 or ENGR 1412 and MATH 2133. Design of machine components such as gears, bearings, fasteners, springs and weldments.

4213 Kinematics and Mechanisms. Lab 2. Prerequisites: 1223, 3003, CS 2103 or EET 1003 or ENGR 1412. Analysis and design of mechanisms such as the 4-bar linkage, slidercrank, cam and gear. Graphical and computer techniques.

4303 Computer Integrated Manufacturing. Lab 2. Prerequisite: GENT 1223, 2103, MATH 1613. Introduction to programming techniques and manufacturing applications of computer numerical control (CNC) and robotics. Machine capabilities and tooling requirements with programs being prepared manually and with COMPACT II computer assistance.

4313 Electrohydraulics and Motion Control. Lab 3. Prerequisites: 1223, 3014. Principles of electronics as applied to fluid power controls. Trends in modern fluid power systems. Solenoid systems, proportional control, servo systems, programmable controllers, and robotics. Lab includes design, fabrication and operation of practical systems.

4453 Applied Thermodynamics. Prerequisite: ENSC 2213 or GENT 5433. Mixtures, psychrometrics, combustion cycles, heat pumps, internal and external combustion engines. Refrigeration.

4463 Thermal Fluids Laboratory. Lab 3. Prerequisites: 3513, GENT 4433 and GENT 4453. Laboratory and industrial observation and analysis of thermal science applications including heat transfer, transfer engines, and heat pumps.

4883 Tool Design. Lab 3. Prerequisite: 2213, 3433. Basic design and development of special tools for processing or manufacturing engineering materials. Design and specification and inspection of tool steel and tooling equipment. Laboratory activities using appropriate techniques of engineering graphics and analysis.

4993 Mechanical Engineering Technology Practice. Prerequisite: junior standing and consent of department head. Supervised industrial experience in mechanical engineering technology practice with minimal continual duration of eight weeks. Comprehensive journal, written report, and oral presentation.

Mechanized Agriculture (MCAG)

1413 Introduction to Engineering in Agriculture. Prerequisite: MATH 1513 or concurrent enrollment. Application of the physical and engineering sciences to agricultural problems. Energy; energy conversion; thermal, electrical, mechanical and fluid systems; equipment calibration; environmental control of agriculture buildings and irrigation system requirements.

2313 Surveying. Lab 3. Prerequisite: MATH 1613. A study of the equipment and practices used in surveying for small areas. Common practices of plane surveying: differential, profile, and topographic leveling; field notes, accuracy and precision, error and error control, and land measurement.


3213 Engines and Power. Lab 4. Prerequisites: 1413, MATH 1513. Theory, operation, performance and diagnostics of internal combustion engines for mobile applications.

3223 Metals and Welding. Lab 3. Prerequisite: 1413. Essential knowledge and theory necessary for understanding the principles of hot and cold metal fabrication. Laboratory provides opportunity to apply and develop associated skills.

3311 Surveying. Lab 4. Prerequisites: 1413, MATH 1513. Use of surveying equipment and common applications in agriculture.

4013 Agricultural Electrification. Lab 4. Prerequisites: 1413, MATH 1513. A study of electrical theory and electrical applications in agricultural environments.

4123 Principles of Food Engineering. Prerequisite: MATH 1513. For non-engineers. Application of the engineering approach to solving heat and mass transfer problems in food processing. An introduction to the basic concepts of the conservation laws, fluid flow, heat transfer, refrigeration, freezing, psychrometrics, and energy conservation.

4200* Topics in Mechanized Agriculture. 1-4 credits, maximum 4. Investigations in specialized areas of mechanized agriculture.

4203* Irrigation Principles. Prerequisite: MATH 1513. Sources, measurement and efficient use of irrigation water. Selection of pumping plants and power units. Layout and management of surface and sprinkler systems.

4211 Machinery Calibration. Lab 4. Prerequisites: 1413, MATH 1513. Analysis of the metering function, calibration, and management of agricultural planting, fertilizing, and pesticide application equipment.

4212 Safety and Health in Agribusiness. Lab 2. Prerequisite: junior standing or above. Study of the causes and prevention of accidents in agribusinesses. Investigations including the acute and chronic risks of machinery, animals, gases, confined spaces, outdoor and hazardous materials.

4220* Advanced Methods in Agricultural Mechanics. 1-6 credits, maximum 6. Prerequisite: 4222. Developing agricultural mechanics programs for vocational agriculture and technical schools. Application of agricultural mechanics methods, practices and skills to advanced projects.

4223 Methods and Management of Agricultural Mechanization. Lab 3. Prerequisite: MATH 1513. The role of agricultural mechanics in educational systems. A study of the principles of agricultural mechanics, methods of teaching, instructor responsibility and liability, laboratory safety, project construction, selection of resources, project evaluation, and the selection, use and care of tools.

302 Mechanical Engineering Technology
1513 Introduction to Biomedical Science I. Prerequisites: CHEM 1515 and PHYS 1214 or equivalent. Health science applications of biology, chemistry and physics. Inferential reasoning and application of mathematics. Interpretation of research and graphical data.

3023 Introduction to Biomedical Science II. Prerequisites: CHEM 1515 and PHYS 1214 or equivalent. Health science applications of biology, chemistry and physics. Inferential reasoning and application of mathematics. Interpretation of research and graphical data. Continuation of 3013.

3143 Medical Mycology. Lab 4. Prerequisite: 2124. Examination of fungi as animal pathogens; laboratory techniques used in the identification of human and animal pathogens, and differentiation from common contaminants.

Microbiology (MICR) 4131 Technology and Environment. Lab 4. Prerequisites: 1413, MATH 1513. A study of the impact of technology on the environment.

4142* Environmental Microbiology. Lab 2. Prerequisite: 3224. Microbes, microbial processes and microbial diversity in the environment. Fundamental and applied aspects of microbial ecology, microbial physiology and genetics. Microbial transformation of organic, inorganic and pollutant compounds. Case studies and real-world simulations in the lab and recitation.


4134* Pathogenic Microbiology. Lab 3. Prerequisites: 2124. Corequisites: 3224. Analysis of pathogenic bacteria as they relate to humans, other animals, plants and insects.

4236 Clinical Hematology. Lab 12. Prerequisites: concurrent internship in affiliated hospital, and all degree requirements for B.S. in medical technology except 30 hours MTCL. The theory and laboratory methodology of analytical biochemistry, clinical microscopy, routine and special procedures, and medical significance.

4246 Clinical Immunology. Lab 12. Prerequisites: concurrent internship in affiliated hospital, and all degree requirements for B.S. in medical technology except 30 hours MTCL. Immunologic responses and procedures used in serological determinations; immunohematology, fundamentals of antigen-antibody reactions, blood groups and types, compatibility testing, blood components, and the lab methods used as they relate to the medical significance of immunology and infectious diseases.

Topics in Medical Microbiology. Prerequisites: concurrent internship in affiliated hospital, and all degree requirements for B.S. in medical technology except 30 hours MTCL. Principles and practices of the medical laboratory including basic management, quality assurance, education methodology, computer applications, laboratory safety, and special projects in selected areas.

4351 Introduction to Microbiology. Lab 4. Prerequisites: one year of chemistry; and BIOL 1604, and 1403 or 1604. General principles of microbiology.
Membrane Physiology. Prerequisites: PHYS 1214, and BIOL 3014 or BIOL 4113 or CHEM 3354 or PHYS 3313. Application of biophysical, biochemical and biological techniques to the study of the structure and function of membranes and membrane components; kinetic measurements, spectroscopic techniques and diffractive techniques. Application of these illustrated with current research problems. Same course as PHYS 5353.

Biotechnology Projects. Lab 8. Prerequisites: 4135, MCR 5142. An indepth exposure to the practical application of biological principles. Classical and modern (genetic engineering) biotechnology, within a framework involving the identification of a problem or need, determination of a solution or product, strain development, scale-up technology, and product recovery or process enhancement.

Three Dimension Computer Visualization and Modeling of Biological Macromolecules. Prerequisite: graduate standing or consent of instructor. Visualization and modeling of 3-D structure of biologically important macromolecules, such as DNA, RNA, and proteins; important components of modern biological research. Computer programs used in the modern research environment. The operation, applications, and limitations of computer programs employed for analysis of genetic information and the correlation between genetic information and macromolecular structure.

Special Problems. 1-4 credits, maximum 10. Prerequisite: permission of instructor. Investigations in the field of microbiology.

Dissertation. 1-15 credits, maximum 45. Prerequisite: consent of major adviser. Research in microbiology for the Ph.D. degree.

Molecular Biology of Bacterial Viruses. Prerequisites: 4123 and 4133. Advanced study of bacteriophages.

Recent Advances in Microbiology. 1-3 credits, maximum 6. Prerequisite: one graduate course in biochemistry. Discussion and evaluation of recent scientific contributions in terms of the living organism.

Advanced Microbial Physiology. Lab 3. Prerequisite: 3224 or consent of instructor. Discussion of selected topics in microbial physiology. Critical analysis of research papers.


Microbial Evolution. Prerequisites: 2124, BIOL 3653, BIOL 3024. The mechanisms and results of microbial evolution in nature and in the laboratory, with emphasis on microbes as model evolutionary systems, molecular evolution, classification and phylogeny, and discussion of protozoology and the probable fate of engineered microbes.

Genetics of Simple Eukaryotes. Prerequisites: solid understanding of basic cellular maintenance and propagation processes and consent of instructor. Indepth discussion of lessons learned from simple eukaryotes such as S. cerevisiae (yeast), A. nidulans (fungus), D. melanogaster (fly) and C. elegans (worm).

Current Topics in Eukaryotic Signal Transduction and Gene Regulation. Prerequisites: BIOL 3653, BIOL 3014, 3024. Discussion of current literature on the mechanisms of eukaryotic signal transduction and gene regulation.

Military Science (MLSC)

Leadership Laboratory. 1 credit, maximum 2. Lab 2. Prerequisites: concurrent enrollment in 1112 and 1212. Learning and practicing basic skills such as rappelling, drill and ceremony, land navigation, individual first aid, individual training in small unit tactics.


Introduction to Leadership. Principles of effective leading, communication skills, and organizational ethical values. Concurrent enrollment in MLSC 1000 recommended. Optional weekend exercise.

Camp Challenge. Lab 4. Prerequisites: open only to students who have not completed all of basic ROTC and who pass physical examination. A five-week summer camp similar to Army Basic Training. No military obligation incurred.

Military Physical Conditioning. 1 credit, maximum 2. Lab 3. Prerequisite: must be enrolled in MLSC theory classes. Participation in and learning to plan and lead a physical fitness program. Development of an individual fitness program and the role of exercise and fitness in person’s life.

Self and Team Development. Lab 2. Ethics-based leadership skills that develop individual abilities and contribute to the building of effective teams. Skills in oral presentation, writing, planning, coordinating groups, land navigation and basic military tactics.


Leading Small Organizations I. Lab 2. Prerequisites: completion of lower-division MLSC or equivalent, and approval of professor of military science. Practical opportunities to lead small groups in situations of increasing complexity receiving personal assessments and encouragement. Use of small unit defensive tactics and opportunities to plan and conduct training for lower-division students both to develop such skills and as vehicles for practicing leading.

Music (MUSI)

Concert and Recital Attendance. Graduation requirement for music degree or certification candidates.


Piano Class Lessons. For students with no previous experience.

Voice Class Lessons.

Organ Class Lessons.

Single Reed Techniques. Lab 2. Methods for playing and teaching the clarinet and saxophone.
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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<tr>
<td>1370</td>
<td><strong>Major Saxophone</strong>. 1-4 credits, maximum 8.</td>
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<td>1380</td>
<td><strong>Major Bassoon</strong>. 1-4 credits, maximum 8.</td>
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<td>1390</td>
<td><strong>Major Trumpet</strong>. 1-4 credits, maximum 8.</td>
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<td>1400</td>
<td><strong>Major French Horn</strong>. 1-4 credits, maximum 8.</td>
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<td>1410</td>
<td><strong>Major Trombone</strong>. 1-4 credits, maximum 8.</td>
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<td>1420</td>
<td><strong>Major Euphonium</strong>. 1-4 credits, maximum 8.</td>
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<td>1430</td>
<td><strong>Major Tuba</strong>. 1-4 credits, maximum 8.</td>
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<td>1440</td>
<td><strong>Major Percussion</strong>. 1-4 credits, maximum 8.</td>
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<td>1450</td>
<td><strong>Major Harpsichord</strong>. 1-4 credits, maximum 8.</td>
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<tr>
<td>1513</td>
<td><strong>Music Literature</strong>. Music of the Baroque, Classical, Romantic, and Contempo-</td>
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<td>rary periods, with emphasis on style analysis.</td>
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<td>1531</td>
<td><strong>Sightseeing and Eartraining I</strong>. Prerequisite: 2672 or successful completion</td>
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<td></td>
<td>of Music Theory Placement Examination. Development of skills in sightseeing</td>
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<td></td>
<td>and aural perception. Taken concurrently with MUSI 1533.</td>
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<td>1533</td>
<td><strong>Theory of Music I</strong>. Prerequisite: Successful completion of Music Theory</td>
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<td></td>
<td>Placement Examination.</td>
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<td>1541</td>
<td><strong>Sightseeing and Eartraining II</strong>. Prerequisites: 1531 and 1533. A continu-</td>
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<td>ation of 1531. Taken concurrently with 1543.</td>
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<td>1543</td>
<td><strong>Theory of Music II</strong>. Prerequisites: 1531 and 1533. A continuation of 1533,</td>
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<td>taken concurrently with 1543.</td>
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<td>1623</td>
<td><strong>Introduction to Music Business</strong>. A survey of music business procedures,</td>
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<td>opportunities, technologies and trends.</td>
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<td>1723</td>
<td><strong>Introduction to Music Education</strong>. An entry level course designed to so-</td>
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<td>cialize the music education major to the role of the music education</td>
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<td>teacher within U.S. schools. Motivation and discipline, teaching cycles,</td>
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<td>stimulus variation, multicultural music, music learning theories, music</td>
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<td>advocacy, foundations of music introduction, structured observational skills.</td>
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<tr>
<td>2010</td>
<td><strong>Piano Class Lessons</strong>. Prerequisites: 1021 and music major status. Class</td>
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<td></td>
<td>lessons for music majors (non-keyboard concentration) preparing for the piano</td>
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<td>proficiency examination.</td>
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<td>2021</td>
<td><strong>Piano Class Lessons</strong>. Prerequisites: 2011 and music major status. Success-</td>
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<td>ful completion of the course fulfills piano proficiency examination for music</td>
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<td>majors (non-keyboard concentration).</td>
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<td>2052</td>
<td><strong>String Instrument Techniques</strong>. Methods for playing and teaching the violi-</td>
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<td></td>
<td>n, viola, cello and double bass.</td>
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<tr>
<td>2071</td>
<td><strong>Flute Techniques</strong>. Lab 2. Methods for playing and teaching the flute.</td>
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<td>2091</td>
<td><strong>Low Brass Techniques</strong>. Lab 2. Methods for playing and teaching the trombo-</td>
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<td>ne, euphonium, and tuba.</td>
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<td>2250</td>
<td><strong>Major Organ</strong>. 1-6 credits, maximum 12. Prerequisite: 1250.</td>
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<td>2260</td>
<td><strong>Major Piano</strong>. 1-6 credits, maximum 12. Prerequisite: 1260.</td>
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<td>2270</td>
<td><strong>Major Voice</strong>. 1-6 credits, maximum 12. Prerequisite: 1270.</td>
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<td>2280</td>
<td><strong>Major Violin</strong>. 1-6 credits, maximum 12. Prerequisite: 1280.</td>
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<td>2290</td>
<td><strong>Major Viola</strong>. 1-6 credits, maximum 12. Prerequisite: 1290.</td>
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<td>2300</td>
<td><strong>Major Cello</strong>. 1-6 credits, maximum 12. Prerequisite: 1300.</td>
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<td>2310</td>
<td><strong>Major Double Bass</strong>. 1-6 credits, maximum 12. Prerequisite: 1310.</td>
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<td>2320</td>
<td><strong>Major Guitar</strong>. 1-6 credits, maximum 12. Prerequisite: 1320.</td>
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<td>2330</td>
<td><strong>Major Harp</strong>. 1-6 credits, maximum 12. Prerequisite: 1330.</td>
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<td>2340</td>
<td><strong>Major Flute</strong>. 1-6 credits, maximum 12. Prerequisite: 1340.</td>
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<td>2350</td>
<td><strong>Major Oboe</strong>. 1-6 credits, maximum 12. Prerequisite: 1350.</td>
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<td>2360</td>
<td><strong>Major Clarinet</strong>. 1-6 credits, maximum 12. Prerequisite: 1360.</td>
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<td>2370</td>
<td><strong>Major Saxophone</strong>. 1-6 credits, maximum 12. Prerequisite: 1370.</td>
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<td>2380</td>
<td><strong>Major Bassoon</strong>. 1-6 credits, maximum 12. Prerequisite: 1380.</td>
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<td>2390</td>
<td><strong>Major Trumpet</strong>. 1-6 credits, maximum 12. Prerequisite: 1390.</td>
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<td>2400</td>
<td><strong>Major French Horn</strong>. 1-4 credits, maximum 8. Prerequisite: 1400.</td>
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<td>2410</td>
<td><strong>Major Trombone</strong>. 1-6 credits, maximum 12. Prerequisite: 1410.</td>
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<td>2420</td>
<td><strong>Major Euphonium</strong>. 1-4 credits, maximum 8. Prerequisite: 1420.</td>
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<td>2430</td>
<td><strong>Major Tuba</strong>. 1-6 credits, maximum 12. Prerequisite: 1430.</td>
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<td>2440</td>
<td><strong>Major Percussion</strong>. 1-6 credits, maximum 12. Prerequisite: 1440.</td>
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<td>2450</td>
<td><strong>Major Harpsichord</strong>. 1-4 credits, maximum 8.</td>
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<tr>
<td>2551</td>
<td><strong>Sightseeing and Eartraining III</strong>. Prerequisites: 1541 and 1543. Further</td>
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<td></td>
<td>development of skills in sightseeing and aural perception. Taken concurrently</td>
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<td>with 2553.</td>
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<td>2553</td>
<td><strong>Theory of Music III</strong>. Lab 1/2. Prerequisites: 1541 and 1543. Choral and</td>
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<td>instrumental writing correlated with sightseeing, melodic and harmonic</td>
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<td>dictation and keyboard skills. Taken concurrently with 2551.</td>
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3712  
Basic Conducting. Principles of conducting choral and instrumental groups.

3722  

3731  
Introduction to Elementary Music Education. Orientation to methods (including Orff, Kodaly, Dalcroze, and Manhattanville Music Curriculum Project) appropriate for teaching music in the elementary school.

3732  
Teaching Choral Music. Prerequisite: 3712. Repertoire, rehearsal procedures, and vocal techniques for the public school choral teacher.

3733  
Survey of Rock and Roll Styles. Elements and musical styles of rock and roll, its evolution and its social, economic and cultural effects.

3743  
Foundations of Music Education. Prerequisite: full admission to Teacher Education. Interdisciplinary approach including aspects of philosophy, aesthetics, sociology and psychology as they are applied in music in post-elementary public schools.

3753  
History of Music to 1750. Prerequisites: 1513 and 1533, or equivalent. Aids music majors and other qualified students in understanding the musical styles, forms, schools, composers and instruments that developed in Western civilization from antiquity through the Baroque period.

3763  
History of Music from 1750. Prerequisite: 1513, 1533 or equivalent. Aids music majors and other qualified students in understanding the musical styles, forms, schools, composers and instruments that developed in Western civilization from the pre-classical period to the 20th century.

3772  
Counterpoint. Prerequisites: 2563 and satisfactory upper-division examination. Analysis and application of contrapuntal techniques of the 18th century.

3773  
Survey of Jazz Styles. Elements and stylistic features of jazz, its evolution and its impact on society.

3783  
Form and Analysis. Prerequisites: 2563 and satisfactory upper-division examination. Analysis of standard repertoire with emphasis on form and structural harmonic analysis.

3793  
Conducting and Teaching Lab IV. Prerequisite: 3693. Final course in a four semester sequence. Vocal techniques for all music educators, advanced conducting, score study and methods for high school level literature, evaluation techniques for public school music.

3832  
Elementary Music Methods K-6. Prerequisite: 3731. Current elementary music trends, techniques, and materials. For those who will be involved with teaching elementary music grades K-6.

3842  
Marching Band Methods. Prerequisite: 3731. Organizational responsibilities and charting for public school marching bands.

3901  
Junior Recital. Prerequisite: junior standing and consent of major applied music teacher.

4021  
Piano Class Lessons. Prerequisite: senior music major status.

4031  
Solo Literature for the Adolescent Singer. Examination of solo literature and pedagogical approaches suitable for use at the high school level.

4100  
Music Industry Internship. 1-6 credits, maximum 8. Prerequisites: 90 credit hours and minimum 2.50 GPA in all music and business courses. Directed practical experiences in an approved retail store or in a work situation related to the music industry.

4250  
Major Organ. 1-6 credits, maximum 12. Prerequisites: 3250 and successful completion of recital attendance requirements.

4260  
Major Piano. 1-6 credits, maximum 12. Prerequisites: 3260 and successful completion of recital attendance requirements.

4270  
Major Voice. 1-6 credits, maximum 12. Prerequisites: 3270 and successful completion of recital attendance requirements.

4280  
Major Violin. 1-6 credits, maximum 12. Prerequisites: 3280 and successful completion of recital attendance requirements.

4290  
Major Viola. 1-6 credits, maximum 12. Prerequisites: 3290 and successful completion of recital attendance requirements.

4300  
Major Cello. 1-6 credits, maximum 12. Prerequisites: 3300 and successful completion of recital attendance requirements.

4310  
Major Double Bass. 1-6 credits, maximum 12. Prerequisites: 3310 and successful completion of recital attendance requirements.

4320  
Major Guitar. 1-6 credits, maximum 12. Prerequisites: 3320 and successful completion of recital attendance requirements.

4330  
Major Harp. 1-6 credits, maximum 12. Prerequisites: 3330 and successful completion of recital attendance requirements.

4340  
Major Flute. 1-6 credits, maximum 12. Prerequisites: 3340 and successful completion of recital attendance requirements.

4350  
Major Oboe. 1-6 credits, maximum 12. Prerequisites: 3350 and successful completion of recital attendance requirements.

4360  
Major Clarinet. 1-6 credits, maximum 12. Prerequisites: 3360 and successful completion of recital attendance requirements.

4370  
Major Saxophone. 1-6 credits, maximum 12. Prerequisites: 3370 and successful completion of recital attendance requirements.

4380  
Major Bassoon. 1-6 credits, maximum 12. Prerequisites: 3380 and successful completion of recital attendance requirements.

4390  
Major Trumpet. 1-6 credits, maximum 12. Prerequisites: 3390 and successful completion of recital attendance requirements.

4400  
Major French Horn. 1-6 credits, maximum 12. Prerequisites: 3400 and successful completion of recital attendance requirements.

4410  
Major Trombone. 1-6 credits, maximum 12. Prerequisites: 3410 and successful completion of recital attendance requirements.

4420  
Major Euphonium. 1-4 credits, maximum 8. Prerequisites: 3420 and successful completion of recital attendance requirements.

4430  
Major Tuba. 1-6 credits, maximum 12. Prerequisites: 3430 and successful completion of recital attendance requirements.

4440  
Major Percussion. 1-6 credits, maximum 12. Prerequisites: 3440 and successful completion of recital attendance requirements.

4450  
Major Harpsichord. 1-4 credits, maximum 8.

4490*  
Lessons in Applied Music (Major Field). 1-4 credits, maximum 4. Prerequisite: bachelor’s degree or equivalent performing level in applied major field. Major applied music field.

4600*  
Chamber Ensembles. 1-2 credits, maximum 12. Lab 2. Prerequisite: 4 hours of MUSI 2600 or equivalent. Combinations of voices, keyboard, and orchestral instruments for performing chamber music, music theater and duo piano repertoire.

