COURSE DESCRIPTIONS

For the most up-to-date catalog information:
www.montana.edu/wwwcat

Course Description Information
Course offerings are subject to the availability of staff and adequate enrollment. Check the Schedule of Classes for the courses actually offered each semester.

Numbering System
001-099 - courses below college level. No college credit given. Credits may not be counted toward a degree.
100-199 - Freshman - Lower Division
200-299 - Sophomore - Lower Division
300-399 - Junior - Upper Division
400-499 - Senior - Upper Division
500-599 - Graduate Courses
600-699 - Graduate Courses

Core 2.0 Courses
Core 2.0 courses are designated by a letter following the course number (e.g. CLS 10111S). The following letters are used to specify the core groups:
• US - University Seminar
• W - College Writing
• Q - Quantitative Reasoning
• D - Diversity
• CS - Contemporary Issues in Science
• IA - Inquiry Arts
• IH - Inquiry Humanities
• IN - Inquiry Natural Science
• IS - Inquiry Social Science
• R - Research
• RA - Research Arts
• RH - Research Humanities
• RN - Research Natural Science
• RS - Research Social Science

Classification of Courses
In the second line of each course description, following the number of credits for the course, there appears a course classification designation which indicates the mode of instruction for that course. In some cases two classifications are listed along with the number of credits in each.

Following is an explanation of course classifications.

LEC - Lecture: Presentation of course material by the instructor, utilizing the lecture method.
LAB - Laboratory: Instructing and supervising students in laboratory investigations.
STU - Studio: Instructing and supervising students in studio investigations.
RCT/DIS - Recitation-Discussion: Presentation of course materials designed to involve students in recitation and/or discussion.
SEM - Seminar: Students share, with the instructor, responsibility for preparation and presentation of course material.
IND - Independent Study: Directed study and/or research on an individual basis, under supervision of instructor.

Graduate Credit
Courses which may be taken for graduate credit are designated by a 500 or 600 number.

Uniform Course Numbers
Uniform numbers are used in all departments.
200, 300, 400 and 500 - Seminar
270, 470 and 570 - INDEPENDENT STUDY (individual projects)
280, 480, 580 - Special Topics (first or one-time class offering)
475 - Undergraduate Projects
276, 476, 576 - Internship
489, 490 - Undergraduate Scholars Program
489, 490 - Undergraduate Scholars Program
575 - Graduate Research - Paper (professional paper or professional project)
588 - Professional Development
589 - Graduate Consultation
590 - Master's Thesis
689 - Reading and Research
690 - Doctoral Thesis

These courses may be repeated for credit. Specific titles of Special Topics courses are listed in the Schedule of Classes, on the Class Rolls and the student’s permanent record.

Some courses such as Special Topics, INDEPENDENT STUDY and Internship are offered for varying amounts of credit, e.g. 1-5. A maximum number of credits is also imposed e.g., Maximum 6 cr. A student may repeat such courses to earn the maximum number of credits by registering for two or more projects with the credits for each project totaling the maximum allowed. If there is no stated maximum for Internship, then all earned credits will count toward graduation, but these credits will only count toward meeting degree requirements as determined by the student’s department. Credits earned beyond the stated maximum cannot be applied toward graduation.

Special Topics and INDEPENDENT STUDY Courses
The maximum number of credits allowed toward graduation in 280 plus 480 courses in each rubric is 12, and the maximum number of 470 credits in each rubric is six. Some departments have established lower limits than these, and the student is responsible for checking the specific course listings to see that he or she does not exceed the allowable number of credits. The maximum number of 570 credits applicable to a graduate degree depends upon the degree. No 470 credits are applicable to a graduate degree.

Courses Offered on Demand
A course designated as “On demand” with a specific semester (i.e., F, S, Su) preceding this phrase means that the course will be offered that semester if there is sufficient demand.

Undergraduate courses designated as given “On demand” may be offered
COURSE DESCRIPTIONS: ACCT 220 - ACCT 400

2. Seniors with a cumulative grade-point average of 3.25 or higher, and
3. Other seniors who have a petition approved by the head of the student’s major department, and the Dean of the College of Graduate Studies.

Some courses are limited to students with graduate standing or certain levels of graduate standing. These specific conditions are indicated within the course prerequisite or description statements. Students below senior standing are not eligible to take graduate-level courses.

ACCT 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of Associate Dean.
- Directed research and study on an individual basis.

ACCT 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ACCT 288R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT. May be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ACCT 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND. May be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

ACCT 325R ACCOUNTING INFORMATION SYSTEMS
3 cr. LEC 3
PREREQUISITE: ACCT 223 or consent of instructor. For non-business majors: Formal admission to the College of Business.
- A study of how organizations capture, record, store, protect, analyze, and report accounting information. Topics include business processes, transaction processing, internal controls, data security, systems documentation, information technology, and software applications.

ACCT 327 INTERMEDIATE ACCOUNTING I
F, S 3 cr. LEC 3
PREREQUISITE: ACCT 225 or consent of instructor. For business majors: Formal admission to the College of Business.
- The theory and practice of financial accounting and reporting. A study of the conceptual framework and process by which accounting standards are established; preparation of financial statements and disclosures; applications of fair value concepts and present value measurements to accounting events; and accounting for current assets, plant assets, natural resources, intangible assets, current and long-term liabilities, and related income and expense elements.

ACCT 328 INTERMEDIATE ACCOUNTING II
F, S 3 cr. LEC 3
PREREQUISITE: ACCT 327. For business majors: Formal admission to the College of Business.
- The theory and practice of financial accounting and reporting. A study of stockholders’ equity, dilutive securities, earnings per share, investments, revenue recognition, deferred income taxes, pensions, leases, accounting changes, error analysis, the statement of cash flows and full disclosure in financial accounting.

ACCT 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering. For business majors: Formal admission to the College of Business.
- Topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting discussion material.
ACCT 421 PRINCIPLES OF AUDITING  
F 3 cr. LEC 3  
PREREQUISITE: ACCT 328 or consent of instructor. For business majors: Formal admission to the College of Business.  
- Practice and theory of auditing financial statements. A study of most of the major activities performed during the conduct of a financial statement audit, from client acceptance to issuance of an audit report.

ACCT 425 INTRODUCTION TO TAXATION  
F 3 cr. LEC 3  
PREREQUISITE: BUS 222 or ACCT 223. For business majors: Formal admission to the College of Business.  
- The theory and practice of financial accounting.  
- Contemporary issues in information systems.  
- Practice and theory of auditing financial statements. A study of most of the major activities performed during the conduct of a financial statement audit, from client acceptance to issuance of an audit report.

ACCT 433 COST/ MANAGEMENT ACCOUNTING I  
F 3 cr. LEC 3  
PREREQUISITE: ACCT 328. For business majors: Formal admission to the College of Business.  
- A study of the accounting principles and financial reporting unique to the governmental and not-for-profit sectors of the U.S. economy.

ACCT 434 COST/ MANAGEMENT ACCOUNTING II  
S 3 cr. LEC 3  
PREREQUISITE: ACCT 328. For business majors: Formal admission to the College of Business.  
- Focus on cost accounting concepts, with emphasis on developing and evaluating information that management needs to plan, make key decisions, and monitor business performance. Key topics include cost and behavior and how each impacts decision-making process and product costing, cost-volume-profit analysis, flexible budgeting, incremental decision analysis, and performance evaluation.

ACCT 436 ADVANCED ACCOUNTING  
On Demand 3 cr. LEC 3  
PREREQUISITE: ACCT 328. For business majors: Formal admission to the College of Business.  
- Advanced topics in cost/managerial accounting. This course examines cost and managerial accounting issues from both technical and applied perspectives. Students will utilize cost accounting and decision analysis tools to evaluate the impacts of managerial decision making.

ACCT 444 ADVANCED ACCOUNTING SYSTEMS  
On Demand 3 cr. LEC 3  
PREREQUISITE: Junior standing and completion of ACCT 325 or BUS 311. For business majors: Formal admission to the College of Business.  
- Contemporary issues in information systems.  
- Practice and theory of auditing financial statements. A study of most of the major activities performed during the conduct of a financial statement audit, from client acceptance to issuance of an audit report.

ACCT 453 FINANCIAL STATEMENT ANALYSIS  
F 3 cr. RCT 3  
PREREQUISITE: ACCT 327. For business majors: Formal admission to the College of Business. Cross-listed with FIN 453.  
- Analysis with emphasis on how managers' investing and financing decisions have financial statement implications. Coverage includes: revenue-recognition methods, cash flow analysis, ratios, inventory analysis, capitalizing vs. expensing, depreciation, leasing vs. buying, and overall financial health and earnings quality of the firm.

ACCT 470 INDEPENDENT STUDY  
On Demand 1 - 3 cr. IND Maximum 6 cr.  
PREREQUISITE: Junior standing, consent of instructor and approval of Associate Dean. For business majors: Formal admission to the College of Business.  
- Directed research and study on an individual basis.

ACCT 476 INTERNSHIP  
On Demand 2 - 12 cr. IND Maximum 12 cr.  
PREREQUISITE: Formal admission to the College of Business.  
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ACCT 480 SPECIAL TOPICS  
On Demand 1 - 4 cr. Maximum 12 cr.  
PREREQUISITE: Course prerequisites as determined for each offering. For business majors: Formal admission to the College of Business.  
- Courses not required in anncurriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ACCT 489R UNDERGRADUATE RESEARCH/ CREATIVE ACTIVITY INSTRUCTION  
On Demand 1 - 3 cr. RCT Maximum 12 cr.  
PREREQUISITE: ACCT 440. For business majors: Formal admission to the College of Business.  
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ACCT 490R UNDERGRADUATE RESEARCH/ CREATIVE ACTIVITY  
On Demand 1 - 6 cr. IND Maximum 12 cr.  
PREREQUISITE: ACCT 440. For business majors: Formal admission to the College of Business.  
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

ACCT 500 SEMINAR  
On demand 1 cr. SEM 1  
PREREQUISITE: Admission to the MPAc program. (For business majors: Formal admission to the College of Business. This course is designed to expose students to the internal operations and client management efforts of professional services organizations and providers, with a particular focus on accounting firms. Topics include managing service relationships, service firm structure and the service-profit chain.

ACCT 515 PROFESSIONAL SERVICES MANAGEMENT  
On demand 3 cr. LEC 3  
PREREQUISITE: Admission to the MPAc program or consent of instructor.  
- This course introduces students to international accounting with special emphasis on four major topics: 1) accounting systems as expressions of cultural, political, and ideological forces, 2) comparative international accounting patterns, 3) efforts to harmonize international accounting standards worldwide, and 4) accounting issues faced by multinational corporations.

ACCT 524 INTERNATIONAL ACCOUNTING  
On Demand 3 cr. LEC 3  
PREREQUISITE: ACCT 528 and admission to MPAc Program.  
- A study of complex financial accounting issues and the underlying theoretical rationale. Key topics include derivative financial instruments, hedge accounting, elements of the other comprehensive income, sale-leaseback transactions, consignment accounting, and troubled debt restructuring.

ACCT 526 ADVANCED TAXATION  
S 3 cr. LEC 3  
PREREQUISITE: ACCT 425 and admission to MPAc Program.  
- Study of the federal tax law and incidental tax planning, and gift taxes and providing liquidity for their payment.  
- Topics offered at the graduate level that are not required in anncurriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ACCT 527 ESTATE & GIFT TAXATION  
On Demand 3 cr. LEC 3  
PREREQUISITE: ACCT 425 and admission to MPAc Program or consent of instructor.  
- Study of the federal tax law and incidental property and probate law as it relates to the taxation of gifts and estates. Emphasis is placed upon planning techniques for minimizing estate and gift taxes and providing liquidity for their payment.

ACCT 528 LEGAL ISSUES FOR ACCOUNTANTS  
S 3 cr. LEC 3  
PREREQUISITE: BUS 561 or equivalent and admission to MPAc Program.  
- Analysis of legal issues for accounting students, including debtor/creditor law, bankruptcy, securities regulation, antitrust, employment regulation, uniform commercial code and real property. Course includes significant written work and oral presentations.
ACCT 529 RESEARCH IN ACCOUNTING
F 3 cr. LEC 3
PREREQUISITE: ACCT 528 and admission to MPAc Program.
- A project-oriented seminar that focuses on developing tools for researching, developing and communicating defensible solutions to accounting issues and problems of the type likely to be encountered throughout a professional career in accounting.

ACCT 530 TAX RESEARCH AND PLANNING
F 3 cr. LEC 3
PREREQUISITE: ACCT 425.
- Study and application of research methodologies related to tax compliance and tax planning work commonly performed by accountants.

ACCT 531 TAX PRACTICUM
S 3 cr. LEC 3
PREREQUISITE: ACCT 425 and concurrent enrollment in ACCT 529 or consent of instructor.
- This course emphasizes how the broad principles of taxation affect individuals, corporations, partnerships, S-corporations, estates, and trusts. Students apply their knowledge by assisting low income individuals with their tax returns as part of the Volunteer Income Tax Assistance Program.

ACCT 532 GOVERNMENTAL AND NOT-FOR-PROFIT ACCOUNTING II
On Demand 3 cr. LEC 3
PREREQUISITE: ACCT 492 and admission to MPAc Program or consent of instructor.
- An in-depth study of the uniquely different characteristics of accounting and financial reporting for the governmental and not-for-profit sectors of the U.S. economy.

ACCT 536 ADVANCED ACCOUNTING
F 3 cr. LEC 3
PREREQUISITE: ACCT 528 and admission to MPAc Program or consent of instructor.
- The theory and practice of financial accounting and reporting pertaining to business combinations and consolidated financial statements, accounting for partnerships and related business forms, foreign currency transactions and financial statement translations, and other advanced accounting topics.

ACCT 570 INDEPENDENT STUDY
On Demand 1-3 cr. IND 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Associate Dean and Dean of Graduate Studies.
- Directed research and study on an individual basis.

ACCT 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
On Demand 1 - 4 cr. IND
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ACCT 576 INTERNSHIP
On Demand 1-3 cr. IND
PREREQUISITE: Graduate standing and consent of instructor.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ACCT 580 SPECIAL TOPICS
On Demand 1 - 4 cr.
PREREQUISITE: Upper division courses and others as determined by each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ACCT 590 GRADUATE CONSULTATION
F, S, Su 1-3 cr. IND
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and Thesis if on a Thesis Plan) but who need additional faculty or staff time or help.

AG Agriculture
College of Agriculture
(406) 994-5744

AG 101 INTRODUCTION TO AGRICULTURAL & ENVIRONMENTAL RESOURCES
F 1 cr. LEC 1
PREREQUISITE: Freshman or New Transfer Students.
- This course is optional but all freshmen in the College of Agriculture are strongly encouraged to enroll. Students taking this course will be introduced to all areas of the very broad field of agriculture, including all department programs and areas of specialty, career opportunities, professionalism, history, and ethics.

AGEC Agricultural Economics
Department of Agricultural Economics & Economics
(406) 994-3701

AGEC 210I THE ECONOMICS OF AGRICULTURAL BUSINESS
S 3 cr. LEC 3
PREREQUISITE: ECON 101.
- This course provides an introduction to marketing, trade, risk, strategic, resource, and financial management of farms/ranches and agribusiness firms in the domestic and global economy. Basic economic principles will be applied to farm/ranch and agribusiness management, marketing, and international agricultural trade issues.

AGEC 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

AGEC 298R UNDERGRADUATE RESEARCH
F, S, Su 1 - 8 IND
PREREQUISITE: ECON 101 and consent of instructor.
- Intended for lower division undergraduate research/undergraduate scholars program. The student will work closely with the supervising faculty.

AGEC 300 SEMINAR
F, S 1 cr. SEM 1
PREREQUISITE: Junior standing.
- Current agricultural problems and writings of people in the profession. Topics vary each semester; check with the department before registering.

AGEC 315 AGRICULTURE IN A GLOBAL CONTEXT
S, to be offered alternate years, 2010
5 cr. Lec 2 SEM 1
PREREQUISITE: ECON 201 or PSPP 102 or ARNR 230 and consent of instructor.
- The primary goal of this course is to provide students with an integrated view of the science, technology, production practices, product handling, product marketing system, and end uses for agricultural products produced in Montana.

AGEC 321 ECONOMICS OF AGRICULTURAL MARKETING
F 3 cr. LEC 3
PREREQUISITE: ECON 201 or ECON 250.
- Issues in marketing agricultural products and the economic principles that assist in analysis of these issues. Factors affecting market prices, and topics associated with methods of marketing are considered. Emphasis on Montana products.

AGEC 337 AGRICULTURAL LAW
F, S 3 cr. LEC 3
PREREQUISITE: Junior standing.
- Application of general principles of law to ownership and operation of farming business and its relationship with other agribusiness firms, government agencies and people.

AGEC 341 FARM & RANCH MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: ECON 201 or ECON 250 and ECON 509.
- Basic tools of economic decision making useful to farm and ranch managers are examined.

AGEC 345 AGRICULTURAL FINANCE & CREDIT ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: ECON 201 or ECON 250.
- Alternatives available to farmers for acquiring and maintaining control over resources used in agriculture production. Emphasis is on the management of cash, credit, debt, taxes, and interest in relation to agricultural price levels and general economic conditions.

AGEC 421 ADVANCED AGRICULTURAL MARKETING
S 3 cr. LEC 3
PREREQUISITE: AGEC 321.
- Economic analysis of current issues in agricultural marketing including market structure, risk, and efficiency, commodity promotion, futures and options markets; price forecasting; and retained ownership options.
AGEC 445 AGRIBUSINESS MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: ECON 301, STAT 216, and either
AGEC 345 or FIN 352.
- Students are expected to use tools and concepts
developed in earlier course work to address typical
problems faced by agribusiness and agricultural
producers. Case studies modified from actual situa-
tions are used extensively.

AGEC 451RS ECONOMICS
OF AGRICULTURAL POLICY
S 3 cr. LEC 5
PREREQUISITE: ECON 301.
- Senior capstone course. Consideration of the
economic problems of American agriculture and
of alternative solutions. Rigorous analysis of the
causes and consequences of government programs
(both past and present) on consumers, producers,
and taxpayers.

AGEC 467 QUANTITATIVE
METHODS IN ECONOMICS
F 3 cr. LEC 3
PREREQUISITE: ECON 301, MATH 221 and
approval of instructor.
- Static and dynamic optimization models in
economics. Nonlinear and dynamic programming
models are introduced. Emphasis on formulating
economic and management problems in terms of
quantitative models.

AGEC 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of
instructor, and approval of department head.
- Directed research and study on an individual
basis.

AGEC 480 SPECIAL TOPICS
On Demand 1 - 4 cr. LEC Maximum 12 cr.
PREREQUISITE: Course prerequisites are
dependent on the offering.
- Courses not required in any curriculum for which
there is a particular one-time need, or given on a
trial basis to determine acceptability and demand
before requesting a regular course number.

AGEC 489R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: AGEC 490.
- Classroom instruction associated with directed
undergraduate research/creative activity projects.

AGEC 490R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY
F, S, Su 1 - 5 cr. IND
PREREQUISITE: ECON 201, junior standing, and
approval of instructor.
- Intended for upper division undergraduate
research/undergraduate scholars program. The
student will work closely with the supervising
faculty.

AGEC 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of
instructor, approval of department head and Dean
of Graduate Studies.
- Directed research and study on an individual
basis.

AGEC 580 SPECIAL TOPICS
On Demand 1 - 4 cr. LEC Maximum 12 cr.
PREREQUISITE: Upper division courses, and
others as determined for each offering.
- Courses not required in any curriculum for which
there is a particular one-time need, or given on a
trial basis to determine acceptability and demand
before requesting a regular course number.

AGEC 589 GRADUATE CONSULTATION
F, S, Su 3 cr. IND
PREREQUISITE: Master's standing and approval of
the Dean of Graduate Studies.
- This course may be used only by students who
have completed all of their coursework (and thesis,
if on a thesis plan) but who need additional faculty
or staff time or help.

AGEC 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND May be repeated.
PREREQUISITE: Master's standing.

AGED
Agricultural Education
Division of Agricultural Education
(406) 994-3861

AGED 106 MICROCOMPUTERS
IN AGRICULTURE
S 3 cr. LEC 1 LAB 2
- Utilizing and selecting microcomputer software
for the broad field of agriculture. Decision aid
software, spreadsheets, database, telecommu-
nication and financial records are emphasized.
Application of computers to control, monitor, and
calibrate devices in addition to aiding management
decisions. IBM

AGED 200 SEMINAR
On Demand 1-2 cr. SEM 1 Maximum 6 cr.
PREREQUISITE: Consent of instructor.
- Topics offered at the lower division level which
are not covered in regular courses. Students
participate in preparing and presenting discussion
material. (Freshman and Sophomore students
only.)

AGED 251US LEADERSHIP DEVELOPMENT FOR
AGRIBUSINESS & INDUSTRY EMPLOYEES
F, S 3 cr. LEC 2 LAB 1
- Process of developing and managing individu-
als by providing leadership and guidance at all
levels of personnel development. Self concepts
developed through situational leadership and man-
agement, principles of people management, goal
setting, and belief systems. Collaborative learning
and field experience utilized.

AGED 253 AGRICULTURAL
EDUCATION IN PUBLIC SCHOOLS
S 3 cr. LEC 3
- Establish a philosophy of agricultural education
at the secondary, middle school, and elementary
level. Instructional content in agricultural science,
mechanics, and leadership will be identified.
Principles needed in developing agricultural
experiences associated with agricultural education
will be presented.

AGED 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and
approval of department head.
- Directed research and study on an individual
basis.

AGED 580 SPECIAL TOPICS
On Demand 1 - 4 cr. LEC Maximum 12 cr.
PREREQUISITE: None required but some may be
determined necessary by each offering.
- Courses not required in any curriculum for which
there is a particular one-time need, or given on a
trial basis to determine acceptability and demand
before requesting a regular course number.

AGED 590R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY
F, S 1-3 cr. RCT.
- Directed undergraduate research/creative activity
which may culminate in a written work or other
creative project.

AGED 599 PHILosophy
AND PROGRAMS IN EXTENSION
S alternate years, to be offered odd years
S, Su 3 cr. IND.
PREREQUISITE: EDCI 209.
- Designed to introduce prospective county
extension educators to fundamental philosophy
activities, and educational and planning methods
undergirding the Cooperative Extension Service.
Identification of educational and program needs in
order to provide instructional programs for rural
and urban youth and adults.

AGED 510 COMMUNICATING
AGRICULTURE TO THE PUBLIC
S alternate years, to be offered even years
S 5 cr. LEC 3
PREREQUISITE: EDCI 209.
- Designed to serve students in Agricultural Educa-
tion, Relations Option and related fields, or any
agricultural student who may have a communica-
tion component as part of their career.

AGED 514 POWER SYSTEMS
OPERATION & CONTROL
F 5 cr. LEC 2 LAB 1
- A study of internal combustion engine systems
and the electronic control of these systems.
Emphasis on power service, fuel, electrical,
ignition, and emission systems used on modern
engines. Lab activities include testing, adjusting,
and servicing the various systems.

AGED 535 CONSTRUCTION TECHNOLOGY
F 3 cr. LEC 1 LAB 2
- Various construction systems that are used to con-
struct structures on site. Includes all aspects of the
construction industry such as basic planning, ma-
terials, estimating, building techniques, managing,
and the actual construction of building projects.
AGED 353 COOPERATIVE BUSINESS PRINCIPLES AND PRACTICES
F 3 cr. S LEC
The course will acquaint students with cooperative and the cooperative way of doing business. Students will learn the role of cooperatives in marketing, bargaining, purchasing, and service. Cooperative business decision making will be emphasized throughout the course.

AGED 355 TEACHING PRACTICES
F 1 cr. LAB 1
COREQUISITE: To be taken concurrently with EDSD 452
Provides additional experience in planning, teaching, and evaluating lessons in agricultural education.