4753*  
Advanced Music History and Literature. Prerequisite: two semesters of music history. Advanced music history and literature. Historical and stylistic analyses of musical forms and composers’ techniques. Open to graduate students and advanced undergraduate students.

4810*  
Problems in Musical Composition. 1-2 credits, maximum 2. Prerequisites: 1543 and consent of instructor. Practical experiences in musical composition.

4840*  
Special Studies in Music Literature. 1-2 credits, maximum 4. Prerequisite: junior standing or consent of instructor. Survey of music literature suitable for teaching various levels in applied music.

4890*  
Special Studies in Music Pedagogy. 1-2 credits, maximum 4. Prerequisite: junior standing or consent of instructor. Survey of music pedagogical methods suitable for various levels and types of applied music.

4901  
Senior Recital. Prerequisites: senior standing and permission of major applied music teacher.

4912  
Orchestration and Arranging. Prerequisite: upper-division standing as a music major or consent of instructor. Orchestrating for instrumental ensembles and arranging for choral ensembles.

4940  
Student Teaching in Public School Music. 1-12 credits, maximum 12. Prerequisites: 3501 and full admission to Teacher Education. Directed observation, seminars, and supervised student teaching in selected elementary and secondary music programs. Graded on a pass/fail basis.
4952* Music in the School Curriculum. Aims, content and motivation of the music education program in elementary and secondary schools from the standpoint of the classroom teacher, music specialist and administrator.

4962* Music Education Seminar. Research into latest developments of public school choral and instrumental music.

4972 Twentieth Century Music Theory and Literature. Prerequisites: 2563, 3763. Melodic, harmonic and rhythmic techniques in 20th century music.

4990* Selected Studies in Music and Music Education. 1-3 credits, maximum 8. Short-term area studies in music and music education.

4993 Senior Honors Project. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided program in musicological research, music composition, or music performance, ending with an honors project under the direction of a faculty member with a second faculty member to complete an examining committee. Required for graduation with departmental honors in music.

5004* Final Degree Project. Preparation of a recital of significant repertoire to be conducted or played in public performance, depending upon the student’s degree track. Submission of a formal paper that is a formal interpretive analysis of each work.

5113* Introduction to Graduate Studies in Music. Prerequisite: admission to Master of Music program. Understanding of the resources available for research in the field of music. Examination of the types of research materials needed for classes in the Master of Music degree program, as well as providing the groundwork for success in the professional world as a music educator and performer.

5480* Lessons in Applied Music (Minor Field). 1-4 credits, maximum 12. Prerequisite: bachelor’s degree or equivalent performance level in applied major field.

5490* Lessons in Applied Music (Major Field). 1-4 credits, maximum 12. Prerequisite: bachelor’s degree or equivalent performing level in applied major field. Private Lessons.

5512* Advanced Studies in Music Literature and Pedagogy I. Prerequisite: 3753, 3763 or equivalent. Techniques of successful programing, teaching and performance of ensemble literature through a survey of repertoire appropriate to the student’s chosen medium.

5522* Advanced Studies in Music Literature and Pedagogy II. Prerequisite: 3753, 3763 or equivalent. A continuation of 5512 with emphasis upon music of the 20th century and its attendant specialized performance techniques.

5583* World Music. Survey of the richly diverse music of non-Western cultures emphasizing traditional musical practices prior to contact with Westernized media. Historical recordings supplemented by video tapes. Knowledge of Western classical music notation helpful. Taught in conjunction with 3583.

5610* University Bands. 1-2 credit, maximum 12. Large ensembles.

5620* Symphony Orchestras. 1-2 credit, maximum 12. Large ensembles.

5630* University Choral Ensembles. 1-2 credit, maximum 12. Large ensembles.

5712* Advanced Studies in Conducting I. Prerequisites: 3712 and 3722 or equivalent. Acquisition of an expressive conducting gestural vocabulary as it relates to the student’s chosen medium.

5722* Advanced Studies in Conducting II. Prerequisites: 5712. A continuation of 5712 focusing upon the gestural vocabulary as it relates to the specific complexities of contemporary music.

5733* Techniques of Pedagogy and Performance. Prerequisites: 3712 and 3722 or equivalent. Advanced techniques and modes for preparing music for performance.

5742* Conducting Practicum. Lab 2. Prerequisites: 5712, 5722. Supervised conducting opportunities with major OSU ensembles or approved off-campus ensembles.

5750* Seminar in Music History. Prerequisites: 3753 and 3763 or equivalent. Major European musical genres and pedagogical methods of a specified time in musical history. Acquaintance with source materials from the specified period to facilitate a knowledge of performance of genres studied. Topics vary.

5842* Music Repertory. Survey of music literature suitable for teaching various levels in applied music.

5972* 20th Century Music Theory and Literature. Prerequisites: 2563, 3763 or equivalent. Musical techniques and literature in the 20th century.

5973* Analysis of Musical Styles. Prerequisite: 3763 or equivalent. Exploration of techniques appropriate for the analysis of selected music of various styles from the Middle Ages to the 20th century, including Schenkerian analysis and set theory applications.

Natural Science (NATS)

5050 Report. 1-2 credits, maximum 2. Prerequisite: enrollment in program leading to M.S. in natural science. Guidance in reading and research required for M.S. in natural science degree.

5990* Topics in Natural and Applied Sciences. 1-3 credits, maximum 9. Prerequisite: graduate standing. Special topics in the natural and applied sciences for students interested in topics not normally covered in existing course work.

Nutritional Sciences (NSCI)

2111 Professional Careers in Nutritional Sciences. Career opportunities in dietetics and foods and nutrition. Roles and responsibilities of nutritional sciences professionals. Routes to professional memberships and current issues in professionalism.

2114 (N) Principles of Human Nutrition. Functions of the nutrients in human life processes. Nutrient relationship to health as a basis for food choices. Open to all University students.

2850 Special Topics in Nutritional Sciences. 1-3 credits, maximum 4. Study of specific consumer education issues or topics in nutritional sciences.

3133* Science of Food Preparation. Lab 3. Prerequisites: HRAD 1114, organic chemistry. Application of scientific principles to food preparation.

3213 Management in Hospitality and Food Service Systems. Prerequisite: a course in economics. Function and methods of management as related to the hospitality and food service industries.

3223 Nutrition Across the Life Span. Prerequisite: 2114 or equivalent. Nutritional needs and dietary concerns of individuals from conception through old age.

3440 Nutritional Sciences Preprofessional Experience. 1-3 hours, maximum 3. Supervised work experience in one or more of the following: college and university food service, health care facilities, and food processing plants.

3543 (MIS) Food and the Human Environment. Impact of the various factors that affect food availability, production, processing, distribution and consumption of food in the world. International cultures and foods. Challenges of and solutions to the world food crisis.

3553 Purchasing in Hospitality and Food Service Systems. Prerequisite: 3133 or concurrent enrollment. Procurement of food and non-food materials in hospitality and related industries.


4013* Experimental Foods. Lab 6. Prerequisite: 3133 or consent of instructor. Investigations in physical, chemical and sensory qualities of foods under experimental conditions. Development of an individual research project.

4023* Nutrition and Health Issues. Prerequisites: 2114, 3223. Analysis of the role of specific nutrients in health maintenance and in prevention of chronic disease. Communication of nutritional information to the public.

4133* Nutrition for Exercise and Sport. Prerequisites: HHP 3114, NSCI 4323 and BIOL 3653 or consent of instructor. Application of principles of nutrient metabolism as they relate to physical activity, sport and health.
4323* Human Nutrition and Metabolism. Prerequisites: 2114 or equivalent, organic chemistry, physiological biochemistry, or metabolism of nutrients; functions and health implications in the human organism.

4333* Food, Beverage and Labor Cost Controls. Prerequisites: ACCT 2203, Junior standing. Menu analysis and food/beverage/labor cost controls associated with hospitality industry operations.

4365* Quantity Food Production Management. Lab 3. Prerequisites: HRAD 2125, HRAD or NSCI 3553 and a course in accounting or mathematics or consent of instructor. Organizing, purchasing, costing, preparation and service of food in a quantity food production setting.

4373* Creative Teaching of Nutrition. Prerequisites: 2114, 3223 or concurrent enrollment. Analyses of various methods, techniques, resources and evaluation for nutrition education. Experimental component required.

4573* Food Systems Administration. Lab 3. Prerequisites: HRAD 3553, 4365. Management and integration of financial, human, physical, food and other material resources in various settings.

4643 Critical Issues in Nutrition and Healthcare. Prerequisite: senior standing. Integration of the body of knowledge of nutrition and healthcare through examination of critical issues.

4733* Community Nutrition. Prerequisites: 2114, 3223 and an educational methods course. Application of nutrition, education and communication principles to community nutrition programs and services. Field work required.

4850 Special Unit Studies in Nutritional Sciences. 1-3 credits, maximum 6. Special units of study in nutritional sciences.

4853 Medical Nutrition Therapy I. Lab 2. Prerequisites: 3812, 4323 or concurrent enrollment. Physiological and metabolic bases for dietary modifications in disease states. Applications of laboratory data to nutritional care.

4863 Medical Nutrition Therapy II. Lab 2. Prerequisite: 4853. A continuation of 4853.

4900 Honors Creative Component. 1-3 credits, maximum 5. Prerequisites: College of Human Environmental Sciences Honors Program participation, senior standing. Guided creative component for students completing requirements for College Honors in College of Human Environmental Sciences. Thesis, creative project or report under the direction of a faculty member in the major area, with second faculty reader and oral examination.

5000* Research in Nutritional Sciences. 1-6 credits, maximum 6. Prerequisite: consent of adviser. Individual research and thesis that will fulfill the requirements for the master’s degree.

5012* Public Policy Development in Food, Nutrition and Related Programs. Rationale underlying selected governmental programs in food and nutrition and other home economics areas and assessment of the effectiveness of the programs.

5123* Research Developments in Nutritional Sciences. Basic components of the research process and application of research methods to nutritional sciences.

5220* Contemporary Issues in Dietetics. 1-3 credits, maximum 3. Prerequisite: admission to internship required. Contemporary issues in the practice of dietetics: formulation of innovative solutions and processes to enhance effectiveness in the workplace. Graded on a pass-fail basis.

5230* New Findings in Nutrition. 1-3 credits, maximum 6. Prerequisite: 2114 or equivalent. Current emphases in nutrition, with implications for nutrition research, education, and public service.

5233* Quantity Food Development. Lab 5. Prerequisite: 4363 or equivalent. Experimental approach to methods in quantity food production as related to time factor, institutional equipment and proportions of ingredients.

5343* Organization and Management of Food Service Systems. Prerequisite: 4573 or equivalent. Contemporary theories of organizational structures as applied in the management of food service systems.

5363* Maternal and Infant Nutrition. Prerequisite: 2114 or equivalent. Nutritional needs and dietary concerns during pregnancy, lactation and the first year of life. Implications for nutrition intervention, education and policy.

5373* Childhood Nutrition. Prerequisite: 2114 or consent of instructor. Normal nutritional needs of children, preschool through grade 12. Dietary implications for child care programs, school food service and parent education.

5393* Nutrition and Aging. Prerequisite: 2114 or equivalent. Nutritional needs, and dietary concerns of the elderly. Implications for food and nutrition programs, policies, research and education.

5440* Dietetic Internship Practicum. 1-6 credits, maximum 9. Prerequisites: acceptance as a dietetic intern and American Dietetic Association verification. Supervised learning experiences in approved facilities for the achievement of performance requirements for entry level dietitians. Graded on a pass-fail basis.

5463* Advanced Human Nutrition. Prerequisites: a biochemistry course and an upper-level nutrition course. Application to the human being of metabolic processes which involve essential dietary components.

5553* International Nutrition and World Hunger. Prerequisite: consent of instructor. Advanced study of the magnitude, causes, and nature of hunger and undernutrition in low income countries; emphasis on programs, policies and planning directed toward alleviating hunger.

5563* Nutritional Assessment. Prerequisites: 3223, 4323, or equivalent. Dietary, physical, and biochemical assessment techniques and their application to patient or client nutritional status assessment in health care systems.

5593* Quality of Work Life in Food Service Organizations. Prerequisite: one course in personnel management. Analysis of administrative problems in food service organizations. Focus on quality of work life assessment.

5612* Theory, Research and Practice of Nutrition Education. Prerequisites: 4373 or equivalent and consent of instructor. Analyses of various learning and behavior change theories and application in nutrition education.

5643* Advanced Medical Nutrition Therapy. Prerequisite: admission to dietetic internship or consent of instructor. Physiological and metabolic bases for nutritional support in disease.

5650* Advanced Food Conservation and Processing. 2 credits, maximum 2. Lab 3. Prerequisite: 4013. Recent advances in food processing in relation to quality of product and conservation of food nutrients.

5673* Manpower Management in Health Care and Related Industries. Lab 3. Prerequisites: 3213, 4573, or consent of instructor. Management of human resources in health care and related industries.

5713* Community Dietetics. Prerequisites: 4373 or equivalent. Analysis of the impact of political, legislative, economic and cultural diversity factors on dietician practice in public health and other community nutrition programs.

5743* Experimental Methods in Nutritional Sciences. Prerequisites: a course in biochemistry, a course in statistics, a graduate course in food or nutrition. Experimental design for research in food and nutrition based on analytical laboratory techniques and other research methodology.

5753* Management in Health Care Systems. Prerequisite: 4365, 4373 or consent of instructor. Total quality management for nutrition and food services in health care and related industries. Basics, systems and tools for monitoring and evaluating quality in nutrition and food service departments.

5850* Special Topics in Nutritional Sciences. 1-3 credits, maximum 4. Prerequisite: graduate standing. Specialized workshops in nutrition, food science or food service administration.

5870* Problems in Nutritional Sciences. 1-4 credits, maximum 6. Analysis of emerging problems and trends in nutritional sciences.

5960* Seminar in Nutritional Sciences. 1 credit, maximum 2. Prerequisite: for M.S. students. Individual and group seminars on current issues and research in nutritional sciences.

6000* Doctoral Thesis. 1-12 credits, maximum 30. Prerequisite: consent of major professor.

6113* Critical Analysis of Current Issues in Nutrition. Prerequisite: 5463 or consent of instructor. Current issues in human nutrition with emphasis on interrelationships of nutrients in metabolism and their impact on health.

6123* Micronutrients in Human Nutrition. Prerequisite: one course in biochemistry. In depth study of vitamins and minerals and their interrelationships in metabolism.

Nutritional Sciences
6233* Critical Analysis of Current Issues in Food Service Administration. Prerequisites: 5593, 5673. Current issues in food service administration with emphasis on total quality management, robotics, solid waste management and research needs.

6453* Advanced Research Developments in Nutritional Sciences. Prerequisites: one course in research methods and one course in statistics. Components of the research process for students who have completed an advanced degree. Development, application and interpretation of research methodology.

6870* Independent Study in Nutritional Sciences. 1-3 credits, maximum 6. In-depth analysis of research issues in nutritional sciences.

6960* Advanced Studies in Nutritional Sciences. 1 credit, maximum 3. Critical evaluation of research in nutritional sciences. Individual and group seminars on selected topics.

Occupational Education (OCED)

3901 Seminar in Teacher Education. Procedures for gaining admission to Teacher Education and student teaching. Requirements for certification and graduation, and course planning and evaluation. Documentazione and completion of 45 clock hours of observation in various school settings. Graded on a pass-fail basis.

4010* Occupational Education Workshop. 1-3 credits, maximum 6. Professional workshops of various topics and lengths. Focus on a particular topic from such areas as the development, use and evaluation of instructional methods and materials.


4213 Computers and Multimedia for Workplace Education. Lab 2. Overview of MS-DOS microcomputer applications in workplace education, including selection of hardware and software, databases, spreadsheets, authoring systems, Internet and other on-line databases, and multimedia applications.

4223* Program Planning and Development in Occupational Education. Planning and designing programs for the development of human resources. Program goals and objectives, curriculum, facilities, teaching-learning theories, materials development, program resources and program and instructional evaluation.

4333* (I) International Occupational Education. Comparison and analysis of international occupational education.

4470 Teaching Practicum in Occupational Education. 1-12 credits, maximum 12. Prerequisite: full-admission to Teacher Education. Organized teaching experiences under the guidance and direction of a local school cooperating teacher and university teacher educator. Participants assigned to a cooperating teacher with responsibility for planning, implementing and evaluating the classroom, laboratory or shop. Graded on a pass-fail basis.

5000* Thesis or Report. 2-10 credits, maximum 10. Students studying for a master’s degree may enroll for a total of two credit hours if they write a report or six hours if they write a thesis. Students working on a specialist’s degree may earn a maximum of 10 hours credit.

5010* Seminar. 1-3 credits, maximum 6. Graduate student seminars focusing on current and critical issues and common problems relevant to occupational education.

5113* Principles of Occupational Education. Underlying principles and evolving concepts in occupational and adult education. Critical analysis of educational programs and service areas and the resulting implications for leadership personnel at all levels of program responsibility.

5123* Evaluation of Programs and Instruction in OCED. Philosophies, principles and techniques of evaluation and strategies for applying them in planning, managing and improving occupational education programs. Designing, conducting, and reporting evaluations of OCED programs and instruction.

5133* International Workplace Education. Prerequisite: graduate standing. Ideas, practices and systems of occupational education in other countries compared with contemporary practices in the United States to provide a basis for an enlarged, critical view of technical education.

5153* Curriculum Planning in Occupational Education. Principles and procedures for curriculum planning, development and management in occupational and adult education with analyses of current trends and practices and their implications for program quality.

5313* History and Organization of Vocational and Technical Education. Prerequisite: graduate standing. Social, political, and economic forces acting upon vocational and technical education studied in depth for leadership development.

5333* Administration and Supervision of Local Occupational Education Programs. The duties of administrative and supervisory personnel responsible for the development, coordination and promotion of occupational education programs.

5340* Special Problems in Occupational Education. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed independent study of special topics involving assigned readings, library research, field work or a combination of these.

5443* Interpreting Research in Occupational Education. Seminar on the methods of research, review, synthesis and interpretation with application to particular fields of occupational and adult education.

5480* Modern Technology in Occupational Education. 1-6 credits, maximum 6. Technological developments in specialized occupational areas examined and analyzed for educational curriculum and program implications.

5553* Occupational Education for Students with Special Needs. Techniques and procedures by which occupational education may serve individuals with special needs. Field experiences an integral part of the course.

5720* Workshop. 1-3 credits, maximum 10. Professional workshops of various topics and lengths. Each workshop designed to meet unique or special needs of individuals concerned with adult education and human resource development.

5773* School-to-Work Transition. Strategies and procedures for coordinating school-to-work transition programs (e.g., cooperative education, youth apprenticeship, career exploration). Planning, organizing, implementing, and evaluating school-related, work-based learning.

5880* Internship in Occupational Education. 3-6 credits, maximum 6. Prerequisite: consent of instructor. Supervised experience working in business, industry, human service, or education settings.


6103* Philosophy of Occupational Education. Alternative perspectives for developing a philosophical position in occupational and adult education.

6110* Graduate Reading in Occupational Education. 1-6 credits, maximum 6. Prerequisites: graduate standing and consent of supervising professor. Supervised readings of significant literature not included in regularly scheduled courses.

6113* Teacher Education and Personnel Development for Occupational Education. Prerequisite: 6103. Research, trends and innovative practices in teacher education and personnel development for occupational education.

6233* Contextualized Learning and Communities of Practice. An analysis of communities of practice, situated cognition, constructivism, and information on learning through occupations. Expansion of the understanding and knowledge of an active, student-centered teaching/learning process, in work-based learning context.

6333* Strategic and Tactical Planning and Development. Theory, practice and trends in concepts and implementation. Analysis of comparisons and articulation among various public and private sector organizations.

6343* Financing Vocational-Technical Education. Prerequisite: graduate standing. Development of conceptual and legal bases for funding public vocational-technical education programs. Sources of funds, distribution strategies, local, state and federal accountability requirements, and fraud and abuse of funds.
Petroleum Technology (PET)

1234 Petroleum Fluid Properties. Lab 2. Prerequisites: MATH 1513 or 1715; CHEM 1215 or 1314. Chemical and physical properties of petroleum, petroleum products, natural gas, coal and drilling fluids. Introduction to reservoir engineering.

Philosophy (PHIL)

1013 (H)Philosophical Classics. Basic works by great thinkers, including Plato, Descartes and Hume.

1213 (H)Philosophies of Life. Introductory ethics and social philosophy. Moral decision-making, the good life, social values, freedom and responsibility.

1313 (A)Logic and Critical Thinking. Formal and informal reasoning, common fallacies, definitions and language functions, patterns of explanation. Practical criticism and development of everyday arguments.

2113 (H)Introduction to Philosophy. Selected philosophical problems: the nature of reality, knowledge, value, social ideals and religion.


3113* (H)Ancient and Medieval Philosophy. Main systems of Western thought from the Greeks to 15th century Europe. Emphasis on Plato, Aristotle, Augustine and Aquinas.

3213* (H)Modern Philosophy. Major philosophers and problems in Western thought from the 18th through the 19th century. Emphasis on Descartes, Hume and Kant.

3313 (H)19th and 20th Century Philosophy. Major philosophers and problems in Western thought from Hegel to the present.

3413 (H)Ethics. Contemporary and classical views on the nature of moral judgments, moral value, relativity and objectivity, freedom and responsibility.


3713 (H)Philosophy of Education. Classical and contemporary philosophers who have systematically developed their ideas about education, including Plato, Aristotle, Rousseau, Locke and Dewey.

3803 (H)Business Ethics. Ethical issues in business, such as employer-employee duties and loyalties, advertising uses, preferential treatment practices. Analytic grounding in basic theories of ethics.

3813* (H)Recent American Philosophy. Dominant trends in American philosophy during the last 100 years, with emphasis on pragmatism.

3823 (H)Engineering Ethics. Philosophical analysis of moral issues in engineering practice, such as whistleblowing, conflicts of interest and product liability. Professional codes of ethics.

3833* (H)Biomedical Ethics. Moral problems brought about by recent developments in scientific research and medical technology. Abortion, euthanasia, genetic engineering, and human experimentation.

3843 (H)Philosophy of Law. Prerequisite: upper-division standing. Philosophical issues related to U.S. law. The relationship between law and morality, the nature and functions of law, and grounds of liability.

3913* (H)Existentialism. Selected writings and themes in the development of existentialism and related intellectual movements. Subjectivity, phenomenological description, hermeneutics, freedom and value; and such writers as Kierkegaard, Nietzsche, Heidegger, Sartre, Marcel and Buber.

3923 (H)Contemporary Issues in Philosophy. Selected current controversies and recent trends in philosophy.

3943* (H, I)Asian Philosophy. Three main streams of Asian thought: Indian, Chinese and Buddhist. How various thinkers in the three traditions have dealt with questions of being and becoming, knowledge, ethics and society.

4003* Mathematical Logic and Computability. Prerequisites: 3000 or 3003 or MATH 3613 or consent of instructor. The basic metamathematics of first order logic: soundness, completeness, compactness, Löwenheim-Skolem theorem, undecidability of first order logic, Gödel's incompleteness theorem. Enumerability, diagonalization, formal systems, standard and nonstandard models, Gödel numberings, Turing machines, recursive functions, and evidence for Church's thesis. Same course as CS 4003 and MATH 4003.

4013* (H)Perspectives on Death and Dying. Issues that arise as individuals confront the fact of mortality. Dying patients, the ethical issues of euthanasia and suicide, the process of grief, death in literature and the arts, and philosophical and religious views on immortality.

4113* (H)Philosophy of Art and Literature. Nature of aesthetic objects and experiences; form, meaning and value in the arts; the function of art in society; criteria of criticism of the arts.


4453* (H)Philosophy in Literature. Selected literary works examined for philosophical ideas and themes. Attention to the interrelation of form and content. Thematic approach.

4713* (H)Philosophy of Science. Philosophical issues related to science and its role in society. Topics include science and common sense, laws and theories, causality, nature of scientific progress.

4733* (H)Philosophy of Biology. Selected philosophical topics, such as Darwinism and other theories of evolution, physical reductionism, and issues of genetic engineering.

4983* Metaphysics and Epistemology. Prerequisite: 12 credit hours of philosophy. The study of the fundamental nature of reality and human knowledge of it.

4990* Special Studies in Philosophy. 1-3 credits, maximum 10. Selected philosophical topics or works.

4991* Contemporary Philosophy Research. Prerequisites: upper-division standing, at least 12 hours in philosophy completed. Study of leading edge research in philosophy through presentation and discussion of current philosophy journal articles with faculty.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a faculty member, with a second faculty reader and oral examination. Required for graduation with departmental honors in philosophy.

5000* Thesis in Philosophy. 1-6 credits, maximum 6. Supervised individual work on a thesis for a master's degree.

5210* Seminar on a Major Philosopher. 3 credits, maximum 9. Prerequisite: three courses in philosophy. The writings of a major philosopher and related material.

5310* Seminar on a Field of Philosophy. 3 credits, maximum 9. Prerequisite: three courses in philosophy. Selected topics in one field of philosophy.

5610* Philosophical Issues in Education. 2-3 credits, maximum 3. Contemporary issues in educational theory and practice. The relation of education to political thought, religion, public law and culture.

5710* Contemporary Philosophies of Education. Analysis of contemporary educational philosophies, with attention to recommended aims, curricula and methods.

5910* Research Problems in Philosophy. 1-3 credits, maximum 10. Prerequisite: consent of instructor and department head. Individual or group research on specific philosophical problems.

Physics (PHYS)

1014 (N)Descriptive Physics. A survey course presenting the basic concepts and principles of physics with a minimum of mathematics. Motion, waves, temperature, electricity, magnetism, optics, atomic structure, and nuclear energy. No credit for students with credit in 1114.

1114 (L,N)General Physics. Lab 2. Prerequisite: high school algebra and trigonometry, or MATH 1483 or MATH 1715. Algebra-based introductory course covering the basic concepts of physics. Practical examples of the role of physics in other disciplines. Newtonian mechanics, fluids, heat, thermodynamics, waves, sound.

1214 (L,N)General Physics. Lab 2. Prerequisite: 1114. Continuation of 1114; electricity, magnetism, optics, quantum physics, atomic and nuclear structure.

1313 (L,N)Inquiry-based Physics. Lab 3. Properties of matter, motion, light and color, electrical circuits and energy conservation. Recommended for elementary education majors as model course to learn and teach science.


2414 General Physics for Science Majors II. Lab 2. Prerequisite: 2014 or 2314. Continuation of 2314. Electrostatics, electric fields and currents, circuits, waves, physical optics, modern physics, nuclear physics, and thermodynamics.

3013* Mechanics I. Prerequisites: 2114 or equivalent, and MATH 2233 or concurrent enrollment. Mechanics of particles, systems of particles and rigid bodies.

3113* Heat. Prerequisites: 1214 or equivalent, and MATH 2155 or concurrent enrollment. Thermodynamics, heat transfer, elementary theory of specific heat and the three laws of thermodynamics.

3213* Optics. Prerequisites: 2114 or 2414 and 3513, or consent of the instructor. Geometrical optics, interference, diffraction, dispersion, absorption and polarization of light.

3313* Modern Physics for Engineers. Prerequisite: 2114 or equivalent. Emphasis on nuclear, molecular and solid state physics with engineering applications.

3322* Modern Laboratory Methods I. Lab 6. Prerequisites: 2014, 2114. Introduction to electric and electronic measurements and computer applications in experimental control, data collection and laboratory computation. Experiments on test instruments, integrated electronics, signal processing, computer interfacing and data acquisition.

3513* Mathematical Physics. Prerequisites: 1214, 2114 or 2414 and MATH 2155. Physical applications of vectors, vector calculus and differential equations. Fourier analysis. Orbital geometry, coordinate systems and transformation of coordinates. Matrices and determinants.

3622 Modern Laboratory Methods II. Lab 6. Prerequisites: 2014, 2114. Introduction to the operating principles and applications of modern physical methods used in research. Laboratory experiments with lasers, wave propagation, thermometry, radiation detection, optical interferometry and spectroscopy.

3713 Modern Physics I. Prerequisite: 2114. Atomic physics, special theory of relativity, and introduction to solid state and nuclear physics.

4003* Computer Simulation Methods in Physics. Prerequisites: 3013, 3113, 3313 or consent of instructor. Introduction to computer simulation methods used in the physical sciences. Linear systems, nonlinear systems, molecular dynamics, Monte Carlo methods, cellular automata, simple quantum systems. Some knowledge of either C, FORTRAN, Pascal or BASIC required.

4010* Special Problems. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Individual laboratory work of an advanced nature.

4113* Electricity and Magnetism. Prerequisites: 2114 and MATH 2233, or their equivalents. Electrostatic fields, magnetic fields of steady currents, induced EMFs, Maxwell's equations and introduction to electromagnetic wave theory. Vector analysis used.

4213* Introduction to Nuclear and Particle Physics. Prerequisites: 8 hours of physics and 8 hours of chemistry. For nonphysics majors. Fundamentals of nuclear physics with applications to chemistry, engineering and biology.

4263* Introduction to Solid State Physics. Structure, specific heat, dielectric properties, lattice vibrations, free electron theory, band structure and superconductivity of solids.

4413* Modern Physics II. Prerequisites: 3013 and 3713. Atomic and X-ray spectra; one-dimensional Schroedinger equation; nuclear structure; introduction to statistical mechanics and elementary quantum statistics.

4423* Mechanics II. Prerequisite: 3013. Coupled oscillators, propagation of waves in discrete and continuous media; mechanics of discrete and continuous media and acoustics.

4513* Introductory Quantum Mechanics. Prerequisite: 3713. Uncertainty principle, setting up Schroedinger equation (time dependent as well as time independent) and solving it for linear oscillator, hydrogen atom, periodic and other potentials.

4663* Radioactivity and Nuclear Physics. Prerequisite: 3913. Natural and artificial radioactivity, decay laws; absorption, detection and measurement of radiations; nuclear transformations.

4712* Senior Project. Lab 6. Advanced individual experimental projects. Project proposal, formal laboratory report, and oral presentation are required.

4813* Electromagnetic Radiation. Prerequisites: 3213, 3513, 4113. Electromagnetic wave theory, reflection and refraction of electromagnetic waves; resonant cavities, wave guides, fiber propagation of electromagnetic waves; radiation sources; relativistic description of electromagnetic fields.

4993 Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in physics.

5000* Master's Thesis Research or Report. 1-9 credits, maximum 9. Prerequisite: consent of major professor. Thesis research or report for master's degree.

5110* Seminar. 1-5 credits, maximum 20. Prerequisite: graduate standing in physics. Special topics in physics.


5133* Theory of Spectra. Line spectra, hyperfine structure, Lamb shift, band spectra, NMR spectra and ESR spectra.


5213* Statistical Mechanics. Prerequisites: 5113 and 5613 or consent of instructor. Classical and quantum mechanical distribution functions for independent particles; interacting classical and quantum systems, superfluidity, phase transitions and critical phenomena, approximation methods.
5263* Particle Physics. Prerequisites: 5163. Nuclear forces, structure of nuclei and nuclear models.

5313* Electromagnetic Theory. Prerequisite: 5453. Electric and magnetic fields in free space and in matter. Boundary value problems, Green’s functions, stress tensors, multipole expansions, thermodynamics; electromagnetic waves.

5350* Special Problems. 1-3 credits, maximum 3. Prerequisite: graduate standing in physics. Special problems of experimental or theoretical nature. Largely individual work with written report required.

5353* Membrane Physiology. Prerequisites: 1214 and BIOL 3014 or BIOL 4113 or CHEM 3354 or PHYS 3313. Application of biophysical, biochemical and biological techniques to the study of the structure and function of membranes and membrane components, kinetic measurements, spectroscopic techniques and diffraactive techniques. Application of these illustrated with current research problems. Same course as MICRO 5223.

5413* Classical Mechanics. Prerequisite: 4423 or consent of instructor. Generalized coordinates and advanced dynamics; coupled systems, wave motion; theory of elasticity.

5453* Methods of Theoretical Physics. Prerequisite: 3513. Introduction to the various methods and techniques used in theoretical physics.

5613* Quantum Mechanics I. Prerequisite: 5453. Postulates of quantum mechanics. Operators, commutation relations, eigenfunctions. Schroedinger, Heisenberg and interaction formalisms, angular momentum and central field problems; nondegenerate perturbation theory.

5663* Solid State Physics I. Prerequisite: 4513. Crystal structure, cohesive energy of ionic crystals and metals, specific heats, free electron theory of metals, band theory. Brillouin zones, insulators and alloys; magnetic properties, optical properties and thermal and electrical conductivity of solids.

5713* Solid State Physics II. Prerequisite: 5663 or equivalent. Symmetry, dielectric properties, ferroelectrics, magnetic properties, mechanical properties and defects of solids.

5913* Selected Topics in Astrophysics. Recommended: ASTR 3023. Derivation of fundamental equations and application to problems in astronomical spectroscopy, stellar atmospheres, stellar interiors, interstellar matter and radio astronomy.

5960* Problems in Chemical Physics. 3-6 credits, maximum 6. Prerequisite: consent of instructor. Intermolecular forces, interaction of radiation with matter in bulk form, dielectric properties of matter, polymer physics and quantum theory of biopolymers.

600* Doctoral Dissertation Research. 1-15 credits, maximum 60. Prerequisites: admission to candidacy and permission of major professor.

6010* Advanced Graduate Seminar. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Special topics of an advanced nature in physics.

6113* Advanced Theory of Solids. Prerequisite: 5663. Many-body techniques, transport processes, band theoretical techniques, superconductivity, dynamics of electrons in a magnetic field, and alloys.

6213* Group Theory for Physics. Prerequisites: 5453. Group theory and imperfections in crystals; Dislocation theory and color centers.

6243* Semiconductors I. Prerequisites: 5113, 5613, 5663. The first part of a survey of the physics of semiconductors. Bonding and structure, crystal growth, epitaxial growth, band theory, phonons, photons, defects, intrinsic and extrinsic properties, trapping and recombination.

6313* Quantum Mechanics II. Prerequisite: 5613. Scattering theory, many-particle quantum mechanics and application to atomic and molecular systems; degenerate and time-dependent perturbation theory.

6343* Semiconductors II. Prerequisite: 6243. The second part of the semiconductors sequence. Transport phenomena, junctions, devices, heterostructures and optical properties.

6413* Modern Optics. Prerequisites: 5313, 5163, 5613. Non-linear optics, higher-order susceptibilities; four-wave mixing; quantum optics and photon statistics, Maxwell-Bloch equations.

6513* Advanced Topics in Solid State Physics. Prerequisite: 5663 or equivalent. Interaction of radiation and matter, neutron scattering, phase transitions, magnetic resonance and cooperative phenomena.

6613* Advanced Nuclear and Particle Physics. Prerequisites: 5263, 6313. Nuclear and elementary particle interactions, resonances, and models; relativistic quantum mechanics and quantum field theory.

6713* Classical Theory of Fields. Prerequisite: 5513. Radiation theory, waveguides, scattering and dispersion relations; relativity.

6803* Photonics I: Advanced Optics. Lab 9. Prerequisite: ECEN 3213 or 3813. Advanced optical instrumentation including the design and use of optical systems. The design and use of optical systems. The design and use of optical systems.

6811* Photonics II: THz Photonics and THz-TDS. Lab 3. Prerequisite: ECEN 6803. THz photonics and THz-time-domain spectroscopy (THz-TDS). Concepts and techniques of driving electronic circuitry with ultrashort laser pulses to generate and detect freely propagating pulses of THz electromagnetic radiation using several operational research systems. Same course as CHEM 6811 and ECEN 6811.

6821* Photonics II: Spectroscopy Lab. 3. Prerequisite: 6803. Operating principles and applications of laser spectroscopy of atoms, molecules, solids and complex fluids. Absorption, emission, photon correlation, coherence, time resolved Fourier transform. Raman spectroscopy and non-linear optical. Same course as CHEM 6821 and ECEN 6821.

6831* Photonics III: Microscopy I. Lab 3. Prerequisite: CHEM 3553 or consent of instructor. The structure and imaging of solid surfaces. Basics of scanning probe microscopy (SPM). Contact and noncontact atomic force microscopy (AFM). Scanning tunneling microscopy (STM) in air. Same course as CHEM 6841 and ECEN 6841.

6841* Photonics III: Microscopy II. Lab 3. Prerequisite: 3553 or consent of instructor. Advanced techniques of SPM. Magnetic force microscopy, Kelvin force microscopy, STM in vacuum. Characterization of materials with SPM. Nanolithography with SPM. Device manufacturing and analysis. Same course as CHEM 6851 and ECEN 6851.

6861* Photonics III: Microscopy III and Image Processing. Lab 3. Prerequisite: ECEN 5793. Digital image processing, including projects. Image transformations, image enhancement, geometric operations, linear and nonlinear filtering, image restoration, edge detection, image analysis, morphology, segmentation, recognition, and coding/compression. Same course as CHEM 6861 and ECEN 6861.


6891* Photonics IV: Semiconductor Synthesis and Devices III. Lab 3. Prerequisite: 6803. Processing, fabrication and characterization of semiconductor optoelectronic devices in class 100/10000 cleanrooms. Classroom operation including general procedure for material processing and device fabrication. Device processing using a variety of processing such as mask aligner, vacuum evaporators and rapid thermal annealer. Testing using optical and electrical testing apparatus such as I-V, C-V, Hall, and optical spectral measurement systems. Same course as CHEM 6891 and ECEN 6891.
3344 Introductory Plant Pathology. Lab 2. Prerequisite: BIOL 1114 or 1404. Introduction to basic principles and concepts of plant pathology, including the nature, cause and control of biotic and environmentally induced plant diseases, with emphasis on principles and methods of disease management.

3553 Fungi: Myths and More. Lab 2. Prerequisite: biology. Colorful folklore and myths of fungi and the role of fungi in the ecosystem and human affairs as diseases of plants, animals, and humans. Laboratory instruction on mushrooms, mechanisms of dispersal and genetic recombinations. Undergraduate research component on isolation and growth of mushrooms and other fungi.

3663 Turfgrass Integrated Pest Management. Lab 2. Prerequisite: 3344, ENTO 2023. The biology, ecology and identification of fungal, nematode and insect turfgrass pests. Contemporary concepts and applications of integrated control practices available for managing turfgrass pests presented along with decision-making principles for use in turfgrass pest management programs. Same course as ENTO 3663.

4400 Undergraduate Research. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Undergraduate research problems in plant pathology.

4922* Applications of Biotechnology in Arthropod and Pathogen Control. Prerequisites: introductory biology and chemistry or equivalent. Applications of biotechnology in controlling arthropod pests of plants and animals and plant pathogens. Introduction to underlying technology, products being deployed, their effectiveness and associated problems or concerns resulting from their use. Same course as ENTO 4922.

5000* Research. 1-6 credits, maximum 6. Research for the M.S. degree.

5004* Plant Nematology. Lab 3. Prerequisite: 3344 or concurrent enrollment. General morphology, taxonomy and bionomics of nonparasitic and plant parasitic nematodes. Plant parasitic nematode assay techniques, subfamily identification, symptomology, pathogenicity and control.

5012* Plant Virology Laboratory. Lab 4. Prerequisite: previous or concurrent enrollment in 5013. Methods of investigating plant viruses.

5013* Plant Virology. Prerequisites: 3344 or equivalent; one course in biochemistry or physiology. Transmission, characterization, differentiation, replication and control of plant viruses; discussion of current literature.

5043* Principles of Phytopathology. Lab 2. Prerequisite: elementary botany or plant physiology. An in-depth survey of the basic principles and practices of plant pathology presented at the graduate level. Ecology and epidemiology of plant pathogens. Field trips to view plant diseases in natural settings. Student-planned and conducted hands-on experimentation with plant pathogens.

5104* Mycology. Lab 4. Prerequisite: graduate standing. A systematic study of the fungi, with emphasis on taxonomy, comparative morphology and fungal biology. Taught in the Department of Plant Pathology. Same course as BOT 5104.

5304* Phytobacteriology. Lab 4. Prerequisite: 3344. Bacteria as plant pathogens, with examination of the taxonomy, genetics, ecology, physiology, host-parasite interaction and control of phytobacteria.

5413* Plant Disease Epidemiology. Lab 3. Prerequisite: 3344 or 5043. Introduction to methodology and technological equipment used in epidemiological research and application of epidemiological principles in plant disease control.

5523 Integrated Management of Insect Pests and Pathogens. Prerequisites: 3344 and ENTO 2023 or equivalent or consent of instructor. Modern theory and practices for management of insect pests and pathogens in plant production systems, emphasizing an ecologically-based, integrated approach. Basic concepts of pest management, decision-making, cost-benefit analysis, and risk/benefit analysis. Same course as ENTO 5523.

5560 Problems in Plant Pathology. 1-5 credits, maximum 10. Prerequisite: consent of instructor.

5613* Host Plant Resistance. Lab 2. Prerequisites: 3344 and ENTO 2023 or equivalent and a general genetics course; or consent of instructor. Interactions of plants and the herbivorous insects and pathogenic microorganisms that attack them. Development and deployment of multiple-pest resistant cultivars in crop management systems. Same course as ENTO 5613.

5724* Physiology of Host-Pathogen Interactions. Lab 4. Prerequisites: 3344 and BIOL 3653. Physiology of the interactions between plants and pathogens. Mechanisms by which pathogens infect and by which plants resist infection.

5850* Plant Pathology Seminar. 1 credit maximum per semester. 2 credits for M.S. and 4 credits for Ph.D. required.

5860* Colloquium. 2 credits, maximum 2. Prerequisite: 3344. Concepts and principles of plant pathology through discussions of pertinent literature.

5870* Scientific Presentations. 1 credit, maximum 1. Prerequisite: consent of instructor. Preparation and delivery of scientific presentations including 50-minute seminars, 10-minute talks, and posters. Same course as ENTO 5870.

5992* Career Skills and Professionalism for Scientists. Prerequisite: graduate standing. For graduate students majoring in science-based fields, especially those nearing graduation. Skills needed for effective job application and interviewing, career development and advancement, communication with professional colleagues and the public, and personal professional development. Same course as ENTO 5992.


6102* Genetics of Plant Disease. Lab 4. Prerequisites: 3344 or equivalent and a course in general genetics. Genetics of host plants, plant pathogens and the interaction between the two. Flor’s gene-for-gene hypothesis and its implications in breeding for disease resistance.

6303* Soilborne Diseases of Plants. Lab 3. Prerequisite: 3344. Soilborne diseases, their recognition and importance, the pathogens involved, rhizoplant and rhizosphere influences, inoculum potential, specialization of pathogens, suppressive soil effects and disease management. Lecture and discussion sessions will emphasize in-depth understanding of problems and complexities associated with studies of soilborne pathogens.

Plant Science (PLNT)

1213 Principles of Crop Science. Production, management and improvement of modern agronomic crops. Structure and growth of crop plants relating to management strategies and adaption to varying abiotic and biotic factors. Importance of crop production to the producer and the consumer.

2012 Crop Production Laboratory. Lab 2. Prerequisite: 1213. Hands-on experiences with crop plants. Identification of crops in seed, seedling, mature stages; crop morphology, seed quality, grain grading, growth stages of crops.

2041 Career Orientation. Prerequisite: sophomore standing in the Department of Plant and Soil Sciences. Development and improvement of written and oral communicative skills; orientation to research and extension activities related to plant and soil sciences, and academic requirements and procedures. Graded on pass-fail basis.

3111 Weed Control Laboratory. Lab 2. Prerequisites: 1213 and 3112 (or concurrent enrollment). Identification of common weeds, principles and practices of herbicide application, and application equipment, handling and proper use of herbicides.

3112 Principles of Weed Control. Prerequisite: 1213. Weed control principles and practices included in cultural and chemical weed control. Current weed control practices in crops, rangeland and crop situations.

3213* Pasture Management and Forage Production. Prerequisites: 1213, SOIL 2124, and MA 1411. Pasture systems, livestock management and forage crop production for maximum economical production of introduced forage species.

3554* (N)Plant Genetics and Biotechnology. Lab 2. Prerequisite: BIOL 1114. Basic principles of heredity. Interrelationship between classical genetics and molecular genetics emphasized. Mendelian genetics, cytogenetics, mutations, gene regulation and genetic engineering.

3781 Market Grain Technology. Lab 2. Prerequisite: 1213. Quality characteristics of grain for commercial use; identification of different market classes of grain, quality factors, and admixtures affecting the commercial grade; practice in grading grain using the federal grain standards.

3790 Seed and Plant Identification. 1 credit, maximum 2. Lab 3. Prerequisite: 1213. Identification and classification of agronomically important crop and weed species from seed and from seedling, vegetative, flowering or mature plants.
4080 Professional Internship. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Internship must be at an approved agribusiness unit or other agency serving agronomic agriculture. Requires a final conference with on-campus adviser and a written report. Graded on a pass-fail basis.

4113* Advanced Weed Science. Prerequisites: 3111 and 3112. Integrated approach for weed management. Weed life cycles and biology, weed crop interferences, herbicide families and their characteristics, and finally a systematic and integrated weed management system. Methods of conducting and interpreting research results in appropriate topics.

4123* Crop Physiology. Prerequisites: 1213 and BOT 3463. Application of basic physiological concepts of growth and cultural management and underlying crop production; environmental and genetic effects on growth of crop plants. Plant ecosystems at the community level relative to optimum yields and quality.

4353* Plant Breeding. Prerequisite: 3554 or equivalent. Basic principles dealing with the improvement of plants through application of genetic principles.

4470* Problems and Special Study. 1-3 credits, maximum 12. Lab 1-3. Prerequisite: consent of the instructor. Problems in plant science selected from topics in range and turf, plant breeding and genetics, crop management and physiology, and weed control.

4571 Senior Seminar. Prerequisite: senior standing in plant and soil sciences. Career opportunities (talks and field trips); preparation of resumes and interviews. Graded on a pass-fail basis. Same course as RLEM 4571 and SOIL 4571.

4673* Grain Crops. Lab 2. Prerequisite: 1213. Production, distribution, classification, utilization and improvement of the major cereal crops.

4772* Oilseed, Pulse and Mucilage Crops. Prerequisite: 1213. Production, utilization and improvement of oilseed, pulse and mucilage crops with special emphasis on peanuts and soybeans.

4783* Cotton Production. Prerequisite: 1213. Production, utilization and improvement of cotton. Several other agronomic fiber crops briefly discussed.

5000* Master’s Thesis. 1-6 credits, 6 maximum total credits under Plan I, and 2 maximum total credits under Plan II. Prerequisite: consent of adviser. Research planned, conducted and reported in consultation with a major professor.

5020* Graduate Seminar. 1 credit, maximum per semester 1 credit on M.S. program and 2 credits on a Ph.D. program required. Prerequisite: graduate standing. Philosophy of research, methods of research, or interpretation of research.

5110* Problems and Special Study. 1-4 credits, maximum 6. Prerequisite: consent of instructor. Supervised study of special problems and topics not covered in other graduate courses.

5112* Herbicide Fate in the Environment. Prerequisite: 4112. Processes involved in the behavior and fate of herbicides in air, soil, and water. Reaction, movement and dissipation of herbicides in soil.

5230* Research. 1-4 credits, maximum 4. Prerequisite: consent of a faculty member supervising the research. Supervised independent research on selected topics.

5293* Plant Response to Water Stress. Prerequisites: BIOL 3653, BOT 3463. Physiological ramifications of water deficit stress on cells, tissues, plants and canopies. Discussion of the soil/plant/atmosphere continuum, and avoidance and tolerance mechanisms leading to growth, resistance, and optimization, transpiration, and water-use efficiency and their relationship to biomass accumulation and crop yield.