AGED 400 SEMINAR
On Demand 1 - 2 cr. SEM Maximum 6 cr.
PREREQUISITE: Junior standing and as determined for each offering and consent of instructor.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

AGED 417 CRITICAL THINKING FOR THE FOOD AND FIBER SYSTEM
S 3 cr. LEC 1 LAB 2
PREREQUISITE: Senior standing in AGED or AOT.
- Senior capstone course. Following an overview of current food and fiber system issues related to Montana, a team of students will select a problem to analyze, and will propose solutions to solve the problem. Application of prior knowledge, communication skills, and higher order thinking skills are required.

AGED 470 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

AGED 476 INTERNSHIP
On Demand 2 - 8cr. IND
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field of Agricultural Education.

AGED 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

AGED 482 NON-FORMAL TEACHING METHODS IN AGRICULTURE
F 2 cr. LEC 2
PREREQUISITE: Junior standing.
- Non-Formal Teaching Methods in Agriculture is a course designed for senior and graduate level students in Agricultural Relations and other majors who will be designing, implementing and evaluating learning through Cooperative Extension and/or other careers. Graduate teaching assistants may also take this course to aid in developing their teaching skills. The course covers theories, principles and practices associated with effective non-formal teaching and learning for adult education as well as non-adult educational settings such as 4-H meetings, conferences, and conventions.

AGED 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

AGED 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

AGED 500 SEMINAR
On Demand 1 cr. SEM Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

AGED 506 RESEARCH METHODS
F 3 cr. LEC 3
- Principles and techniques of research appropriate for planning, conducting and reporting agricultural and extension education research.

AGED 507 PROGRAM PLANING & EVALUATION
S,Su 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- A study of the literature on specific facets of program planning and evaluation applicable to agricultural and extension education. Application of program planning and evaluation concepts through individual and class projects.

AGED 510 THE SCIENCE OF NUTRITION: AGRICULTURAL LITERACY IN MONTANA SCHOOLS
Su 2 cr. LEC 2 Maximum credits unlimited.
PREREQUISITE: Montana Teacher Certification.
- Integrating factual and scientific educational material from all areas of agriscience into the Montana elementary and middle school curriculum.

AGED 570 INDEPENDENT STUDY
S,F 16 cr. IND 1-6
PREREQUISITE: Graduate Standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Direct research and study on an individual basis.

AGED 575 PROFESSIONAL RESEARCH PAPER
On Demand 1-4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate Standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student, the major advisor, and graduate committee.

AGED 576 INTERNSHIP
S,F, SU 2-12 cr. IND 2-12
PREREQUISITE: Graduate Standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

AGED 589 GRADUATE CONSULTATION
S, F, S, Su 3 cr. IND
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan), but who need additional faculty or staff time or help.

AGED 590 MASTER'S THESIS
S,F, S,U 1-10 cr.
PREREQUISITE: Master's Standing.

AMST
University Courses
Department of Letters and Science
(406) 994-3120

AMST 201D INTRODUCTION TO AMERICAN STUDIES
F 3 cr. LEC 2 LAB 1
PREREQUISITE: ENGL 121.
- Introduction to the field of American Studies and to major issues in American history, literature, and the arts.

AMST 202RA THE ARTS IN AMERICA
F, S, Su 3 cr. LEC 3 to be offered every even years.
PREREQUISITE: W or US core.
- This course uses the methodologies of American Studies to question the history, theory, and criticism of various American art forms and movements. Disciplines covered include: film, photography, television, sculpture, painting, architecture, and music.

AMST 401 SEMINAR IN AMERICAN STUDIES
S to be offered every even years 4 cr. SEM 4
PREREQUISITE: AMST 201.
- Capstone course in American Studies. Students will research and design solutions to contemporary problems in American Society.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Credit Hours</th>
<th>Course Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 101D</td>
<td>Anthropology and the Human Experience</td>
<td>-</td>
<td>3 cr.</td>
<td>Comparative focus on human behavior and human cultural systems from the local to global levels. The nature and sources of diversity associated with the human experience are explored and reinforced using examples from archaeology, biological anthropology, cultural anthropology, and linguistics.</td>
</tr>
<tr>
<td>ANTH 201IS</td>
<td>Human Prehistory</td>
<td>-</td>
<td>3 cr.</td>
<td>Introduction to basic concepts and ideas about the biological and cultural evolution of human species. Topics include primate ancestors, human origins, evolutionary theory, genetics, archaeological interpretation, and cultural change from the earliest stone tools to the rise of ancient civilization.</td>
</tr>
<tr>
<td>ANTH 204IS</td>
<td>Culture &amp; Society</td>
<td>-</td>
<td>3 cr.</td>
<td>Introduction to basic concepts and ideas about the biological and cultural evolution of human species. Topics include primate ancestors, human origins, evolutionary theory, genetics, archaeological interpretation, and cultural change from the earliest stone tools to the rise of ancient civilization.</td>
</tr>
<tr>
<td>ANTH 221IS</td>
<td>Mysteries of the Past</td>
<td>-</td>
<td>3 cr.</td>
<td>Focuses on archaeological thinking and the use of the scientific method in archaeology. Examines a variety of archaeological and pseudo-archaeological claims from this perspective.</td>
</tr>
<tr>
<td>ANTH 225CS</td>
<td>Bones, Apes, &amp; Ancestors</td>
<td>-</td>
<td>3 cr.</td>
<td>Exploration of human biological evolution from an anthropological perspective, emphasizing scientific understanding through examination of important fossil discoveries and of the behavior and anatomy of living non-human primates, especially apes. Aimed particularly at students not majoring in anthropology.</td>
</tr>
<tr>
<td>ANTH 252</td>
<td>Contemporary Social Issues in Japan</td>
<td>-</td>
<td>3 cr.</td>
<td>Introduction to major political, economic, social and cultural issues in contemporary Japanese society. On-going legacy of World War II, re-emerging nationalism, and backlash against ideas and institutions of &quot;political democracy&quot;. Citizen activism on these issues in and outside Japan.</td>
</tr>
<tr>
<td>ANTH 288RS</td>
<td>Undergraduate Research Experience in Anthropology</td>
<td>ANTH 101 or ANTH 204</td>
<td>5 cr.</td>
<td>Undergraduate experiences for non-majors fulfilling their core research requirement. Course content is determined by the upper-level anthropology course to which this class is linked and by student's interests. Upper level majors serve as research mentors. At least fifty percent of the course grade is based on library and field or laboratory research.</td>
</tr>
<tr>
<td>ANTH 290R</td>
<td>Undergraduate Research/Creative Activity</td>
<td>-</td>
<td>1-3 cr.</td>
<td>May be repeated. Classroom instruction associated with directed undergraduate research/creative activity projects.</td>
</tr>
<tr>
<td>ANTH 303</td>
<td>Biological Anthropology</td>
<td>-</td>
<td>3 cr.</td>
<td>The study of ancient and extant cultures of a selected world region with a comparative focus between the archaeology and ethnography of ancient and extant societies. Explores theoretical and methodological implications associated with the linkages between archaeology and ethnography.</td>
</tr>
<tr>
<td>ANTH 326</td>
<td>Language &amp; Culture</td>
<td>ANTH 204</td>
<td>3 cr.</td>
<td>Focus on classroom instruction associated with directed undergraduate research/creative activity projects.</td>
</tr>
<tr>
<td>ANTH 340</td>
<td>Archaeology Field School</td>
<td>ANTH 101</td>
<td>On Demand 1-9 cr.</td>
<td>A summer of archaeological field work at a location away from the University; training in excavation and laboratory methods. (Offered when funding available.)</td>
</tr>
<tr>
<td>ANTH 350</td>
<td>Old World Prehistory</td>
<td>ANTH 201</td>
<td>3 cr.</td>
<td>Focus on classroom instruction associated with directed undergraduate research/creative activity projects.</td>
</tr>
<tr>
<td>ANTH 353</td>
<td>Popular Culture in/Out of Japan</td>
<td>ANTH 201</td>
<td>3 cr.</td>
<td>Focus on classroom instruction associated with directed undergraduate research/creative activity projects.</td>
</tr>
</tbody>
</table>
COURSE DESCRIPTIONS: ANTH 370 - ARCH 243

ANTH 370 MEDICAL ANTHROPOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing, ANTH 201, ANTH 204.
- Anthropological research materials, their methodological treatment and theoretical grounding as applied to health-related practices in local and trans-cultural contexts. Cultural constructions of diseases, intervention and treatment strategies, and the analysis of health concerns associated with globalization and accelerated culture change.

ANTH 435 ANALYSIS OF STONE TECHNOLOGY
S 3 cr. LEC 3
PREREQUISITE: ANTH 101, ANTH 201, and Junior standing, or consent of instructor
- This course examines prehistoric stone technology and the methodological and theoretical underpinnings of archaeological interpretation. The course material is conveyed through hands-on activities, individual analyses, and discussions of the theoretical foundations for archaeological interpretations.

ANTH 440 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 3 cr. LEC 3
PREREQUISITE: Consent of director
- Directed research and study on an individual basis.

ARCH 243 ARCHITECTURAL STRUCTURES I
F 4 cr. LEC 3 RCT 1
PREREQUISITE: Consent of director
- Introduction to structural design, analysis of horizontal and vertical members as applied to architectural works; basic statics, moment and shear of rigid bodies and architectural forms; strength concepts using stress and strain assessment; application of analytical and intuitive structural concepts in a design context; introduction to wood design project.
ARCH 244 ARCHITECTURAL STRUCTURES II
S 4 cr. LEC 3 RCT 1
PREREQUISITE: ARCH 243.
- Design of structural elements in wood, steel, masonry, and concrete. Lateral considerations and calculations including environmental and seismic loads. Understanding of building systems; diaphragms; connections; structural engineer-architect communications. Complete structural design/drawings for small commercial building-group project. Notebook computer required.

ARCH 253 ARCHITECTURAL DESIGN I
S 5 cr. LEC/RCT 2 STU 3
PREREQUISITE: ARCH 152, ARCH 261. Admission into the architectural design program.
COREQUISITE: ARCH 262.
- Small-scale infill design projects requiring integration of spatial, visual concepts, emphasizing relationship of architecture to its context with principles of order; constituents of form, light, structural awareness, nature of materials, architectural coherency. Includes inclusive orthographic graphics design drawing conventions.

ARCH 261 ARCHITECTURAL GRAPHICS I
F 3 cr. LEC 1 STU 2
PREREQUISITE: Admission into the environmental design program.
COREQUISITE: ARCH 243.
- Basic techniques in architectural graphic expression. Course utilizes observation drawing studio supplemented by design drawing lecture/demonstrations sessions. Topics include freehand, multi-view, paraline, perspective and shade/shadow drawing. Hand and digital applications focus on image manipulation and desktop publishing. Notebook computer required.

ARCH 262 ARCHITECTURAL GRAPHICS II
S 3 cr. LEC 1 STU 2
PREREQUISITE: ARCH 261. Admission into the environmental design program.
COREQUISITE: ARCH 253.
- Basic techniques in architectural graphic expression. Course emphasizes observation drawing studio supplemented by design drawing lecture/demonstration sessions. Topics include freehand, perspective, and shade and shadow drawing techniques. Two and three-dimensional digital applications introduced. Notebook computer required.

ARCH 270 INDEPENDENT STUDY
On Demand 1-3 cr. Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed study and research on an individual basis.

ARCH 280 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARCH 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ARCH 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

ARCH 313 PROFESSIONAL PRACTICE
S 3 cr. LEC 1 STU 2
COREQUISITE: ARCH 355.
- Architecture as a social practice, emphasis includes developmental strategies: political, managerial, legal, economic, interdisciplinary relations, community relations and client relations. Topics include marketing, business planning, project management, delivery methods, technology, regulation, accessibility and trends of practice. Notebook computer required. Cross listed with ARCH 413.

ARCH 321A WORLD ARCHITECTURE I
F 3 cr. LEC 3
PREREQUISITE: Junior standing for non-majors, ENGL 121W.
- A survey of world architectural history from primitive developments to the Gothic.

ARCH 321A WORLD ARCHITECTURE II
S 3 cr. LEC 3
PREREQUISITE: Junior standing for non-majors, ENGL 121W.
- A survey of world architectural history from the Renaissance to Industrial Revolution.

ARCH 331 ENVIRONMENTAL CONTROLS I
F 4 cr. LEC 4
PREREQUISITE: MATH 160.
- Architectural and site responses to climate at a regional, community, and small building scale including passive solar energy and heat flow fundamentals. Analysis and design of the heating, ventilating, and air-conditioning systems used in architecture. Analysis and design of water supply and sanitation systems. Notebook computer required.

ARCH 332 ENVIRONMENTAL CONTROLS II
S 4 cr. LEC 4
PREREQUISITE: MATH 160.
- Analysis and design of lighting systems, electrical systems, fire safety systems, and acoustical systems. Issues of visual and perceptual comfort and day lighting developed. Notebook computer required.

ARCH 340 BUILDING CONSTRUCTION II
F 4 cr. LEC 3 RCT 2
PREREQUISITE: ARCH 241, ARCH 244 and ARCH 351 or permission of instructor.
- Development and integration of building materials and assemblies, construction costs and building systems into the construction documentation, specifications, and designs for a small project. Building systems to be investigated include: structural environmental and enclosure, life safety and sustainability. Notebook computer required. Cross listed with ARCH 440.

ARCH 354 ARCHITECTURAL DESIGN II
F 5 cr. LEC 1 RCT 1 STU 3
PREREQUISITE: ARCH 253.
COREQUISITE: ARCH 241, and ARCH 363.
- Small-to medium-size projects extending the development of the design process to site and adjacency analysis, diagramming, fundamental relationship to landscape and context. Topics include hybrid uses of hand and digital graphic communication including 2D and 3D drawing, and modeling.

ARCH 355 ARCHITECTURAL DESIGN III
S 5 cr. LEC/RCT 2 STU 3
PREREQUISITE: ARCH 354.
COREQUISITE: ARCH 313.
- Further exploration of ecologically-sound design with emphasis on the integration of structures, building envelope service systems, and building materials, including design for life safety and accessibility. Building scale and program complexity increases, utilizing long-span structural systems. Notebook computer required.

ARCH 363 ARCHITECTURAL GRAPHICS III
F, S cr. LEC 1 STU 2
PREREQUISITE: ARCH 362.
COREQUISITE: ARCH 354.
- Advanced principles of computer-aided design and hand applications in architectural practice, including three-dimensional computer-aided design, hand and digital delineation, and presentations. Topics provide foundation for graphic applications in ARCH 354 design studio. Notebook computer required.

ARCH 400 SEMINAR
F, S, Su 1-3 cr. SEM Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ARCH 412 CONSTRUCTION DRAWINGS & SPECIFICATIONS
On Demand 3 cr. LEC 3 RCT 1 STU 2
PREREQUISITE: ARCH 241.
- The theory and practice of drawings and specifications as contract documents for building projects using procedures similar to those found in a professional architect's office and incorporating the use of computer-aided design. Notebook computer required.

ARCH 413 PROFESSIONAL PRACTICE
F 8 cr. LEC 1 STU 2
PREREQUISITE: Architecture as a social practice, emphasis includes developmental strategies: political, managerial, legal, economic, interdisciplinary relations, community relations and client relations. Topics include marketing, business planning, project management, delivery methods, technology, regulation, accessibility and trends of practice. Notebook computer required. Cross listed with ARCH 313.

ARCH 414 ARCHITECTURAL STUDY ABROAD
F, S 9 cr. LEC 6 IND 3
PREREQUISITE: ARCH 355.
- Structured study in foreign countries under the direction of an architecture faculty member to obtain an understanding of modern and historical architecture and the forces shaping them. Holistic study of urban environments cross-disciplinary, urban design, architectural history, planning, and travel arrangements, and pre-travel design and research. Itineraries include opportunities for additional destinations and independent travel. Notebook computer required.

ARCH 424 CONTEMPORARY ARCHITECTURAL HISTORY AND THEORY
On Demand 3 cr. LEC 3
PREREQUISITE: ARCH 322 and ARCH 323.
- Critique and discussion of architectural projects built and ideology proposed in writings, drawings, and models since the turn of the century, including the simultaneous social and technical context, in order to examine the architectural issues of today.
ARCH 425 WESTERN ARCHITECTURAL HISTORY
On Demand 3 cr. SEM 3 Maximum 6 cr.
PREREQUISITE: ARCH 322 and ARCH 323.
- A study of events and influences that led to the development of western architectural styles, ideology, and forms of individual expression.

ARCH 426 IDENTIFICATION OF CONTEMPORARY PLACES
On Demand 3 cr. LEC 3 Maximum 6 cr.
PREREQUISITE: ARCH 322 and ARCH 323.
- A course in applied architectural history and theory. Lectures, discussions, and student projects investigate characteristics which convey a sense of place based on historical development, architectural styles, and urban design.

ARCH 427 NON-WESTERN ARCHITECTURAL HISTORY
On Demand 3 cr. SEM 3 Maximum 6 cr.
PREREQUISITE: ARCH 322 and ARCH 323.
- A study of events and influences that led to the development of non-western architectural styles, ideology, and forms of individual expression.

ARCH 428 FOREIGN STUDY HISTORY
F, S 5 cr. LEC 2 IND 1
PREREQUISITE: ARCH 322 and ARCH 323.
COREQUISITE: ARCH 414.
- An on-site study in a foreign country of the social, cultural, and historic influences on architectural design. This course is only offered in conjunction with the foreign study program within the School of Architecture. Course shall include research and on-site visits documented in a written report.

ARCH 440 BUILDING CONSTRUCTION II
S 4 cr. LEC 2 STU 2
PREREQUISITE: ARCH 241, ARCH 331, and ARCH 344, or permission of instructor.
- Development and integration of building materials and assemblies, construction costs and building systems into the construction documents, specifications and design of a small project. Building systems to be investigated include: structural environmental and enclosure, life safety and sustainability. Notebook computer required.

ARCH 444 COMPUTATIONAL DESIGN FOR STRUCTURES
On Demand 3 cr. LEC 2 STU 1.
PREREQUISITE: ARCH 243 and ARCH 265.
- Introduction to spreadsheets and blackboard computational software; spreadsheet and blackboard developments for typical structural computations used in architecture; introduction to structural design/analysis software; and development of a library of computational software tools for the application of structural architectural design. Notebook computer required.

ARCH 450 COMMUNITY DESIGN CENTER
On Demand 5 cr. LEC 1 STU 4
PREREQUISITE: ARCH 355.
- The CDC assists public and non-profit groups by providing planning, programming, and conceptual design ideas. Emphasis and scope of projects are determined by the community needs. Projects are intended to complement and promote the professional practice of architecture in the State of Montana.

ARCH 451 DESIGN FOR THE COMMUNITY
F, S 3 cr. IND 3 Maximum 6 cr.
PREREQUISITE: ARCH 355.
- Students will be engaged in architecturally-related activities with government and non-profit agencies. This will enable students to be involved in a service learning academic experience.

ARCH 456 ARCHITECTURAL DESIGN IV
F, S 5 cr. LEC/ RCT 2 STU 3
PREREQUISITE: ARCH 355.
- Architectural designs integrating building, landscape, and urban context using multi-story projects. Field trip required.

ARCH 457 ARCHITECTURAL DESIGN V
F, S 5 cr. LEC 1 STU 4
PREREQUISITE: ARCH 356.
- Senior capstone course. Advanced architectural design projects integrating site analysis, programming, building systems, and contemporary design theory. Emphasis placed on the inclusive synthesis of conceptual processes, analysis, preliminary design investigation, and design development. Notebook computer required.

ARCH 458 ARCHITECTURAL DESIGN VI
F, S, Su 5 cr. LEC 1 STU 4
PREREQUISITE: ARCH 355.
- A continuation of the holistic design synthesis encountered in ARCH 457 with emphasis on development of student's emerging design values and theoretical perspective. Field trip possible. Notebook computer required.

ARCH 464 INTERMEDIATE COMPUTER APPLICATIONS
On Demand 3 cr. RCT 1 STU 2
PREREQUISITE: ARCH 265 or ARCH 365.
- The investigation of two-dimensional computer-aided design and drawing as applied to architectural practice. Lectures and projects will explore the use of two-dimensional CAD programs to create design drawings and construction documents.

ARCH 465 ADVANCED COMPUTER APPLICATIONS
On Demand 4 cr. RCT 1 LAB 2
PREREQUISITE: ARCH 464 or consent of instructor.
- The investigation and application of advanced two-dimensional and three-dimensional computer-aided design, modeling, and presentation techniques for architectural practice. Lectures and projects may include topics of three-dimensional modeling, animation, delineation, or CNC milling. Notebook computer required.

ARCH 470 INDEPENDENT STUDY
F, S, Su 1 - 3 cr. IND 6 Maximum 12 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

ARCH 471 DIRECTED RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-4 cr. IND May be repeated.
COREQUISITE: ARCH 472
- Directed research/creative activity which may culminate in a research paper, journal article, or design project.

ARCH 472 DIRECTED RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1/2 cr. RCT May be repeated. Maximum 4 cr.
COREQUISITE: ARCH 471.
- Classroom instruction associated with directed research/creative activity projects.

ARCH 476 INTERNSHIP
F, S, Su 3-12 cr. IND. Maximum 12 cr.
PREREQUISITE: ARCH 313 or ARCH 413, ARCH 340 or ARCH 440, ARCH 355 and all other architectural courses through the third year.
- Students arrange for employment in an architectural office for a continuous period of twenty-four weeks. Students will participate in a structured work/study professional practice experience and are required to present the content of this experience upon their return to campus. Specific course requirements determined by credit loads.

ARCH 490 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARCH 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: ARCH 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects. Will not count toward graduate credit.

ARCH 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
COREQUISITE: ARCH 490.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

ARCH 515 INSPECTION FIELD TRIP
On Demand 3 cr. IND 3 Maximum 6 cr.
PREREQUISITE: Admittance to the graduate program or seniors by petition, completion of ARCH 340 or ARCH 440, ARCH 513 or ARCH 413, ARCH 437 and all other architectural courses through the third year.
COREQUISITE: ARCH 476 or ARCH 576.
- An on-site study of social, cultural, and historical influences and their manifestation in architecture and urban design within a particular community. Research, documentation, paper and graphic presentation are required.

ARCH 531 ARCHITECTURAL THEORY
F, S 3 cr. SEM 3 Maximum 9 cr. May be repeated. PREREQUISITE: Graduate standing or seniors by petition.
- Specific architectural, urban, planning and preservation theories, their application and context within contemporary practice will be investigated through the study of essays, drawings, models and built projects.
ARCH 522 HISTORICAL ISSUES IN ARCHITECTURE AND URBAN DESIGN
- On Demand 3 cr. SEM 3 Maximum 9 cr.
- May be repeated.
- PREREQUISITE: ARCH 522, ARCH 523. Graduate standing or seniors by petition.
  - Close examination of historic periods and individuals. Emphasis upon in-depth studies of particular personalities and the social, cultural, artistic and scientific developments that influenced the progress of architecture, urban design and city planning.

ARCH 523 ISSUES IN CITY PLANNING
- On Demand 5 cr. RCT/DIS 3
- PREREQUISITE: Graduate standing or seniors by petition.
  - Problems and issues, processes and regulations in planning, urban design, and historic preservation. Field trip possible.

ARCH 524 DESIGN COMPETITION
- On Demand 5 cr. LAB/STU 3 Maximum 6 cr.
- PREREQUISITE: ARCH 555 or consent of instructor. Admission to graduate program or seniors by petition.
  - Students will work under the direction of a faculty member in the research, design, development and presentation of a project in response to a design competition.

ARCH 525 SPECIAL DESIGN TOPIC
- F, S 5 cr. LAB/STU 5 Maximum 9 cr.
- May be repeated.
- PREREQUISITE: ARCH 555 and consent of instructor. Admission to graduate program or seniors by petition.
  - Students will work under the direction of a faculty member in the research, design, development and presentation of a design, research, or historic preservation project.