5403* Physiological Action of Herbicides. Prerequisite: BOT 3463. The mode of action, uptake and translocation, and metabolism of herbicides in crops and weeds.

5414* Plant Breeding Theory, Methods and Strategies. Prerequisites: 3554, 4353 and STAT 5013, or consent of instructor. Development and application of statistical and genetic principles to breeding methodology of self- and cross-pollinated crops; emphasis on selection methods pertinent to plant improvement; examination of philosophies and strategies employed in private and public plant breeding programs.

5433* Biotechnology in Plant Improvement. Prerequisites: 3554, 4353, and BIOL 3014 or consent of instructor. Use of emerging technologies for the improvement of plants and manipulation of plants. Emphasis on genetic systems which influence productivity and end-product utilization. The integration of biotechnology into plant breeding programs and issues concerning the release of genetically engineered organisms into the environment.

5443* Advanced Genetics. Prerequisites: 3554; BIOL 3653. Concepts of eukaryotic genetics on classical, molecular and quantitative genetics.

5452* Cytogenetics. Prerequisite: 5443 or concurrent enrollment in BOT 5232. Behavior of chromosomes, cellular organelles and cytoplasm in relation to genetic behavior.

5663* International Agricultural Research Systems. Organization, management and budgeting of agricultural research systems with emphasis on developing countries. Analysis of research and training priorities, budgeting, staffing and management of projects.

6000* Doctoral Thesis. 1-6 credits, maximum 20. Prerequisite: consent of adviser. Independent research to be conducted and reported with the supervision of a major professor as partial requirement for the Ph.D. degree.

6010* Advanced Topics and Conference. 1-6 credits, maximum 12. Prerequisite: M.S. degree. Supervised study of advanced topics. A reading and conference course designed to acquaint the advanced student with fields not covered in other courses.

6410* Topics in Plant Breeding and Genetics. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Selected topics in the statistical and experimental analysis of quantitative traits, evolutionary development of domesticated plants and animals, and techniques used in breeding crop plants.

Political Science (POLS)

1010 Studies in American Government. 1-2 credits, maximum 2. Special study in American government to allow transfer students to fulfill general education requirements as established by Regents’ policy.

1113 American Government. Organization, processes and functions of the national government of the United States. Satisfies, with HIST 1103 or 1483 or 1493, the State Regents requirement of six credit hours of American history and American government before graduation.

2013* (S)Introduction to International Relations. Analysis of the major concepts in international relations - power, sovereignty, self-help, cooperation, dependency, and introduction to the dominant theoretical approaches to its study realism, pluralism, Marxism and feminism.


2033 Introduction to Public Administration. Public administration, including administration, administrative organization, decision-making, governmental public relations, and administrative responsibilities.

2113 (S)Comparative Politics. A comparative study of the political processes and institutions of contemporary societies. Introduction to the concepts and methods of comparative politics.

2993 Honors Tutorial in Political Science. Prerequisites: 1013, honors standing, and invitation by head of department. For the special needs of the sophomore-level honors student majoring in political science who wishes to study individualized topics at an accelerated pace in a tutorial format. After mastering basic principles in an area of interest the student will conduct independent research under close faculty supervision and prepare a report or paper.

3003 (I&S)The Soviet Union: History, Society and Culture. A comprehensive view of the Soviet Union, stressing those issues in the political, economic, technological, geographical and cultural spheres which are most relevant to the current situation. Accessible to beginning undergraduates. Same course as HIST 3003 and RUSS 3003.

3006* International Law. The nature and scope of public international law, with emphasis on problems related to the recognition of states and governments, jurisdiction over nations and aliens, and state responsibility in cases of expropriation and revolutionary damage.
3043 Politics of International Trade and Development. Theory and practice of international political economics. The patterns of association between political and market-based processes among nation states. Emphasis on interactions among advanced industrial states, transnational phenomena, and opportunities and pitfalls in north-south relations.

3053 (I,S)Introduction to Central Asian Studies. A comprehensive view of newly-emerged Central Asian states examining the history, politics, economics, geography, and culture of Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan as reflected in their thoughts, religion, literature, and architecture. In the past, and the strategic importance of their natural wealth for the present and future. Same course as HIST 3053 and RUSS 3053.

3100 Political Science Internship. 1-6 credits, maximum 6. Prerequisite: consent of department. Internship education experience in a specific subfield in the discipline of political science.


3133* (I)Politics of Anglo-American Democracies. Political processes and governmental institutions of the United Kingdom, Ireland, Canada, Australia, and New Zealand with comparisons to the United States.

3143* (I)Politics of Western Europe. Political processes and governmental institutions of continental West European states, with emphasis on France, Germany and Italy.

3193 (I,S)Government and Politics in Latin America. Analysis of processes, institutions and contemporary trends in the politics of selected Latin American countries; political development, democratization, political role of the military, political economy and social movements.

3223* (I)Politics and Administration in East Asia. Political processes, governmental institutions and administration in China, Japan and Korea.

3233 (LS)Chinese Politics. Political process, government institutions and experience of development in People’s Republic of China.

3243 Foreign Policies in the Former Soviet Bloc. The comparative foreign policies of the territories of the former “Eastern bloc” in the period following the revolutions of 1989-91. The resurgence of nationalism and the effects of defining and pursuing national self-interest on the foreign policies of Eastern European and former Soviet territories.

3313* (I)Governments and Politics in the Middle East. Analysis of political institutions and processes with emphasis on selected countries of the Middle East; the social and economic basis of politics; nationalism, political development and factors of instability and change.

3353* (S)Parties and Interest Groups. Political parties and interest groups as institutions; their role in elections and government.

3414* Political Campaigns. Lab 2. Planning, fundraising, targeting, public opinion, support operations, voter contact, the mass media, and candidate activities. Lab work in campaigns or government offices.

3423 Voting and Elections. Electoral systems and their relationship to political development, political socialization, issue emergence, voting patterns, and electoral cycles.

3453* (S)The Legislative Process. The power and organization of legislatures, as well as the selection and behavior of legislators. Special attention given to the U.S. Congress.

3483* (S)The American Presidency. The politics of presidential selection, removal and succession; formal and informal powers of the president; relations with Congress; the national judiciary and national executive branch; proposed reforms and the vice-presidency.

3493* Public Policy. Prerequisite: any one of 1013, 2033, 2113, ECON 1113, 2123, SOC 1113, PHIL 2113. Identification of policy options open to policy makers and examination of measurement and rationale of underlying governmental programs.

3503 Campaign Research and Technologies. Prerequisite: 1113. Introduction to technical innovations in political management. Political commercial creation and testing involving digital video cameras and audience response systems such as the “perception analyzer.” The use of computers for database management, on-line information retrieval and electronic mail systems. Integration of research skills and political techniques by using the advanced information technologies of neural networks, intelligence gathering, computer-mediated political communications and electronic focus groups.

3513 Public Opinion and Polling. The nature of public opinion. Public opinion polling, the factors influencing opinion formation, and the effects of public opinion on policy and policy makers.

3523 Campaign Fundraising and the Media. Prerequisite: 1113. Techniques used by successful candidates for elective office to present their positions to the voting public. Beginning with the basic elements of fundraising exploration on current campaign finance laws, fundraising techniques and campaign budgeting. Message development, media production and ad placement. Preparation of a fundraising strategy.

3533 Political Lobby and Grassroots Organization. Prerequisite: 1113. Traditional special interest lobbying and the rapidly emerging local grassroots constituent movement. New federal laws pertaining to lobbying and rules that govern the conduct of state lobbying. The implications of technology and the potential advent of a plebiscite form of government. Development of complete grassroots strategy on an issue either at the federal or state level.

3613* (S)State and Local Government. Political processes, government and administration of American states, cities and counties; special emphasis on Oklahoma.

3663* Political Thought. The teachings of the three lasting traditions of Western political thought: classical, Christian and modern.

3713 Fire Service Administration. Designed to present issues related to the administration of a fire service organization including the study of federal, state and local statutes and regulations governing department operations; emergency and non-emergency operations and procedures for professional standards and Fire Officer professional qualifications; and inter-governmental relations and operations.

3733 Incident Management and Tactical Operations. Strategic management of an emergency incident through the use of the Incident Management System. A thorough study of the IMS system and tactical decision making forming the base for case study analysis and emergency operations simulations.

3743 Firefighter Health and Safety. Comprehensive occupational safety and health for the fire service. Examination of the NFA 1500 standard as the basis for studies of health and safety issues in emergency and non-emergency activities.

3813 Aim and Scope of Emergency Management. An overview of the history and philosophy of the current emergency management system. Concepts, issues and programs associated with the development of an emergency management program. Local, state and federal roles and responsibilities for responding to disasters and emergencies with emphasis on man-made natural and technological hazards.

3823 Political and Legal Issues in Fire and Emergency Management. Effect of legal and political issues on the management and administration of fire and emergency management organizations. Applicable law and regulations related to organizational administration and emergency operations. The politics of disaster, in particular, within the framework of applicable federal, state, and local law and guidelines, through case studies and guest lecturers.

3893 Terrorism and Emergency Management. A general introduction to the basic concepts for preparedness, response and command functions at the scene of a potential terrorist incident.

3953 (S)Minorities in the American Political System. Prerequisite: 1113. Examination of mass and elite level behavior of minorities in the contemporary U.S. political system.

3983* (S)The Judicial Process: Courts, Judges and Politics. The American judiciary and legal process from a political perspective with particular emphasis on judicial organization and powers, recruitment, fact-finding, decision-making, impact of decisions, the legal profession and relations among courts. Oklahoma judicial organization.

4003* Political Analysis. Prerequisites: 60 credit hours, or 45 hours with GPA of 3.25, including 2113. Logic and techniques of modern political analysis, including the logic of political analysis, the collection and analysis of political information, and data processing and computer applications to the study of politics.

4013* American Foreign Policy. Major problems and policies of American foreign relations since World War II and description of foreign formulation and aid administration.
4108 Problems of Government, Politics and Public Policy. 1-6 credits, maximum 6. Prerequisite: 4430 or GPA of 3.25, including 2023 or 3983 recommended. Development of principles of constitutional law by the Supreme Court concerning federalism and separation of powers with particular emphasis on political and doctrinal developments surrounding judicial review, regulation of commerce, taxing and spending, and presidential power. Introduction to legal research techniques.

4930 Political Science Honors Thesis. Prerequisite: student standing, Honors Program participation. A guided reading and research program ending with a final honors thesis under the direction of a faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in political science.

4513 American Politics. Significant developments and issues in American politics, including American political behavior and political leadership.

4553 (H)American Political Thought. A survey of the major developments in American political thought from the Colonial period to the present, followed by a topical analysis of important recent theoretical developments in political science.

4593 (S)Natural Resources and Environmental Policy. Current issues in the law, politics and administration of energy, land, water, mineral and other natural resources policy with particular emphasis on relations to environmental policies and law.

4653 (H)Contemporary Political Thought. An analysis of 19th and 20th century political ideas, with emphasis on the rise and fall of ideologies along side controversies over relativism, positivism, pragmatism, and resurgent religious faiths.

4663 Politics and Human Reason. An overview of past and present accounts of politics as a rational activity, with attention given to Aristotle, the Federalist, and modern social choice theory.


4713 Strategic Analysis and Change Management in the Fire Service. A study of strategic planning, needs analysis, and the effective management of change in the fire service. Principles such as commitment to excellence, team building, participating planning and decision-making, process modeling, and strategic planning models. Case studies, team projects, and analysis of current research and literature to develop a skill base for practical application.

4780 Special Topics in Fire and Emergency Management. 3 credits, maximum 6. Prerequisite: 3713. Special problems in fire service management. Current issues and challenges on the national and local level. Case studies, guest lecturers and studies of current research and literature as learning tools and to facilitate student involvement.

4833 Principles and Process of Disaster Preparedness, Relief and Recovery. Current conceptualizations of community preparedness for natural and man-made disasters, disaster recovery, and the recovery process. Related issues such as governmental assistance, computer mapping, hazard analysis, planning, structural protection, and new technologies. The relationship and effectiveness of preparedness to action and recovery through case study analysis.

4963 (S)American Constitutional Law: Equal Protection of the Laws. Prerequisite: 2023 or 3983 recommended. Development and principles of constitutional law by the Supreme Court concerning individual and group rights, with particular emphasis on equal protection of the laws concepts in matters of race, gender, wealth, citizenship, legislative reapportionment and voting rights, government employment and affirmative action programs. Legal research techniques.

4973 American Constitutional Law: The Division of Governmental Powers. Prerequisite: 2023 or 3983 recommended. Development of principles of constitutional law by the Supreme Court concerning federalism and separation of powers with particular emphasis on political and doctrinal developments surrounding judicial review, regulation of commerce, taxing and spending, and presidential power. Introduction to legal research techniques.

4983 (S)American Constitutional Law: Due Process of Law. Prerequisite: 2023 or 3983 recommended. Development of principles of constitutional law by the Supreme Court concerning 5th and 14th Amendment due process concepts, with particular emphasis on suspect’s rights, search and seizure, free speech and press, religious liberty, property rights and procedural requirements at national and state level. Legal research techniques.

4993 Politics and Human Reason. An overview of past and present accounts of politics as a rational activity, with attention given to Aristotle, the Federalist, and modern social choice theory.

5000 Thesis. 1-6 credits, maximum 6.

5013 Quantitative Methods of Political Analysis. Required of all graduate students. Fundamental methodological issues in the scientific study of politics. Logic of science, principles of research design and computer data manipulation and analysis.

5020 Research in Public Administration, Public Policy and Politics. 1-6 credits, maximum 6. Individually supervised research.

5030 Internship in Public Administration and Government. 1-6 credits, maximum 6. Individually supervised internships in administrative and governmental career areas. Paper required.

5040 Readings in Politics, Public Policy or Public Administration. 1-6 credits, maximum 6. Prerequisite: consent of supervising professor. Readings in the student’s major area of study.

5100 Advanced Problems in Government, Politics, and Public Policy. 3 credits, maximum 6. Special seminar, topics vary from semester to semester.

5113 Seminar in Public Program Evaluation. Methodology of evaluation research in public programs. Emphasis will be placed on designing and interpreting evaluative research rather than the mastery of particular mathematical, statistical or computer skills.

5210 Seminar in International Relations. 3 credits, maximum 6. Research on the dynamics and institutions of international politics.

5213 Seminar in the International Political Economy. Prerequisite: graduate standing. Research on the mechanics and theories of interaction between economic and political phenomena. Same course as IS 5213.
### Seminar in Fire and Emergency Services Administration
3 credits, maximum 6. Preparation for the environmental manager, fire manager, and fire department manager to communicate and negotiate with the public and media concerning environmental threats to human health routine and non-routine releases of chemicals and radioactive materials. Strategies for community-based planning, emergency preparedness, environmental response, site damage, and conflict management.

### Seminar in American Political Institutions
1-3 credits, maximum 6. American institutions, including Congress, the presidency, courts, political parties and interest groups.

### Seminar in Public Law
4 credits. Literature of public law in the United States. Overview of the approaches that shape the theoretical and empirical contours of the public law field and contribute to multidisciplinary law and social science studies.

### Seminar in Women and Politics
3 credits, maximum 6. Research on a variety of topics concerning women and politics, including women's movements, women and elections, and public opinion.

### Practicum in Fire and Emergency Management Administration
Prerequisite: consent of instructor. Supervised practicum in fire and emergency management administration.

### Psychology (PSYC)

#### 1113 (S)Introduction to Psychology
Principles, theories, vocabulary, and applications of the science of psychology.
5193* Ethics and Professional Development in Psychology. Prerequisite: graduate standing in the Department of Psychology. Principles of ethics with a focus on the guidelines and standards for psychology. Legal and ethical issues for the practice of clinical psychology.

5303* Quantitative Methods in Psychology I. Prerequisite: 3213. Statistical methods of evaluating research hypotheses in psychology. Descriptive measures, Student’s t, one-way analysis of variance, comparisons among groups and statistical robustness are stressed.

5314* Quantitative Methods in Psychology II. Lab 2. Prerequisite: 5303. A continuation of 5303. Higher-order analysis of variance designs, correlation and regression techniques, and analysis of covariance, with emphasis on applications to psychological experimentation. Computer applications of all procedures using SPSS and/or SAS during the lab.

5333* Systems of Psychotherapy. Prerequisites: 5113; graduate standing in the clinical program of the Department of Psychology or consent of instructor. The major approaches to psychotherapy. Methods for creating multiple impact for behavioral change, including interpersonal, social, community and preventative interventions.

5360* Research. 1-12 credits, maximum 12. Prerequisite: consent of instructor. Research project on some psychological problem.

5620* Seminar in Psychology. 1-9 credits, maximum 9. Prerequisite: consent of instructor. Consideration of special topics that are particularly timely or technical in nature.

5660* Teaching Practicum. 1-2 credits, maximum 2. Prerequisite: consent of instructor. Primarily for graduate students with well-defined new teaching responsibilities.

5823* Cognitive Processes. Theory and experimental research findings dealing with human thought processes from a developmental and functional standpoint.

6000* Dissertation. 1-16 credits, maximum 60. Research and report thereon by graduate students in partial fulfillment of requirements for the Doctor of Philosophy degree.

6083* Principles of Behavior Therapy. Prerequisite: graduate standing in the clinical program of the Department of Psychology or consent of instructor. Principles and procedures of behavior therapy and modification.

6133* Ethnic and Cultural Diversity in Psychotherapy. Prerequisites: six credit hours of psychology and consent of instructor. Increasing understanding and appreciation of ethnic and cultural diversity in the psychotherapy context. Critical examination of theory and research related to psychotherapy with multicultural populations.

6143* The Psychology of Substance Abuse. Prerequisite: consent of instructor. Introduction to psychological classification of psychoactive substances (alcohol and drug use disorders. Theory and research on psychological, biological, and environmental factors that are concomitants of substance abuse. Overview of major treatment techniques and treatment modalities in this area.

6173* Child Psychopathology and Treatment. Prerequisites: 3443, 3583 or equivalent; graduate standing in the clinical program of the Department of Psychology, the doctorate school psychology program or the psychometry program, or consent of instructor. Theoretical considerations and issues in child psychopathology. Procedures used in the treatment of psychological disorders of children.

6223* Research Design. Prerequisites: 3914 and doctoral level standing. Experimental techniques in psychophysics, sensory processes, attention and perception, motivation and emotion, and learning and memory.

6233* Clinical Research Design. Prerequisites: 5303, 5513, and 6223 or consent of instructor. Methodology and research practices in clinical psychology, including experimental design, research practice, data analysis and interpretation, ethics, and dissemination of research findings.

6253* Seminar in Human Development. Prerequisite: consent of instructor. Behavioral aspects of development from the prenatal period to senescence. Normal development contrasted to exceptional development.

6263* Personality Theories. Prerequisites: nine credit hours of psychology and consent of instructor. Various theories of personality.

6283* Factor Analysis. Factor analysis and implications for measurement of mental abilities, personality traits and learning.

6353* Psychology and Motivation. Prerequisite: 3914. Outline of theory and research in human and animal motivation.

6383* Community Psychology. Prerequisite: consent of instructor. Positive rehabilitative and preventive objectives; application of psychological knowledge and skills to problems of social change and general improvement of the quality of life. Physical, psychological and social factors viewed through system analysis.

6393* Psychology of Language. Review of data and theories of speech and language behaviors. Laboratory techniques and experimental designs will also be reviewed to emphasize understanding of psycholinguistic research.

6413* Systems of Psychology. Two different meanings of “system” considered: the traditional meaning dealing with the various schools of psychology, and the modern meaning in which contemporary social problems are viewed as sets of interrelated variables that produce unforeseen and remote effects.

6433* Psychology of Information Processing: Development and Aging Aspects. Attention, long processing, pattern recognition and related areas in terms of contemporary facts, theory and application. Special attention paid to development and aging aspects of information processing.

6443* Behavioral Medicine. Prerequisites: graduate standing in the clinical program of the Department of Psychology, consent of instructor. An advanced graduate course for students in training for a Ph.D. in clinical psychology. General considerations for psychophysiological disorders and general intervention strategies in behavioral medicine including biofeedback, and specific consideration and intervention strategies for specific disorders.

6453* Pediatric Psychology. Prerequisite: graduate standing in the Department of Psychology; consent of instructor. Overview of the field of pediatric psychology, including historical perspectives, theoretical underpinnings and applications in a variety of child health problems. Childhood chronic illness, injury prevention, pain management, and consultation and intervention in medical contexts.

6483* Neurobiological Psychology. Prerequisites: 3073 and 3914 or consent of instructor. Physiological, neuroanatomical, and biochemical underpinnings of human behavior. Emphasis on effects of central nervous system dysfunctions on behavioral processes ranging from sensation to concept formation.

6513* Group Treatment Methods. Prerequisite: graduate standing in the clinical program of the Department of Psychology or the doctorate counseling psychology program, or consent of instructor. Introduction to major techniques of group treatment including Gestalt and transactional analysis as well as more conventional techniques.

6523* Family Treatment Methods. Prerequisite: graduate standing in the clinical program of the Department of Psychology or the doctorate counseling psychology program. Introduction to techniques and philosophies of family treatment. Includes marital counseling and emphasis on family dynamics.

6553* Advanced Practice in Marital and Family Treatment. Prerequisites: 6523, concurrent enrollment in counseling or clinical psychology; graduate standing in the clinical program of the Department of Psychology or the doctorate counseling psychology program, or consent of instructor. Advanced methods in assessment, diagnosis and treatment of marital and family problems. Skill development, professionalism, ethics and case management. Dynamics of co-therapy and conjoint treatment. Case consultation format. Same course as ABSE 6553.

6563* Advanced Social Psychology. Prerequisite: 3743. History, theory and experimentation of dynamic interaction of group membership and individual behavior.

6582* Developmental Psychology. Prerequisites: 3073 or equivalent; consent of instructor. An exploration of the biological aspects of human development, with particular emphasis on the physiological, ethological, and genetic perspectives.

6613* Experimental Learning Theories. Prerequisite: nine credit hours of psychology. Basic concepts and empirical findings in animal and human learning.

6640* Clinical Practicum. 1-12 credits, maximum 17. Prerequisite: graduate standing in the clinical program of the Department of Psychology. Practicum experience for graduate students in the clinical psychology program.
6643* Psychopharmacology. Prerequisites: 3073 or 5054, consent of instructor. A comprehensive course dealing with the various classes of drugs that affect the central nervous system. Primary focus is on clinical research with humans. Covers topics ranging from drug-receptor interactions through substance abuse and behavioral disorders.

6650* Practicum. 1-16 credits, maximum 16. Prerequisite: graduate standing in the clinical program of the Department of Psychology. For the marriage and family practicum only, doctoral level counseling psychology students may also enroll. Practicum experience for graduate students in the clinical program of the Department of Psychology who are doing supervised practicum in specific clinical areas of specialization.

6673* Neuropsychological Assessment. Prerequisites: 5054 or 6493, and 5064 and 5160-6753; graduate standing in the clinical program in the Department of Psychology or consent of instructor. Psychological assessments of the effects of cerebral damage or disease.

6713* Projective Psychodiagnostic Methods. Prerequisites: 5113, 5153; graduate standing in the clinical program in the Department of Psychology or consent of instructor. Administration and interpretation of projective tests such as the Rorschach, TAT, DAP and their derivatives.

6723* Child Diagnostic Methods. Prerequisites: 5153, graduate standing in the clinical program in psychology or the doctoral school psychology program or consent of instructor. Administration and interpretation of diagnostic instruments used specifically with children.

6753* Assessment of Personality. Prerequisites: graduate standing in the clinical or counseling program or consent of instructor. Personality assessment and training in the practice of clinical assessment. Trait theory and assessment, techniques of test construction, contemporary assessment techniques including the MMPI-2, test result interpretation and communication, and behavioral methods of assessment.

6883* Seminar in Psychological Testing. Prerequisites: 5153, 6713, 6753, and graduate standing in the clinical program of the Department of Psychology or consent of the instructor. The administration, interpretation, and integration of projective and objective personality test data and intelligence test data with adult psychiatric patients.