ARCH 526 ADVANCED ENVIRONMENTAL CONTROLS
- On Demand 5 cr. SEM 5.
- PREREQUISITE: ARCH 531 and ARCH 532. Admission to the graduate program or seniors by petition.
  - Advanced architectural lighting design explored through experimental exercises, calculations, physical modeling and computer simulations. Includes an in-depth study of new lamps, luminaries, electrical lighting design and daylighting design.

ARCH 545 ADVANCED APPLIED DESIGN AND CONSTRUCTION
- On Demand 5 cr. LAB/STU 3 Maximum 6 cr.
- PREREQUISITE: ARCH 241, consent of instructor, and graduate standing or seniors by petition.
  - Small scale projects industrial products, furniture, buildings, etc., will be designed and built by students as an exploration of the opportunities and limitations of materials, technology, economics, and construction methods.

ARCH 546 ADVANCED STRUCTURES
- On Demand 5 cr. LEC 2 STU 3
- PREREQUISITE: ARCH 244 or ARCH 544 and graduate standing or seniors by petition.
  - Advanced structural topics, load path, performance design, structural system planning, connection design, computer software for structural analysis/design; structural restoration; complete design/analysis/structural issues for a medium sized multi-use building (class project). Notebook computer required.

ARCH 551 ADVANCED ARCHITECTURAL STUDIO
- F, S, Su 6 cr. LEC 2 STU 4
- PREREQUISITE: ARCH 457 and graduate standing.
  - Building and/or urban design projects which explore a specific theoretical position with regard to contemporary architectural, urban design or historic preservation issues. Research and analysis of theoretical positions. Utilization of methods and models and techniques for analysis.

ARCH 552 ARCHITECTURAL STUDIO RESEARCH
- On Demand 5 cr. LEC 1 RCT 2
- PREREQUISITE: Graduate standing.
  - Graduate research and analysis of a major theoretical position advocated through the writings, drawings and models of architectural theorists.

ARCH 555 URBAN DESIGN STUDIO
- On Demand 5 cr. STU 3.
- PREREQUISITE: Graduate standing.
  - Urban design projects that develop an understanding of public planning goals and constraints, urban infrastructure, formal urban fabric, historic preservation, and socio-cultural issues. Notebook computer required. Field trip required.

ARCH 556 URBAN DESIGN THEORY
- On Demand 5 cr. LEC 1 RCT 2
- PREREQUISITE: Graduate standing.
  - Graduate research and analysis of contemporary and historic design theory. Notebook computer required. Field trip required.

ARCH 557 ARCHITECTURAL DESIGN STUDIO
- F, S, Su 6 cr. LEC 2 STU 4
- PREREQUISITE: Graduate Standing.
  - Advanced architectural design projects integrating site analysis, programming, building systems, and contemporary design theory. Emphasis placed on the inclusive synthesis of conceptual processes, analysis, preliminary design investigation, and final design development. Notebook computer required.

ARCH 558 ADVANCED BUILDING STUDIO
- F, S, Su 6 cr. LEC 1 RCT 5
- PREREQUISITE: Graduate Standing.
  - Graduate studio with an underlying theoretical approach that will guide the design of a programatically complex building type on a challenging site. Mastery of the theoretical, humanitarian, systemic and technical aspects of a sophisticated building is required.

ARCH 564 ADVANCED ARCHITECTURAL GRAPHICS
- F 3 cr. LAB/STU 3 Maximum 6 credits.
- PREREQUISITE: ARCH 262, admission to graduate program or seniors by petition.
  - Advanced architectural presentation strategies for exploring visual perception and design development through graphic exploration.

ARCH 565 ADVANCED COMPUTER APPLICATIONS II
- On Demand 3 cr. RCT 1 LAB 2.
- PREREQUISITE: ARCH 263 or ARCH 464.
  - Computer-aided design and theory for architecture. Lectures and projects may include topics of three-dimensional modeling, animation, delineation or CNC milling. Notebook computer required.

ARCH 570 INDEPENDENT STUDY
- On Demand 1-4 cr. IND Maximum 8 cr.
- PREREQUISITE: Admission to graduate program.
  - Directed graduate research and study of architectural, urban design or historic preservation issues on an individual basis.

ARCH 576 ARCHITECTURAL PRACTICE INTERNSHIP
- F, S, Su 5-9 cr. IND Max. 18 cr.
- PREREQUISITE: Graduate Standing.
  - Students arrange for employment in an architectural office for a continuous period of twenty-four weeks. Students will participate in a structured work/study professional practice experience and are required to present the content of their internship experience upon their return to campus. Specific course requirements determined by credit loads.

ARCH 580 SPECIAL TOPICS
- On Demand 1-4 cr. Maximum 12 cr.
- PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
  - Courses for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARCH 589 GRADUATE CONSULTATION
- F, S, Su 1-3 cr. IND 1-3.
- PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
  - This course may be used only by students who have completed all of their course work but who need additional faculty or staff time or help.

ARCH 590 MASTER'S THESIS
- F, S, Su 1-10 cr. IND 1-10 Maximum credits unlimited.
- PREREQUISITE: Master's standing.

ARCH 591 MASTER'S STUDIO RESEARCH
- On Demand 3 cr. LEC 1 SEM 2
- PREREQUISITE: Graduate Standing.
  - Directed research and analysis of historic, formal, and functional precedents in preparation for a project design undertaken in ARCH 592.

ARCH 592 MASTER'S STUDIO IN ARCHITECTURE
- On Demand 6 cr. SEM 3 IND 3
- PREREQUISITE: ARCH 591.
  - An architectural design or historic preservation project chosen by the student and subject to approval by the student's master's studio advisor and graduate coordinator.
ARCH 593 MASTER'S STUDIO SYNTHESIS
On Demand 5 cr. RCT 3
PREREQUISITE: ARCH 591.
- Advanced study and development of the graphic and three-dimensional materials required to illustrate the design process and project solution.

ARNR 208 INTERMEDIATE ENGLISH EQUITATION
F S 2 cr. LAB 2
PREREQUISITE: ARNR 114.
- Advanced English equitation techniques including collecting, lateral movements and beginning jumping.

ARNR 209 INTERMEDIATE WESTERN EQUITATION
F, S 2 cr. LAB 2
PREREQUISITE: ARNR 208.
- Principles of breaking and training young horses.

ARNR 215 SPECIALIZED HORSE TRAINING
S 2 cr. LAB 2
PREREQUISITE: ARNR 208.
- Advanced techniques and training for either reining, cutting, or working cow horses. For experienced riders.

ARNR 215 CALVING MANAGEMENT
S 2 cr. LEC 1 LAB 1
PREREQUISITE: ARNR 200 and ARNR 230 or consent of instructor.
- Procedures to correctly identify calving problems and subsequently assist the birthing process and application of techniques to maximize calf survival.

ARNR 230 RANGE LIVESTOCK PRODUCTION
S 3 cr. LEC 3
PREREQUISITE: ARNR 100, ARNR 101.
- Principles of beef and sheep production in rangeland environments. Breeding, reproduction, nutrition, marketing, and distribution.

ARNR 231 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-SWINE
S 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Animal management practices associated with swine production.

ARNR 232 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-SHEEP
S 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Management practices associated with farm flock and range sheep enterprises.

ARNR 233 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-HORSES
F 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Laboratory designed to familiarize students with approved management practices for horse enterprises.

ARNR 234 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-BEEF CATTLE
S 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Methods which can be used by private operators as well as state and federal land managers to identify site potential, inventory forage resources, evaluate range and pasture condition, estimate stocking rates, and measure forage utilization by wildlife and livestock.

ARNR 235 RANGE AND PASTURE MONITORING
F 1 cr. LAB 1
PREREQUISITE: ARNR 100, ARNR 101, ARNR 102.
- Techniques for the evaluation of carcasses. Procedures include U.S. grading standards, introduction to carcass pricing and objective carcass measurements.

ARNR 207 INTERMEDIATE ENGLISH EQUITATION
F, S 2 cr. LAB 2
PREREQUISITE: ARNR 114.
- Advanced English equitation techniques including collecting, lateral movements and beginning jumping.

ARNR 206 TODAY'S LIVESTOCK INDUSTRY
F 1 cr. SEM 1
PREREQUISITE: ARNR 100.
- Introduction to today's modern livestock industry and the many complex issues the livestock industry faces. This course will explore various career paths for students and how they may better prepare themselves for jobs in the livestock industry of today and tomorrow.

ARNR 202 TODAY'S EQUINE INDUSTRY
F 1 cr. SEM 1
PREREQUISITE: ARNR 100.
- Introduction to today's horse industry. This course will expose students to career paths in the industry and how they may better prepare themselves for jobs in this industry.

ARNR 205 INTRODUCTION TO MEAT EVALUATION
F 2 cr. LAB 2
PREREQUISITE: ARNR 100.
- Techniques for the evaluation of carcasses. Procedures include U.S. grading standards, introduction to carcass pricing and objective carcass measurements.

ARNR 102 MONTANA RANGE PLANTS LAB
F 1 cr. LAB 1
COREQUISITE: ARNR 101.
- The laboratory exercises are designed to complement the lectures of ARNR 101. Range-land inventory and classification methods will be reviewed. Sixty common native and introduced plants will be identified in the field and the classroom.

ARNR 114 BEGINNING ENGLISH EQUITATION
F, S 2 cr. LAB 2
- Beginning English equitation techniques including introductory training techniques.

ARNR 112 WESTERN EQUITATION
F, S 2 cr. LAB 2
- Western equitation techniques including introductory training techniques.

ARNR 101 NATURAL RESOURCE CONSERVATION
F 3 cr. LEC 3
- Description of the rangelands of the Western U.S., historical, present, and potential use. Explanation of how uses affect the biological cycles of rangelands. Concepts of ecological condition and trend are introduced.

ARNR 101 CALVING MANAGEMENT
S 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Principles and techniques of breaking and training young horses.

ARNR 100 MONTANA RANGE PLANTS LAB
F 1 cr. LAB 1
COREQUISITE: ARNR 101.
- The laboratory exercises are designed to complement the lectures of ARNR 101. Range-land inventory and classification methods will be reviewed. Sixty common native and introduced plants will be identified in the field and the classroom.

ARNR 100 INTRODUCTION TO ANIMAL SCIENCE
S 3 cr. LEC 3
- Introductory Animal Science includes basic principles of animal nutrition, production, animal evaluation, reproduction, and their application to the production of beef and dairy cattle, sheep, swine, horses, and poultry.

ARNR 100 APPLIED TECHNIQUES
F, S 2 cr. LAB 2
- The laboratory exercises are designed to complement the lectures of ARNR 101. Range-land inventory and classification methods will be reviewed. Sixty common native and introduced plants will be identified in the field and the classroom.

ARNR 100 BEGINNING WESTERN EQUITATION
F, S 2 cr. LAB 2
- The laboratory exercises are designed to complement the lectures of ARNR 101. Range-land inventory and classification methods will be reviewed. Sixty common native and introduced plants will be identified in the field and the classroom.

ARNR 100 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-SWINE
S 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Animal management practices associated with swine production.

ARNR 100 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-SHEEP
S 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Management practices associated with farm flock and range sheep enterprises.

ARNR 101 NATURAL RESOURCE CONSERVATION
F 3 cr. LEC 3
- Description of the rangelands of the Western U.S., historical, present, and potential use. Explanation of how uses affect the biological cycles of rangelands. Concepts of ecological condition and trend are introduced.

ARNR 100 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-BEEF CATTLE
S 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Methods which can be used by private operators as well as state and federal land managers to identify site potential, inventory forage resources, evaluate range and pasture condition, estimate stocking rates, and measure forage utilization by wildlife and livestock.

ARNR 101 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-BEEF CATTLE
S 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Methods which can be used by private operators as well as state and federal land managers to identify site potential, inventory forage resources, evaluate range and pasture condition, estimate stocking rates, and measure forage utilization by wildlife and livestock.

ARNR 101 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-BEEF CATTLE
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S 1 cr. LAB 1
PREREQUISITE: ARNR 100.
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ARNR 101 APPLIED TECHNIQUES IN LIVESTOCK MANAGEMENT-BEEF CATTLE
S 1 cr. LAB 1
PREREQUISITE: ARNR 100.
- Methods which can be used by private operators as well as state and federal land managers to identify site potential, inventory forage resources, evaluate range and pasture condition, estimate stocking rates, and measure forage utilization by wildlife and livestock.
COURSE DESCRIPTIONS: ARNR 301 - ARNR 415

ARNR 301 LIVESTOCK INDUSTRY STUDY TRIP
On Demand 1 cr. LAB 1
PREREQUISITE: ARNR 100 and junior standing.
- Exposure of students to livestock operations and related business enterprises in different geographical locations. One three-day field trip. Graded P/F.

ARNR 305 ADVANCED MEAT EVALUATION
F 2 cr. LEC 3
PREREQUISITE: ARNR 205 or consent of instructor.
- Advanced skills in carcass evaluation, U.S. grading standards, and carcass pricing.

ARNR 309 INTRODUCTION TO LIVESTOCK EVALUATION
F 2 cr. LAB 2
PREREQUISITE: ARNR 100 and ARNR 205, or consent of instructor.
- Techniques and experience in live animal evaluation. Practical use of production data and other evaluation techniques.

ARNR 314 EQUESTRIAN INSTRUCTION
S 2 cr. LEC 1 LAB 1 Maximum 2 cr.
PREREQUISITE: ARNR 110, ARNR 208, or consent of instructor.
- The object of this course is to develop competent riding instructors who can communicate effectively and motivate students to higher riding skills.

ARNR 316 MEAT SCIENCE
S 4 cr. LAB 1
PREREQUISITE: ARNR 100 and BIOL 102 and CHEM 121.
- The meat industry within North America and beyond will be discussed. Live animal evaluation, pricing and carcass evaluation will be discussed. The class will include an explanation of muscle structure and function and its effect on tenderness and functionality.

ARNR 320 ANIMAL NUTRITION
F 4 cr. LAB 3
PREREQUISITE: ARNR 250 and BCHM 122 and VTMB 271 or consent of instructor.
- Digestion and metabolism of nutrients, nutrient requirements, feed composition, diet formulation, and practical feeding of various classes of domestic animals.

ARNR 321 PHYSIOLOGY OF REPRODUCTION
F 4 cr. LEC 1
PREREQUISITE: VTMB 271.
- A study of the anatomy and physiology of reproduction with major emphasis on domestic animal species. This class introduces students to emerging concepts and current technologies for improving reproductive efficiency in domestic animals.

ARNR 322 PRINCIPLES OF ANIMAL BREEDING AND GENETICS
S 3 cr. LEC 3
PREREQUISITE: ARNR 100, BIOL 102, and either STAT 216 or STAT 332 or FSPP 318.
- Genetic improvement of farm animals through performance testing, methods of selection, and application of mating systems such as crossbreeding.

ARNR 325 WILDLIFE-LIVESTOCK RANGE NUTRITION
S 3 cr. LEC 3
PREREQUISITE: ARNR 100 and ARNR 101 and ARNR 102, and ARNR 230.
- Nutrition of free ranging ungulates including deer, elk, antelope, bison, sheep, cattle and feral horses. Topics will include digestive systems, intake, food habits, feeding behavior and management.

ARNR 327 EQUINE LAMENESS
F 3 cr. LEC 3
(Change in credit effective Fall 2005)
PREREQUISITE: VTMB 271.
- This course is structured to familiarize students with the many types of lameness in the horse. Students will be instructed in the correlation between anatomy, conformation, locomotion and lameness. Selected diseases of the bones, joints, and soft tissue will be discussed. Significant time will also be spent on lameness diagnosis, treatment, prognosis, as well as shoeing principles for sound and lame horses.

ARNR 331 SWINE PRODUCTION
F alternate years, to be offered odd years, 3 cr. LEC 3
PREREQUISITE: ARNR 100 and Junior standing.
- Principles of swine production and the swine industry will be discussed. Topics include management of the swine herd, nutrition, reproduction, economics, breeding, and health related to efficient swine production; pork quality, nutrient management plans.

ARNR 337 DISEASES OF DOMESTIC LIVESTOCK
S 3 cr. LEC 3
PREREQUISITE: VTMB 271.
- This course is structured to familiarize students with the common diseases of domestic livestock. Infectious and non-infectious diseases of horses, cattle, sheep and swine will be covered. Particular emphasis will be placed on regional diseases.

ARNR 345 RIPARIAN ECOLOGY AND MANAGEMENT
S 3 cr. LEC 2 LAB 1
PREREQUISITE: ARNR 240 or BIOL 305 or LRES 352 and LRES 201.
- This course will provide an overview of one of the most ecologically diverse ecosystems in western North America. Students will have the opportunity to study the physical and biological processes which shape and maintain riparian ecosystems. A field laboratory will provide experience in biological and physical monitoring methodologies that are central to land management decisions.

ARNR 347 EQUINE FORM TO FUNCTION
F 3 cr. LEC 2 LAB 1
PREREQUISITE: VTMB 271 and Junior standing.
- Development of methods for analyzing a horse's conformation along with a good understanding of anatomy and its relationship to performance.

ARNR 350 VEGETATION OF WESTERN WILDLANDS
S 3 cr. LEC 2 LAB 1
PREREQUISITE: ARNR 240, BIOL 230, and either BIOL 434 or BIOL 436.
COREQUISITE: ARNR 351.
- Identification of commonly occurring plants of western North America biomes. Important ecological and management relationships of the plants will be emphasized.

ARNR 351 BIOMES OF WESTERN WILDLANDS
S 2 cr. LEC 2
PREREQUISITE: ARNR 240, BIOL 230.
COREQUISITE: ARNR 350.
- Climatic, physical, and biological interactions of natural biomes. The structure of western North America biomes will be considered in detail.

ARNR 353 GRAZING ECOLOGY AND MANAGEMENT
F 3 cr. LEC 2 LAB 1
PREREQUISITE: ARNR 101, ARNR 102, and ARNR 250 or ARNR 240.
- Ecological perspectives of livestock grazing in the major biomes of the western United States and southern Canada. Impacts on soils, individual plants, plant communities, livestock, wildlife, and hydrology will be reviewed in the scientific literature.

ARNR 355 FIRE ECOLOGY AND MANAGEMENT
F 3 cr. LEC 2 LAB 1
PREREQUISITE: ARNR 101 or ARNR 240 or BIOL 303.
- This course covers the wildlife patterns that shape and define western rangeland and forest ecosystems. Discussions on the historical role of fire will provide the background for using prescribed fire to accomplish a broad range of habitat management goals.

ARNR 355 WILDLIFE-LIVESTOCK HABITAT RESTORATION
F 3 cr. LEC 2 LAB 1
PREREQUISITE: ARNR 101 or LRES 110 or F&WL 301, and BIOL 250, and ARNR 240 or BIOL 305.
- Improvement and rehabilitation of habitats used by wildlife and free-ranging livestock in the western United States. Topics include methods used to improve wildlife habitat as well as livestock forage. Design criteria for stock ponds, offsite water development, construction of bird/small mammal guzzlers, use of prescribed fire, mechanical, chemical and biological techniques to rehabilitate and improve wildlife and livestock habitats.

ARNR 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ARNR 409 ADVANCED LIVESTOCK EVALUATION
F, S 3 cr. LEC 3
PREREQUISITE: ARNR 309 or equivalent.
- Advanced skills in evaluation of animals and data associated with growth and genetic improvement. Develop decision making and oral communication skills.

ARNR 410 VETERINARY ENTOMOLOGY
(Previously ENTO 410)
S 2 cr. LEC 2
PREREQUISITE: BIOL 101, BIOL 204.
- This course will provide an overview of the importance of arthropods and their effects on human and animal health. Topics covered will include classification and identification of insects, mites, and ticks, basic biology, behavior and ecology, feeding mechanisms, pathogen transmission, vector competency, production impacts, integrated management and prevention.

ARNR 415 EQUINE REPRODUCTION
F 4 cr. LEC 3
PREREQUISITE: VTMB 271, ARNR 321.
- This course is designed to familiarize students with the reproduction in horses. Students will be instructed on the appropriate methods for management of the stallion, mare and foal. The curriculum will also include equipment and facilities use, as well as management of a breeding facility.
**COURSE DESCRIPTIONS: ARNR 416R - ARNR 541**

**ARNR 416R MEAT PROCESSING**
- F alternate years, to be offered odd years
- 3 cr. LEC 2 LAB 1
- **PREREQUISITE:** ARNR 316 or instructor approval.
- Students will learn to manufacture processed meat products such as fresh sausage, ham, bacon and cooked sausages. They will also be developing new flavor profiles and new products that will be presented to a panel with proposed marketing plans.

**ARNR 421 ASSISTED REPRODUCTIVE TECHNOLOGIES**
- F 4 cr. LEC 2 LAB 2
- **PREREQUISITE:** ARNR 321.
- Reproductive management programs applying physiological knowledge to increase meat and milk production in cattle. Experience in the techniques of artificial insemination and pregnancy evaluation in cattle.

**ARNR 422 TOPICS IN BEEF CATTLE NUTRITION**
- S alternate years, to be offered even years
- 2 cr. LEC 2
- **PREREQUISITE:** ARNR 320 and Junior standing or consent of instructor.
- Critical evaluation of current issues and related scientific literature in beef cattle nutrition; application to decision making and problem solving.

**ARNR 423 EQUINE NUTRITION**
- S alternate years, to be offered odd years
- 2 cr. LEC 2
- **PREREQUISITE:** ARNR 320 and Junior standing or consent of instructor.
- Critical evaluation of current issues and related scientific literature in equine nutrition; application to designing effective feeding programs.

**ARNR 426 TOPICS IN WILDLIFE - LIVESTOCK HABITAT**
- S 3 cr. LEC 3
- **PREREQUISITE:** F&WL 301, either ARNR 240 or BIOL 303, and senior standing or consent of instructor.
- Contemporary topics related to wildlife habitat ecology and management, with consideration of agriculture and historical influences. Emphasis of habitat management in coordination with other land uses (i.e. agriculture, recreation, and development) will be detailed in depth.

**ARNR 430 HORSE MANAGEMENT**
- S 4 cr. LEC 3 LAB 1
- **PREREQUISITE:** ARNR 320, ARNR 321, ARNR 322, VTM 271.
- Horse management and problems with emphasis on behavior, nutrition, reproduction, and management programs.

**ARNR 435 SHEEP MANAGEMENT**
- S 3 cr. LEC 2 LAB 1
- **PREREQUISITE:** ARNR 230, ARNR 232, ARNR 320, and ARNR 321 or consent of instructor.
- Management of the ewe flock, nutrition, reproduction, economics, breeding, and health related to efficient sheep production will be discussed. Production preparation and wool marketing in U.S. and world markets and economics of Montana wool production will be covered.

**ARNR 434R BEEF CATTLE MANAGEMENT**
- F 4 cr. LEC 2 LAB 2
- **PREREQUISITE:** ARNR 230, ARNR 240, ARNR 320, ARNR 321, ARNR 322 and AGEC 210 or AGE 341.
- Integration of the principles of nutrition, genetics, physiology, range ecology, and economics into practical and profitable ranch management and business plans. Utilization of performance and financial records, budgeting, feed resource planning, marketing strategies, breeding plans, computer applications, and case studies.

**ARNR 438 WILDLIFE HABITAT ECOLOGY**
- S 3 cr. LEC 3
- **PREREQUISITE:** F&WL 301, and either ARNR 240 or BIOL 303 and senior standing.
- Principles of habitat importance and management. Habitat requirements within wildlife population constraints will be emphasized with consideration of other natural resource demands.

**ARNR 435 HABITAT INVENTORY & ANALYSIS**
- F 3 cr. LEC 2 LAB 1
- **PREREQUISITE:** ARNR 240 or BIOL 303, STAT 210 or PSPP 318, and Junior standing.
- Focus on collecting, analyzing, and interpreting measures of rangeland resources including plant, animal, soil, and watershed components. Emphasis on sampling objectives, field procedures, monitoring, and evaluation.

**ARNR 470 INDEPENDENT STUDY**
- On Demand - 3 cr. IND
- **MAXIMUM 6 CR.
- **PREREQUISITE:** Junior standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

**ARNR 476 INTERNSHIP**
- On Demand - 2 - 12 cr. IND
- **PREREQUISITE:** Junior standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

**ARNR 480 SPECIAL TOPICS**
- On Demand - 1 - 4 cr. Maximum 12 cr.
- **PREREQUISITE:** Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

**ARNR 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION**
- F, Su 1 - 2 cr. RCT
- **MAXIMUM 6 CR.
- **PREREQUISITE:** ARNR 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

**ARNR 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY**
- F, Su 1 - 4 cr. IND
- **MAXIMUM 12 CR.
- **PREREQUISITE:** Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

**ARNR 500 SEMINAR**
- On Demand - 1 cr. SEM
- **MAXIMUM 4 CR.
- **PREREQUISITE:** Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

**ARNR 507 RESEARCH METHODS**
- F, S 1 cr. SEM 1 Maximum 5 cr.
- **PREREQUISITE:** Graduate standing.
- Application of scientific method and research techniques, including design of experiments and use of appropriate statistical procedures.

**ARNR 529 NUTRIENT METABOLISM OF DOMESTIC ANIMALS**
- F alternate years, to be offered odd years
- 3 cr. LEC 3
- **PREREQUISITE:** ARNR 320, and either BCHM 229 or BCHM 340 or consent of instructor.
- Biochemistry of animal nutrition with emphasis on integration of biochemical principles to animal production systems. Nutrients emphasized are proteins, carbohydrates and lipids.

**ARNR 521 ADVANCED RUMINANT NUTRITION**
- F alternate years, to be offered even years
- 3 cr. LEC 3
- **PREREQUISITE:** ARNR 320 or consent of instructor.
- Physiological and microbiology aspects of ruminant digestion and their influence on the metabolism of extraruminal tissues.

**ARNR 523 ADVANCED PHYSIOLOGY OF REPRODUCTION**
- S alternate years, to be offered odd years
- 3 cr. LEC 3
- **PREREQUISITE:** BIOL 411, BCHM 340, ARNR 321 or consent of instructor.
- Study of the basic concepts of reproductive process of mammals with special emphasis on the application of recent techniques in solving reproductive problems associated with fertility and infertility.

**ARNR 534 ADVANCED ANIMAL BREEDING**
- S alternate years, to be offered even years
- 3 cr. LEC 3
- **PREREQUISITE:** ARNR 322.
- Quantitative genetics applied to the improvement of animals. Biometrical relationships among relatives, methods of estimating genetic parameters, application of crossbreeding systems and selection techniques.

**ARNR 535 MUSCLE AND GROWTH BIOLOGY**
- S alternate years, to be offered even years
- 3 cr. LEC 3
- **PREREQUISITE:** BCHM 340 AND BIOL 102N.
- Growth and development of muscle, muscle structure and how growth is controlled by hormones and DNA will be studied. The impact of growth manipulation on the final product, meat, will also be evaluated.

**ARNR 541 RANGE ECOPHYSIOLOGY**
- S alternate years, to be offered even years
- 3 cr. LEC 3
- **PREREQUISITE:** ARNR 240 or BIOL 303 or BIOL 450.
- Integration of the principles of nutrition, genetics, physiology, range ecology, and economics into practical and profitable range management and business plans. Utilization of performance and financial records, budgeting, feed resource planning, marketing strategies, breeding plans, computer applications, and case studies.
ARNR 543 RIPARIAN PROCESSES AND FUNCTION
S alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: ARNR 345, BIOL 305 and 1RES 352 or ESCI 452.
- This course involves an in-depth investigation of the geomorphological physical and biological parameters unique to riparian areas of the Northern Rocky Mountains and Great Plains. Emphasis will be placed on how these parameters interact to create the biotic communities associated with riparian areas.

ARNR 544 ADVANCED GRAZING MANAGEMENT AND ECOLOGY
S alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: ARNR 340 or ARNR 350 or ARNR 351 or BIOL 303.
- Review of management principles for livestock grazing grasslands and shrub lands and their ecological relationship to other areas. Study design and scientific results will be examined to critically review information.

ARNR 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

ARNR 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S 4 cr. LEC 3 RCT 1 STU 2
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

ARNR 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARNR 589 GRADUATE CONSULTATION
F, S 3 cr. IND Maximum credits unlimited
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ARNR 590 MASTER'S THESIS
F, S 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

ARNR 690 DOCTORAL THESIS
F, S 10 cr. IND
PREREQUISITE: Doctoral standing.

ART

School of Art
(406) 994-4501

ART 110RA 2D ART FUNDAMENTALS
F 4 cr. RCT 1 STU 3
- The development of basic two-dimensional technical and aesthetic concepts through an emphasis on design elements and principles. Visual problem-solving in 2D pictorial construction and color theory. Critiques develop student's ability to formulate and verbalize knowledgeable responses to visual production. Required weekly lecture on various aspects of visual arts practice.

ART 111RA 3D ART FUNDAMENTALS
S 4 cr. RCT 1 STU 3
- The development of basic three-dimensional technical and aesthetic concepts through an emphasis on design elements and principles. Visual problem-solving in 3D form and space through various processes and materials. Critiques develop student's ability to formulate and verbalize knowledgeable responses to visual production. Required weekly lecture on various aspects of visual arts practice.

ART 112RA DRAWING FUNDAMENTALS
S 5 cr. RCT 3
- The development of basic drawing skills and concepts through an emphasis on observation and visual problem-solving. Representation and expression are explored through black and white drawing media. Critiques develop student's ability to formulate and verbalize knowledgeable responses to visual production.

ART 202IA ANCIENT THROUGH MEDIEVAL ART HISTORY
F 3 cr. LEC 2 RCT 1
- This course examines the visual arts from their beginnings to ancient Egypt, Greece, and Rome through the Medieval period. It focuses on an understanding of art as the nonverbal expression of universal cultural concepts.

ART 203IA RENAISSANCE THROUGH MODERN ART HISTORY
S 3 cr. LEC 2 RCT 1
- A survey of Renaissance, Baroque, and 19th and 20th century art which focuses on the evolution of humanistic expression and the emergence of the artist as an individual responding to the impact of modern society.

ART 204I H EXPLORING ARTISTS ON FILM
F 3 cr. LEC 5
- Analyzes a variety of portrayals of art and artists throughout history in Hollywood and foreign feature films. Artists and their works will be studied in their historical context, and in terms of how history is mediated by fictional depiction in film.

ART 205 PAINTING
F, S 4 cr. RCT 2 STU 2
PREREQUISITE: ART 110, ART 112.
- Introduction to oil and/or acrylic painting. Exploration of basic aesthetic and technical concepts in painting. Primarily representational subject matter. Understanding and developing individual stylistic tendencies. Individual and group critiques.

ART 206 METALSMITHING
F, S 4 cr. RCT 2 STU 2
PREREQUISITE: ART 111.
- A beginning course in basic metal smithing techniques and three-dimensional design skills. Design concepts, small metal fabrication methods and practical demonstrations.

ART 207 SCULPTURE
F, S 4 cr. RCT 2 STU 2
PREREQUISITE: ART 111.
- Introduction to three-dimensional form through projects involving plaster, woodworking, welding, and non-traditional materials. Introduction to tools, materials, processes, and safety procedures with a conceptual approach to problem solving.

ART 208RA CERAMICS
F, S 4 cr. RCT 2 STU 2
PREREQUISITE: ART 111.
- Contemporary ceramics - the history, development, and aesthetics of ceramic vessels and sculpture. The technical aspects of clay, glazes, and the firing of ceramic objects. Problem solving and the development of ideas.

ART 209 PRINTMAKING
F, S 4 cr. RCT 2 STU 2
PREREQUISITE: ART 110.
- A beginning course in which multiple original prints are made from a variety of blocks and plates. Emphasis on relief and intaglio history and processes including woodcut, lino cut, engraving, etching, and aquatint.

ART 223 GRAPHIC DESIGN I
F 4 cr. RCT 2 STU 2
PREREQUISITE: ART 110.
- Further exploration of design principles with increased emphasis on typographic skills and visual communications.

ART 224 GRAPHIC DESIGN II
S 4 cr. RCT 2 STU 2
PREREQUISITE: ART 223.

ART 235RA REPRESENTATIONAL DRAWING
F, S 4 cr. LEC 2 STU 2
PREREQUISITE: ART 110, ART 112.
- Introduction to the basic vocabulary of drawing, observation, problem solving, and personal expression. Critiques develop student's ability to formulate and verbalize informed analysis of the completed projects.

ART 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of the director.
- Directed research and study on an individual basis.

ART 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
ART 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-5 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ART 290B UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

ART 302 SURVEY OF ASIAN ART
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: ART 202 or ART 203.
- The purpose of this course is to offer students a broad exposure to art and architecture produced in China, Japan, Southwest Asia and India from the Neolithic period through the 20th century with special emphasis placed on Chinese developments.

ART 308 HISTORY OF PRINTMAKING (1450-1945)
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: ART 203.
- This course introduces students to the vocabulary, techniques and history of printmaking in the western world from the mid-fifteenth century to the end of World War II.

ART 312 DECORATIVE ARTS & ENVIRONMENT
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: ART 208.
- This course introduces students to the history of decorative arts in western Europe and the United States from the Renaissance through the early 20th Century. Emphasis will be placed on major media and stylistic trends. Attention will also be given to the use of objects in their original spatial environments.

ART 315 CERAMICS II
F, S 5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 208.
- Advanced problems in ceramics.

ART 325 METALSMITHING II
F, S 5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 206.
- Advanced course designed around a set of specific problems and demonstrations for advanced jewelry and metal forming concepts. Emphasis will be placed on technical development and personal imagery.

ART 357 PRINTMAKING-LITHOGRAPHY
F alternate years, to be offered even years
5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 209 and ART 238.
- An intermediate course in which multiple original prints are made from hand-drawn images on lithographic limestone. Editioning in black and multicolor using crayon, tusche, transfer, and photo methods.

ART 359 ADVANCED DRAWING
F, S, Su 5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 208.
- Advanced technical and aesthetic concepts in drawing with emphasis on the development of a personal artistic style. Use of traditional and non-traditional subject matter. Individual and group critiques.

ART 340 SURVEY OF ANCIENT ART
F alternate years, to be offered even years 3 cr. LEC 3
- This course will examine the art and architecture of ancient civilizations surrounding the Aegean and Mediterranean seas. Beginning with the Aegean civilizations, the course will then examine the rise of the historical Greeks and will conclude with the Roman world.

ART 341 ADVANCED RELIEF PRINTMAKING
F alternate years, to be offered odd years 5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 209.
- An advanced course in which multiple original prints are made using plank and end grain wood and plastic/rubber relief plates. Methods include reduction and multi-plate color, shaped and found object (collagraph), color overlay, split fountain, roller and brush inking, and various hand and press printing methods.

ART 344 PRINTMAKING-SERIGRAPHY
S alternate years, to be offered even years 5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 209.
- A course in which student will work on individual projects, with each student working with their own equipment that desire to explore the new media of the fine art digital print.

ART 353 SCULPTURE II
F, S 5 cr. RCT 2 STU 3 Maximum 15 cr.
PREREQUISITE: ART 207.
- Development of concept, creative thinking and problem solving in sculpture. Advanced experiences of materials and methods within three-dimensional form.

ART 358 ALTERNATIVE PRINT MEDIA
F alternate years, to be offered even years 5 cr. RCT 2 STU 3
PREREQUISITE: ART 209.
- An advanced course in which students are offered a wide range of printing processes. These may include monotone, photo techniques, experimental lithography, large format printing, multimedia, and digital printmaking. The structure of the course is based on technical demonstrations, studio assignments, and critiques.

ART 365 INTERMEDIATE GRAPHIC DESIGN I
F 5 cr. RCT 2 STU 3
PREREQUISITE: ART 224, Portfolio review.
- Graphic production procedures and studio tools and techniques. Projects incorporate communication problem solving with fundamentals of mechanical preparation. Development of computer skills using graphic design programs including QuarkXpress, Photoshop, and Illustrator. Laptop computers are required for all upper level graphic design courses.

ART 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ART 401 GREEK ART AND ARCHITECTURE
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: ART 202 and ART 203.
- This course is arranged as a chronological presentation of the art and architecture of ancient Greece from its origins in the Dark ages through the Hellenistic period. Study begins with the Bronze Age of antecedents of Hellenic art and ends with the widespread dissemination of Greek material culture after the death of Alexander the Great.

ART 403 DRAWING
F, S 1-5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 398.
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of drawing. Written, signed contract required prior to registering for this course.

ART 406 ROMAN ART & ARCHITECTURE
S 3 cr. LEC 3
- This course is a survey of the public and private art and architecture of Republican and Imperial Rome. The study encompasses both the Etruscan and Republican foundations-cultural, political and artistic-of Rome and then moves on to the period when emperors ruled and the borders of the empire at its height ranged from Britain to North Africa. The course is arranged as a chronological survey moving from the prehistory of the Italic peninsula to the reign of the emperor Constantine in the fourth century CE.
ART 410 CAREERS IN ART
F 1 cr. LEC 1
PREREQUISITE: Junior, Senior or consent of instructor.
- Presentations by professional artists about important career elements such as resume writing, photographing and marketing your work, making presentations to galleries and design firms, starting a business, researching graduate schools, teaching as a career, and applying for grants and fellowships.

ART 411 PAINTING
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 250.
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of painting. Written, signed contract required prior to registering for this course.

ART 412 SCULPTURE
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 325.
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of sculpture. Written, signed contract required prior to registering for this course.

ART 413 METALSMITHING
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 326.
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of metalworking. Written, signed contract required prior to registering for this course.

ART 414 PRINTMAKING
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 327 or ART 344, ART 341, ART 348, ART 368
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of printmaking. Written, signed contract required prior to registering for this course.

ART 415 CERAMICS
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 315.
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of ceramics. Written, signed contract required prior to registering for this course.

ART 416 GRAPHIC DESIGN
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 366.
- Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of graphic design. Written, signed contract required prior to registering for this class.

ART 417 INTERMEDIA
F, S, Su 1 - 5 cr. IND.
PREREQUISITE: ART 315 or 325 or 327 or 333 or 338 or 341 or 350 or 365.
- Course in which the student will work on an individual basis with a faculty member in developing imagery and techniques combining various media including digital technology.

ART 418 BEGINNINGS OF MODERN ART
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: ART 203.
- From Post-Impressionism to World War I. Major artists include Gauguin, Van Gogh, Cezanne, Matisse, Picasso, and the German Expressionists.

ART 419 20TH CENTURY ART
S 1 cr. LEC 5
PREREQUISITE: ART 203.
- Art from World War I to the present.

ART 425 FIELD STUDY
IN ART AND ART HISTORY
S 2-5 cr. LAB 2-5
PREREQUISITE: ART 110, ART 111 or ART 203, or consent of instructor.
- Course will allow students to study at an off-campus location such as a foreign country under the direction of an art faculty member. Includes preparatory meetings, several hours per day of discussion on site, and writing or creative project which assimilates direct experience and research.

ART 435 ART OF EGYPT & NEAR EAST
S alternate years, to be offered odd years 3 cr. LEC 3
- This course is an exploration of the art and architecture of ancient Egypt and the Near East (Anatolia, Mesopotamia and Persia). Due to the nature of the surviving material, the emphasis will be on the ideas and attitudes of these civilizations about the relationship between humans and divinities, the cult of the ruler/king, and funerary cult and the afterlife.

ART 436 LATE GOthic PAINTING
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: ART 203.
- This course will deal with the development of Gothic painting in Italy and its subsequent influence on the Northern tradition of painting in the Netherlands and Germany. Major masters include Giotto, Jan van Eyck, Bosch, Grunewald, Durer, and Bruegel.

ART 440 ART IN THE AGE OF REVOLUTION
S alternate years, to be offered even years 3 cr. LEC 5
PREREQUISITE: ART 203.
- This course offers students an in-depth understanding of painting and sculpture in France and Britain in the 18th century. Through focused lectures, readings and discussions and writing assignments students will learn about the 18th century cultural, philosophical and scientific developments in their original contexts as well as their bearing on the present day.

ART 442 MEDIEVAL ART
F alternate years, to be offered odd years 3 cr. LEC 3
- Early Christian, Byzantine, Romanesque, and Gothic periods.

ART 446 EARLY RENAISSANCE ART
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: ART 203.
- A study of painting, sculpture and architecture in Italy in the 15th century. Major artists include Donatello, Masaccio, Piero della Francesca and Botticelli, Michelangelo, and Giorgione.

ART 448 HIGH RENAISSANCE AND MANNERISM
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: ART 203.
- This course is a study of the high renaissance in Rome, Florence and Venice, and the reactions to this in the style of mannerism. Major artists include Leonardo, Michelangelo, Raphael, Pontormo and Titian.

ART 450 CONTEMPORARY ART
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: ART 419.
- This course will focus on issues in contemporary painting, sculpture, and related radical art forms. Students are responsible for discussions of assigned readings and presentations of research projects.

ART 457 BAROQUE IN ITALY & N. EUROPE, 1600-1700
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: ART 203.
- The purpose of this course is to offer students a more indepth study of art in the Baroque period in Europe (1600-1700) by focusing on cultural developments in the Republic of the Netherlands and its colonies.

ART 463 19TH CENTURY ART
F 3 cr. LEC 3
PREREQUISITE: ART 203.
- This course examines the major artists of the 19th century in Europe and America and the development of the styles of Neoclassicism, Romanticism, Realism, and Impressionism.

ART 465 ADVANCED GRAPHIC DESIGN
F 5 cr. RCT 2 STU 3
PREREQUISITE: ART 366.
- Comprehensive projects dealing with a variety of visual communication applications. Emphasis on high standards of typography and graphic design, computer techniques, and presentation. Laptop computers are required for all upper level graphic design courses.

ART 468 GRAPHIC ILLUSTRATION
S 5 cr. RCT 2 STU 3
PREREQUISITE: ART 365.
- The fundamentals of illustration concepts, formats, tools, media, and production processes with application to creative projects including small press publications.

ART 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of the director.
- Directed research and study on an individual basis.
ART 476 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of the director.
– An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ART 480 SPECIAL TOPICS
On Demand 1 - 5 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ART 489 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. Rct May be repeated. Max 4 cr.
COREQUISITE: ART 490.
– Senior capstone course. Classroom instruction associated with directed undergraduate research/creative activity projects. Graphic design students only.

ART 490 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 5 cr. IND May be repeated. Max 12 cr.
– Senior capstone course. Directed undergraduate research/creative activity which may culminate in a research paper, undergraduate thesis paper, or undergraduate thesis exhibition. Graphic design students must take this course in the spring.

ART 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 6 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
– Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ART 505 PAINTING
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 411, graduate standing.
– Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of painting.

ART 515 CERAMICS
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 415, graduate standing.
– Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of ceramics.

ART 524 METALSMITHING
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 415, graduate standing.
– Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of metalsmithing.

ART 525 DRAWING
F, S, Su 1 - 3 cr. IND Maximum 15 cr.
PREREQUISITE: ART 405, graduate standing.
– Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of drawing.

ART 527 PRINTMAKING
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 414, graduate standing.
– Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of printmaking.

ART 529 SCULPTURE
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 412, graduate standing.
– Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of sculpture.

ART 530 INTERMEDIA
F, S, Su 1 - 5 cr. IND Maximum 15 cr.
PREREQUISITE: ART 335, ART 338, ART 350 and graduate standing.
– Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of intermedia.

ART 570 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, and Dean of Graduate Studies.
– Directed research and study on an individual basis.

ART 575 PROFESSIONAL PAPER
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
– A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ART 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ART 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 5 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
– Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subtitled.

ART 589 GRADUATE CONSULTATION
F, S, Su 3 cr.
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
– This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ART 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum 15 cr.
PREREQUISITE: Master’s standing.

BCHM
Biochemistry
Department of Chemistry & Biochemistry
(406) 994-4801

BCHM 100 UNDERGRADUATE SEMINAR I
F 1 cr. SEM 1
– For the new student. Integration into the department and its research and educational program. Scientific communication and chemical literature searching skills.

BCHM 104RN THE BIOCHEMISTRY OF HEALTH FOR NON-SCIENCE MAJORS
S 4 cr. LEC 3 LAB 1
– Introduction for non-science majors to the biochemical basis of nutrition, health, DNA, and the human genome. The class and laboratory includes training for in depth searching of Internet and library information resources, evaluating and presenting the information found, and an introduction to DNA fingerprinting.

BCHM 122 ORGANIC & BIOCHEMICAL PRINCIPLES
F, S 1-6 cr. IND may be repeated
PREREQUISITE: CHEM 121, CHEM 131, or equivalent.
– An introduction into functional group organic chemistry and important biochemical structures, concepts, and processes. The laboratory is closely integrated with lecture coverage.

BCHM 201 UNDERGRADUATE SEMINAR II
PREREQUISITE: CHEM 100 or BCHM 100.
S 1 cr. SEM 1
– Introduction to faculty research through faculty mini seminars. Departmental research facilities. Research groups. Research planning decisions (MSU laboratory, summer internship, student exchange, REU, USP, etc).

BCHM 270 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
– Directed research and study on an individual basis.

BCHM 280 SPECIAL TOPICS
On Demand 1 - 4 cr. LEC Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BCHM 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
– Classroom instruction associated with directed undergraduate research/creative activity projects.

BCHM 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
– Directed undergraduate research/creative activity which may culminate in a written work or other creative project.
COURSE DESCRIPTIONS: BCHM 300 - BCHM 690

BCHM 300 UNDERGRADUATE SEMINAR III
F 1 cr. SEM 1
PREREQUISITE: CHEM 201 or BCHM 201.
- Research techniques, procedures, and reports. Seminar reporting and presentation skills. Career planning and resume preparation. May be repeated once.

BCHM 340 GENERAL BIOCHEMISTRY
F, S, Su 5 cr. LEC 4 LAB 1
PREREQUISITE: BIOL 102, or BIOL 214, or BIOL 208; CHEM 312, or CHEM 315 or CHEM 215.
- Carbohydrate, lipid, protein, and nucleic acid structure and function; enzyme kinetics; energetics; major metabolic pathways for carbohydrates, lipids, and amino acids; photosynthesis; regulation of gene function.

BCHM 401 CAPSTONE SEMINAR
S 1 cr. SEM 1
PREREQUISITE: CHEM 500 or BCHM 500.
- Senior capstone course. Taught in collaboration with departmental Honors Thesis, CHEM 451. The chemistry/biochemistry research undergraduate experience constrains the synthesis of our (bio)chemistry class room and laboratory education. The projects are orally presented in seminar form, discussed on the basis of acquired knowledge, and analyzed using stringent scientific methods and criteria. A complete personal resume is prepared. May be repeated once.

BCHM 441 BIOCHEMISTRY OF MACROMOLECULES
F 3 cr. LEC 3
PREREQUISITE: BCHM 340 (B or higher) or consent of instructor.
- Biochemical basis of modern molecular biology; structure and function of proteins, nucleic acids, and membranes; replication; transcription; translation; regulation of gene expression; and recombinant DNA.

BCHM 442 METABOLIC REGULATION
S 3 cr. LEC 3
PREREQUISITE: BCHM 540 (B or higher) or BCHM 441 (C or higher) or consent of instructor.
- In-depth biochemical treatment of metabolism and its regulation in cellular processes.

BCHM 444R BIOCHEMISTRY & MOLECULAR BIOLOGY METHODS
S 3 cr. LEC 1 LAB 2
PREREQUISITE: BCHM 441 (B or higher) or consent of instructor.
- This course focuses on molecular biology/biochemistry procedures integral to current research. Methods include PCR; gene cloning; DNA sequencing; and expression, isolation, purification, and characterization of the gene-encoded protein.

BCHM 470 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

BCHM 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BCHM 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

BCHM 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

BCHM 500 SEMINAR
F, S 1 cr. SEM 1 May be repeated.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

BCHM 524 MASS SPECTROMETRY
F alternate years, to be offered odd years 5 cr LEC 3
PREREQUISITE: CHEM 323 or CHEM 301.