6933* Communication and Persuasion. Seminar concerning the communication process at all levels, from face-to-face encounters to the mass media, with emphasis on the social-psychological factors that influence persuasive attempts.

Rangeland Ecology and Management (RLEM)

1011 Professions in Natural Resources. An examination of the profession of the ecology and management of natural resources. Exploration of academic and career options. Graded on a pass-fail basis. Same as course as ZOOL 1011.

2913 Ecology and Natural Resources. Prerequisite: BIOL 1114 or PLNT 1213. Introduction to and application of general ecological principles to agricultural and natural ecosystems. Relationships between climate, soils, plants, and animals of terrestrial ecosystems. Nutrient cycles, energy flow, species interactions, biological diversity, population ecology, productivity, sustainability and landscape and ecosystem management.

3883 Aerial Photogrammetry and Information Systems. Lab 3. Prerequisite: MATH 1613. Principles and techniques of aerial photogrammetry, remote sensing, aerial photo interpretation, and geographic information systems. Applications to management of natural resources utilizing photogrammetric instrumentation and geographic information system software. Same course as FOR 3883.

3913* (N) Rangeland Management and Restoration. Prerequisites: 2913 or BIOL 1404 or BIOL 3034; SOIL 2124. Managing and restoring rangeland vegetation for wildlife, livestock and other uses; grazing management; herbicides; prescribed burning; mechanical treatments; revegetation. Field trips required.

4571 Senior Seminar. Prerequisite: senior standing in plant and soil sciences. Career opportunities (talks and field trips); preparation of resumes and interviews. Graded on a pass-fail basis. Same course as PLNT 4571 and SOIL 4571.

4954* Ecology of Rangeland Habitats and Landscapes. Lab 3. Prerequisite: 2913 or BIOL 3034. Advanced ecology and management of grasslands, shrublands and forest for wildlife and livestock. Understanding the effects of grazing, fire and other disturbances on biotic and abiotic processes. Vegetation dynamics, wildlife habitat evaluation, woody plant encroachment, rangeland monitoring and landscape ecology. Field trips required at additional costs to students.


4973 Rangeland Resources Planning. Lab 3. Prerequisite: 4954, ANSI 3612. Inventory of ranch resources, survey and evaluation of ranch practices, and economic analysis. Development of a comprehensive ranch management plan. Managing rangeland and ranch resources in a social context. Written and oral reports. Field trips required. Same course as ANSI 4973.

4983* Prescribed Fire. Lab 3. Prerequisites: 3913. When to use prescribed fire and how to use prescribed fire to accomplish specific land management objectives. Writing prescribed fire plans, policy and laws, weather, equipment, conducting burns, and post-burn mop-up. Field trips required.

4990* Special Topics in Range Management. 1-3 credits, maximum 3. Prerequisite: 15 hours of range management. Advanced topics and new developments in range management.

4993 Advanced Prescribed Fire. Lab 3. Prerequisite: 4983 or consent of instructor. Preparing fire plans and executing prescribed fires as the fireboss. Same course as RLEM 5993. No credit for both RLEM 4993 and RLEM 5993.

5000 Master's Thesis. 1-6 credits, 6 maximum total credits under Plan I, and 2 maximum total credits under Plan II. Prerequisite: consent of adviser. Research planned, conducted and reported in consultation with a major professor.

5020* Graduate Seminar. 1 credit, maximum per semester 1 credit on M.S. program and 2 credits on a Ph.D. program required. Prerequisite: graduate standing. Philosophy of research, methods of research, or interpretation of research.

5230* Research. 1-4 credits, maximum 8. Prerequisite: consent of a faculty member supervising the research. Supervised independent research in selected topics.

5760 Special Topics in Rangeland Science. 2-4 credits, maximum 4. Prerequisite: consent of instructor. Selected topics in rangeland research methods or other rangeland topics.

5954* Ecology of Rangeland Habitats and Landscapes. Lab 3. Prerequisite: graduate standing. Advanced ecology and management of grasslands, shrublands and forests. Understanding the effects of grazing, fire and other disturbances on biotic and abiotic processes. Vegetation dynamics, wildlife habitat evaluation, woody plant encroachment, rangeland monitoring and landscape ecology. Field trips required at additional cost to students. No credit for students with credit in RLEM 4954.

5973* Rangeland Resources Planning. Lab 3. Prerequisites: 4954, ANSI 3612. Detailed analysis of case studies of rangeland and ranch management problems. Resource inventory, evaluation of ranch operations, and economic analysis. Integrated planning for representative ranch firms. Written and oral reports. Field trips required. No credit for students with credit in 4973.

5993* Advanced Prescribed Fire. Lab 3. Prerequisite: 4954, ANSI 3612. Special topics in prescribed fire. Preparing fire plans and executing prescribed fires as the fireboss. Same course as RLEM 4993. No credit for both RLEM 4993 or RLEM 5993.

6000* Doctoral Thesis. 1-6 credits, maximum 20. Requisite: consent of adviser. Independent research to be conducted and reported with the supervision of a major professor as partial requirement for the Ph.D. degree.

6010 Advanced Topics and Conference. 1-6 credits, maximum 6. Prerequisite: M.S. degree. Supervised study of advanced topics. A reading and conference course designed to acquaint the advanced student with fields not covered in other courses.

Religious Studies (REL)

1103 (H) The Religions of Mankind. Major world religions such as Hinduism, Buddhism, Judaism, Christianity and Islam with a view to understanding the general nature of religion and its various dimensions.
3013 (H)The Old Testament and Its Study. A study of the Hebrew Scriptures with emphasis upon content, historical background, the history of its study and the critical analysis and theological interpretation of selected passages.


3243 (H)Paul and the Early Church. Recommended: 3023. The letters of Paul in their historical context with special emphasis on his theology and ethics.

3573 (H)The Religions of Native Americans. Recommended: 1103. Selected tribal worldviews, belief systems and religious ceremonies, as depicted in oral traditions, songs and literature. Emphasis on Northern and Southern Plains Indians.

3613 (H)African Cultures and Religion. Key ideas, values and achievements in African culture and tradition as found in literature, art and music viewed in historical and religious perspective.

3713 (H)Religion, Culture and Society. Recommended: 1103, ANTH 2353, SOC 1113. An introduction to the scientific study of religion. Religious activity in both tribal and technologically advanced societies studied in the light of contemporary interpretations of culture and of social behavior. Same course as SOC 3713.

4050* Studies in Religion. 2-6 credits, maximum 6. Independent studies, seminars and courses on selected topics in religion.

4113* (H,J)The World of Islam: Cultural Perspectives. The cultural heritage of the world of Islam explored through its expression in the art, architecture and literature of the Muslim peoples.

4330* Seminar in Biblical Studies. 3 credits, maximum 9. Prerequisites: two courses in Biblical Studies. Selected topics in the academic study of the Bible.

Research, Evaluation, Measurement and Statistics (REMS)

4052 Measurement and Evaluation in the School. Prerequisite: full admission to Professional Education. Construction and selection of classroom tests. Contrasts between criterion-referenced and norm-referenced measurement strategies. Grading techniques, rudiments of standardized test selection and score interpretation and the basic statistics used to summarize and analyze test results.

5000* Master’s Thesis. 1-6 credits, maximum 6. Prerequisite: consent of instructor.

5013* Research Design and Methodology. Required of all graduate students in education. An introduction to the concepts of research design, methodology, sampling techniques, internal and external validity and the scientific method in educational problem solving. Critic analysis of educational research studies and the writing of proposals. No credit for student with credit in 5015.

5320* Seminar in Research, Evaluation, Measurement and Statistics. 3-6 credits, maximum 6. Prerequisite: consent of instructor. In-depth exploration of contemporary problems of research, evaluation, measurement and statistics.

5373* Educational Measurements. Appropriate applications of tests in the schools. Development of teacher-made tests, selection of standardized tests, interpretation of test results. Understanding of the statistics reported in testing literature, uses of test results and recent developments in educational measurement.

5953* Elementary Statistical Methods in Education. Elementary statistical methods needed by consumers of educational research. Descriptive and inferential statistics. No credit for students with credit in 5015.

6000* Doctoral Dissertation. 1-25 credits, maximum 25. Prerequisite: consent of instructor. Required of all candidates for doctorate in applied behavioral studies. Credit given upon completion and acceptance of dissertation.

6003* Analyses of Variance. Prerequisite: admission to a doctoral level program. A thorough examination of analysis of variance procedures as they relate to principles of experimental design in education and behavioral sciences.

6013* Multiple Regression Analysis in Behavioral Studies. Prerequisite: 6003 or consent of instructor. Applications of multiple regression as a general data analysis strategy for experimental and non-experimental research in behavioral sciences.

6023* Psychometric Theory. Prerequisite: 6013 or consent of instructor. Theoretical basis for applying psychometric concepts to educational and psychological measurement. The Classical True Score model and applications to instrumental development and design of studies for evaluating instrument quality.

6373* Program Evaluation. Prerequisites: 5013 and admission to a doctoral level program or consent of instructor. Contexts, purposes and techniques of evaluating educational programs. Evaluation design, information collection, analysis, reporting and uses of results for programs ranging from individual lessons to nation-wide multi-year projects. Special emphasis on evaluation requirements of federally funded programs.

6663* Applied Multivariate Research in Behavioral Studies. Prerequisite: 6013 or consent of instructor. An overview and analysis of multivariate procedures commonly applied to educational and behavioral research. Emphasis on conceptual design and application of these procedures.

6850* Directed Reading. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing.

Russian (RUSS)

1115 Elementary Russian I. Lab 1 1/2. Understanding, speaking, reading and writing. Method of instruction is audio-lingual.

1225 Elementary Russian II. Lab 1 1/2. Prerequisite: 1115 or equivalent. Continuation of 1115.

2115 (I)Intermediate Russian I. Prerequisite: 1225 or equivalent. Continuation of 1225. Russian grammar, composition and conversation.

2225 (I)Intermediate Russian II. Prerequisite: 2115 or equivalent. Continuation of 2115.

3003 (I,S)The Soviet Union: History, Society and Culture. A comprehensive view of the Soviet Union, stressing those issues in the political, economic, technological, geographical and cultural situation. Accessible to beginning undergraduates. Same course as HIST 3003 and POLS 3003.

3053 (I,S)Introduction to Central Asian Studies. A comprehensive view of newly-emerged Central Asian states examining the history, political, economic, technology, and culture of Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan as reflected in their thoughts, religion, literature, and architecture, in the past, and the strategic importance of their natural wealth for the present and future. Same course as HIST 3053 and POLS 3053.

3113 (I)Russian Conversation. Prerequisite: 2225 or equivalent. Development of conversational skills in formal and informal Russian language; study of oral communication and idioms; vocabularial enhancement.

3123 (H,J)Russian Culture and Civilization. Art, literature, music, architecture, and contemporary life of Russia. Course taught in English.

3223 (I)Russian Composition. Prerequisite: 2225 or equivalent. The development of all forms of written communication in Russian through practice in writing compositions, letters, reports and other documents in Russian.

4013 (H)Survey of Russian Literature I. Prerequisites: 20 credit hours of Russian or equivalent. Survey of Russian literature from its beginning to late nineteenth century with readings in Russian of representative texts. Course conducted in Russian.

4023 (H)Survey of Russian Literature II. Prerequisites: 20 credit hours of Russian or equivalent. Survey of Russian literature from late nineteenth century to post-Soviet era with readings in Russian of representative texts. Course conducted in Russian.


322 Religious Studies
Social Foundations (SCFD)

3223 Role of the Teacher in American Schools. Prerequisite: declaration of intention to pursue a degree in Education. One half-day per semester on-site lab required. A review of the school as an institution and an introduction to the role of the teacher as a professional in the schools. Addressing the student socio-economic class and education, the nature of multicultural education, school experiences of women and ethnic groups, school governance, professional organizations, ethics, and the nature of teaching.

3223 (S)History of Education. The development of major educational ideas and programs with emphasis on the growth of public education in the United States from the Colonial period to the present.

4913 (S)International Problems and the Role of the School. Prerequisite: junior or senior standing. Extends the student’s intercultural awareness by focusing on international problems and expanding their meaning to include the school and its relationship to existing international concerns in other types of societies. Consideration of such international problems as natural resources, environment, food supply, urbanization and conflict resolution.

5000* Master’s Report or Thesis. 1-6 credits, maximum 6. Students studying for a master’s degree enroll in this course for a total of 2 credit hours if they write a report, or 6 hours if they write a thesis.

5720* Education Workshop. 1-8 credits, maximum 8. For teachers, principals, superintendents, and supervisors who have definite problems in instruction or administration. Students must register for the full number of credit hours for which the workshop is scheduled for a particular term.

5850* Directed Study. 1-3 credits, maximum 3. Directed study for master’s level students.

5883* Educational Sociology. The manner in which social forces and institutions influence education and the educational system in the United States.

5913* Introduction to Qualitative Inquiry. Examination of the major approaches and fieldwork techniques of qualitative research as well as the challenges associated with conducting this form of inquiry.

(S)Sociology of Death and Dying. Death and dying as social phenomena including cross-cultural perspective. An understanding of occupations and professions dealing with terminal patients in hospitals and with funerals. Students required to engage in original research from community sources.

3952  
Applied Sociology. Prerequisite: sociology majors or consent of instructor or adviser. Application of sociological theory and methods to various job situations.

3993  
(S)Sociology of Aging. Sociological problems of aging, including the analysis of the behavior of the aged within the framework of social institutions.

4003  
Senior Thesis in Sociology. Prerequisites: 3113, 4013, 4133, STAT 4013, and consent of instructor. Preparation of a research project (review of literature, prepare proposal, gather and analyze data and report results) on a sociologically significant topic or issue.

4013  
Qualitative and Applied Social Research Methods. Prerequisites: 3113 and STAT 4013. Conducting, analyzing and reporting qualitative social research. Research design, data collection, analysis and write-up of evaluation research and social impact assessments. Individual research project included.

4023  
(S)Juvenile Corrections and Treatment Strategies. Prerequisite: 3523 or 4333. The juvenile justice system, emphasizing the juvenile court, diversion and youth service bureaus as well as the more traditional training schools and foster homes. Experimental treatment strategies with institutionalized delinquents.

4043  
(S)Gender and Work. Prerequisite: one upper-division course. Consideration of unpaid, paid and volunteer work and gender differences. Linkages between economy, work and family with examples from United States and less developed countries.

4133  
(S)Social Research Methods. Prerequisites: 3113 and STAT 4013. Applying sociological theory to designing quantitative and qualitative research; methods of data collection, processing and analysis; basic skills in computer analysis of social data. Research project included.

4213  
(S)Sexuality in American Society. Prerequisite: junior standing or consent of instructor. Sociological aspects of sexual behavior, attitudes and belief systems in society. Similarities and differences in males and females in all types of sexuality.

4233  
(S)Sociology of Entrepreneurship: Race and Ethnicity Issues. Prerequisite: upper-division standing. Exploration of nature, philosophy and the role of entrepreneurship in societies. How entrepreneurship is organized around race, ethnicity, gender and immigrant groups.

4323  
Sociology of Agriculture. Overview of U.S. agriculture focusing on changing markets and technologies and their impact on farm families and other social institutions and relationships. Emphasis on agricultural problems, policies and alternatives to traditional farming practices.

4333  

4343  
(S)Medical Sociology. Health and illness as social and societal phenomena including the doctor-patient relationship, distribution and etiology of disease, the social meaning of health and illness, basic epidemiology, and the social processes involved in medical practice. Cross-cultural comparisons and the sociology of the health professions.

4383  
(S)Social Stratification. Systems of class and caste, with special attention to the United States. Status, occupation, income and other elements in stratification.

4423  
(S)Community Organization and Development. Structure, change and development of the local community in rapidly changing society. Emphasis on community organization and planned change.

4433  
(S)Environmental Sociology. Critical assessment of the social causes and consequences of problems with resource scarcity and environmental degradation. Environmental problems viewed as social problems viewed as social problems requiring an understanding of the structural conditions producing environmental problems and inhibiting resolutions.

4443  
(S)Sociology of Law and Legal Institutions. Prerequisite: 3523 or 4333. Criminal and civil law as mechanisms of social control; conflict and consensus models of legislation; legal doctrine and its application by police, prosecution and defense, courts and administrative agencies. Decision processes in the criminal justice system, personnel and case loads and related areas. Native American law; federal policy and trust status, criminal and civil law, tribal jurisdiction, tribal courts.

4513  
(S)Demography of Ethnic and Immigrant Population in Global Perspective. The population characteristics of immigrant, ethnic and race groups along major demographic dimensions. Cross-national comparisons between minority groups on demographic and cultural factors.

4533  
(I,S)World Population Problems. Fertility, mortality and migration, and other factors related to population size, density, and composition; the population explosion, worldwide famine, birth control, and other serious social issues.

4623  
(I)International Industry and Work. Prerequisite: six hours of social sciences. A focus on work, industry and globalization within a sociocultural context. The impact of country cultures upon industry and work and adjustment to cross-cultural problem solving and development of global work teams.

4643  
(S)Women in Society. A sociological exploration of the image and status of women in society, including family, work and politics. Socialization, education and the women’s movement. Introduction to feminist theory.

4723  
(S)American Marriage, Family, and Male-Female Relationships. The sociological relationship between marriage and family and other institutional structures and systems, especially work and the economy. Male and female roles and relationships in mate selection, sexuality, marriage, divorce, and other intimate situations.

4850  
Internship in Sociology. 1-4 credits, maximum 4. Prerequisites: 3952, completion of 12 hours of sociology, or consent of internship coordinator. Field experience in a variety of work settings.

4923  
The Field of Corrections. An overview of correctional work focusing on probation, parole and institutions. A survey of contemporary alternatives to conventional imprisonment.

4990  
Exploration of Sociological Issues. 1-3 credits, maximum 6. Prerequisite: consent of instructor. Examines sociologically significant topics and issues.

4993  
Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a senior faculty member, with second faculty reader and oral examination. Required for graduation with departmental honors in sociology.

5000  
Theory in Sociology. 1-6 credits, maximum 6.

5043  
Advanced Topics in Gender and Work. Prerequisite: graduate standing. In-depth examination of sociological theories of paid, unpaid and volunteer work with special emphasis on gender differences. Case studies including empirical research from the United States and less developed countries.

5113  
Classical Sociological Theory. Prerequisite: 3113 or equivalent. Major trends in sociological thought. The emergence of sociological theory in Europe and America.

5123  
Contemporary Sociological Theory. Prerequisite: 3113 or equivalent. Critical examination of significant theoretical formulations, 1920 to the present. Relation between theoretical development and current research emphasis.

5213  
Techniques of Population Analysis. Prerequisite: graduate standing. Examination of primary techniques and statistics employed in studies of population characteristics. Examination of sources of demographic data, methods employed in the collection and analysis of data on population characteristics, composition and change.

5223  
Culture, History and World Systems. Prerequisites: admission to Graduate College and international studies program. The modern world system and its new social formations resulting from increasing globalization. Examination of cultural, socio-economic, and political changes in developed and developing societies. Modern societies, their historical developments, the cultural politics of difference, and the re-emergence of ethnic groups worldwide. Existing theoretical models of change for profit and non-profit organizations.
Social Research Design and Analysis. Techniques in design, data collection, analysis and interpretation of data for qualitative and quantitative sociological research.

Quantitative Methods of Social Research. Prerequisites: 4133, STAT 4013 or equivalent. Advanced techniques in sociological research and data analysis focusing on the formulation of substantive research questions and application of a variety of research procedures to answer such questions.

Qualitative Research Methods. Examination of ethnographic studies and implementation issues connected with qualitative research. Research project required.

Seminar on Collective Behavior and Social Movements. Prerequisite: graduate standing. Examination of major theoretical and empirical approaches employed in the study of social movements. Exploration of problems on the nature and current theories of social movements including individual versus group approaches. Grassroots resistance, community organizing, political conflicts, and revolutions.

Rural Social Systems. Prerequisite: graduate standing or consent of instructor. Rural social systems in contemporary societies examined historically, theoretically and empirically, focusing on rural social organizations and institutions within rural societies and their relationship to urban social structures.


Correctional Institutions and Residential Treatment. Prerequisite: 4923 or equivalent. Nature and effects of custodial institutions on the inmates. Prison community, its structure, social processes and dynamics. Resocialization of prison inmates in new vocational and social skills.

Seminar in Medical Sociology. Advanced study in the sociology of medicine, including the doctor-patient relationship, the social meanings of health and illness, epidemiology, health care delivery, and the medicalization of American society. Analysis of the sociology of organic illness and mental illness using readings from both classical and contemporary sources.

Community Treatment of Offenders. Prerequisite: 4923 or equivalent. Treating offenders in the community without incarcerating them in prisons. Probation, parole and other rehabilitative services. Impact of new community treatment centers, group homes, probation hotels and halfway houses. Effectiveness of the individual, group and family therapies on the offenders.

American Pluralism, Race and Ethnicity in American Life. Prerequisite: graduate standing. Analysis of the dynamics of intercultural and intergroup relations in America with special emphasis on the examination of major conceptual perspectives that have characterized the study of race and ethnicity in American life.

Complex Organizations. Prerequisite: six hours of undergraduate sociology or equivalent. Nature and types of complex organizations: organizational structure; organizations and society; organizational changes.
4363* Environmental Soil Science. Prerequisites: BIOL 1114 and CHEM 1215. Presentations of soil processes and interpretation for natural resource management; land reclamation; identification of wetlands; oil and soil damages; impact of fertilizer, pesticide and other agricultural chemicals on soil and water quality; water resources; long-term soil erosion and landscape formation; transformations of manure, sewage sludge and other organic by-products.


4470* Problems and Special Study. 1-3 credits, maximum 6. Prerequisite: consent of the instructor. Problems in soil science selected from topics in soil chemistry and fertility, soil physics, soil biology, soil conservation and soil morphology.

4483* Soil Microbiology. Prerequisite: 2124 and BIOL 1114 or consent of instructor. A comprehensive overview of microorganisms living in soil and activities that are of agricultural and environmental significance.

4563* Dynamics of Wetland, Forest and Rangeland Soils. Prerequisite: 2124. Dynamics of soils that receive minimal or no production input. Identification of wetland soils and the biogeochemical reactions occurring in wetland soil environments. Nutrient cycling, physical, chemical and biological properties of forest and rangeland soil systems.

4571 Senior Seminar. Prerequisite: senior standing in plant and soil sciences. Career opportunities (talks and field trips); preparation of resumes and interviews. Graded on a pass-fail basis. Same course as PLNT 4571 and RLEM 4571.

4683* Physical Properties of Soils. Prerequisites: 2124 and PHYS 1114. Soil physical properties and processes, and their influence on plant growth.

4863* Animal Waste Management. Prerequisite: 2124. Aspects of animal waste management related to animal nutrition, system design, land application and economic acceptability.

5000* Master’s Thesis. 1-6 credits, 6 maximum total credits under Plan I, and 2 maximum total credits under Plan II. Prerequisite: consent of adviser. Research planned, conducted and reported in consultation with a major professor.

5020* Graduate Seminar. 1 credit, maximum per semester 1 credit on M.S. program and 2 credits on a Ph.D. program required. Prerequisite: graduate standing. Philosophy of research, methods of research, or interpretation of research.

5110* Problems and Special Study. 1-4 credits, maximum 6. Prerequisite: consent of instructor. Supervised study of special problems and topics not covered in other graduate courses.

5193* Spatial and Non-spatial Data Base Management of Natural Resources. Prerequisites: one course in statistics and programming experience. Methods of acquiring, managing and analyzing spatial data using geographic information systems. Management of non-spatial data using relational database managers. Development of applications using these tools for evaluating and managing natural resources.

5224* Soil Chemical Processes and Impact on Environmental Quality. Lab 3. Prerequisites: 3893 and CHEM 2113 or CHEM 3324 or equivalent. A comprehensive study of chemical processes in soils that impact biogeochemical cycles and environmental quality. Modern theory of soil solution thermodynamics, kinetics of soil chemical processes, soil colloid chemistry, and soil geochemistry. Environmental soil science applications including environmental fate of toxic substances and remediation of contaminated soil. Laboratory component provides hands-on experience with techniques used for soil chemical investigations and with chemical speciation computer models.