BCHM 526 ADVANCED PROTEIN NMR SPECTROSCOPY
F alternate years, to be offered 2006 3 cr. LEC 3
PREREQUISITE: CHEM 523 or CHEM 501.
- Cross-referenced with CHEM 526.

BCHM 534 PROTEINS
F alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: BCHM 441.
- Structure-function relationships of proteins and enzymes. Current literature stressed. Written student reports required.

BCHM 544 MOLECULAR BIOLOGY
F alternate years, to be offered 2006 5 cr. LEC 3
PREREQUISITE: BCHM 441, BIOL 202, MB 449 or comparable course.
- Recent advances in understanding and research methods using both eukaryotic and prokaryotic systems.

BCHM 545 ADVANCED PHYSICAL BIOCHEMISTRY
S alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: CHEM 324 and BCHM 441.
- Theoretical presentation of the molecular structures and interactions occurring in proteins and nucleic acids. Discussion of spectroscopy techniques used to study bio molecular structures and function. Includes concepts in: Nuclear Magnetic Resonance, X-ray Diffraction, Ultraviolet Absorption, Fluorescence, Circular Dichroism, Vibrational Spectroscopy, molecular motion and transport properties including diffusion, sedimentation, and viscosity.

BCHM 547 BIOINORGANIC CHEMISTRY
F alternate years, to be offered odd years 5 cr LEC 3
PREREQUISITE: CHEM 334 AND BCHM 441.
- This course provides an introduction and overview of the field of bioinorganic chemistry, the chemistry of metals in biological systems, with a particular emphasis on metal trafficking, metal center assembly and metal clusters in biology.

BCHM 550 PRINCIPLES OF STRUCTURE DETERMINATION BY X-RAY CRYSTALLOGRAPHY
S alternate years, to be offered even years 5 cr LEC 3
PREREQUISITE: BCHM 441 and BCHM 442 or the equivalent and MATH 182M.
- This course focuses on theory and practice of molecular structure determined by x-ray crystallography. Topics include crystallization of macromolecules, molecular structure determination from x-ray data, and evaluation of the quality of the resulting macromolecular models.

BCHM 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

BCHM 575 PROFESSIONAL PAPER
F, S 1 - 6 cr. IND
PREREQUISITE: Consent of instructor.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

BCHM 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BCHM 590 MASTER'S THESIS
F, S Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

BCHM 689 GRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 3 cr. RCT
PREREQUISITE: Graduate standing.
COREQUISITE: BCHM 590 or BCHM 690.
- Classroom instruction associated with directed graduate research/creative activity projects.

BCHM 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: PhD standing.
Biol 298 Human Physiology II
F 3 cr. LEC 3
PREREQUISITE: BIOL 102 or BIOL 207 or BIOL 214 or BIOL 297 or MB 301 with grades of "C-" or better in each course.
- Function of the human digestive, cardiovascular, respiratory, reproductive, and urinary systems. Principles of integration, metabolism, energy flow and homeostasis will be emphasized.

Biol 301 Principles of Genetics
F, S 3 cr. LEC 3
PREREQUISITE: BIOL 102 or BIOL 214 or MB 301.
- Introduction to classical and molecular genetics of eukaryotes, with emphasis on transmission genetics, the structure and regulation of genes, and mechanisms of genetic change.

Biol 302 Advanced Cell & Molecular Biology
S 3 cr. LEC 3
PREREQUISITE: BCHM 340 or consent of instructor.
- In-depth study of cell structure and function.

Biol 303 Principles of Ecology
S 3 cr. LEC 3
PREREQUISITE: BIOL 101 or BIOL 215; MATH 105 or MATH 170; STAT 216 or PSSP 318; or equivalents; junior standing.
- Relation of organisms to their environment. The composition, structure, function and distribution of populations, communities, and ecosystems.

Biol 310 Comparative Vertebrate Anatomy
S 4 cr. LEC 3 LAB 2
PREREQUISITE: BIOL 101 or BIOL 215.

Biol 311 Developmental Biology
S 4 cr. LEC 3 LAB 1
PREREQUISITE: BIOL 102 or BIOL 214
- Developmental Biology: Introduction to the cell signaling pathways and morphogenetic processes that establish the basic vertebrate body plan and organs. Laboratory utilizes microscopic and experimental study of chicken and frog embryos.

Biol 312 Histology
F 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 102 or BIOL 214, senior standing and consent of instructor.
- Microscopic study of cells, tissues, and selected mammalian organs.

Biol 313 Neurophysiology
F 3 cr. LEC 3
PREREQUISITE: BIOL 213 and BIOL 214.
- Physiology of integrative mechanisms in nervous systems. Topics range from the mechanisms of synaptic transmission and action potential generation to the neural basis of learning and memory.

Biol 395 Advanced Human Physiology
S 3 cr. LEC 2 IND 1
PREREQUISITE: BCHM 340.
- Topics include cardiovascular, respiratory, and renal physiology. The course will use a medical approach to the study of these systems. Students expected to give a presentation on the diagnosis, pathophysiology, or treatment of a disease involving one of these systems.

Biol 400 Seminar
F, S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students attend and discuss seminar presentations by professional biologists.

Biol 401 Biology Instructing
F, Su 2 cr. LAB 2 Maximum 4 cr.
PREREQUISITE: Junior or senior standing, consent of instructor and department head.
- Provides training as a biological laboratory assistant for those considering an academic profession. This provides experience in teaching biological laboratory classes and includes teaching responsibilities. Required for departmental or institutional certification.

Biol 403 Evolution
S 3 cr. LEC 3
PREREQUISITE: BIOL 301.
- For seniors in biology. Evolutionary theory is presented and takes two principle directions, the study of evolutionary history, and the study of natural selection.

Biol 405 Behavioral & Evolutionary Ecology
S 3 cr. LEC 3
PREREQUISITE: BIOL 303.
- Abundance and distribution of organisms in relation to their evolution, behavior, population biology and interactions with other organisms.

Biol 406 Rocky Mountain Vegetation
F 2 cr. LEC 1 LAB 1
PREREQUISITE: Junior or senior status in biological sciences and consent of instructor.
- Field identification of major Rocky Mountain vegetation types; the composition, structure and function of climax and alternate communities; their environments, geography and history; and discussion of management alternatives. Includes introduction to field methods, statistical evaluations, remote sensing, and library use.

Biol 407 Alpne Ecology
Su 3 cr. LEC 2 LAB 1
PREREQUISITE: Junior standing, BIOL 101.
- The ecological characteristics of alpine areas. A three-day field trip will confirm and reinforce material presented in class and is a course requirement.

Biol 410 Advanced Human Anatomy
S 4 cr. LEC 2 LAB 2.
PREREQUISITE: Senior standing, completion of at least two upper division courses in the biological sciences and consent of instructor.
- Dissection and prosection of the detailed anatomy of the human thorax, abdomen and pelvis with special dissection emphasis on the extremities. Topographic, three-dimensional and detailed relationships of organs, nerves and vessels are emphasized. Can fulfill upper division honor credits.

Biol 411 Animal Physiology
F 3 cr. LEC 3
PREREQUISITE: BIOL 102 or BIOL 214, and one of the following: CHEM 215, CHEM 311, or BCHM 122.
- General homeostatic physiology of animals with emphasis on mammals. Selected body systems are covered with major emphasis on the integration of body processes.

Biol 413 Neurophysiology
(F to be offered as BIOL 513)
F 3 cr. LEC 3
PREREQUISITE: Junior standing and BIOL 411 or BIOL 207 or BIOL 214 or consent of instructor.
- Physiology of integrative mechanisms in nervous systems. Topics range from the mechanisms of synaptic transmission and action potential generation to the neural basis of learning and memory.

Biol 415 Ichthyology
S 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 310.
- Basic principles of taxonomy, classification, evolution, and life histories of major groups of marine and freshwater fishes, with an emphasis on North American freshwater fauna. Laboratory emphasizes identification, nomenclature, morphology, and distribution of Montana species.

Biol 418 Mammalogy
F 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 310.

Biol 419 Ornithology
S 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 310.
- Evolution, functional biology, distribution, and classification of birds. Montana species recognition is developed through laboratory use of a representative skin collection.

Biol 420 Field Ornithology
Su 3 cr. LAB 3
PREREQUISITE: Junior standing, and either BIOL 100 or BIOL 101.
- Field identification, habitat affinities and life histories of birds of the northern Rockies. Includes early morning field trips.

Biol 421 Yellowstone Wildlife Ecology
Su 3 cr. LEC 2 LAB 1
PREREQUISITE: Junior standing, and either BIOL 100 or BIOL 101.
- Basic ecology of the major animal species of the Yellowstone area and the ecological controversies surrounding their management.

Biol 422 Genes and Cancer
F 3 cr. LEC 3
PREREQUISITE: BIOL 302.
- This course will focus on the molecular and cellular mechanism of human cancer. The role of oncogenes and tumor suppressor genes in normal and cancerous cells will be examined, with an emphasis on how mutations in certain genes results in altered cell-cell signaling and cell proliferation. The role of genetic mutation in breast, colorectal and lymphoma cancers will be discussed, along with new technologies to detect and treat these cancers.

Biol 424 Freshwater Ecology
F 3 cr. LEC 3
PREREQUISITE: BIOL 305 or consent of instructor.
- This course examines relationships between freshwater organisms and their environment. Students learn about the ecology of rivers, lakes, reservoirs, and wetlands, with exposure to a wide diversity of organisms and processes. Emphasis is placed on linking basic concepts and real-world applications.
BIOL 425 SENSORY NEUROPHYSIOLOGY
S 3 cr. LEC 3
PREREQUISITE: BIOL 313.
- Neurophysiology of sensory cells and systems.
- Topics range from the mechanisms underlying sensory reception to the processing of sensory information at higher stages.
- The major focus will be on human sensory systems.
- Pathologies that affect sensory perception will be considered.

BIOL 425 NEUROTOLOGY
On Demand 5 cr. LEC 3
PREREQUISITE: Consent of instructor.
- Neural and hormonal bases of animal behavior, including mechanisms underlying sensory perception and motor responses, learning and memory, spatial navigation, language, dominance hierarchies and aggression, mating systems, and parental behavior.
- Model systems from a variety of different animal species will be studied including humans.

BIOL 427 AQUATIC FIELD ECOLOGY
F 2 cr. LEC 1 LAB 1
PREREQUISITE: Prior or concurrent registration in BIOL 424.
- Optional laboratory for BIOL 427. Introduction to representative freshwater habitats, communities, organisms, and sampling methods through laboratory and field exercises and classroom discussions.
- Formal written reports are required after completed exercises.

BIOL 430 PLANT PHYSIOLOGY
S 3 cr. LEC 3
PREREQUISITE: Junior standing, BIOL 101 and one of the following: CHEM 215, CHEM 311, or BCHM 129.
- Physiological processes of higher plants, including photosynthesis, water relations, mineral nutrition, and development.
- Cross-listed with PS 450.

BIOL 435 INSECT IDENTIFICATION
(Previously ENTO 432) S alternate years, to be offered odd years 4 cr.
LEC 2 LAB 2
PREREQUISITE: ENTO 204 and one of the following: BIOL 100, BIOL 101, or BIOL 102.
- The identification of insects and related terrestrial arthropods.
- Evolutionary patterns reflected in modern insect diversity will be used to illustrate classification methods.
- Taxonomic methods will be used as an access to information retrieval.

BIOL 436 PLANT SYSTEMATICS
F alternate years, to be offered even years 5 cr.
LEC 1 LAB 2
PREREQUISITE: BIOL 101 and BIOL 230.
- Introduction to the local vascular plant flora emphasizing characteristics of the common families and genera.
- Lab concentrates on plant identification of common angiosperm plant families in Montana; preparation of about 120 reference specimens taken from the local flora.
- Cross-listed with PS 456.

BIOL 437 PLANT DEVELOPMENT
F alternate years, to be offered even years 3 cr.
LEC 3
PREREQUISITE: BIOL 301.
- Cellular and molecular mechanisms of the development of multi cellular life forms that consist of walled cells, and primarily plants.
- Some topics include developmental differences between plants and animals, regulation of gene expression, environmental effects on plant development, and computer modeling of development.
- Cross-listed with PS 457.

BIOL 438 DEVELOPMENTAL MECHANISMS
F 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 302.
- This course will focus on the molecular and cellular mechanisms which drive developmental processes.

BIOL 443 CURRENT TOPICS IN BIOLOGY
S 2 cr. SEM 2
PREREQUISITE: Senior standing in Ecology Dept., and prior or concurrent registration in BIOL 405.
- Senior capstone course. Discussion of topics that integrate evolutionary theory with ecology, genetics, medicine, behavior, or other subjects that are part of the biology curriculum.

BIOL 445 COGNITIVE NEUROSCIENCE
S 3 cr. LEC 3
PREREQUISITE: BCHM 340 plus one of: BIOL 208, PSY 301, BIOL 411.
- This course will survey our present knowledge of the neural basis of normal and abnormal cognitive function in humans and non-human primates.
- Topics will range from perception and action to attention, consciousness and mental illness.

BIOL 447 CONSERVATION BIOLOGY
F 3 cr. LEC 3
PREREQUISITE: BIOL 303.
- Examines issues relevant to conservation of wild populations, focusing primarily on animals.
- Emphasis is on approaches that use demography, population biology and genetics to address conservation questions.
- Readings are from the primary literature, rather than a textbook, including case studies.
- Cross-listed with BIOL 521.

BIOL 448 CONSERVATION GENETICS
F 3 cr. LEC 3
PREREQUISITE: BIOL 301.
- Introduces the theory and practice of conservation genetics, focusing primarily on animals.
- Case studies will be used liberally, and emphasis will be placed on interpreting genetic data.
- Readings will include primary literature.

BIOL 449 POPULATION GENETICS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: BIOL 301.
- Introduction to theory and empirical data on genetics of populations.
- Topics covered include modeling natural and artificial selection, nonrandom mating, gene flow and effective population size as factors influencing the maintenance of genetic variation in populations.
- The approach emphasizes the development of simple mathematical models to illustrate fundamental conceptual issues in the field.

BIOL 451 CELL BIOLOGY & NEUROSCIENCE DEPARTMENT CAPSTONE SEMINAR
F, S 2 cr. SEM 2
PREREQUISITE: Senior standing in the Cell Biology & Neuroscience Department.
- Senior capstone course. Students are expected both to present and to discuss advanced topics from the current biomedical literature.
- These topics will expand upon material presented in regular courses in the biomedical science curriculum.
- Students will write at least one major paper.

BIOL 453R BIOMIMETIC INTELLIGENT SYSTEMS
F 4 cr. LEC 1 LAB 3
PREREQUISITE: CS 150, MATH 170 or MATH 176 or MATH 182, STAT 216 or STAT 352.
COREQUISITE: BIOL 515 or CS 436 or EE 508.
- Students will study behaviors, structures and organs of simple biological organisms and model key aspects of these organisms in biomimetic robots.
- Students will gain hands-on experience with mathematical, engineering and software tools, all in the context of biological modeling.

BIOL 455 PLANT ECOLOGY
S 3 cr. LEC 3
PREREQUISITE: BIOL 101 or BIOL 215 and BIOL 303 or ARNR 240.
- Principles of plant ecology, covering plant-environment relations, plant species interactions, plant community concepts, succession, and the role of plants in ecosystem processes.

BIOL 465B GENE CONSTRUCTION
F 3 cr. LEC 3
PREREQUISITE: BIOL 302 or BCHM 340.
- The goals are to provide upper level students with the opportunity of designing and building their own genes.
- The goal of the course is to use this design experience to learn basic techniques in cell and molecular biology.

BIOL 467 MOLECULAR MEDICINE
S 3 cr. LEC 1 SEM 2
PREREQUISITE: BIOL 301 and BCHM 340.
- Lecture and seminar courses based on recent, original papers.
- Moves from human disease to molecular explanations.
- Intended for upper level students with a strong background in biology.

BIOL 470 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

BIOL 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

BIOL 489R UNDERGRADUATE RESEARCH/Creative Activity Instruction
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

BIOL 490R UNDERGRADUATE RESEARCH/Creative Activity
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

BIOL 500 SEMINAR
On Demand 1 cr. SEM Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition and course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses.
- Students participate in preparing and presenting discussion material.
BIOL 501 EVOLUTIONARY GENETICS
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: BIOL 301.
- The operations of fundamental genetic principles in populations of living things. Emphasis on natural populations with a thorough consideration of factors of evolution, particularly at the species level and below.

BIOL 502 ADVANCED LIMNOLOGY
S alternate years, to be offered even years
4 cr. LEC 2 LAB 2
PREREQUISITE: MATH 170, BIOL 404, BIOL 427, BCHM 122 or BCHM 340.
- Advanced quantitative study of the physical, chemical and biological dynamics of lakes and reservoirs.

BIOL 503 PALEOBIOLOGY
S alternate years, to be offered odd years
3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 310, BIOL 403.
- A study of the fossil record as a means of inferring biological characteristics of extinct species. Current topics in paleontology, phylogenetic systematics, patterns of evolution, speciation and extinction and osteohistology will be examined.

BIOL 504 QUANTITATIVE BIOLOGY
F alternate years, to be offered even years
3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 303, either STAT 216 or STAT 332, and one of the following: MATH 170, MATH 181, MATH 182.
- Applications of mathematical models to biological phenomena with examples drawn from physiology, ecology and bioengineering. The course is intended to develop facility with optimization techniques, numerical methods, matrix operations, complex variables and simple statistical ideas. Computer lab.

BIOL 505 ENVIRONMENTAL ANALYSIS
S alternate years, to be offered even years
3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 303, either STAT 216 or STAT 332, and one of the following: MATH 170, MATH 181, MATH 182.

BIOL 506 POPULATION DYNAMICS
S alternate years, to be offered odd years
3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 303, either STAT 216 or STAT 332, and one of the following: MATH 170, MATH 181, MATH 182.
- Techniques for modeling the growth, regulation, and simulation models. For graduate students and motivated undergraduates.

BIOL 507 COEVOLUTION
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: BIOL 301, BIOL 303, or BIOL 403.
- Exploration of nature and dynamics of symbiotic relationships between and among plants, animals, fungi and bacteria.

BIOL 508 SCIENTIFIC WRITING
S 3 cr. LEC 2 LAB 1
PREREQUISITE: Graduate standing and permission of instructor.
- The course is designed to provide an intensive scientific writing experience for graduate students in the process of writing the first draft of their thesis or dissertation, including editing and critique sessions by both peers and the instructor.

BIOL 509 INTRODUCTION TO PRACTICAL MODELING
F 3 cr. LEC 2 LAB 1
PREREQUISITE: First courses in calculus and statistics for course of instruction.
- With computers, the power of mathematical modeling is accessible to every biologist. We will discuss philosophies, strategies, techniques and pitfalls of modeling. After this course, students should be able to understand biological questions by formulating and analyzing mathematical/computational models.

BIOL 510 TOPICS IN NEUROBIOLOGY
S 3 cr. LEC 2 RCT 1 Maximum of 9 credits
PREREQUISITE: Graduate standing and at least one upper division or graduate course in neurobiology.
- Recent advances in topics in neurobiology with emphasis in different years on either neurophysiology, neuroendocrinology/neuroimmunology, or developmental neurobiology.

BIOL 513 TERRESTRIAL ECOLOGY OF PLAINS AND PRAIRIES
Su 1 cr, RCT 1
PREREQUISITE: Either BIOL 406 or BIOL 516, graduate standing, secondary teacher certification, two years teaching experience, and computer access.
COREQUISITE: Suggested: ESCI 513.
- Students will develop plant keys for classroom use, quantitatively analyze two grassland communities, and develop classroom activities in Biological Sciences.

BIOL 515 LANDSCAPE ECOLOGY AND MANAGEMENT
F alternate years, to be offered odd years
4 cr. LEC 2 LAB 2
PREREQUISITE: Graduate standing or consent of instructor.
- Principles on landscape pattern, change, and function. Application of theory to conservation including population viability, reserve design, multiple-use landscapes. Lab introduces GIS, GPS, and simulation models. For graduate students and motivated undergraduates.

BIOL 516 TERRESTRIAL ECOLOGY OF THE NORTHERN ROCKY MOUNTAINS
Su 2 cr. RCT 1 LAB 1
PREREQUISITE: Graduate standing, two years of classroom teaching, undergraduate science degree, and one year of biology.
- Exploration of the ecology and habitat of avian raptors in the Greater Yellowstone Ecosystem (GYE). Application of the scientific method to the study of raptors. Field identification of raptors, investigation of species life histories, and inquiry methods of species-specific habitat needs. Student will develop methods and skills for classroom based research on wildlife. This course is designed for secondary school teachers enrolled in the MSSE program.

BIOL 517 PARAMETER ESTIMATION FOR ECOLOGICAL MODELS
F alternate years, to be offered odd years
5 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 504 or equivalent.
- Statistical methods to quantify uncertainty, and to plan data collection for cost-effective reduction in uncertainty, application to ecological models where data are often sparse and processes are often noisy, and management decision must take account of uncertainty.

BIOL 519 BIOLOGY OF RIPARIAN ZONES AND WETLANDS
Su 2 cr. RCT 2
PREREQUISITE: Either BIOL 516 or BIOL 406, secondary teacher certification, two years teaching experience, and computer access.
COREQUISITE: Suggested: ESCI 512, ESCI 515.
- Students will develop plant keys for classroom use, quantitatively analyze two riparian and two wetland areas, and develop classroom activities about ecology of those areas. Distance learning class offered by internet connection. This course is designed for secondary school teachers enrolled in the MSSE program and cannot be used in graduate programs in Biological Sciences.

BIOL 520 ANIMAL BIODIVERSITY IN GYE
Su 2 cr. LEC 1 LAB 1
PREREQUISITE: BIOL 303, F&WL 301, BIOL 405, or equivalent and (a) 2 years science technology experience or (b) enrolled in MSSE.
- Exploration of biodiversity's meaning, importance & determinants; key ecological features of the Greater Yellowstone Ecosystem and patterns of change in those features; possible strategies for maintaining biodiversity in the Greater Yellowstone Ecosystem.

BIOL 521 CONSERVATION BIOLOGY
F 3 cr. LEC 3
PREREQUISITE: BIOL 503, BIOL 403 and STAT 216, or equivalents.
- A broad survey of conservation biology, with studies spanning genetics, demography/population dynamics, and community/ecosystem/landscape ecology. Approaches include empirical field studies, mathematical models and conceptual discussion. Includes lab modeling exercises extensive reading in primary literature, and writing a research paper. Cross-listed with BIOL 447.

BIOL 522 BIRDS OF PREY IN THE GREATER YELLOWSTONE ECOSYSTEM
Su 2 cr. LEC 1 LAB 1
PREREQUISITE: BIOL 503, FWL 301, BIOL 405, or equivalent and 2 years science technology experience or enrolled in MSSE.
- Exploration of the ecology and habitat of avian raptors in the Greater Yellowstone Ecosystem (GYE). Application of the scientific method to the study of raptors. Field identification of raptors, investigation of species life histories, and inquiry methods of species-specific habitat needs. Student will develop methods and skills for classroom based research on wildlife. This course is designed for secondary school teachers enrolled in the MSSE program.

BIOL 523 CONSERVATION BIOLOGY
F alternate years, to be offered even years
5 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 504 or equivalent.
- Statistical methods to quantify uncertainty, and to plan data collection for cost-effective reduction in uncertainty, application to ecological models where data are often sparse and processes are often noisy, and management decision must take account of uncertainty.
BIOL 523 WILDLIFE ECOLOGY OF THE NORTHERN ROCKY PLAINS
Su 2 cr. LEC 2
PREREQUISITE: BIOL 303, FWL 301, BIOL 405, or equivalent and 2 years science technology experience or enrolled in MSSE.
- Introduction to wildlife species and the range of habitats present in the Northern Rocky Mountain ecosystems. Emphasis on large carnivores and ungulates within montane terrestrial systems.
- Application of the scientific method to study interactions between predators, prey, and human impacts. This course is designed for middle and high school teachers.

BIOL 524 FRONTIERS IN LANDSCAPE ECOLOGY
F alternate years to be offered even years
5 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 303 or the equivalent.
- Students and instructor will write a scientific paper for publication that synthesizes an important question in landscape ecology. Students will select the topic, review and synthesize current knowledge on the topic, and write a scientific manuscript.

BIOL 525 RESEARCH METHODS AND THE SCIENTIFIC PROCESS
F 3 cr. LEC 2 RCT 1
PREREQUISITE: Graduate standing or consent of instructor.
- Application of the scientific method to answer biological questions and the development of skills needed to prepare research proposals, critique research studies and communicate research findings. For first year graduate students.

BIOL 532 PHYSIOLOGICAL PLANT ECOLOGY
F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: BIOL 303.
- Outlines the plant's Hutchinsonian niche through review of energy, water, nutrients and toxins and mechanical (including animal) factors. Computer modeling of plant function in the environment is discussed.

BIOL 533 PHYSIOLOGICAL PLANT ECOLOGY LAB
F alternate years, to be offered odd years
1 cr. LAB 1
COREQUISITE: BIOL 532.
- A research project in physiological plant ecology will be chosen, carried out and reported in scientific journal format.

BIOL 534 VEGETATION ECOLOGY
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: BIOL 303.
- Considers the composition, structure, function, distribution in time and space, ecology and classification of communities. Emphasizes universal methods, current studies and Rocky Mountain systems. Complementary field experience is available in BIOL 406.

BIOL 540 ANALYSIS OF ECOLOGICAL COMMUNITIES
F alternate years, 5 cr. LEC 2 LAB 1
- Multivariate statistical analysis of data from terrestrial or aquatic, plant or animal communities. Classification, ordination, and predictive modeling of species and communities, emphasizing a hands-on approach and practical problem solving in community ecology.

BIOL 570 INDEPENDENT STUDY
On Demand 1 - 6 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

BIOL 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND
Graduate standing and committee approval.
- A research or professional paper or project dealing with a topic in the field. The topic must be mutually agreed upon by the student and his or her major advisor and graduate committee.

BIOL 576 INTERNSHIP
On Demand 5 - 12 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

BIOL 580 SPECIAL TOPICS
On Demand 1 - 12 cr. PREREQUISITE: BIOL 405, consent of instructor.
- Courses offered on a one time basis to fulfill requirements or enrolled in MSSE.

BIOL 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 6 cr. Maximum 12 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- Courses offered on a one time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

BIOL 589 GRADUATE CONSULTATION
F, S, Su 3 cr. IND
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

BIOL 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

BIOL 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

BREN
Bio-Resources Engineering
Department of Civil Engineering
(406) 994-2111

BREN 432 ADVANCED ENGINEERING HYDROLOGY
S 3 cr. LEC 3
PREREQUISITE: CE 331.
COREQUISITE: CE 332.
- Hydrology emphasizing engineering design. Topics include modern techniques for flow estimation, flood routing and sediment yield; design of conveyance structures, and water project development.

BREN 454 GROUND WATER SUPPLY AND REMEDIATION
S 3 cr. LEC 3
PREREQUISITE: EM 335.
- Contemporary groundwater topics including water supply, contaminant transport, and remediation technologies.

BREN 441 NATURAL TREATMENT SYSTEMS
S 3 cr. LEC 3
PREREQUISITE: CE 340.
- Planning, design, and operation of remediation facilities emphasizing natural versus mechanical elements. Specific topics include stabilization ponds, constructed wetlands, land treatment, and on-site domestic systems.

BREN 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 4 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head.
- Directed research and study on an individual basis.

BREN 480 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BREN 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Maximum 4 cr.
COREQUISITE: BREN480.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

BREN 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Maximum 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

BREN 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
BUS 480 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined by each offering.
Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BSI 500 SEMINAR
F, S 1 cr. SEM 1
PREREQUISITE: Graduate status or seniors by petition.
- Presentations and discussion of current research by faculty, students, and guest lecturers on the biological, physical, cultural, economic, and social components of Montana ecosystems. Participation required of all graduate students enrolling for multidisciplinary study in the Big Sky Institute.

BSI 580 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Graduate status or seniors by petition.
- Explores interactions between the natural (i.e., nonhuman) and human processes that drive mountain ecosystems. Weekly lectures present current research on relevant topics. Required of all graduate students enrolling for multidisciplinary study in the Big Sky Institute.

BUS 101US FIRST YEAR SEMINAR
F S 3 cr. SEM 5
- Introduction to business concepts, careers, and the culture of professionalism. This freshman seminar introduces students to the principal areas of business including accounting, finance, management, and marketing, while emphasizing ethics, written and oral communication, teamwork, and critical thinking skills.

BUS 201 MANAGERIAL COMMUNICATION
F, S Su 3 cr. LEC 3
PREREQUISITE: Completion of University Seminar and Writing University Core Requirement.
- Strategies for written, oral, visual, and nonverbal communications in business organizations.

BUS 211 BUSINESS SOFTWARE APPLICATIONS
F, S 3 cr. LEC 3
PREREQUISITE: Placement exam or CS 150.
- Focuses on best business practices with word-processing, presentation, spreadsheet, and database software. Emphasis on producing and evaluating effective and efficient information designs with applications in finance, accounting, marketing, and management.

BUS 211 PRINCIPLES OF ACCOUNTING I
F, S, Su 3 cr. LEC 3
PREREQUISITE: MATH 105 or Math Placement Test.
- An introduction to the principles of financial accounting for students of all business curricula. Specific topics include key accounting concepts, accounting transaction recording, financial statement preparation, accounting systems overview, business entity structures and financial statement analysis.

BUS 222 MANAGERIAL ACCOUNTING
F, S, Su 3 cr. LEC 3
PREREQUISITE: BUS 221 and BUS 211 as pre- or corequisite.
- An introduction to the area of accounting that provides information to managers for use in planning, control, and decision making. Topics include product costing, cost-volume-profit analysis, budgeting, variance analysis, and decision analysis tools.

BUS 301 MANAGEMENT AND ORGANIZATION
F, S, Su 3 cr. LEC 3
PREREQUISITE: Junior standing and ECON 102.
- Design and control of organizations: work groups, individual behavior, interpersonal relations, communication, leadership, organizational structure, decision making, planning, control, staffing, motivation, and international issues.

BUS 302 CAREER PERSPECTIVES
F, S, Su 1 cr. LEC 1
PREREQUISITE: BUS 201. This course is limited to College of Business students.
- This highly interactive course helps students manage their career planning for business-related fields with an emphasis on proactive career exploration and planning. Topics include self-assessment, researching career information, understanding the job search process, interviewing skills, and professionalism.

BUS 311 INFORMATION SYSTEMS
F, S, Su 3 cr. LEC 3
PREREQUISITE: Junior standing, BUS 211, and BUS 221.
- A survey of the uses of information in organizational management, with emphasis on strategic systems and systems to support managerial decision making. Students apply concepts in practical application projects using currently available software.

BUS 331 OPERATIONS MANAGEMENT
F, S, Su 3 cr. LEC 3
PREREQUISITE: Junior standing and BUS 211.
- Introduction to the topics and methods of production and operations management. Emphasis is given to critical thinking, business analyses and computer modeling. Application areas include accounting, finance, marketing, and management.

BUS 341 PRINCIPLES OF MARKETING
F, S, Su 3 cr. LEC 3
PREREQUISITE: Junior standing and ECON 102.
- Marketing management decision-making in the product, price, promotion, and distribution areas. The behavioral, legal, ethical, competitive, technological, and economic environments as they affect decisions in the domestic and international organization.

BUS 351 FINANCE
F, S, Su 3 cr. LEC 3
PREREQUISITE: Junior standing and ECON 201; and MATH 170 or STAT 216; and BUS 221 or ACCT 220.
- Study of the principles of finance with emphasis on the application and integration of financial concepts in decision making.

BUS 361 INTRODUCTION TO LAW
F, S, Su 3 cr. LEC 3
PREREQUISITE: Junior standing.

BUS 474 BUSINESS SENIOR SEMINAR
F, S, Su 4 cr. LEC 1 SEM 3
PREREQUISITE: Senior standing, Formal admission to the College of Business, and completion of BUS 301, BUS 302, BUS 311, BUS 341, BUS 351, and BUS 361. This course is taken the last or next-to-last semester prior to graduation.
- Senior capstone course. Policy, strategy, and ethics will be addressed in this integrative senior capstone courses.

CAA
College of Arts and Architecture
College of Arts and Architecture
(406) 994-4405

CAA 290R COLLABORATIVE RESEARCH/CREATIVE ACTIVITY
F, S 1-4 cr. IND May be repeated. Max 8 cr.
COREQUISITE: Freshman or sophomore standing and consent of instructor.
- Intended for lower division undergraduate research and creative projects undertaken in an interdisciplinary team format. The student will work closely with students and faculty colleagues seeking creative project solutions while exploring innovative methods of collaborative problem solving.

CAA 310A HISTORY OF FILM MUSIC
F 3 cr. LEC 3
PREREQUISITE: Junior standing or permission of instructor.
- A composer and director trace the development of film music. Key concepts in the development of the film soundtrack will be examined. Various musical styles, as well as technological developments applicable to soundtrack/music production, will be studied.

CAA 490R COLLABORATIVE RESEARCH/CREATIVE ACTIVITY
F, S 1-4 cr. IND May be repeated. Max 8 cr.
COREQUISITE: Junior or higher standing and approval of instructor.
- Intended for upper division undergraduate research and creative projects undertaken in an interdisciplinary team format. The student will work closely with students and faculty colleagues seeking creative project solutions while exploring innovative methods of collaborative problem solving.
CE 101 INTRODUCTION TO CIVIL ENGINEERING
F 1 cr. LEC 1
PREREQUISITE: Must be taken within your freshman year.
- This course is optional for students entering civil engineering but is encouraged for freshmen wanting to learn about the breadth of the discipline. Students choosing to take the course will be introduced to civil engineering, including department programs and areas of specialty, civil engineering career options, professionalism, history, and ethics.

CE 201 SURVEYING
F, S; Su on demand, 3 cr. LEC 2 LAB 1
PREREQUISITE: MATH 175 or MATH 181.
- Surveying field practice, error propagation analysis, survey for project design.

CE 202 APPLIED ANALYSIS & TECHNICAL COMMUNICATION
F, S 2 cr. LEC 2 LAB 2
PREREQUISITE: MATH 175 or MATH 181.
- Computer applications in civil engineering using math-based software and a programming language. Introduction to engineering communication.

CE 220 CS CIVIL ENGINEERING & CONSTRUCTION-FROM THE ANCIENT TO THE MODERN
Su 3 cr. LEC 3
- Through the lenses of civil engineering and construction, follow the advancement of civilizations. Assess and evaluate decisions that we must make as a society with respect to protecting the health of the public and the environment with our finite resources.

CE 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CE 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CE 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

CE 307 CONSTRUCTION ESTIMATING & BIDDING
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 202 or CET 203 and CE 308.
- Preparation of cost estimates and bids for construction projects. Introduction of computer estimating software and procedures.

CE 308 CONSTRUCTION PRACTICE
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: BUS 201 and ME 116.
- Contract documents, insurance, bonding, specifications, drawings, labor and labor law, estimating, bidding and scheduling, business organizations, leadership, and ethics. Significant technical and business writing required.

CE 312 STRUCTURES I
F, S 3 cr. LEC 3
PREREQUISITE: EM 253.
- Study of loading on structures. Study of structural systems and systems modeling. Analysis of determinate and indeterminate structures. Introduction to matrix methods. Introduction to structural analysis software. Introduction to design approaches and philosophies.

CE 315 STRUCTURES II
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 312.
- Structural design of steel and reinforced concrete members used in buildings and bridges. Theory and application of design codes. Laboratory experience utilizing construction materials.

CE 320 GEOTECHNICAL ENGINEERING
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: EM 253.

CE 331 ENGINEERING HYDROLOGY
F 2 cr. LEC 2
PREREQUISITE: CHE 132.
- Surveying field practice, error propagation analysis, survey for project design.

CE 332 ENGINEERING HYDRAULICS
F, S 2 cr. LEC 1 LAB 1
PREREQUISITE: EM 335.
- Pipe flow, open channel flow, and hydraulic machines with applications in water resources engineering.

CE 340 PRINCIPLES OF ENVIRONMENTAL ENGINEERING
F, S 3 cr. LEC 3
PREREQUISITE: CHEM 132.
COREQUISITE: EM 335.
- Environmental science utilizing construction materials.
- Introduction to design approaches and philosophies.

CE 350 TRANSPORTATION ENGINEERING
F 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 201.
- Introduction to vehicle operating characteristics, geometric and pavement design, traffic flow theory, signal design and analysis, capacity analysis and planning. Laboratory work will introduce various in-practice software packages.

CE 351 ENGINEERING HYDROLOGY
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 201.
- Contract documents, insurance, bonding, specifications, drawings, labor and labor law, estimating, bidding and scheduling, business organizations, leadership, and ethics. Significant technical and business writing required.

CE 361 LEGAL PRINCIPLES IN SURVEYING
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 201.
- Principles of the profession: case law, legal aspects of boundary location, monumentation, and property descriptions.

CE 362 PUBLIC LAND SURVEY SYSTEM
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 201.
- Federal and state laws and regulations governing legal land surveying; case studies and professional responsibilities.

CE 363 ADVANCED SURVEYING COMPUTATIONS
S alternate years, to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 201.
- Modern instrumental and computational techniques in surveying.

CE 401 PROFESSIONAL PRACTICE AND ETHICS
F, S 1 cr. RCT 1
PREREQUISITE: Concurrent registration with CE 457 required.
- Professional ethics, social responsibility, public policy, and leadership.

CE 404 HEAVY CONSTRUCTION EQUIPMENT & METHODS
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: STAT 216, I & ME 325, and CET 302 or CS 520.
COREQUISITE: CE 307.
- Construction equipment operating characteristics, economics, and production rate estimation. Heavy construction methods associated with tunneling, aggregate production, and mass earthwork operations.

CE 405 CONSTRUCTION PROJECT PLANNING & SCHEDULING
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 307.
- Project planning and scheduling procedures involving both network (CPM) and non-network techniques. Introduction to computer scheduling software.

CE 413 REINFORCED CONCRETE DESIGN
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CE 315.
- Design of reinforced concrete members and systems.

CE 414 STEEL DESIGN
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 315.
- Design of structural steel members and systems.

CE 415 DESIGN OF MASONRY STRUCTURES
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CE 315.
- Design of masonry structures.

CE 416 DESIGN OF WOOD AND TIMBER STRUCTURES
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 315.
- Students will be exposed to the basic behavior of wood and timber structures. They will also be exposed to the current building codes and methodology for the design of wood and timber structures.
CE 420 EARTH AND FOUNDATION ENGINEERING  
F 3 cr. LEC 3  
PREREQUISITE: CE 320.  
- Application of soil mechanics principles to the engineering of shallow and deep foundations, analysis of lateral earth pressures and design of retaining walls, and the stability of natural and engineered slopes.

CE 425 GEOTECHNICAL STRUCTURES  
F 3 cr./LEC 3  
PREREQUISITE: CE 320.  
- Analysis of lateral earth pressures and design of retaining structures and braced excavations. Stability analysis of natural and engineered slopes. Analysis and design of embankments and dams.

CE 431 OPEN CHANNEL HYdraulICS  
F 3 cr. LEC 3  
PREREQUISITE: CE 332 or consent of the instructor.  
- Principles of open channel flow; hydraulic design of open channel structures.

CE 435 CLOSED-CONDUIT HYdraulICS  
S 3 cr. LEC 3  
PREREQUISITE: CE 332.  
- Advanced topics in hydraulic engineering, with emphasis on analysis and design of pipe transmission lines, pumps, and pipe distribution networks.

CE 451 HIGHWAY PAVEMENTS  
S alternate years, to be offered even years  
S 3 cr. LEC 2 LAB 1  
PREREQUISITE: CE 320, CE 350.  
- Design of highway pavements including drainage and base/subbase/subgrade preparation. Laboratory in bituminous materials.

CE 452 TRAFFIC ENGINEERING AND ITS  
F alternate years, to be offered odd years  
S 3 cr. LEC 2 LAB 1  
PREREQUISITE: CE 350, I&ME 350.  
- Application of driver, vehicle, and roadway characteristics to principles of traffic control, operations, and safety. Traditional and advanced technology solutions will be explored.

CE 454 TRANSPORTATION PLANNING  
F alternate years, to be offered even years  
S 3 cr. LEC 2 LAB 1  
PREREQUISITE: CE 350, I&ME 350.  
- Transportation planning process and travel demand forecasting including trip generation, trip distribution, mode split and traffic assignment. Laboratory work will introduce TransCADWin software.

CE 456 HIGHWAY GEOMETRIC DESIGN  
S 3 cr. LEC 3  
PREREQUISITE: CE 301, CE 350.  
- Advanced geometric design of highway systems including two-lane and interstate roadways and intersection design and traffic control.

CE 457R SENIOR PROJECT I  
F, S 2 cr. RCT 1 LAB 1  
PREREQUISITE: Student must be within two semesters of graduation.  
COREQUISITE: I&ME 325, CE 308 and ENGR 310. Concurrent registration with CE 401 is required.  
- Senior capstone course. Discussion of the design process from conceptual/preliminary design to final design, plans, and specifications. Develop proposal for engineering services, including scope of work, data acquisition, and organization of design team.

CE 458R SENIOR PROJECT II  
F, S 2 cr. RCT 1 LAB 1  
PREREQUISITE: CE 457.  
- Senior capstone course. Design of an engineering project. Evaluation of design alternatives and design recommendations. Development of construction documents. Discussion of project management, cost estimates, and engineering services during construction.

CE 463 PHOTOGRAMMETRY  
F alternate years, to be offered odd years 2 cr.  
LEC 1 LAB 1  
PREREQUISITE: MATH 175 or MATH 181.  
- Measurement and computation techniques for mapping from photographs; photo geometry, flight planning, ground control, cameras, control extension, stereoscopic instruments.

CE 464 PROJECT DESIGN IN SURVEYING  
S alternate years, to be offered odd years 5 cr.  
LEC 2 LAB 1  
PREREQUISITE: CE 501.  
- Surveying requirements of large project; land subdivision, utilities, topography, and earthwork. Term project research and report required.

CE 470 INDEPENDENT STUDY  
On Demand 1 - 3 cr.  
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head.  
- Directed research and study on an individual basis.

CE 476 INTERNSHIP  
On Demand 2 cr.  
PREREQUISITE: Junior standing, consent of instructor and approval of Department Head.  
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. Students may not take this course the semester they graduate.

CE 480 SPECIAL TOPICS  
On Demand 1 - 4 cr.  
PREREQUISITE: Course prerequisites as determined for each offering.  
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CE 488R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION  
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.  
COREQUISITE: CE 490.  
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CE 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY  
F, S, Su 1 - 4 cr. IND May be repeated. Max 12 cr.  
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

CE 500 SEMINAR  
F, S 1 cr. SEM 1 Maximum 4 cr.  
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.  
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

CE 504 CONSTRUCTION PRODUCTIVITY  
On Demand 3 cr. LEC 3  
PREREQUISITE: One year of experience or one internship (CE 476 or CET 476).  
COREQUISITE: CET 408 or equivalent.  
- Productivity improvement data collection, analysis, and solutions to include the construction work face and the office. Human factors and economics involved in productivity will be emphasized.

CE 505 QUALITY ASSURANCE/RISK MANAGEMENT IN CONSTRUCTION  
On Demand 3 cr. LEC 3  
PREREQUISITE: Either I&ME 350, I&ME 554 or STAT 332 and CE 308 or equivalent plus one year of industrial experience or one internship (CE 476 or CET 476).  
- Analysis of quality assurance and control concepts to include utilization of statistical analysis. Application of risk analysis principles to the construction process to minimize liability and project costs.

CE 506 ADVANCED CONSTRUCTION MANAGEMENT  
On Demand 3 cr. LEC 3  
PREREQUISITE: One year of industrial experience or one internship (CE 476 or CET 476).  
COREQUISITE: CET 408 or equivalent.  
- Quality improvement techniques to include Total Quality Management and Partnering. Enlightened leadership and management concepts.

CE 511 BUILDING STRUCTURAL SYSTEMS  
F alternate years, to be offered even years  
2 cr. LEC 2  
PREREQUISITE: CE 413 or CE 414 or CE 415 or CE 416.  
COREQUISITE: CE 512.  
- Analysis of military structural systems. Emphasis on lateral force resisting systems in buildings.

CE 512 STRUCTURAL DYNAMICS  
F alternate years, to be offered even years  
2 cr. LEC 2  
PREREQUISITE: CE 512.  
- Response of structures to dynamic loads, including seismic loads.

CE 513 BEHAVIOR OF CONCRETE STRUCTURES  
S alternate years, to be offered odd years  
S 3 cr. LEC 3  
PREREQUISITE: CE 413.  
- Behavior of reinforced concrete members, frames, and shear wall systems. Significance of behavior in design of reinforced concrete structures.

CE 514 BEHAVIOR OF STEEL STRUCTURES  
S alternate years, to be offered even years  
S 3 cr. LEC 3  
PREREQUISITE: CE 414 and EM 415.  
- Behavior of steel members and frames. Significance of behavior in design of steel structures.

CE 519 BRIDGE & Prestressed Concrete Design  
F alternate years, to be offered odd years  
S 5 cr. LEC 3  
PREREQUISITE: CE 515.  
- Design of concrete structures utilizing pre- and post-tensioned concrete elements. Introduction to bridge analysis and design.
CE 551 APPLIED GEOTECHNICAL ENGINEERING
F alternate years, to be offered even years 3 cr.
LEC 2 LAB 1
PREREQUISITE: CE 320.
- Principles of advanced geotechnical laboratory testing and field investigative techniques. Application of laboratory and field test results to the geotechnical design of soil-supported structures.

CE 524 ADVANCED SOIL MECHANICS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 320.
- Topics leading to an advanced understanding of the behavior of soils with an emphasis on settlement and shear strength.

CE 529 GROUNDWATER CONTAMINATION
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: BREN 454.
- Subsurface mass transport and microbial processes and their affect on fate and transport of organic and inorganic contaminates. Bioremediation and other contemporary remediation technologies will be emphasized.

CE 530 ADVANCED HYDRAULIC INVESTIGATIONS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CE 431.
- Advanced topics in open channel flow.

CE 552 ROAD ECOLOGY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CE 350 or consent of instructor.
- This course provides multidisciplinary coverage of ecological effects of transportation systems, primarily focusing on rural highways. Ecological impacts on air quality, water quality, vegetation, and wildlife will be covered (there will be more coverage of impacts to wildlife than the other areas).

CE 554 TRANSPORTATION SAFETY
S 3 cr. LEC 3
PREREQUISITE: CE 350 or consent of instructor.
- This course addresses safety of the highway system as related to design, construction, and operations. The course provides an overview of the various elements of the highway system namely, road users, vehicles, roadways, and environment as related to safety. Apart from the introduction, the course is structured in three distinct components that represent the sequential stages in highway life; i.e. design, construction, and operations.

CE 556 TRAFFIC FLOW FUNDAMENTALS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CE 350 or consent of instructor.
- This course covers traffic stream parameters, their relationships, and important analytical techniques in traffic engineering such as capacity analysis, queueing analysis, shockwave analysis, and traffic simulation. Topics covered are essential in understanding the behavior of vehicular traffic as a complex system.

CE 570 INDEPENDENT STUDY
On Demand 1 - 3 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

CE 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

CE 576 INTERNSHIP
On Demand 2 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of Department Head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

CE 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CE 589 GRADUATE CONSULTATION
F, S, Su 1-3 cr. TUT
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

CE 590 MASTER'S THESIS
F, S, S 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

CE 690 DOCTORAL THESIS
F, S, Su 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

CET Construction Engineering Technology
Department of Civil Engineering
(406) 994-2111

CET 202 CONSTRUCTION SURVEYING & EARTHWORK
S 3 cr. LEC 2 LAB 1
PREREQUISITE: CE 201.
- Advanced construction and route surveys, earthwork mass diagrams, quantity takeoff, computer analysis.