5230* Research. 1-4 credits, maximum 4. Prerequisite: consent of a faculty member supervising the research. Supervised independent research on selected topics.

5353* Advanced Soil Genesis and Classification. Lab 2. Prerequisite: 3433. Processes and factors of soil formation. Comparison of world soil morphology and classification systems.

5483* Soil Biodegradation and Bioremediation. Prerequisite: 4483. A comprehensive overview of microorganisms living in soil and their activities of agricultural and environmental significance. Soil quality, and biodegradation and bioremediation of soil.

5583* Soil Physics. Prerequisites: MATH 2265 or 2263, PHYS 1214. Fluid flow through saturated and unsaturated soils; temperature change and heat flow in soil; soil strength and deformation as it applies to plant response.

5613* Laboratory Methods of Soil, Plant and Environmental Analysis. Lab 3. Prerequisites: CHEM 2122, 3324 or equivalent. Theory, principles and techniques of laboratory methods used for chemical analysis of soil, plant material and environmental samples. Modern analytical methods used for soil testing of plant available nutrients, determination of environmental contaminants, and chemical characterization of soil. Operational theory of applicable instruments including atomic spectroscopic (ICP, AA, UV-VIS, XRF), chromatographic (GC, GC-MS, HPLC, IC), and potentiometric methods. Laboratory component hands-on experience of chemical methods.

5813* Soil-Plant Nutrient Cycling and Environmental Quality. Prerequisite: 4234 or equivalent. Theory and application of soil plant relationships in production and nonproduction environments. Nutrient cycling, mass balance, soil nutrient supply and plant response. Methods to reduce the impact of nutrients on environmental quality, soil-plant buffering and response models.

5990* Soil Physical Analyses. 1-2 credits, maximum 2. Lab 1 or 2. Prerequisite: 4683. Principles and techniques.

6000* Doctoral Thesis. 1-6 credits, maximum 20. Prerequisite: consent of adviser. Independent research to be conducted and reported with the supervision of a major professor as partial requirement for the Ph.D. degree.

6010* Advanced Topics and Conference. 1-6 credits, maximum 12. Prerequisite: M.S. degree. Supervised study of advanced topics. A reading and conference course designed to acquaint the advanced student with fields not covered in other courses.

Spanish (SPAN)

1115 Elementary Spanish I. Lab 1 1/2. Pronunciation, conversation, grammar and reading.

1225 Elementary Spanish II. Lab 1 1/2. Prerequisite: 1115, or equivalent. Continuation of 1115.

2115 (I)Intermediate Spanish I. Prerequisite: 1225 or equivalent. Further development of speaking, listening, reading and writing skills, along with short cultural and literary readings.

2223 (I)Intermediate Spanish III. Lab 1. Prerequisite: 2112 and 2113 or equivalent. Skill consolidation with emphasis on conversation and reading. May be taken concurrently with 2223.

2223 (I)Intermediate Spanish IV. Lab 1. Prerequisite: 2112 and 2113 or equivalent. Skill consolidation with emphasis on conversation and composition. May be taken concurrently with 2222.

3003 (H)Survey of Peninsular Literature. Prerequisite: 20 credit hours of Spanish or equivalent. Development of literature from Spain to the present.

3013 (I)Survey of Latin-American Literature. Prerequisite: 20 hours of Spanish or the equivalent. Development of the literature written in Spanish in the new world.

3203 (I)Advanced Conversation. Prerequisites: 20 credit hours of Spanish or equivalent proficiency. Practice in conversation skills, designed to bring students to a high level of proficiency in speaking and listening. Class conducted in Spanish.

3213 (I)Advanced Grammar and Composition. Prerequisites: 20 hours of Spanish or equivalent proficiency. Study of advanced grammar and stylistics with emphasis on composition skills, designed to bring students to a high level of proficiency in writing.

3333 (H)Hispanic Civilization I. Prerequisite: 2222 and 2223, or equivalent. Reading and discussion of selected texts outlining the development of contemporary Spanish civilization.

3483 (I)Advanced Diction and Phonetics. Lab 1. Prerequisite: 2222 and 2223, or equivalent. Required course for teacher certification/licensure. Spanish speech sounds and intonation patterns, with practice to improve the student’s pronunciation.
4113
(H.I) Chicano Literature and Civilization. Prerequisite: one 3000-level Spanish course, or equivalent. Reading, analysis, and discussion of the most outstanding works in Chicano literature produced since 1848. Contemporary works are emphasized. Classes conducted in Spanish.

4173
(H.I) Hispanic Drama. Prerequisite: one 3000-level Spanish course, or equivalent. Reading and interpretation of dramatic works selected from the Hispanic literatures.

4223
(i) 20th Century Hispanic Literature. Prerequisite: one 3000-level Spanish course, or equivalent. Major 20th century Hispanic writers.

4243
(i) Translation and Writing of Documents. Prerequisite: one 3000-level Spanish course, or equivalent. Translation of documents produced by government agencies, universities, business and industrial organizations. Writing of letters, memos and contracts.

4253
(H.I) Masterpieces of Hispanic Literature I. Prerequisite: one 3000-level Spanish course, or equivalent. Reading and analysis of classics selected from the Hispanic literatures.

4263
(H.I) Masterpieces of Hispanic Literature II. Prerequisite: one 3000-level Spanish course, or equivalent. Reading and analysis of classics selected from the Hispanic literatures. A continuation of 4253.

4333
(H.I) Hispanic Civilization II. Prerequisite: 23 credit hours of Spanish or equivalent. Reading and discussion of selected texts outlining the development of contemporary Hispanic civilization outside the Iberian peninsula.

4550
(i) Seminar in Spanish. 1-3 credits, maximum 9. Prerequisite: one 3000-level Spanish course, or equivalent. Reading and analysis of classics selected from the Hispanic literatures. A continuation of 4253.

5110* Advanced Hispanic Studies. 1-3 credits, maximum 9. Prerequisite: one 3000-level Spanish course, or equivalent. Reading and discussion of major works in the field of Hispanic studies.

5202 Education of Exceptional Learners. Learning characteristics, needs and problems of the exceptional learner in the public schools. Implications of the learning, environmental and cultural characteristics; planning and program assistance available for accommodating the exceptional learner in regular and special education programs; observation of exceptional learners.

5320* Observation and Participation in Special Education. 1-3 credits, maximum 6. Lab 1-3. Supervised activities with various types of exceptional learners and their educational provisions for them. Graded on a pass-fail basis.

5363 Assessment and Intervention for Exceptional Infants and Children-Birth to Age 6. Assessment techniques and intervention strategies appropriate for exceptional infants and young children. Basic theories of development and research supportive of various intervention strategies and assessment techniques.

4453* Educational Diagnosis and Remediation. Provides skills in the application of standardized and informal assessment information for educational planning. Includes analysis of commonly used achievement, perceptual, motor and language tests and behavioral analysis techniques.

4513* Introduction to the Emotionally Disturbed. Characteristics, identification and teaching of the emotionally disturbed or behavior disordered student; a variety of theoretical approaches to the subject.


4640 Student Teaching in Special Education. 1-12 credits, maximum 12. Supervised teaching experience in the area of special education in which the student is preparing to qualify for a teaching certificate. Graded on a pass-fail basis.

4643 Clinical Teaching Seminar. Lab 2. A supervised clinical experience with special needs individuals. Practical application of skills in instructional techniques and approaches, writing and implementation of IEP's and lesson plans, developing or selecting appropriate activities and materials.

4653* Education of the Mentally Retarded. Education program needs and social-cultural environment of mentally retarded children, adolescents and adults.

4713* Individualizing Education Programs for Exceptional Individuals. Techniques for teaching individuals with handicapping conditions.

4723* Curriculum and Methods for Teaching Mentally Retarded Adolescents and Adults. Techniques for teaching the mentally retarded individual from adolescence through adulthood.

4753* Techniques of Behavior Management and Counseling with Exceptional Individuals. Techniques to develop and evaluate programs of behavior change for exceptional students including counseling with the exceptional individual and conferencing with professionals and parents.

5000* Master’s Thesis. 1-6 credits, maximum 6.

5320* Seminar in Applied Behavioral Studies. 3-6 credits, maximum 6. In-depth exploration of contemporary problems of applied behavioral studies.

5523* Characteristics of Students with Severe and Profound Disabilities. Educational, psychological and physiological characteristics of students with severe and profound disabilities.

5573* Communication Strategies for Individuals with Severe and Profound Disabilities. Methods for communicating with severely or profoundly disabled persons and for facilitating their communication through speech, sign, assistive devices and technology.

5583* Methods for Teaching Persons with Severe and Profound Disabilities. Instructional procedures and techniques available for working with the severely or profoundly disabled learner.

5620* Practicum with Exceptional Learners. 1-8 credits, maximum 8. Lab 1-8. Prerequisite: consent of instructor. Supervised individual and group experience with exceptional learners. The particular experience (learning disability, mental retardation, gifted, etc.) determined by the student’s field of specialization.

5624* Characteristics and Teaching Techniques for Individuals with Disabilities. Educational, psychological and physiological characteristics of individuals with mild and moderate disabilities. Professional roles of the teacher; current techniques, models and approaches used to teach, and their theoretical bases.

5633* Behavior Characteristics of Exceptional Individuals. Individual differences and problems that exceptional individuals experience. Educational programs and resources available to assist administrators, teachers and parents in dealing with unique individual needs.

5643* Counseling Parents of Exceptional Children. Aiding the classroom teacher and other professional personnel in the understanding of unique activities and interpersonal relations involved in counseling with parents of exceptional children.

5653* Play Therapy in Special Education. Theories and practices of the principles of play therapy. The application of play therapy for special education children. Supervised clinical experience with children with emotional, social and psychological problems.

5673 Developmental Language and Intervention Strategies for the Exceptional Individual. Normal language development and variations from normal demonstrated by exceptional learner. Assessment techniques and intervention strategies appropriate for exceptional infants and children; theoretical approaches to language training, formal and informal; assessment techniques, and techniques for exceptional individuals.

5683* Techniques and Consultation Models for Teaching Individuals with Disabilities. Current techniques, models and approaches used to teach students with mild and moderate disabilities and the theoretical bases for these techniques and approaches. Professional roles of the teacher of students with mild and moderate disabilities including communication with other teachers.

5733* Teaching Strategies for Students with Physical and Health Disabilities. Prerequisites: 5523 and graduate student standing. Design and implementation of educational programs, collaboration with families and other professionals, and advocacy for students with disabilities.

5743* Curriculum Modifications for Exceptional Individuals. Materials and resources designed for use by teachers and other professionals, paraprofessionals and parents in working with exceptional individuals. Includes commercial and teacher-student-made materials.
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>5783*</td>
<td>Psycho-educational Testing of Exceptional Individuals. Intensive practice in the selection, administration, and interpretation of individual tests, appropriate for exceptional individuals.</td>
</tr>
<tr>
<td>5824*</td>
<td>Characteristics of Interventions for Individuals with Emotional Behavioral Problems. Characteristics, identification, and intervention strategies, and resources available for working with learners with emotional and behavioral disorders. Exploration of a wide range of theoretical approaches.</td>
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<tr>
<td>5853*</td>
<td>Advanced Methods for Teaching the Mentally Retarded. A review of research and methodological developments related to the instruction of mentally retarded children, adolescents, and adults.</td>
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<tr>
<td>5873*</td>
<td>Instructional Strategies and Resources for the Emotionally Disturbed Learner. Instructional procedures and resources available for working with emotionally disturbed/behavior-disordered learner. A wide range of theoretical approaches explored.</td>
</tr>
<tr>
<td>5883*</td>
<td>Behavior Management and Affective Education. The utilization of various approaches to the management of individual and group behavior; affective education in a wide range of instructional settings.</td>
</tr>
<tr>
<td>5993*</td>
<td>Diversity in Special Education. Examination of the influence of ethnic, socioeconomic class, and gender factors on students with disabilities. Ethnographic inquiry through service-learning field placements for understanding cultural diversity and special education. Applicable educational approaches.</td>
</tr>
<tr>
<td>6063*</td>
<td>Research Topics in Special Education. Prerequisites: REMS 6003, 6013. Classic and current significant research topics; review and reinforcement of professional inquiry skills in reading, utilizing, planning, conducting, and reporting research in special education.</td>
</tr>
<tr>
<td>6183*</td>
<td>Legal Aspects in Special Education. Familiarization and analysis of legal rights and responsibilities of students, educators, and administrators in special education; federal and state mandates, case law, and recent legal developments affecting special education.</td>
</tr>
<tr>
<td>6563*</td>
<td>Program Development in Special Education. Physical, social, and psychological factors in communities such as power structure, economic, prejudice, religion, as well as national activities influencing in establishing programs for the exceptional student.</td>
</tr>
<tr>
<td>6603*</td>
<td>Current Trends and Issues in Special Education. Current research and literature regarding the education of exceptional children.</td>
</tr>
<tr>
<td>6850*</td>
<td>Directed Reading. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing.</td>
</tr>
<tr>
<td>6880*</td>
<td>Internship in Education. 1-8 credits, maximum 8. Lab 3-24. Directed off-campus experience designed to relate ideas and concepts to problems encountered in the management of the school program.</td>
</tr>
<tr>
<td>6900*</td>
<td>Research and Thesis. 1-25 credits, maximum 25. Prerequisite: approval of major professor. Required of all candidates for doctorate in special education for graduation with departmental honors. Departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a faculty member. Required for graduation with departmental honors in speech communication.</td>
</tr>
<tr>
<td>7201</td>
<td>Speech Activity Participation. 1-3 credits, maximum 6. Preparation for, and participation in, speech communication and speech pathology activities.</td>
</tr>
<tr>
<td>3703</td>
<td>Small Group Communication. General systems approach to small group processes. Special consideration given to group roles, norms, leadership, and decision making. Participation in various types of discussion groups.</td>
</tr>
<tr>
<td>3720</td>
<td>Practicum I. 1-2 credits, maximum 2. Prerequisite: speech communication major. Communication facilitation for the speech communication major, with student's initial role as interventionist.</td>
</tr>
<tr>
<td>3723</td>
<td>Business and Professional Communication. Oral communication encounters in business and professional settings. The interview, informative briefing, talking-paper, small group interaction and informative, integrative and persuasive speeches.</td>
</tr>
<tr>
<td>3733</td>
<td>Communicating Elements of Persuasion. Principles and concepts of interpersonal and public persuasion. The instrumental and interactive nature of persuasion. Designing and participating in actual persuasive campaigns.</td>
</tr>
<tr>
<td>3743</td>
<td>Advanced Public Speaking. The preparation and delivery of various types of public speeches.</td>
</tr>
<tr>
<td>3793*</td>
<td>Communication in Interviews. General principles of interviewing. Specific guidelines for the interviewer in survey, journalistic, counseling, selection, appraisal, legal, medical, and sales interviews.</td>
</tr>
<tr>
<td>4010</td>
<td>Independent Study in Speech Communication. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Supervised research projects in speech communication.</td>
</tr>
<tr>
<td>4703</td>
<td>Communication Theory. Survey of current theories and models dealing with symbolic and communicative behavior.</td>
</tr>
<tr>
<td>4710</td>
<td>Topics in Speech Communication. 1-3 credits, maximum 6. Selected current topics in speech communication.</td>
</tr>
<tr>
<td>4720</td>
<td>Practicum II. 1-3 credits, maximum 3. Prerequisite: consent of instructor. Individual research projects providing practical experience for advanced undergraduate students on and off campus.</td>
</tr>
<tr>
<td>4723*</td>
<td>(H)History of Public Address. Analysis of speeches of selected American orators as artifacts and rhetorical responses. Content, structure, and style of the speeches and the historical situations in which they were given.</td>
</tr>
<tr>
<td>4733</td>
<td>Legal Communication. Analysis and applications of oral communication and analytical skills required for effective performance in trial courts. Course culminates in a day-long mock trial.</td>
</tr>
<tr>
<td>4743*</td>
<td>Problems of Interpersonal Communication. Application of communication theory to interactions in person-to-person settings. Identification and management of barriers related to the concepts of perception, attraction, self-disclosure, listening, and conflict.</td>
</tr>
<tr>
<td>4753*</td>
<td>Intercultural Communication. Social and cultural differences between individuals from diverse backgrounds as possible barriers to effective communication.</td>
</tr>
<tr>
<td>4763</td>
<td>Organizational Communication. The interpersonal interface between communication theory and organizational structure. Nature of communication problems in organizations, strategies for overcoming such problems and the design of effective communication systems in organizational settings.</td>
</tr>
<tr>
<td>4793*</td>
<td>(S)Nonverbal Communication. Nonverbal aspects of speech communication.</td>
</tr>
<tr>
<td>4993</td>
<td>Senior Honors Thesis. Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis under the direction of a faculty member. Required for graduation with departmental honors in speech communication.</td>
</tr>
<tr>
<td>5000*</td>
<td>Research and Thesis. 1-3 credits, maximum 6. Prerequisite: approval of major professor. Research in speech and audiology.</td>
</tr>
<tr>
<td>5013*</td>
<td>Introduction to Graduate Study. Research methods with special emphasis on those used most frequently in communication research; professional opportunities in the various speech fields; practical experience in outlining a piece of research.</td>
</tr>
<tr>
<td>5023*</td>
<td>Introduction to Quantitative Research in Speech. Methods and major findings of empirical research in speech.</td>
</tr>
<tr>
<td>5210*</td>
<td>Advanced Practicum. 1-3 credits, maximum 9. Prerequisite: consent of instructor. Practical experience for advanced students on and off campus.</td>
</tr>
<tr>
<td>5710*</td>
<td>Seminar in Speech. 1-3 credits, maximum 9. Individual and group investigations of problems in speech communication, theater, and speech pathology and audiology.</td>
</tr>
<tr>
<td>5713</td>
<td>Rhetorical Theory. Contemporary rhetorical theory focusing on the processes of social influence.</td>
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</tbody>
</table>
5723* Oral Communication Theory. Modern theories dealing with symbolic and communicative behavior.

5733* Human Relations in Organizations. The place of oral communication in decision-making in organizations. Relationship of oral communication to organizational structure, organizational needs, patterns of leadership and techniques of information collection.

5763* Seminar in Organizational Communication Consultancy. Diagnostic measures for identifying communication problems in organizations and the development of consulting or interventionist programs to solve such problems.

Statistics (STAT)

2013 (A)Elementary Statistics. Prerequisite: MATH 1483 or 1513. An introductory course in the theory and methods of statistics. Descriptive measures, elementary probability, samplings, estimation, hypothesis testing, correlation and regression. There is a separate section for students in social sciences. No credit for students with credit in 2023.

2023 (A)Elementary Statistics for Business and Economics. Prerequisite: MATH 1483 or 1513. Basic statistics course for undergraduate business majors. Descriptive statistics, basic probability, sampling, estimation, hypothesis testing, correlation and simple linear regression. No credit for students with credit in 2013.

2053 Elementary Statistics for the Social Sciences. Prerequisite: MATH 1513. An introductory course in the theory and methods of statistics. Descriptive measures, elementary probability, sampling, estimation, hypothesis testing, correlation and regression. No credit for students with credit in STAT 2013 or 2023.

3013* Intermediate Statistical Analysis. Prerequisite: STAT 2013 or 2023. Hypothesis testing, confidence intervals, correlation, and multiple linear regression, nonparametric statistics, survey sampling, time series and Bayesian analysis.

4013 (A)Statistical Methods I. Lab 2. Prerequisites: 60 credit hours including MATH 1513. Basic experimental statistics, basic probability distributions, methods of estimation, tests of significance, linear regression and correlation, analysis of variance for data that are in a one way, a two-way crossed, or in a two-fold nested classification.

4023* Statistical Methods II. Lab 2. Prerequisite: 3013 or 4013 or 4033. Basic concepts of experimental design. Analysis of variance, covariance, factorial arrangements of treatments, multiple regression in estimation and curvilinear regression, enumeration data.

4033 Engineering Statistics. Prerequisite: MATH 2155. Introduction to probability, random variables, probability distributions, estimation, confidence intervals, hypothesis testing, linear regression.

4043* Applied Regression Analysis. Prerequisite: one of 4013, 4033, 5013 or equivalent. Matrix algebra, simple linear regression, residual analysis techniques, multiple regression, dummy variables.

4053 Statistical Methods I for the Social Sciences. Prerequisite: MATH 1513. Basic experimental statistics, basic probability distributions, methods of estimation, tests of significance, linear regression, calculation and analysis of variance for one and two-way classifications. No credit for students with credit in STAT 4013.

4063 Statistical Methods II for the Social Sciences. Prerequisites: 3013 or 4013 or 4033. Basic concepts of experimental design. Analysis of variance, covariance, split-plot design. Factorial arrangements of treatments, multiple and curvilinear regression, enumeration data. No credit for students with credit in STAT 4023.

4091* Statistical Analysis System. Prerequisite: 4013 or equivalent. SAS dataset construction, elementary statistical analysis, and use of statistical and graphics procedures available in the SAS package.

4113* Probability Theory. Prerequisites: MATH 2155 and one other course in MATH that has either 2145 or 2155 as a prerequisite. Basic probability theory, random events, dependence and independence, moments, distributions of functions of random variables, weak laws of large numbers, central limit theorems.

4203* Mathematical Statistics I. Prerequisite: MATH 2155. Introduction to probability theory for students who are not graduate majors in mathematics. Probability, dependence and independence, random variables, univariate distributions, multivariate distributions, moments, functions of random variables, moment generating functions.

4213* Mathematical Statistics II. Prerequisites: 4203 and MATH 3013. Statistical inference for students who are not graduate majors in statistics or mathematics. Sampling distributions, maximum likelihood methods, point and interval estimation, hypothesis testing.

4223* Statistical Inference. Prerequisites: 4113 and MATH 3013. Sampling distributions, point estimation, maximum likelihood methods, Rao-Cramer inequality, confidence intervals, hypothesis testing, sufficiency, completeness.

4910* Special Studies. 1-6 credits. Maximum 6. Prerequisite: consent of instructor. Special subjects in statistics.

4993 Senior Honors Project. Prerequisite: departmental invitation, Honors Program participation. A guided reading and research program ending with an honors project under the direction of a faculty member, with a second faculty reader and an oral examination. Required for graduation with departmental honors in statistics.


5013* Statistics for Experimenters I. Prerequisites: graduate standing and MATH 1513. Introductory statistics course for graduate students. Descriptive statistics, basic probability, probability distributions, fundamentals of statistical inference, hypothesis testing, regression, one-way classification, analysis of variance, comparative experiments, correlation and linear regression, introduction to categorical data analysis.

5023* Statistics for Experimenters II. Prerequisites: graduate standing and 4023 or 5013. Analysis of variance, covariance, use of variance components and their estimation, completely randomized, randomized block and Latin square designs, multiple comparisons.

5033* Nonparametric Methods. Prerequisite: one of 4023, 4043, 5023 or consent of instructor. A continuation of 4013 and 4023, concentration on nonparametric methods. Alternatives to normal-theory statistical methods; analysis of categorical and ordinal variables based on rank transforms, measures of association, goodness-of-fit tests, order statistics.

5043* Sample Survey Designs. Prerequisite: one of 4013, 5023 or equivalent. Analysis of data involving variables of a categorical nature. Contingency tables, exact tests, binary response models, loglinear models, analyses involving ordinal variables, nonparametric models. Computer usage for analysis is discussed.

5113* Intermediate Probability Theory. Prerequisites: 4113 and MATH 5143. Measure theoretical presentation of probability, integration and expectation, product spaces and independence, conditional expectation, different kinds of convergence in probability theory, characteristic functions, measure theoretical statistical methods; characteristic functions and their applications. Same course as MATH 5113.