CET 205 APPLIED ANALYSIS FOR TECHNOLOGISTS
F, S 1 cr. LAB 1
PREREQUISITE: MATH 175.
- Students will develop computer based solutions to problems encountered in construction engineering technology. Topics includes advanced applications of contemporary software and the development of user-defined subroutines for specific applications.

CET 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CET 290R UNDERGRADUATE RESEARCH/CREATIVITY INSTRUCTION
F, S 1-3 cr. SRT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CET 290R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

CET 302 SOILS & FOUNDATIONS
F, S 4 cr. LEC 3 LAB 1
COREQUISITE: EM 215 and ESCI 111. 
- Physical properties of construction materials with emphasis on soils, aggregates and asphalt. Earth pressures, flow nets, bearing capacity, retaining walls and slope stability.

CET 305 CONCRETE TECHNOLOGY & STRUCTURES
S 3 cr. LEC 2 LAB 1
PREREQUISITE: EM 215.
- Properties of concrete constituents, and service properties of concrete, mix design, field practices. Concrete reinforcing requirements and analysis of concrete members.

CET 408R CONSTRUCTION PROJECT MANAGEMENT
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: BUS 361, 1 & ME 325, and ENGR 310.
COREQUISITE: CE 404 and CE 405; student must be graduating the semester of enrollment in CET 408.
- A senior capstone course encompassing total project control through introduction of a professional construction management organization to ensure cost effectiveness and early completion of a project. Construction safety.

CET 412 STRUCTURAL ELEMENTS
S 3 cr. LEC 3
PREREQUISITE: EM 215.
COREQUISITE: CET 305.

CET 470 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 4 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head.
- Directed research and study on an individual basis.

CET 476 INTERNSHIP
On Demand 1-2 cr. IND
PREREQUISITE: Sophomore standing, consent of instructor, and approval of Department Head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. Students may not take this course the semester they graduate.
COURSE DESCRIPTIONS: CET 480 - CHBE 442

CHBE Department of Chemical and Biological Engineering
Chemical Engineering Program and Bioengineering Program
(406) 994-2221.

CHBE 100 INTRODUCTION TO CHEMICAL & BIOLOGICAL ENGINEERING
F 2 cr. LEC 1 LAB 1
COREQUISITE: MATH 160 or above.
- An introduction to-engineering measurements, computations, problem solving, and experimental design. Discussion of the breadth of opportunities in chemical and biological engineering.

CHBE 120 CHEMICAL AND BIOLOGICAL ENGINEERING COMPUTATIONS
S 2 cr. LEC 2
COREQUISITE: MATH 181.
- Effective methods for applying the computer to common numerical problems encountered in chemical engineering. Chemical engineering examples will provide a basis for more comprehensive problems encountered in the other professional level courses.

CHBE 213 MATERIALS SCIENCE
F, S 5 cr. LEC 3
PREREQUISITE: CHEM 131 or CHEM 121.
COREQUISITE: MATH 175 OR MATH 181.
- Chemistry and internal structure of solids and the relationship of structure to physical and mechanical properties of metals and nonmetallic solids.

CHBE 215 ELEMENTARY PRINCIPLES I
F 5 cr. LEC 5
PREREQUISITE: CHEM 131 and MATH 181.

CHBE 216 ELEMENTARY PRINCIPLES II
S 3 cr. LEC 3
PREREQUISITE: CHBE 215, MATH 182.
- Energy balances and combined energy-material balances. Discussion of contemporary issues in engineering and the impact of engineering solutions in a global, economic, environmental and societal context.

CHBE 226 PRINCIPLES OF BIOLOGICAL ENGINEERING
S 3 cr. LEC 3
PREREQUISITE: CHBE 215, MATH 182.
- Fundamentals of energy balances in biological engineering applications.

CHBE 270 INDEPENDENT STUDY
On Demand 1-3 cr. IND May be repeated.
- Directed research and study on an individual basis.

CHBE 280 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of the Associate Dean.
- Directed research and study on an individual basis.

CHBE 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-2 cr. IND May be repeated. Max 4 cr.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CHBE 321 FLUID MECHANICS OPERATIONS
F, S 3 cr. LEC 3
COREQUISITE: MATH 224.
- Deterministic modeling techniques are applied to chemical engineering operations involving heat transfer. Equipment design and computations of operational rates.

CHBE 322 MASS TRANSFER OPERATIONS
S 3 cr. LEC 3
PREREQUISITE: CHBE 307, CHBE 321.
- Theory and equipment for fundamental chemical engineering operations involving mass transfer. Equipment design and computations of operational rates.

CHBE 323 BIONIATERIALS ENGINEERING
S 3 cr. LEC 3
PREREQUISITE: CHBE 213, CHBE 226, MB 301 or BCHM 540, CHEM 215 or CHEM 311.

CHBE 328 CHEMICAL REACTION ENGINEERING
S 3 cr. LEC 3
PREREQUISITE: CHBE 216, MATH 225.
- Application of the chemical kinetics of homogeneous and heterogeneous reactions to the design of chemical processing equipment.

CHBE 407 CHEMICAL ENGINEERING THERMODYNAMICS II
F 2 cr. LEC 2 cr.
PREREQUISITE: CHBE 307 and CHBE 325 and CHBE 328.
- Application of laws of thermodynamics to physical, chemical, and biological engineering operations. Identification, quantification, and processing of thermodynamic phenomena. Vapor-liquid phase equilibrium, liquid-liquid phase equilibrium, and chemical reaction equilibrium.

CHBE 411R CHEMICAL & BIOLOGICAL ENGINEERING DESIGN I
F 2 cr. LEC 1 RCT 1
PREREQUISITE: CHBE 323, CHBE 328, and CHBE 438.
- Senior capstone course. Design and simulation of chemical engineering equipment, processes and plants.

CHBE 412R CHEMICAL & BIOLOGICAL ENGINEERING DESIGN II
S 3 cr. LEC 1 RCT 1
PREREQUISITE: CHBE 438.
- Senior capstone course. Design and economic analysis of chemical engineering equipment, processes and plants.

CHBE 424 TRANSPORT ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: CHBE 323, MATH 224, MATH 225.
- Deterministic modeling techniques are applied to processes for the transport of momentum, energy and mass. Analytical and numerical solution techniques for the differential equations commonly encountered in the transport processes.

CHBE 438 BIOPROCESS ENGINEERING
S 3 cr. LEC 3
PREREQUISITE: BCHM 540 or MB 301 and CHBE 216.
- Biotechnology process engineering - microbial process fundamentals, enzyme catalysis, bioreactor design and analysis, separation of biomaterials.

CHBE 442 CHEMICAL & BIOLOGICAL ENGINEERING LABORATORY I
F 2 cr. LEC 1 LAB 1
PREREQUISITE: CHBE 323, CHBE 438, University Seminar and ENGL 121.
- Experimental studies of unit operations and transport phenomena. Pilot plant studies. Design of chemical processes and equipment from experimental studies.
COURSE DESCRIPTIONS: CHBE 443 - CHBE 551

CHBE 443 CHEMICAL & BIOLOGICAL ENGINEERING LABORATORY II
S 2 cr. LEC 1 LAB 1
PREREQUISITE: CHBE 442.
- Experimental studies of unit operations and transport phenomena. Design of chemical processes and equipment from experimental studies.

CHBE 451 PROCESS DYNAMICS & CONTROL
S 3 cr. LEC 3
PREREQUISITE: CHBE 328, CHBE 323, MATH 225.
- Transient response analysis of controllers and instruments. Design of chemical process control systems.

CHBE 452 ADVANCED ENGINEERING MATERIALS
On Demand 3 cr. LEC 3
PREREQUISITE: CHBE 213, CHBE 215, MATH 225.
- Micro and macro properties of electronic materials and material processing.

CHBE 461 BIOENGINEERING LABORATORY I
F 2 cr. LEC 1 LAB 1
PREREQUISITE: CHBE 324, CHBE 438, IAME 350.
- Students will develop an experimental objective and experimental design to meet a particular objective. Independently investigate the relevant theory for a proposed experiment, analyze data for statistical significance, draw conclusions from the experimental data. They will then effectively communicate the technical information through written reports.

CHBE 462 BIOENGINEERING LABORATORY II
S 2 cr. LEC 1 LAB 1
PREREQUISITE: CHBE 461.
- Students will develop an experimental objective and experimental design to meet a particular objective. Independently investigate the relevant theory for a proposed experiment, analyze data for statistical significance, draw conclusions from the experimental data. They will then effectively communicate the technical information through written reports.

CHBE 463 COMPOSITE MATERIALS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHBE 213.
- Structure and properties of composite materials and design procedures for composite structures. Crosslisted with ME 463.

CHBE 467 INTRODUCTION TO POLYMER ENGINEERING
F 3 cr. LEC 3
PREREQUISITE: CHBE 213, CHBE 215.
- The nature and special characteristics of synthetic high polymers and the technology of their manufacture and processing.

CHBE 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

CHBE 476 INTERNSHIP
On Demand 1 - 12 cr. IND Maximum 12 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of associate dean.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

CHBE 480 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering. CHBE 480 requires Internship.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHBE 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 3 cr. May be repeated. 4 cr.
PREREQUISITE: CHBE 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CHBE 490 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 3 cr. May be repeated. 12 cr.
PREREQUISITE: Senior Standing.
- Directed undergraduate research/creative activity which may culminate in research paper, journal article, or undergraduate thesis.

CHBE 498 CO-OP EXPERIENCE
On Demand 1-2 cr. IND
PREREQUISITE: Co-op program participant, junior or senior.
- An individualized cooperative education assignment arranged to provide guided experience in the field.

CHBE 500 SEMINAR
F 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

CHBE 503 THERMODYNAMICS
F 3 cr. LEC 3
- Chemical engineering application to phase equilibria and chemical reaction equilibrium. Liquid - liquid, vapor - liquid, and multiple reaction system.

CHBE 506 SEPARATIONS
On Demand 3 cr. LEC 3
PREREQUISITE: CHBE 323.
- Theory and practice of industrial reactions, kinetics, synthesis, modeling of fixed and fluidized beds, process design problems.

CHBE 510 REACTION ENGINEERING: JUNCTION MODELING
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHBE 328.
- Theory and practice of industrial reactions, kinetics, synthesis, modeling of fixed and fluidized beds, process design problems.

CHBE 511 CATALYSIS AND APPLIED SURFACE CHEMISTRY
On Demand 3 cr. LEC 3
PREREQUISITE: CHBE 328.
- The fundamental principles of catalysis, surface chemistry, and reactor design at a working research level.

CHBE 519 SURFACE ENGINEERING
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: Graduate standing.
- Consideration of chemistry and instrumentation needed in engineering design and research, including surface science, and materials.

CHBE 522 ADVANCED ENGINEERING ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: One of the following: ME 450, ME 526, EM 535.

CHBE 525 NUMERICAL SOLUTIONS TO ENGINEERING PROBLEMS
S 3 cr. LEC 3
PREREQUISITE: ME 510.
- Numerical methods used to solve common chemical engineering research problems. Solutions to nonlinear equations. Optimization methods. Cross listed with ME 511-01.

CHBE 530 TRANSPORT PHENOMENA
F 3 cr. LEC 3
PREREQUISITE: CHBE 307, CHBE 322.
- Comprehensive treatment of mass, momentum, and energy transport. Cross listed with ME 533.

CHBE 533 VISCOUS FLUID DYNAMICS
On Demand 3 cr. LEC 3
PREREQUISITE: CHBE 323.

CHBE 534 MASS TRANSFER
On Demand 3 cr. LEC 3
PREREQUISITE: CHBE 424.
- Mass transfer theory, transport in liquids, porous solids, interfacial effects, related mathematical techniques and application.

CHBE 550 FAILURE OF MATERIALS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: One of the following: CHBE 463, EM 415, ME 430.
- Concepts of brittle and ductile fracture, fatigue, creep-rupture and environmentally assisted fracture. Applications to metals, polymers, ceramics and composite materials. This course is cross listed with ME 550.

CHBE 551 ADVANCED COMPOSITE MATERIALS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHBE 463.
- Advanced treatment of composite materials, including constituent properties, interfaces, micromechanics, microscopic behavior, modes and mechanisms of failure. This course is cross-listed with ME 551.
CHEM 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

CHEM 575 RESEARCH OR PROFESSIONAL PAPER PROJECT
On Demand 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing. A research or professional dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee. - Directed research and study on an individual basis.

CHEM 576 CHEM GRAD INTERNERNSHIP
F, Su 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of advisor and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

CHEM 580 SPECIAL TOPICS
On Demand 1 - 5 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHEM 589 GRADUATE CONSULTATION
F, S, Su 5 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

CHEM 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND
PREREQUISITE: Master’s standing.

CHEM 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND
PREREQUISITE: Doctoral standing.

CHEM Chemistry
Department of Chemistry & Biochemistry
(406) 994-4801

CHEM 101CS APPLYING CHEMISTRY TO SOCIETY
S 3 cr. LEC 3
- An introduction to contemporary Chemistry in the contextual framework of current issues including the effect of human impact on the air, water, and earth. This course will examine the scientific basis for current scientific and societal issues such as depletion of the ozone layer, water pollution, acid rain, genetic engineering and nuclear fusion among other issues. Topics will be addressed from a scientific viewpoint to develop knowledge and understanding of the chemical concepts that underlie these contemporary issues. The goal is to inform non-science majors of chemical and scientific issues in order to help them to become well-informed, inquiring citizens.

CHEM 121IN INTRODUCTORY GENERAL CHEMISTRY
F, S, Su 4 cr. LEC 3 LAB 1
PREREQUISITE: High school algebra.
- Introductory general chemistry. Measurement systems, atomic structure, chemical periodicity, bonding, chemical reactions, acid-base chemistry, electrochemistry, nuclear chemistry.

CHEM 131 GENERAL CHEMISTRY I
F, S, Su 4 cr. LEC 3 LAB 1
PREREQUISITE: One year of high school chemistry. Two years of high school math including algebra, or math test score to be eligible for college calculus.
- The first of a two-semester course sequence about the general principles of modern chemistry with emphasis on atomic structure, chemical bonding, the periodic table, equilibria, chemical reactivity, and kinetics.

CHEM 132 GENERAL CHEMISTRY II
F, S, Su 4 cr. LEC 3 LAB 1
PREREQUISITE: CHEM 131 or CHEM 141.
- The second semester of the two-semester general chemistry sequence.

CHEM 141 HONORS GENERAL CHEMISTRY I
F 4 cr. LEC 3 LAB 1
PREREQUISITE: High school chemistry and physics, high school algebra, and some additional mathematics.
- Topic coverage parallels CHEM 131 with emphasis on critical and analytical thought and with a greater reliance on math skills. For departmental honors program.

CHEM 142 HONORS GENERAL CHEMISTRY II
S 4 cr. LEC 3 LAB 1
PREREQUISITE: A grade better than a C in Chem 131 or Chem 141.
- Topic coverage parallels CHEM 132, with emphasis on critical and analytical thought and with a greater reliance on math skills. For departmental honors program.

CHEM 280 SPECIAL TOPICS
F 4 cr. LEC 3 LAB 1
PREREQUISITE: MATH 170, PHYS 205, and CHEM 215 or CHEM 312.
- A physical chemistry course directed toward the life sciences, health professions, and agricultural sciences.

CHEM 290 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CHEM 290B UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

CHEM 300 UNDERGRADUATE SEMINAR III
F 1 cr. SEM 1
PREREQUISITE: CHEM 201 or BCHM 201.
- Seminar reporting and presentation skills. Career planning and resume preparation. May be repeated once.

CHEM 501 ELEMENTS OF PHYSICAL CHEMISTRY
F 4 cr. LEC 4
PREREQUISITE: MATH 170, PHYS 205, and CHEM 215 or CHEM 312.
- A physical chemistry course directed toward the life sciences, health professions, and agricultural sciences.

CHEM 502 PHYSICAL CHEMISTRY LABORATORY
F 1 cr. LAB 1
PREREQUISITE: or COREQUISITE: CHEM 501.
- The laboratory to accompany CHEM 501.
COURSE DESCRIPTIONS: CHEM 311 - CHEM 516

CHEM 311 ORGANIC CHEMISTRY I
F, S S 4 cr. LEC 3 LAB 1
PREREQUISITE: CHEM 132 or CHEM 142.
- The first of a two-semester professional sequence in organic chemistry. In-depth coverage of stereochemistry, synthetic organic chemistry, physical organic chemistry, spectroscopy, and nomenclature. Students should register for both semesters.

CHEM 312 ORGANIC CHEMISTRY II
S, Su 4 cr. LEC 3 LAB 1
PREREQUISITE: CHEM 311.
- The second semester of the two-semester professional sequence in organic chemistry.

CHEM 314 HONORS ORGANIC CHEMISTRY I
F 4 cr. LEC 3 LAB 1
PREREQUISITE: CHEM 141 and CHEM 142 or consent of instructor.
- CHEM 314 is the first of a two-semester honors sequence in organic chemistry. Topic coverage parallels CHEM 311, but at an accelerated pace with in-depth coverage of physical organic chemistry, stereochemistry, synthetic organic chemistry, spectroscopy, and nomenclature.

CHEM 315 HONORS ORGANIC CHEMISTRY II
S 4 cr. LEC 3 LAB 1
PREREQUISITE: A grade of better than a C in CHEM 314.
- CHEM 315 is the second semester of the two-semester honors sequence in organic chemistry. Topic coverage parallels CHEM 312, with more in-depth coverage of mechanisms and more emphasis on retrosynthetic analysis and on solving multi-step synthesis problems.

CHEM 321 PHYSICAL CHEMISTRY I
F, Su 3 cr. LEC 3
PREREQUISITE: CHEM 132 or CHEM 142, PHYS 206, MATH 182.
COREQUISITE: MATH 224.
- The first semester of a two-course sequence for science and engineering majors. Topic coverage includes atomic structure and chemical bonding with emphasis on properties, structure, and the reactions of representative members of the various families of the periodic table.

CHEM 323 PHYSICAL CHEMISTRY II
S, Su 4 cr. LEC 3
PREREQUISITE: CHEM 301 or CHEM 324.
- A systematic presentation of atomic structure and chemical bonding with emphasis on properties, structure, and the reactions of representative members of the various families of the periodic table.

CHEM 324 INORGANIC CHEMISTRY
S 5 cr. LEC 3
COREQUISITE: CHEM 301 or CHEM 324.
- Systematic presentation of atomic structure and chemical bonding with emphasis on properties, structure, and the reactions of representative members of the various families of the periodic table.

CHEM 401 CAPSTONE SEMINAR
S 1 cr. SEM 1
PREREQUISITE or COREQUISITE: CHEM 500 or BCHM 300.
- Senior capstone course. Taught in collaboration with departmental Honors Thesis, CHEM 451. The chemistry/biochemistry research undergraduate experience constitutes a synthesis of our (bio)chemistry class room and laboratory education. The projects are orally presented in seminar form, discussed on the basis of acquired knowledge, and analyzed using stringent scientific methods and criteria. A complete personal resume is prepared. May be repeated once.

CHEM 417 SYNTHE TIC CHEMISTRY
F 3 cr. LEC 3
PREREQUISITE: CHEM 312.
- Organic and inorganic reaction chemistry for advanced students. Modern reagents and transformations are treated in detail, along with relevant theoretical and mechanistic considerations.

CHEM 425 INSTRUMENTAL ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: CHEM 228.
COREQUISITE: CHEM 301 or CHEM 324.
- An advanced analytical chemistry course which covers modern instrumental methods based on spectrochemical and electrochemical principles.

CHEM 428 INSTRUMENTAL ANALYSIS LAB
F 2 cr. LAB 1
COREQUISITE: CHEM 426.
- The laboratory to accompany CHEM 428.

CHEM 451 DEPARTMENTAL HONORS THESIS
S 1 cr. LEC 1
PREREQUISITE: CHEM 490 or BCHM 490 (minimum of 3 cr).
- Thesis format and style will be illustrated, discussed, and monitored. Draft portions of manuscripts are to be completed on a regular schedule. Required of all candidates for departmental honors.

CHEM 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

CHEM 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHEM 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: CHEM 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CHEM 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

CHEM 500 SEMINAR
On Demand 1 cr. SEM Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

CHEM 505 CRITICAL CONCEPTS IN CHEMISTRY
Su 3 cr. LEC 2 LAB 1
PREREQUISITE: CHEM 365 or CHEM 505 or equivalent.
- Course explores innovations in laboratory facilities and new learning strategies that encourage discovery-based learning. Class will explore ways to use computer technology to engage students in discovery-based learning.

CHEM 506 INTEGRATING COMPUTERS INTO LABORATORY INSTRUCTION
Su 3 cr. LEC 2 LAB 1
PREREQUISITE: Secondary teacher certification and 2 years teaching experience. One year introductory chemistry course (CHEM 131 and 132) and coursework or experience equivalent to one semester physical chemistry (CHEM 301). A baccalaureate degree and experience teaching science at the secondary level are required.
- The course will examine and discuss fundamental and critical concepts in chemistry. A practical laboratory component will enable students to develop laboratory and/or demonstration projects for each concept. Individual student-generated presentations are a key course component.

CHEM 507 MODERN ORGANIC AND BIOCHEMISTRY
S 3 cr. RCT 3
PREREQUISITE: Secondary teaching certification and 2 years teaching experience. One year introductory chemistry course (CHEM 131,132) and coursework or experience equivalent to one semester physical chemistry (CHEM 301). A baccalaureate degree and experience teaching science at the secondary level are required.
- The course will examine/discuss fundamental information and concepts in organic chemistry and biochemistry. A module based on drug development will exemplify major topics. Information acquired via the internet will be a significant course component. (A distance learning course)

CHEM 515 STRUCTURE AND BONDING IN INORGANIC CHEMISTRY
F 3 cr. LEC 3
PREREQUISITE: CHEM 354.
- Spectroscopy, structure, and bonding of coordination and organometallic compounds.

CHEM 516 MECHANISMS AND DYNAMICS IN INORGANIC CHEMISTRY
S 3 cr. LEC 3
PREREQUISITE: CHEM 354.
- Mechanisms and dynamics of the reactions of coordination and organometallic compounds.
CHEM 523 ORGANIC REACTION MECHANISMS
F 3 cr. LEC 3
PREREQUISITE: CHEM 512.
COREQUISITE: CHEM 533.
A problem solving course concentrating on analyzing organic reactions and transformations via electron-pushing mechanisms. Problems chosen will be from the current chemical literature.

CHEM 524 MASS SPECTROMETRY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHEM 523 or CHEM 501.

CHEM 525 CHEMICAL REACTIONS AND TRANSPORT IN ANALYTICAL METHODS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHEM 524.
Treatment of complex chemical equilibria, kinetics, and mass transport in the solution and gas phases with respect to their effects on methods of chemical analysis.

CHEM 526 ADVANCED PROTEIN NMR SPECTROSCOPY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHEM 523.
This lecture-based course is designed to teach the fundamental principles of nuclear magnetic resonance (NMR) spectroscopy as it applies to the structural elucidations of proteins in solution. Pre-requisites include familiarity with linear algebra and basic trigonometric functions and CHEM 523.

CHEM 527 OPTICAL SPECTROSCOPY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHEM 523.
Use of optical spectroscopic methods for chemical analysis.

CHEM 533 PHYSICAL ORGANIC CHEMISTRY
F 3 cr. LEC 3
PREREQUISITE: CHEM 417.
A semi-quantitative description of the mechanisms of organic reactions. Topics include M.O. theory, orbital symmetry, addition and elimination reactions, the kinetics and thermodynamics of organic reactions, solvent effects, etc.