5133* Stochastic Processes. Prerequisites: 4113 and MATH 2233, MATH 3013. Definition of a stochastic process, probability structure, the set of sample functions, stationary processes and their spectral analyses, renewal processes, counting processes, discrete and continuous Markov chains, birth and death processes, exponential model queueing theory. Same course as IEM 5133 and MATH 5133.

5203* Large Sample Inference. Prerequisites: 4223 and 53. Different types of convergence in probability theory, central limit theorem, consistency, large sample estimation and tests of hypotheses, concepts of asymptotic efficiency, nonparametric tests.

5213* Bayesian Decision Theory. Prerequisite: 4223. Statistical spaces, decision spaces, loss and risk, minimum risk decisions, conjugate families of distributions, Bayesian decisions.
530* Experimental Design. Prerequisite: 5023 or 4203 with consent of instructor. Review of basic concepts and principles of comparative experiments, the role of randomization in experiment interpretation, interaction of effects and interactions in multi-factor designs, error term selection principles, multiple comparisons, split-unit experiments, incomplete block designs, confounding of factorial effects in 2n and 3n series of factorials, single and fractional replication optimum seeking designs, pooling of experiments over time and space, crossover and switch back designs.

532* Advanced Design of Experiments. Prerequisites: 5033 and 5233 or consent of instructor. Construction of factorial, fractional factorial and response surface experimental designs, such as mutually orthogonal series of Latin Squares, balanced and partially balanced incomplete block designs, confounded and fractionally replicated designs. Response surface methodology. Theory of factorial arrangements of treatments. Confounding of factorial effects. Fractional replication of factorials, confounding in mixed series of factorials, randomization tests, transformations of data, plot techniques and principles of split-plot techniques. Analysis of series of experiments and analysis of covariance.

533* Theory of Linear Models I. Prerequisites: 4223, and MATH 3013, and one of 4023 or 5023. Multivariate normal distributions of quadratic forms, general linear models, Markov theorem, variance components, general linear hypotheses of full rank models.

533* Theory of Linear Models II. Prerequisite: 5323. Maximum likelihood estimation; missing data structures; balanced incomplete block design; less than full rank models; general mixed models; intrinsically linear models; sequential estimation.

534* Theory of Sample Design. Prerequisite: 4113 or 4203. Deriving estimates and variances of estimates for different sampling designs. Mathematical development of sampling. Consideration of simple probability sampling including simple random, stratified random, cluster and multisample sampling. Estimation techniques including ratio and regression techniques. Determination of sample sizes and allocations.


591* Seminar in Statistics. 1-6 credits, maximum 12. Special studies for master’s students. Survey and discussion of research in mathematic statistics and statistical methods.

600* Research and Thesis. 2-10 credits, maximum 30. Prerequisite: consent of advisory committee. Directed research culminating in the Ph.D. thesis.

612* Advanced Probability Theory. Prerequisites: 5113 or MATH 5113, and MATH 4283. Sequences of random variables, convergence of sequences, and their measure theoretical foundations. Different kinds of convergence in probability theory. Characteristic functions and their applications. Laws of large numbers and central limit theorems. Conditioning. Introduction to stochastic processes. Same course as MATH 6123.

621* Advanced Statistical Inference. Prerequisite: 5213. Point estimation, maximum likelihood, Cramer-Rao inequality, confidence intervals, Neyman-Pearson theory of testing hypothesis and power of test.

622* Internship in Higher Education Student Personnel. 2-6 credits, maximum 6. Prerequisite: 6213 or consent of instructor. Work and study opportunities under supervision in areas of student housing, student activities, financial aid, foreign student advisement, student personnel administration, student union, group facilitation and other appropriate work situations.

6850* Directed Reading. 1-6 credits, maximum 6. Prerequisite: consent of instructor. Directed reading for students with advanced graduate standing.

Technical and Industrial Education (TIED)

2000 Field Experience in Industrial Practice. 2-6 credits, maximum 16. Supervised work experience in student teaching and learning area with special emphasis on occupational skill development. Written agreement between student, employer and department must be made prior to beginning of field experience program. Graded on a pass-fail basis.

3000 Trade and Industrial Occupational Experience. 1-24 credits, maximum 24. Credit to be determined by a special skill competency examination.

3203 Foundations and Services of Trade and Industrial Education. Opportunities provided by vocational education, with special emphasis on trade and industrial education and its relationship to other elements of the educational system. Legislative aspects of vocational education, general education, student guidance, and programs for disadvantaged and handicapped students.

4103* Instructional Procedures in Trade and Industrial Education. Methods and techniques for organizing and managing shop and classroom and shop instruction. Emphasis on the use of instructional aids and competency development. No credit for students with credit in OCED 4103.

4110* Trade Technical Information. 1-4 credits, maximum 6. New developments in scientific and technical information and knowledge that are relevant to current trade practices.

4213* Coordinating Vocational Student Organizations and Activities. Student organizations and activities in vocational education at local, state and national levels. Procedures for planning programs of work, incorporation of student organization activities into curriculum, adviser characteristics and responsibilities, fund-raising activities, and techniques for recognizing outstanding members and community support.

4213* Safety, Organization and Management of Learning Facilities. Techniques and procedures for organizing and managing shop and laboratory facilities and learner activities to enhance the quality of instruction and improve efficiency of equipment and space utilization including all safety rules and procedures.
Telecommunications Management (TCOM)

5012* Telecommunications Laboratory. Prerequisite: ECEC 5553; TCOM 5123 or co-requisite. Familiarization with the hardware used to move voice, data and video traffic. Data network experiments include setup and operation of a small LAN, interconnection of these LANs via bridges or routers, and attachment of voice and video modules to the LANs. Telephone network experiments include installation of small PBXs and interconnection of them to the campus phone system, and interconnection of the lab PBXs with crosspoint switches and fiber. Video experiments include interconnection and operation of a small two-camera studio, and digitizing and transferring the video over the laboratory telephone system. Practical operating aspects and standards of distance transmission devices, switching equipment media for transmitting data, voice and video signals. Handling information problems within selected environments.

5113* Industry Overview and Telecommunications Applications. Prerequisite: graduate standing and consent of program director. Overview of telecommunication technology, industry, regulatory environment, and current topics in telephone services (wireless and wireline), business data services, CATV, and Internet services and providers (including JAVA and HTML). Managerial and strategic aspects of telecommunication technologies. Guest speakers from the telecommunications industry.

5123* Telecommunications Systems II. Prerequisites: ECEN 5553 and consent of program director. Applied technical coverage of selected topics from the upper layers of the OSI model. Network and Transport layers using, TCP/IP, IPX/SPX, and Netbeui, as well as security issues and other multi-layer protocolsuite flows. Flow control, RSVP, encryption, compression, and LAN/WAN applications.

5143* Telecommunications Systems Analysis, Planning and Design I. Prerequisites: ECEN 5553 and consent of program director. The fundamentals behind systems analysis and design of telecommunication systems from a managerial perspective. Financial analysis of telecommunication projects, fundamentals of mathematical modeling and queuing theory, and other management tools that are key to the design and analysis of telecommunication networks.

5153* International Telecommunications Management. Prerequisites: graduate standing and consent of program director. Investigation of the institutions that affect the use of telecommunications. The various parts of the federal government involved, such as the Department of Commerce, the FCC and the Department of State. The role of international institutions, including the ITU, UNESCO, and the various satellite organizations such as INTELSAT.

5163* Telecommunications Practicum. Lab 3. Prerequisites: graduate standing and consent of program director. Application of knowledge and skills developed in core courses in an organizational environment to solve telecommunication management problems. Integration of concepts and adaptation of theory to fit organizational reality.

Theater (TH)

1500 Theater Practicum. 1 credit, maximum 6. Lab 2. Laboratory experience in theater production, acting and crew assignments. Graded on a pass-fail basis.

1533 Voice and Diction. Freeing the natural voice; development of proper breathing techniques, resonance, and range; use of International Phonetic Alphabet in developing articulation and pronunciation; exercises in phrasing and intonation; preliminary dialect work.

2413 (H) Introduction to the Theater. Character, plot, theme, historical and production analyses of various types of play scripts; understanding the work of various theater artists; developing appreciative audiences.

2533 Oral Interpretation. Reading aloud effectively; training in voice improvement, platform techniques, selection criteria and audience analysis.

2543 Acting I. Lab 4. Ensemble techniques and creation of improvisation; vocal and physical development for the actor; theories and techniques of acting; fundamental scene and character analysis; scene performance workshops.

2553 Introduction to Stage Design. Lab 2. Prerequisites: 2663, 2673 or consent of instructor. An integrated overview of the theory and practice of design for the stage.

2663 Stage Technology. Lab 6. Elementary techniques of stagework and costume for the stage. Basic stagecraft skills. Practical experience preparing departmental productions.
2673  Costume Technology  Lab 6. Elementary techniques of costume craft and stagecraft for the stage. Basic costumeing skills. Practical experience preparing departmental productions.

3023  (H)Theater History I  Aesthetic and social relationships of theater and western civilization from primitive times to the mid-17th century.

3123  (H)Theater History II  Aesthetic and social relationships of theater and western civilization from the mid-17th century through the 19th century.

3223  (H)Theater History III  Aesthetic and social relationships of theater and western civilization from 1900 to the present.

3400  Upper-division Projects  1-3 credits, maximum 6. Prerequisite: consent of instructor. Individual or group study of techniques, history, or literature of the theater. Required written survey of the project and self-evaluation of its results, or a term paper.

3733  Stage Movement for Actors  Techniques and exercises to build the actor’s awareness and abilities for use of the bodily instrument on stage; preparation and readiness routines; rhythm, posture, and movement patterns appropriate to various styles of theater and to specific character roles.

3743  Acting II  Prerequisite: 2543. Continuation and refinement of 2543. Textual and character analysis; characterization and inner techniques. Audition techniques and realistic comedy through scene work with contemporary plays.

3973  Stage Makeup  Lab 2. Techniques of stage makeup. Application and relationship to character. Facial anatomy, prosthesis, wigs and hair. Laboratory work in preparation for departmental productions.

4123*  (H)Stage Costume History I  Comprehensive history of theatrical costume from ancient Egypt to 1700. Impact of fashion on the stage.

4143*  Acting III  Prerequisite: 3743. Continuation and refinement of 3743. Performance techniques in classic to modern styles. Shakespeare to Miller.

4183*  Scene Design for Theater and Television  The designer’s approach to the script; execution of sketches, models and working drawings.

4323*  (H)Stage Costume History II  Comprehensive history of theatrical costume from 1700 to the present. Impact of fashion on the stage.

4403  Senior Honors Project  Prerequisites: departmental invitation, senior standing, Honors Program participation. A guided reading and research program ending with an honors thesis or performance under the direction of a faculty member, with second faculty committee member. Required for graduation with departmental honors in theater.

4593*  Lighting for Theater and Television  Lab 2. Stage lighting design, elementary electricity, design of lighting instruments. Practical experience in lighting in preparing and running departmental productions.

4735*  Stage Management  Prerequisite: consent of instructor. Procedures and skills of effective stage management. Authoritative coordination of performers and technicians during rehearsal and performance periods. Maintenance and use of the production prompt book, notation of ground plan and blocking; scene shifts; cues for lighting, sound, special effects, and performers; opening and calling the show; post-show wrap-up. Practical experience in stage managing student directed scenes.

4953*  Directing  Prerequisite: 2543. Play analysis for production, problems in staging, and the role of the director. Planning and direction of scenes in laboratory situations.

4963*  Theater Graphic Techniques  Fundamentals of theater graphic techniques to communicate theatrical design ideas.

4973*  Stage Costume Design  Lab 4. Approaches to basic costume design including research, conceptual analysis, figure drawing, and execution of sketches and renderings.

4983*  Scene Painting  Lab 3. Elementary techniques of scene painting. Individual projects in large scale in representing marble, rock to landscape, interiors. Color theory, forced perspective, ability to paint different styles. Practical experience preparing for departmental productions.

5013*  Theater Research Methods  Diverse methods of theater research appropriate to performance, design, and technology, and history and theory. Developing familiarity with standard references and journals of the field, and introduction to professional organizations.

5063*  Scenography  Prerequisites: proven experience in scenery, lighting or costume design and consent of instructor. Scenographic design processes for the advanced theater designer. Investigation of design styles and theories and the designers whose works advance them. Concepts; explore various technical and scenic concepts. Scene planning, concept realization, working drawings.

5213*  Script Analysis  Analytical and interpretive techniques in reading play scripts for theatrical production. Emphasis on writing skills appropriate to script analysis.

5243*  Problems in Advanced Acting  Prerequisites: 4143 and graduate standing or consent of instructor. Experimentation in psychological realism. Concentration on analysis, technical skills, and contacting the emotions. Special preparations for professional interviews and auditions.

5400*  Seminar in Theater  1-3 credits, maximum 12. Prerequisite: consent of instructor. Individual or group studies of techniques, history or literature of the theater. A term paper or written report and self-evaluation of the study or project required.

5413*  Dramatic Theory  Concepts of play construction and audience effects: classic, neoclassic, romantic, realist, to post-modern.

5500*  Individual Theater Projects  1-3 credits, maximum 6. Prerequisite: consent of instructor. Individual projects in directing, acting, or design and technology for a specified theater production, with concept, realization, and self-evaluation under faculty guidance.

5953*  Problems in Advanced Directing  Prerequisites: 4953, consent of instructor. Problems in directing period styles, especially Shakespearean. Restoration comedy, absurdist drama, and avant garde drama. Preparation, rehearsal and staging of a complete production by each student.

University (UNIV)

0111  Developmental Science Process Skills  Instruction on what scientists do as they study and investigate the natural world. Emphasis on critical thinking processes. Observation, classification, metric measurement, data table construction, graph construction and interpretation. May be used as a remediation requirement as established by State Regents policy. Graded on a satisfactory-un satisfactory basis.

1011  American Studies Survey  Provides an overview of the United States society and culture using an interdisciplinary approach. Study of U.S. culture from sociological, anthropological, language, educational, political, geographical, economic, and historical perspectives.

1111  University Academic Services Freshman Orientation  Prerequisite: beginning freshman standing in University Academic Services. Designed to help students ease the transition from high school to college; become aware of campus resources and administrative structures; explore various majors and careers; increase awareness of current issues in education; and enhance study skills and attitudes which can contribute to academic success.

2001  Academic Assessment and Evaluation  Required for students in University Academic Assessment Program and available campuswide to students on academic probation. Identification of reasons for experiencing academic difficulty; assessment of reading ability and individual learning styles; understanding university policies and procedures and current issues in American education; development of goals, attitudes, and study skills needed to achieve academic success; and exploration of careers, majors, and alternative educational experiences.

2510  Innovative Studies  1-3 credits, maximum 6. Lab 0-6. May be used for not more than two semesters for new or experimental topics or techniques. Graded on a pass-fail basis.

3110  Directed Study  1-18 credits, maximum 18. Prerequisite: written application approved by instructor, the department head, and the dean of the student’s college. Independent study, research, field work or internship.


Veterinary Anatomy, Pathology and Pharmacology (VAPP)

5550*  Pathological Techniques and Special Problems  1-4 credits, maximum 20. Prerequisites: graduate standing in biological sciences. Techniques and methods used in diagnosis, technical work and research in pathology.
Veterinary Biomedical Sciences (VBSC)

5000* Masters Research and Thesis. 1-6 credits. Research problem for meeting requirements of the Masters degree.

5110* Special Problems. 1-6 credits, maximum 20. Prerequisites: graduate standing and consent of instructor. Special research problems in the various fields of veterinary biomedical sciences.

5120* Current Topics in Veterinary and Biomedical Science. 1 credit, maximum 4. Prerequisite: a minimum of one undergraduate introductory course in microbiology. Development of oral presentation skills, critical thinking and deductive reasoning through the use of discussion of current literature from the field of veterinary and biomedical science as it pertains to the study of infectious disease in humans and animals.

5213* Diseases and Parasites of Wild Animals. Lab 1. Prerequisite: consent of instructor. A systematic approach to bacterial, viral and parasitic diseases of wild animals. Principles of disease transmission with regard to individual and populations of wild animals. Principles applicable to all areas of zoology, veterinary medicine and wildlife management.

5224* Integrative Vertebrate Cell Structure and Function. Prerequisites: BIOG 3653, ZOOL 3204 or ZOOL 4215. The relationship between structure and function underlying essential processes occurring within individual cells and in interactions among cells. Emphasis on integration of knowledge of morphology, metabolism and physiology to facilitate a comprehensive understanding of the function of vertebrate organisms at the cellular level.

5404* Techniques in Parasitology. Lab 1. Prerequisites: graduate standing and general parasitology; helminthology or concurrent enrollment. Experimental application of basic research and teaching techniques in helminthology and protozoology. Individual participation and analysis of experimental situations and techniques applicable to all areas of zoology.

5523* Advanced Helminthology. Lab 3. Prerequisite: senior or graduate standing in zoology or entomology or graduate standing or consent of department head. Structure, taxonomy, life cycles and host-parasite relationships of helminth parasites affecting invertebrate and vertebrate animals.

5613* Biology of Parasites. Prerequisites: graduate standing, general parasitology, or consent of instructor. A systematic and ecologic approach to the study of parasitology. Host-parasite relationships, physiology, ecology and behavioral aspects of parasitic organisms.

5723* Parasitic Protozoa. Lab 3. Prerequisite: graduate standing in zoology or entomology or consent of instructor. Structure, life cycle, physiology, host-parasite relationships, and diagnosis concerned with protozoan parasites.

5833* Veterinary Diagnostic Microbiology. Lab 2. Prerequisite: graduate veterinarian status or consent of instructor. Laboratory methods employed in the isolation of microorganisms and application of these methods in the diagnosis of specific animal diseases.

6000* PhD Research and Thesis. 1-15 credits, maximum 45. Prerequisite: graduate standing. Research problem for meeting requirements of the Ph.D. degree.

6110* Seminar. 1-6 credits, maximum 6. Prerequisite: graduate standing. Literature and research problems pertaining to veterinary biomedical sciences.

6120* Advanced Physiology of Selected Systems. 2-10 credits, maximum 10. Prerequisite: graduate standing or consent of instructor. Advanced studies in gastrointestinal, cardiovascular, respiratory, excretory and neuroendocrine physiology. Each part of this sequential course may be taken for two hours credit. Student should ascertain the topics before registering for this course a second time.


6200* Topics in Advanced Pharmacology and Toxicology. 2 credits, maximum 15. Prerequisite: consent of instructor. Selected topics in advanced pharmacology and toxicology such as cardiovascular, gastrointestinal or neuropharmacology; chemotherapeutics; heavy metal, chemical or plant toxicology or bio-toxicology. Repeatable; re-enrollment permits study of additional topics.

6222* Fertilization and Early Development. Prerequisite: consent of instructor. Gametogenesis, fertilization, and the activation of embryonic development, described at the cellular and molecular level. Emphasis on current literature.

6233* Laboratory in Electron Microscopy. Lab 12. Prerequisite: consent of instructor. Student learns to prepare specimens for, and to operate, the electron microscope, and techniques for printing and preparation of electron micrographs for publication.

6410* Endocrine Control of Fuel Metabolism. 1-5 credits, maximum 5. Lab 0-2. Prerequisite: consent of instructor. Emphasis on cellular and molecular aspects of hormone action in target tissues as basis for understanding endocrine regulation of organ and whole body metabolism. Special reference to endocrine pancreas regulation of ketone, carbohydrate (glucose) and lipid (FFA) metabolism in pregnancy, lactation, fasting, obesity and diabetes. Content applicable to health and disease in humans and domestic animals. Course offered in spring semester of alternate years.

6550* Problems in Functional Morphology. 1-3 credits, maximum 12. Lab 3-9. Prerequisite: consent of instructor. Investigations in comparative, gross, developmental or histologic morphology for graduate students.

6650* Advanced Pathology Techniques and Special Problems. 1-6 credits, maximum 20. Prerequisites: graduate standing in biological sciences and consent of instructor. Investigations of contemporary techniques and methods used in diagnosis, technical work and research in pathology.

6910* Veterinary Pathology Slide Conference. 1-2 credits, maximum 6. Prerequisite: medical degree. Guided weekly exercises based on veterinary diagnostic microscopy.

6920* Diagnostic Pathology. 1-4 credits, maximum 20. Lab 3-9. Prerequisite: graduate standing in the College of Veterinary Medicine or written consent of department head. Weekly review of current cases submitted to the department and the methods employed in diagnosis. Examination of necropsy reports, specimens, and preparatory materials. Students required to formulate diagnoses.

6930* Comparative Anesthesiology. 1-3 credits, maximum 3. Prerequisite: graduate standing in the College of Veterinary Medicine or consent of the head of the department. Anesthesiology of animals.

6950* Advanced Systemic Pathology. Prerequisites: VMED 5264, graduate standing, consent of instructor. Total credit not to exceed six for the M.S. degree and 12 for the Ph.D. Re-enrollment permits the study of two to four different groups of organs and systems of the animal body. A consideration of the pathogenesis and the morphological, biochemical, and comparative aspects of lesions found in organs and tissues of the domesticated animals.

6963 Advanced Clinical Pathology. Prerequisites: VMED 5362 or equivalent, graduate standing and consent of instructor. Applied clinical biochemistry, organ function tests and related cytopathic examination.

6972* Advanced Hematology. Prerequisites: VMED 5362 or equivalent, graduate standing and consent of instructor. The etiology and pathogenesis of the diseases of the blood and bone marrow.
Veterinary Clinical Sciences (VCS)

5000*
Thesis. 3 credits, maximum 3. Prerequisite: senior standing with registration for graduate credit or graduate standing. Research problem for credit permitted only on approval of the master's degree, under the supervision of a graduate faculty member and with consent of the department head.

6003* Elective I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.

6013* Elective II. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.

6023* Elective III. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.

6033* Elective IV. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.

6043* Elective V. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.

6053* Elective VI. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Continuation of clinical rotations.

6700 Preceptorship Clinic. 1-8 credits, maximum 8. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, prevention and treatment of diseases of animals presented in the preceptorship program. Graded on a pass-fail basis.

6703* Intensive Care Clinic. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Clinical rotation in small animal intensive care/critical and emergency medicine. Letter graded.

6710 Non-OSU Clinic. 1-8 credits, maximum 8. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Approved clinical rotation off the OSU campus. Graded on a pass-fail basis.

6713* Radiology Clinic. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnostic radiography, ultrasound, and other special imaging modalities.

6720 Special Clinic I. 1-8 credits, maximum 8. Prerequisite: fourth-year standing in the College of Veterinary Medicine or graduate veterinarian. Special assignments for introductory clinical studies in the following: selected species clinic; herd-health program; necropsy, clinical pathology and parasitology; diagnostic laboratory; and special aspects of the basic sciences.

6723* Equine Medicine Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of equine medical diseases.

6730 Special Clinic II. 1-8 credits, maximum 8. Prerequisite: fourth-year standing in the College of Veterinary Medicine or graduate veterinarian. Special assignments for continuing clinical studies in the following: selected species clinic; herd-health program; necropsy, clinical pathology and parasitology; diagnostic laboratory; and special aspects of the basic sciences.

6733* General Medicine and Surgery Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of companion animal medical diseases.

6743* Small Animal Medicine Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of companion animal medical diseases.

6753* Small Animal Surgery Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of companion animal surgical diseases.

6763* Food Animal Medicine Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of food animal medical and surgical diseases.

6773 Production Medicine Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Health studies of animals in herds, bands and flocks entered in health programs of the Boren Veterinary Medical Teaching Hospital.

6783* Field Services Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis and treatment of animal disease cases presented to the Field Services unit.

6793 Equine Surgery Clinic I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of equine surgical diseases.

6803 Clinic Pool I. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Semi-elective clinical assignment.

6813* Anesthesiology Clinic. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Management of clinical anesthesia in various domestic species.

6823 Equine Medicine Clinic II. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of equine medical diseases. Continuation of 6723.

6833* General Medicine and Surgery Clinic II. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Receiving and managing emergency and general medical and surgical cases in companion animals. Continuation of 6733.

6843 Small Animal Medicine Clinic II. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of companion animal medical diseases. Continuation of 6743.

6853 Small Animal Surgery Clinic II. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of companion animal surgical diseases. Continuation of 6753.

6863 Food Animal Medicine Clinic II. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of food animal medical and surgical diseases. Continuation of 6763.

6873 Production Medicine Clinic II. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Health studies of animals in herds, bands and flocks entered in health programs of the Boren Veterinary Medical Teaching Hospital. Continuation of 6773.

6893* Equine Surgery Clinic II. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of equine surgical diseases. Continuation of 6793.

6900* Clinical Problems and Investigation. 1-6 credits, maximum 6. Prerequisite: third-year standing in the College of Veterinary Medicine. Diagnosis of animals.

6920* Seminar. 1-3 credits, maximum 3. Prerequisite: graduate standing in the College of Veterinary Medicine or consent of instructor. Discussion for graduate students.

6950* Special Surgical Problems and Techniques. 1-5 credits, maximum 5. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Advanced training in surgical problems and techniques especially as they are related to research.

6981 Clinic Pool II. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Semi-elective clinical assignment. Graded on a pass-fail basis.

Veterinary Infectious Diseases and Physiology (VIDP)

6110* Seminar. 1-6 credits, maximum 6. Prerequisite: graduate standing. Subjects for study and discussion for graduate students.

6203* Advanced Concepts in Veterinary Immunology. Prerequisite: 5113 or BIOC 3653 or MICRO 3254. Induction of immune responses, host defense mechanisms, immunoregulation, antigen presentation and immune recognition by B and T lymphocytes, using contemporary research publications.

6613* Public Health and Preventive Medicine. Prerequisite: third-year standing in the College of Veterinary Medicine or consent of instructor. The relationship of zoonotic diseases to community and environmental health. Epidemiological principles in the practice of veterinary preventive medicine.
Veterinary Medicine (VMED)

5123* Animal Disease Control and Prevention. Prerequisite: Junior standing in the College of Agriculture. Principles of sanitation and of prevention and control of common diseases of livestock and other animals.

5111 Veterinary Medical Orientation I. Prerequisite: First-year standing in the College of Veterinary Medicine. Veterinary medical terminology, history and ethics of the profession, veterinary surveys of the biological kingdom, selected techniques and clinical presentations, and special topics. Graded on a pass-fail basis.

5115* Cell and Tissue Form and Function I. Prerequisite: First-year standing in the College of Veterinary Medicine or consent of instructor. Cell and tissue organization and structure at the microscopic level and physiology of organ systems. (8-week module).

5125* Cell and Tissue Form and Function II. Prerequisite: 5115 or consent of instructor. Continuation of VMED 5115. (8-week module).

5144* Gross and Developmental Anatomy. Prerequisite: First-year standing in the College of Veterinary Medicine or consent of instructor. Embryology and anatomy of domestic mammals using the dog as the primary model. Integrated lecture-dissection-laboratory format. The integration of developmental gross, radiographic and applied aspects of veterinary anatomy as they relate to a topographical appreciation of the living individual. Integrated lecture-dissection-laboratory format. (8-week module).

5221 Veterinary Medical Orientation II. Prerequisite: 5111. Major breeds of animals; veterinary perspective on their diseases. Animal production and marketing systems and marketing; selected techniques and clinical presentations; and special topics.

5234* Cell and Tissue Form and Function III. Prerequisite: First-year standing in the College of Veterinary Medicine or consent of instructor. Three inter-related areas of fuel metabolism, endocrine system, and reproductive physiology and endocrinology.

5243* Comparative Anatomy. Prerequisite: 5144 or consent of instructor. Comparative and functional gross anatomy and developmental anatomy of domestic mammals. The integration of developmental, gross, radiographic, and applied clinical aspects of veterinary anatomy as they relate to a topographical appreciation of the living individual. Integrated lecture-dissection-laboratory format.

5255* Infectious Diseases I. Prerequisite: First-year standing in the College of Veterinary Medicine or consent of instructor. Introduction to infection and immunity in domestic animals and the use of epidemiology to study disease in populations. Basic biology of bacteria, fungi and viruses as related to disease, diagnosis and therapeutics. The constitutive and induced defenses of animals to infectious agents. Basic principles of epidemiology including biometry, disease transmission, use of diagnostic tests, risk assessment and prevention of disease.

5264* General Pathology. Prerequisite: First-year standing in the College of Veterinary Medicine or consent of instructor. Cellular and tissue pathology, pigments, inflammation, immunopathology, disturbances of growth and circulation, and differentials that accompany changes in structures as well as the causes and pathogenesis of diseases.

5313* Epidemiology, Food Safety and Public Health. Prerequisite: Second-year standing in the College of Veterinary Medicine or consent of instructor. Principles and uses of epidemiology in veterinary medicine. Introduction to public health and diseases transmissible to humans. Potential human health hazards in foods of animal origin and principles of safe food production, processing, handling and inspection, including pathogen reduction, HACCP regulations, and pre-harvest food safety.

5323* Veterinary Parasitology I. Lab 2. Prerequisite: Second-year standing in the College of Veterinary Medicine or consent of instructor. Introduction to the general principles of parasitism and parasites of veterinary medicine importance including taxonomy, morphology, biology of parasites, modes of transmission, host-parasite relationships, infectious processes, pathogenicity, diagnostic methods, treatment and control measures and public health importance.

5333* Pharmacology I. Prerequisite: Second-year standing in the College of Veterinary Medicine or consent of instructor. Principles of pharmacodynamics, drug disposition and pharmacokinetics, pharmacological effects, mechanisms of actions, metabolism, disposition, clinical indications and toxic effects of drugs acting on the autonomic, central nervous, cardiovascular, respiratory, and renal systems.

5342* Clinical Anatomy. Lab 6. Prerequisite: Second-year standing in the College of Veterinary Medicine. Aspects of gross anatomy as they relate to clinical applications.

5353* Infectious Diseases II. Lab 1. Prerequisite: Second-year standing in the College of Veterinary Medicine or consent of instructor. Important animal diseases caused by bacteria, fungi and viruses covered on a systems basis. Selected diseases covered in depth to convey the mechanisms of infectious disease processes and the relationship of such processes to disease development, diagnosis, treatment and control. The relationship of zoonotic diseases to community and environmental health as well as important zoonoses. Coverage includes the integumentary, respiratory, urinary and hemopoietic systems.

5362* Clinical Pathology. Lab 20. Prerequisite: Second-year standing in the College of Veterinary Medicine or graduate standing with consent of instructor. Basic concepts pertaining to data interpretation and laboratory methods used in evaluation of disease.

5412* Anesthesiology. Lab 6. Prerequisite: Second-year standing in the College of Veterinary Medicine. Application of the principles of veterinary anesthesiology to incorporate fundamental aspects of physiology and pharmacology in the anesthetic management of important domestic species.

5423* Veterinary Parasitology II. Lab 2. Prerequisite: Second-year standing in the College of Veterinary Medicine or consent of instructor. Principles of parasitism. Introduction to the prevention of animal diseases produced by arthropod, protozoan, rickettsial, and helminth parasites. A problem-based approach to parasitic diseases affecting the integumentary, respiratory, hemato-lymphatic, reproductive, urinary, nervous/sensory, musculoskeletal, and alimentary systems with emphasis on diseases of domestic animals.

5452* Pharmacology II. Prerequisite: 5333 or consent of instructor. A continuation of 5333 that includes the mechanisms of action, spectra of activity, dosages, adverse effects and clinical indications for antimicrobial agents, anti-parasitic agents, anticancer agents, anti-inflammatory agents, and drugs used in the therapy of respiratory, gastrointestinal, and endocrine diseases.

5443* Diagnostic Imaging. Lab 13. Prerequisite: Second-year standing in the College of Veterinary Medicine. Radiographic theory, techniques, and interpretation. Introduction to alternate methods, including ultrasonography.

5453* Infectious Diseases III. Lab 1. Prerequisite: Second-year standing in the College of Veterinary Medicine or consent of instructor. Continuation of 5354.
5531*  Molecular Genetics. Prerequisite: second-year or higher in standing in the College of Veterinary Medicine. Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to the blood and lymphatic system (six-week module).

5582*  Hemolymphatic and Oncology. Prerequisite: second-year standing in the College of Veterinary Medicine. Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to the blood and lymphatic system (six-week module).

5612*  Research Elective. Lab 60. Prerequisite: second-or-third-year standing in the College of Veterinary Medicine. Participation in faculty-directed projects to enhance career development in veterinary biomedical research. Participation in a process mimicking investigator-initiated research by developing a research proposal, participation in a competitive peer-review process, and reporting on completed research. Graded on a pass-fail basis.

5622*  Signs and Symptoms of the Small Animal Medical Diagnosis. Prerequisite: second-or-third-year standing in the College of Veterinary Medicine. Introduction to clinical problem solving through application of a problem-oriented approach to clinical diagnosis. Major problems (clinical signs and symptoms) affecting animals. The pathophysiology of each clinical sign, its differential diagnosis and symptomatic management. Key anatomical, pathological and immunological concepts learned in basic science courses.

5662*  Avian and Exotic Pet Medicine. Lab 6. Prerequisite: second or third-year standing in the College of Veterinary Medicine. Clinical diagnosis, management and treatment, prognosis, and prevention of diseases in avian and exotic pets. Introductory material provided to familiarize students with the species discussed and where clinically important; however, student understanding of the basic sciences required and assumed.

5683*  Dermatology and Endocrinology. Prerequisite: second-year standing in the College of Veterinary Medicine. Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to the skin and endocrine system (nine-week module).

5674*  Cardiopulmonary System. Lab 24. Prerequisite: second or third-year standing in the College of Veterinary Medicine. Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to the cardiovascular and respiratory systems.

5611*  Correlation Discussion. Lab 15. Prerequisite: third-year standing in the College of Veterinary Medicine. Case-based integration of previously discussed systems (1.5 week module at end of semester).

6533  Diagnostics. Prerequisite: fourth-year standing in the College of Veterinary Medicine. Participation in animal necropsy, clinical pathology, and other investigative methods to study diagnosis, prognosis, prevention and treatment of diseases. Graded on a pass-fail basis.

6821  Veterinary Medical Clinic Conference II. Prerequisite: 6711. Presentation and discussion of selected clinical cases by fourth-year students and interdepartmental faculty groups. Graded on a pass-fail basis.

Veterinary Medicine and Surgery (VMS)

5412*  Jurisprudence and Medical Economics. Prerequisite: second-year standing in the College of Veterinary Medicine. Veterinary jurisprudence, medical economics, ethics, public relations, records, banking, insurance, U.S.D.A. and F.D.A. regulations. Visiting lecturers in specialty areas assist in this course.

5422  Veterinary Surgery I. Prerequisites: PHSI 3335; completion or enrollment in BIOC 5753; VPATH 5413; second-year standing in the College of Veterinary Medicine. The pathophysiology of surgery including an introduction to techniques in veterinary surgery and anesthesia.

5441  Clinical and Surgical Techniques I. Prerequisite: second-year standing in the College of Veterinary Medicine. Behavioral traits, physical examination and restraint of animals, introduction to clinical techniques of medicine and surgery relating to clinical handling of animals. Graded on a pass-fail basis.

6501  Avian Medicine and Surgery. Prerequisite: third year standing in the College of Veterinary Medicine. Clinical aspects of diseases of pet, zoo, exotic, and wild birds.

6516*  Systemic Medicine and Diseases of Domestic Animals I. Prerequisite: third-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of diseases of food and fiber animals.

6523  Veterinary Surgery II. Prerequisites: 5422 and third-year standing in the College of Veterinary Medicine. Lectures and discussions in operative techniques and practices in veterinary surgery.

6532*  Diagnostic Imaging. Prerequisite: third-year standing in the College of Veterinary Medicine. Diagnostic imaging with emphasis on radiographic interpretation; also alternate imaging. Presented in a problem-based format.

6542  Clinical and Surgical Techniques II. Prerequisites: 5441 and third-year standing in the College of Veterinary Medicine. Continuation of 5441. Graded on a pass-fail basis.

6614*  Systemic Medicine and Diseases of Domestic Animals II. Prerequisite: third-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of diseases of horses.

6615*  Systemic Medicine and Diseases of Domestic Animals III. Prerequisite: VPATH 6524; third-year standing in the College of Veterinary Medicine. Diagnosis, prognosis, treatment and prevention of diseases of companion animals.
**Zoology (ZOOL)**

1011 
*Professions in Natural Resources.* An examination of the professions of the ecology and management of natural resources. Exploration of academic and career options. Graded on a pass-fail basis. Same course as RLEM 1011.

2104 
*Human Anatomy.* Lab 3. Prerequisite: BIOL 1604. Gross anatomy of the human body and its systems based on comparisons with nonhuman mammals dissected in the laboratory. Minor emphasis on embryology and histology.

3013* 
*Biological Microtechnique.* Lab 3. Prerequisite: BIOL 1404 or 1604. Techniques for preparation of biological materials for microscopic examination. Same course as BOT 3013.

3104* 
*Invertebrate Zoology.* Lab 4. Prerequisite: BIOL 1604. Morphology, physiology, reproduction and ecology of major invertebrate groups.

3113 
*(N)Human Evolution.* An evolutionary perspective on human biology. No credit for students with prior credit in 3133.

3115* 
*Vertebrate Morphology.* Lab 6. Prerequisite: BIOL 1604. Comparative gross anatomy of representative vertebrates with consideration given to embryology, histology and evolution.

3123* 
*(N)Human Heredity.* The impact of genetics on human health. No credit for students with prior credit in BIOL 3024.

3133* 
*Evolution.* Prerequisite: 3123 or BIOL 3024. Development of the evolutionary concept; specialization, evolutionary mechanisms and phylogenetic concepts.

3143 
*Oceanography.* Prerequisite: CHEM 1225. Ocean basins, geology, chemistry, biology, waves, tides, ocean exploration, ocean communities, and resources.

3153 
*(N)Animal Behavior.* Prerequisite: junior standing. Survey of theory and application in basic and applied animal behavior. Interdisciplinary analysis of animal behavior in the field, captive settings and laboratories.

3204* 
*Physiology.* Lab 2. Prerequisites: BIOL 1114; CHEM 1215 or 1314. Anatomy and function of the human body. Emphasis on animal physiology considered in laboratories. No credit for students with prior credit in 4215.

3500 
*Colloquium on the Environment and Conservation.* 1 credit, maximum 4. Current conservation and environmental concerns presented by scholars and experts emphasizing discovery and solutions. Natural resource agencies and conservation organizations.

3502 
*Wildlife Law Enforcement.* Prerequisites: junior standing and consent of instructor. Survey of state and federal wildlife laws with emphasis on Oklahoma statutory and regulatory laws pertaining to wildlife. Lectures, guest lectures, videotapes, and field exercises.

3513* 
*Principles of Conservation Biology.* Prerequisites: 60 credit hours including BIOL 3034. Application of ecological principles to the maintenance and restoration of biological diversity at genetic, population, and community levels.

3700 
*Readings and Special Studies in Zoology.* 1-3 credits, maximum 6. Prerequisites: BIOL 1604 and consent of instructor. Discussion of selected readings.

4103* 
*General Parasitology.* Lab 2. Prerequisite: BIOL 1604; ZOOL 3104 recommended. Fundamentals of parasitism with emphasis on: life cycles, disease conditions, epidemiology, diagnosis, treatment, historical significance, terminology, taxonomy and parasitological techniques.

4113 
*Conservation Genetics.* Prerequisites: BIOL 3024 or equivalent, MATH 1513. Principles of population genetics as they pertain to issues in conservation biology. Evolutionary relationships, hybridization, natural selection, factors affecting small populations, gene flow, captive populations, and META populations. No credit for students with credit in 5113.

4115* 
*Behavior of Fishes, Amphibians and Reptiles.* Lab 5. Prerequisite: BIOL 1604. Systematics, evolution, and natural history of fishes, amphibians and reptiles; laboratory emphasis on Oklahoma species. Offered spring semester of even-numbered years. Weekend field trips required.

4125* 
*Biological of Birds and Mammals.* Lab 2. Prerequisite: BIOL 1604. Classification, identification, evolution, zoogeography, life histories, and techniques of study for wild birds and mammals. Weekend field trips required.

4134* 
*Embryology.* Lab 4. Prerequisite: 3115. BIOL 3014. Biochemical basis of development with emphasis on gene regulation. Comparative development of sea urchin, frog, chick and pig. Experiments using frog and mouse, including the molecular level.

4215* 
*Mammalian Physiology.* Prerequisites: BIOL 1604; CHEM 3015 or CHEM 3035. Descriptive and functional analysis of the mammalian nervous, cardiovascular, musculoskeletal, respiratory, renal, endocrine, and digestive organ systems. For majors in biological, agricultural, or human environmental (including premedical, pre-dental and pre-veterinary) sciences.

4222* 
*Mammalian Physiology Laboratory.* Lab 6. Prerequisite: 4215. Laboratory experiments that illustrate function of organs, organ systems or mechanisms of whole body physiologic control. For students majoring in basic biological sciences.

4231* 
*Seminar in Physiology.* Prerequisite: 3204 or 4215. Oral and written communication in the physiological sciences; critical review of physiological literature.

4243* 
*Introductory Pharmacology.* Prerequisite: 3204 or 4215. Major drugs classes based on their predominant use or principal activity in the body; basis for drug action; and modification of drugs and their action by physiological processes.

4253* 

4264* 
*Cell Physiology.* Lab 3. Prerequisite: BIOL 3653 or 3101. 4264. Cellular activities and fundamental physiological processes. Same course as CLML 4264.

4273 
*Comparative Physiology.* Prerequisite: 3204 or 4215. Comparative, environmental and ecological physiology of nonhuman animals, with emphasis on vertebrates. Thermoregulation, osmoregulation, comparative aspects of respiratory, circulatory, digestive, muscle, and sensory physiology, and adaptations to extreme environments. Same course as 5273.

4283* 
*Endocrinology.* Prerequisites: 3204 or 4215, and CHEM 3015 or consent of instructor. Examination of the hormonal control and regulation of physiological processes in vertebrates. Function of the hypothalamus, pituitary, adrenal, thyroid, pancreas, ovary and testes; comparative endocrinology.

4303* 
*Environmental Toxicology.* Prerequisites: BIOL 1114 or equivalent; CHEM 1215 or 1314; junior standing. Introduction to the basic theories, principles, and techniques of environmental toxicology. Comparative study of the groups of toxicants (e.g. heavy metals, PCB's, insecticides) and discussion of the environmental problems caused by these chemicals and their implications for survival of populations (including humans) on earth.

4414* 
*Fisheries Management.* Lab 4. Prerequisite: BIOL 3034. Techniques and principles involved in management of fishes. Field trip fee required.

4434* 
*Limnology.* Lab 3. Prerequisite: BIOL 3034. Physical, chemical and biological factors in lakes and streams.

4513* 
*Wildlife Management.* Prerequisite: BIOL 3034 or FOR 3213. Biological basis for the management of wildlife populations and habitats, with emphasis on current management problems.

4523* 
*Wildlife Management Techniques.* Prerequisite: 4513, ENGL 3323 strongly recommended. The semistructured format includes problem identification, project planning and design, land use surveys and mapping, wildlife populations and habitat analysis, data interpretation, development of project area research and management recommendations, and report preparation and presentation.
453*  
Zoo Biology and Management. Prerequisite: 4 hours of zoology or biology, Conservation and propagation of endangered species, animal acquisition and transport, restraint, sanitation and animal health, exhibit planning and design, public relations, administration and research. Lectures by professional zoo staff members. Extension course taught at the Oklahoma City and Tulsa zoos.

4700  
Undergraduate Research Problems. 1-4 credits, maximum 4. Prerequisite: consent of instructor. Participation in faculty research or execution of a problem formulated by the student.

4710  
Internships in Zoology. Prerequisites: 2.50 GPA and consent of department head. Zoology related experiences in professional work settings. Graded on a pass-fail basis.

4720  
Zoo Careers Internship. 1-3 credits, maximum 3. Prerequisite: 4533. Hands-on career experience working under the direction of zoo professionals.

4750  
Honors Study in Zoology. 1-5 credits, maximum 5. Prerequisite: Honors Program participation. Individual study in the development of zoological concepts. Extensive reading, literature search and special experimentation. An individual problems course for the gifted student.

5000*  
Research for Master’s Thesis. 1-6 credits, maximum 6. Independent research for the M.S. thesis under the supervision of graduate faculty member.

5010*  
Graduate Seminar. 1-3 credits, maximum 10. Discussion of selected topics.

5020*  
Special Problems. 1-4 credits, maximum 10. Prerequisites: graduate standing and consent of instructor. A report of results obtained is to be placed in department files.

5030*  
Teaching Zoology. 1-4 credits, maximum 4. Prerequisite: consent of instructor. Supervised teaching in the department laboratories. Attendance at all special problems involved in teaching zoology in college.

5112*  
Advanced Herpetology. Selected advanced aspects of evolution, systematics, biogeography, natural history, physiology, husbandry, nutrition, ecology, behavior, and population biology of reptiles and amphibians as drawn from the primary literature.

5113*  
Conservation Genetics. Prerequisite: course in genetics strongly recommended. Theory and principles of population genetics as they pertain to issues in conservation biology. Evolutionary relationships, hybridization, natural selection, factors affecting small populations, gene flow, captive populations, META populations, and data analysis. No credit for students with credit in 4113.

5123*  
Behavioral Ecology. Prerequisite: course in ecology strongly recommended. Analysis and description of the behavior of animals in their natural environment, especially in terms of natural selection and adaptation. A synthesis of ethology, population genetics, sociobiology, and evolutionary theory. Largely descriptive and generalized with limited emphasis on mathematical theory.

5133*  
Evolutionary Ecology. Lab. 2. Prerequisite: course in ecology strongly recommended. Ecological concepts dealing with contemporary evolutionary processes, not phylogeny. Life history traits, R and K selection, sociality, kin and group selection, speciation, competition, predation, plant-plant coevolution, niche theory, species diversity and biogeography. General models and mechanisms, with examples drawn from all kingdoms.

5153*  
Ecoculture Analysis. Prerequisite: ecology and organic chemistry strongly recommended. Theory and principles of ecosystem ecology focusing on metabolism and biochemical cycles in terrestrial and aquatic systems. Application of principles to current issues of environmental change and management. Same course as BOT 5153.

5163*  
Population Ecology. Lab. 3. Prerequisites: BIOL 3034, MATH 1513. Theory and principles of predicting and analyzing population abundance and dynamics. Life history theory, foraging theory, habitat selection, population genetics, and species interactions.

5173*  
Systematic Mammalogy. Lab. 1. Basic principles of systematics as they apply to advanced aspects of mammalian biology including evolution, biogeography, ecology. Field trip required to meet laboratory requirement.

5273*  
Comparative Physiology. Prerequisites: 3204 or 4215 or equivalent. Comparative, environmental and ecological physiology of nonhuman animals, with emphasis on vertebrates. Thermoregulation, osmoregulation, comparative aspects of respiratory, circulatory, digestive, muscle, and sensory physiology, and adaptations to extreme environments. Same course as 4273.

5323*  
Molecular and Cellular Toxicology. Examination of the physiological basis of toxicodynamics (absorption, distribution, metabolism and excretion) and toxicodynamics (mechanisms of toxic effect). Comparative aspects of toxicology in aquatic and terrestrial organisms.

5413*  
Ecotoxicology. Integration of the major abiotic and biotic processes involved in transport, exposure and response of biological systems (organism, population and community) to environmental toxicants.

5424*  
Techniques in Environmental Toxicology. Lab. 4. Practical understanding of modern techniques used to quantify exposure and effects of environmental toxicants. Laboratories include gas chromatography, HPLC, atomic absorption spectroscopy, protein/nucleic acid isolation, immunossay, genetic toxicology, and immunotoxicology.

5433*  
Fisheries Science. Prerequisite: 4414 or equivalent or consent of instructor. Principles of fisheries science as they relate to fish and aquatic biota, their habitats, and the humans who utilize them.
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