CHEM 535 REAGENT CHEMISTRY
S 3 cr. LEC 3
PREREQUISITE: CHEM 417.
A thorough study of synthetic processes, methodologies and reagents.

CHEM 540 ORGANIC SYNTHESIS
F 5 cr. LEC 3
PREREQUISITE: CHEM 533 and CHEM 535.
A thorough study of strategies for the synthesis of complex natural products.

CHEM 551 ORGANIC STRUCTURE ELUCIDATION
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHEM 417.
Spectroscopic structure elucidation of small organic molecules. Techniques to be discussed include 1-D and 2-D NMR spectroscopy, UV, IR, MS, and Raman spectroscopies. Emphasis will be on interpreting spectra to deduce the structure of the compound in question.

CHEM 554 ORGANO METALLIC CHEMISTRY
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHEM 511, CHEM 512 and CHEM 553.
Application of organometallic chemistry to organic transformations.

CHEM 557 QUANTUM MECHANICS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHEM 524 or equivalent.
Applications of quantum mechanics to molecules and spin systems.

CHEM 558 CLASSICAL & STATISTICAL THERMODYNAMICS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHEM 524 or equivalent.
Classical & statistical thermodynamics applied to chemical systems.

CHEM 559 KINETICS AND DYNAMICS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: CHEM 524 or equivalent.
Chemical kinetics, theories of reaction rates, molecular reaction dynamics, with applications to chemical reactions in the gas phase, on surfaces, and in solution.

CHEM 560 SYMMETRY, ORBITALS AND SPECTROSCOPY
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHEM 524.
Group theory with applications, semi-empirical and ab initio calculations, vibrational and electronic spectroscopy, and their interrelationship will be covered.

CHEM 564 ADVANCED QUANTUM CHEMISTRY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHEM 557 or equivalent.
Time independent and time dependent quantum mechanics with application to chemical bonding and molecular spectroscopy.

CHEM 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
Directed research and study on an individual basis.

CHEM 580 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHEM 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; Maximum 3 cr.
PREREQUISITE: Graduate standing; teaching experience and/or current employment in a school or organization; and consent of instructor and Dean of Graduate Studies.
Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subtitled.

CHEM 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

CHEM 590 MASTER’S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

CHEM 689 GRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 3 cr. RCT
PREREQUISITE: Graduate standing.
COREQUISITE: CHEM 590 or CHEM 690.
Classroom instruction associated with directed graduate research/creative activity projects.

CHEM 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

CLS
College of Letters and Science
(406) 994-4288

CLS 101 US KNOWLEDGE AND COMMUNITY
FS 3 cr. SEM 3
PREREQUISITE: First year students (less than 30 credits) only.
Small seminar-style classes. Introduction to university study and the excitement of intellectual inquiry. Participation in a community of learners. Readings in the humanities, social sciences, and natural sciences. Emphasis on critical thinking, effective communication, and active learning.

CLS 201 US KNOWLEDGE AND COMMUNITY
FS 3 cr. SEM 3
Knowledge and Community is similar to CLS 101 but is designed for students beyond their freshman year. CLS 201 is open to students who have completed at least 30 credits, and students will not receive credit if they have passed CLS 101 with a grade of C- or better. Small seminar-style classes.

CLS 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
Classroom instruction associated with directed undergraduate research/creative activity projects.

CLS 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
Directed undergraduate research/creative activity which may culminate in a written work or other creative project.
COURSE DESCRIPTIONS: CLS 460 - CS 309

CLS 460 TEACHING FELLOWSHIP
(TEACHING INTERNSHIP) effective F/05
F, S 2-3 cr. SEM 2 Maximum 6 credits.
- As co-teachers of a section of CLS 101US, College Seminar, students will learn and have the opportunity to practice classroom teaching strategies and mentoring skills.

CLS 470 INDEPENDENT STUDY
F, S 1 - 3 cr. IND Maximum 6 cr.
COREQUISITE: CLS 460.
- Directed research and study on an individual basis.

CLS 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1- 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: CLS 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CLS 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

COLS
College Studies
College of Technology - Bozeman
(406) 994-5536

COLS 100 EFFECTIVE ACADEMIC PRACTICES
F, S 3 cr. LEC 3
- COLS 100 is designed to help freshmen make a smooth transition to college life and to help students maximize their potential in all courses.
- COLS 100 enhances appreciation and meaning of higher education; introduces the College's resources, services, rules/regulations, people, organizations; encourages a positive attitude toward learning; teaches basic academic survival skills; clarifies personal values and needs; and provides an acquaintance with professors and resources for academic assistance. Offered in partnership with COT in Bozeman.

COLS 101US FIRST YEAR SEMINAR
F, S 3 cr. LEC 3
PREREQUISITE: First year students only.
- This multi-disciplinary course, presented in seminar format, draws from the disciplines of psychology, sociology, history, and philosophy, and encourages students to explore issues critical to their academic goals and objectives. The course emphasizes verbal communication, critical thinking, intellectual development, and academic choices. Fulfills university seminar requirement of the core curriculum. This course may not be repeated. Offered in partnership with the COT in Bozeman.

COM
Communications
University Studies
(406) 994-3801

COM 110US INTRODUCTION TO PUBLIC COMMUNICATION
F, S 3 cr. LEC 1 RCT 2
- Overview of the theories, concepts, and principles of public speaking, to include audience analysis, evidence, intercultural communication, small group communication and media communication. Application of those concepts and principles through preparation and delivery of ceremonial, informative, persuasive, and group presentations.

CS
Computer Science
Department of Computer Science
(406) 994-4780

CS 150 COMPUTER LITERACY
F, S 3 cr. LEC 2 LAB 1
- Computer hardware and software concepts as they apply to all computers. Exposure to software packages such as Windows, word processors, spreadsheets, and Internet applications. Laboratory projects reflect practical usage in resolving real world problems/situations.

CS 160 INTRODUCTION TO COMPUTER SCIENCE
F, S 4 cr. LEC 3 LAB 1
PREREQUISITE: MATH 160.
- Introduction to programming: program design, analysis, and implementation in Java, including I/O, assignment, decision, iteration, scalar types, arrays, control structures, methods, classes, and common data types; and Linux fundamentals. No previous programming experience required.

CS 201 PROGRAM DESIGN WITH C
S 3 cr. LEC 2 LAB 1
PREREQUISITE: CS 160.
COREQUISITE: MATH 160.
- C Programming knowledge. Introduces imperative programming and the C standard library. Course covers pointers, memory management and structures.

CS 204 MULTIMEDIA DEVELOPMENT METHODS
S, odd years 5 cr. LEC 2 LAB 1
- The design and development of multimedia presentations using computerized studio techniques. Methods for combining video, audio, photography, studio techniques, and computer-generated art forms. Computer-assisted studio control and editing. Project-oriented course organization with interdisciplinary project teams.

CS 215CS SOCIAL & ETHICAL ISSUES IN COMPUTING
F 3 cr. LEC 2 RCT 1
PREREQUISITE: W core and US core.
- Social and ethical issues as they relate to computing, including privacy, risks, computer abuse, commerce, professionalism, free speech, intellectual property, social justice, and current issues. History of computing.

CS 221 ADVANCED PROGRAMMING
F, S, Su 4 cr. LEC 3 LAB 1
PREREQUISITE: CS 160.
COREQUISITE: MATH 181.
- An examination of advanced Java and basic data structures and their application in problem solving. Data structures include stacks, queues and lists. An introduction to algorithms employing the data structures to solve various problems including searching and sorting, and recursion. Understanding and using Java class libraries. The laboratory uses Java. Introduces Big-O Notation.

CS 222 DISCRETE MATHEMATICS
F, Su 5 cr. LEC 3
PREREQUISITE: CS 160.
COREQUISITE: MATH 181.
- This course covers logic, discrete probability, recurrence relations, Boolean algebra, sets, relations, counting, functions, maps, Big-O notation, proof techniques including induction, and proof by contradiction.

CS 223 DATA STRUCTURES AND ALGORITHMS
S, Su 4 cr. LEC 3 LAB 1
PREREQUISITE: CS 221, CS 222.
COREQUISITE: MATH 181.
- Advanced data structures and programming techniques and their application. Topics include: trees, balanced trees, graphs, dictionaries, hash tables, heaps. Examines the efficiency and correctness of algorithms. The laboratory uses Java.

CS 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

CS 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: To be determined based on actual topic offered.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CS 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
S 1-3 cr. RCT may be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CS 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

CS 309 SYSTEMS ADMINISTRATION
S 3 cr. LEC 3
PREREQUISITE: CS 201 and CS 223.
- The administration and management of Linux computer systems. Includes installation, user/process management, configuration of services and device handling. A thorough knowledge of Linux/Unix command structure is required.
CS 324 DESIGN AND ANALYSIS OF ALGORITHMS  
F 3 cr. LEC 3  
PREREQUISITE: CS 225.  
- A rigorous examination of advanced algorithms and data structures. Topics include average case analysis, probabilistic algorithms, advanced graph problems and theory, distributed and parallel programming.

CS 330 COMPUTER ORGANIZATION AND ARCHITECTURE  
F 4 cr. LEC 3 LAB 1  
PREREQUISITE: CS 221.  
- The structure and function of computer systems: CPU, memory, I/O. Includes digital logic, data type, instruction set design, pipelining, RISC, parallel processing, and assembly language programming.

CS 350 THEORY OF COMPUTATION  
S 3 cr. LEC 3  
PREREQUISITE: CS 222.  
COREQUISITE: MATH 182.  
- Formal languages, theory, automata, Turing Machines, computability, the Church-Turing thesis, computational complexity, and NP-completeness.

CS 351 SOFTWARE ENGINEERING I  
F 3 cr. LEC 3  
PREREQUISITE: CS 223 and ENGL 223.  
- Software lifecycles, Unified Modeling Language, design patterns, software engineering standards, requirements analysis, development issues, efficiency tools, verification and validation, configuration management, testing and maintenance.

CS 355 CONCEPTS OF PROGRAMMING LANGUAGES  
S 3 cr. LEC 3  
PREREQUISITE: CS 223.  
- An examination of several programming paradigms, and languages, as well as their application and underlying execution model. Paradigms examined include imperative, object-oriented, functional, logic and string based. Students will gain exposure to a variety of languages such as C, C++, Scheme, Prolog and Perl.

CS 392 NUMERICAL COMPUTATION FOR SCIENTISTS AND ENGINEERS  
S 3 cr. LEC 3  
PREREQUISITE: MATH 182.  
- Basic computer literacy is assumed.  
- Numerical methods to solve problems in science and engineering using MATLAB. Number systems and error analysis, finding roots, solving linear systems, curve fitting, integration and differentiation, solving ordinary differential equations.

CS 400 SEMINAR  
On Demand 1 cr. SEM 1 Maximum 4 cr.  
PREREQUISITE: Junior standing and as determined by each offering.  
- Topics offered at the upper divisional level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

CS 418 OPERATING SYSTEMS  
F 3 cr. LEC 3  
PREREQUISITE: CS 223 and CS 330 or EE 371.  
- Operating systems design including necessary hardware support. Processes, threads, concurrent programming, and scheduling. Memory, file, and I/O management. Security issues.

CS 422 INTRODUCTION TO SIMULATION  
F 3 cr. LEC 3  
PREREQUISITE: CS 201 and a probability or statistics course.  
- Discrete and continuous simulation modeling methodology using a computer simulation language; random number generation, output analysis, validation, and verification; application to varied system design and analysis problems. Cross-listed with I&ME 422.

CS 425 COMPUTER GRAPHICS  
F 3 cr. LEC 3  
PREREQUISITE: MATH 221 and CS 222.  

CS 430 IMAGE PROCESSING  
S 3 cr. LEC 3  
PREREQUISITE: CS 223.  
- Image processing techniques are used to quantify and manipulate visual information in diverse applications such as satellite imagery, robotic vision, and animation. Topics include enhancement, restoration, segmentation, and digitization techniques.

CS 432 COMPUTATIONAL BIOLOGY  
S odd years 2 cr. LEC 2  
PREREQUISITE: CS 222.  
- This course surveys classic and recent problems from computational biology. Topics covered include algorithms for genomic sequencing and searching, protein structure prediction, and regulatory network discovery.

CS 435 DATABASE SYSTEMS  
F 3 cr. LEC 3  
PREREQUISITE: CS 223.  
- DBMS architecture; major database models; relational algebra fundamentals; SQL query language; index file structures, data modeling and management, entity relationship diagrams.

CS 436 ARTIFICIAL INTELLIGENCE  
F 3 cr. LEC 3  
PREREQUISITE: CS 223.  
- The fundamental bases of artificial intelligence: knowledge representation, search, and learning. Applications include game playing, neural networks, and expert systems. Common Lisp and CLOS are introduced.

CS 440 COMPUTER NETWORKS  
F 4 cr. LEC 3 LAB 1  
PREREQUISITE: CS 223 and CS 201.  
- How computer systems are organized into networks and how communication over networks is organized. Communication protocols and their design with an emphasis on current technology and implementation of software.

CS 445 EMBEDDED SYSTEMS  
S even years 3 cr. LEC 2 LAB 1  
PREREQUISITE: CS 223 and CS 330 or EE 371.  
- The basic tools and techniques of embedded systems using robotics as a platform. Student teams will build an autonomous mobile robot, and learn to program it to perform increasingly sophisticated behaviors. Besides providing an introduction to autonomous mobile robot technologies, the students also learn key concepts of mechanics, electronics, programming techniques, and systems design and integration.

CS 450 COMPILERS  
S 4 cr. LEC 3 LAB 1  
COREQUISITE: CS 350 and CS 355.  
- Compiler design and construction. Scanning, parsing, symbol tables, semantic analysis, intermediate representation, run-time memory management, target code generation, and optimization. Implementation of a small compiler.

CS 451 SOFTWARE ENGINEERING II  
S 3 cr. LEC 3  
PREREQUISITE: CS 351.  
- Functional specification, formal methods, cost models, project management, software management, risk analysis, fault tolerance, metrics, reverse engineering, safety critical software engineering, real-time systems.

CS 460R SENIOR DESIGN PROJECT I  
F, S, Su 3 cr. IND 3  
PREREQUISITE: CS 351.  
- A significant group-based project to solicit requirements, specify, design, build, document and test a software artifact. Can be used for multidisciplinary project work. (First semester of a two semester sequence).

CS 461R SENIOR DESIGN PROJECT II  
F, S, Su 3 cr. IND 3  
PREREQUISITE: CS 460.  
- Continuation of CS 460.

CS 470 INDEPENDENT STUDY  
On Demand 1 - 3 cr. IND Maximum 6 cr.  
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.  
- Directed research and study on an individual basis.

CS 474 UNDERGRADUATE CONSULTATION  
F, S 1 cr. IND  
PREREQUISITE: Junior standing and CS 223.  
- Directed assistance to, and involvement in labs, with lower division CS students. Can only complete once.

CS 476 INTERNSHIP  
On Demand 2 - 6 cr. IND  
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.  
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

CS 488 SPECIAL TOPICS  
On Demand 1 - 3 cr. Maximum 12 cr.  
PREREQUISITE: Course prerequisites as determined for each offering.  
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
CS 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
On Demand 1-2 cr. RCT May be repeated. Max 4 cr.
PREREQUISITE: Graduate standing. Consent of instructor.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

CS 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
On Demand 1-4 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Consent of instructor.
COREQUISITE: CS 489.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

CS 499 COMPUTER SCIENCE PROGRAM ASSESSMENT
F, S 0 cr. IND 0
PREREQUISITE: Graduating Senior.
- Student participation in Computer Science program assessment. Must take the Computer Science Major Field Test.

CS 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

CS 510 COMPUTABILITY
F 3 cr. LEC 3
PREREQUISITE: CS 350.
- Turing machine computability and decidability; abstract time and space complexity; intractability.

CS 513 COMPUTATIONAL RESEARCH TOPICS
S odd years 3 cr. LEC 3
PREREQUISITE: CS 510.

CS 515 ALGORITHMS
S 3 cr. LEC 3
PREREQUISITE: CS 223.
- Concrete time and space complexity; combinatorial algorithms; greedy algorithms; dynamic programming; probabilistic and randomized algorithms; branch-and-bound algorithms.

CS 518 ADVANCED OPERATING SYSTEMS & SYSTEMS PROGRAMMING RESEARCH
F even years 5 cr. LEC 3
PREREQUISITE: CS 418.
- Contemporary topics in systems programming and operating system design and research.

CS 525 GRAPHICS & SCIENTIFIC VISUALIZATION
S odd years 3 cr. LEC 3
PREREQUISITE: CS 425.

CS 530 DATA MINING
F even years 5 cr. LEC 3
PREREQUISITE: A probability or statistics course.
- Clustering, classification and pattern recognition; performing automated discovery of knowledge from a data set.

CS 535 ADVANCED DATABASE SYSTEMS
F odd years 5 cr. LEC 3
PREREQUISITE: CS 435.
- Advanced database models including active, distributed, deductive, temporal, object-oriented, and web-based; normalization theory and query optimization.

CS 536 ADVANCED ARTIFICIAL INTELLIGENCE
S even years 5 cr. LEC 3
PREREQUISITE: CS 456.
- An exposure to advanced topics from the field of artificial intelligence. Topics include machine learning, artificial life, natural language processing, and cognitive science.

CS 540 DISTRIBUTED COMPUTING
S even years 5 cr. LEC 3
PREREQUISITE: CS 524 and CS 440.
- The design and implementation of software systems that utilize multiple host computer networks as a foundation. Concurrency control, homogeneous and heterogeneous systems, inter process communication, protocols and application design.

CS 545 PARALLEL COMPUTING
F odd years 5 cr. LEC 3
PREREQUISITE: CS 550 and CS 592.

CS 550 DESIGN & TRANSLATION OF PROGRAMMING LANGUAGES
F odd years 5 cr. LEC 3
PREREQUISITE: CS 450.
- Contemporary topics in programming language design, advanced compiler design and research.

CS 570 INDEPENDENT STUDY
On Demand 1-5 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

CS 571 RESEARCH EXPERIENCE
F, S, Su 1-4 cr. IND Maximum 4 cr.
PREREQUISITE: Graduate standing.
- Research experience normally obtained through participation in a supervised research project acceptable to the department graduate committee.

CS 575 MASTER'S PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

CS 576 INTERNSHIP
F, S, Su 1 - 3 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of graduate program coordinator.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

CS 580 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CS 589 GRADUATE CONSULTATION
On Demand 1-3 cr. IND
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work, and thesis, if on a thesis plan but who need additional faculty or staff time or help.

CS 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

CS 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

ECON
Economics
Department of
Agricultural Economics & Economics
(406) 994-3701

ECON 101S ECONOMIC WAY OF THINKING
F, S 5 cr. LEC 3
- Introduces important tools and methods of economics, including the core reasoning that underlies decision-making, analytical thinking and problem solving, demand and supply analysis, and indicators of economic performance. Emphasis is on application of the tools of economics to current issues of social and personal importance.

ECON 102 PRINCIPLES OF MACROECONOMICS AND INTERNATIONAL ECONOMICS
F, S, Su 3 cr. LEC 3
PREREQUISITE: ECON 101.
- Topics include inflation, unemployment, interest rates, money, and the impact of government surpluses or deficits. Government policies of growth, employment, income distribution, and international trade are examined.

ECON 132 ECONOMICS & THE ENVIRONMENT
S 3 cr. LEC 3
PREREQUISITE: ECON 101.
- This course includes topics on renewable (fisheries, wildlife, surface water use) and non-renewable (oil, natural gas, minerals) natural resource issues, environmental resources (public lands, resource preservation), pollution control issues, and the global environment (including climate change, biodiversity and population).
COURSE DESCRIPTIONS: ECON 201IS - ECON 470

ECON 201IS INTRODUCTORY MICROECONOMIC THEORY
F, S 3 cr. LEC 3
PREREQUISITE: ECON 101.
Consumer theory and the theory of the firm are utilized to show how independent decisions by consumers and firms interact in markets to determine the price and output of goods and services.

ECON 250IS HONORS ECONOMICS
S 4 cr. SEM 4
ECONOMICS SUMNORS ECONOMICS
- Economic principles are introduced and applied to a wide range of contemporary and historical problems including legal, environmental, resource, health, taxation, poverty, economic development, and macroeconomic policy issues.

ECON 270 INDEPENDENT STUDY
F, S, Su 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

ECON 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Dependent on the offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting regular course number.

ECON 290 UNDERGRADUATE RESEARCH
F, S, Su 1 - 8 cr. IND
PREREQUISITE: ECON 101 and approval of instructor.
- Intended for lower division undergraduate research/undergraduate scholars program.

ECON 300 SEMINAR
F, S 1 cr. SEM 1
PREREQUISITE: ECON 201 or ECON 250 or consent of instructor.
- Current economic problems and current writings of people in the profession. Topics vary each semester; students should check with the department before registering.

ECON 301 INTERMEDIATE MICROECONOMIC THEORY
F, S 3 cr. LEC 3
PREREQUISITE: ECON 201 or ECON 250, MATH 170 or MATH 181.
- A study of microeconomic theory and selected applications with emphasis on theory of consumer behavior and theory of the firm. A major objective of the course is to prepare students for additional upper-division courses in economics.

ECON 302 INTERMEDIATE MACROECONOMIC THEORY
F, S 3 cr. LEC 3
PREREQUISITE: ECON 102 and ECON 201 or ECON 250; MATH 170 or MATH 181.
- The economic theory of economywide aggregates such as national income, levels of employment, income distribution; the determinants of the performance of entire economies: nations, groups of nations, and the world.

ECON 309 MANAGERIAL ECONOMICS
F 3 cr. LEC 3
PREREQUISITE: ECON 201 or ECON 250, MATH 170 or MATH 181.
- An integration of various principles and concepts from different areas of economics. These are combined with several tools of analysis and related to problems of economic decision making and policy formulation at the firm level.

ECON 311 INT. MICROECONOMICS WITH ECONOMIC EDUCATION APPLICATIONS
F, to be offered alternate years, 2008 3 cr. LEC 3
PREREQUISITE: ECON 201 or ECON 250 or consent of instructor.
- A study of microeconomic theory with selected applications in the area of the economics of education and emphasis on the theory of the behavior of consumers, firms, non profit organizations and government agencies, and welfare economics. Applications will address issues such as the labor market for primary and secondary school teachers, the effects of voucher programs on the quality of public and private education, and the returns to primary and secondary education.

ECON 312 LABOR & HUMAN RESOURCE ECONOMICS
S 3 cr. LEC 3
PREREQUISITE: ECON 201 or ECON 250.
- Economics of labor markets, wage determination, and human capital. The theoretical framework of labor market analysis is presented, along with empirical research results and descriptive aspects of current labor issues.

ECON 313 MONEY & BANKING
F, S 3 cr. LEC 3
PREREQUISITE: ECON 102 or ECON 250.
- Principles and problems of money, banking, and credit. Monetary and banking history; monetary theory and policy; structure and operation of our financial system.

ECON 314 INTERNATIONAL ECONOMICS
F 3 cr. LEC 3
PREREQUISITE: ECON 201 or ECON 250.
- A survey of international economic theory and policy. Major concepts explored are comparative advantage, impacts of tariffs, exchange rates, and international payments.

ECON 317 ECONOMIC DEVELOPMENT
S 3 cr. LEC 3
PREREQUISITE: ECON 201 or ECON 250.
- The plight of the world's low income countries, and the many national and international programs devoted to alleviation. Primary emphasis directed to economic factors, but attention given to political and social characteristics vital to economic development.

ECON 320 PUBLIC FINANCE
F 3 cr. LEC 3
PREREQUISITE: ECON 201 or ECON 250.
- Analysis of public expenditure programs, government behavior, and public decision making. Topics such as health care and welfare programs, and principles of taxation will be covered.

ECON 332 ECONOMICS OF NATURAL RESOURCES
F 3 cr. LEC 3
PREREQUISITE: ECON 201 or ECON 250.
- Economic principles regarding the allocation and use of natural resources and the impact of institutional factors within which these decisions are implemented. Emphasis on property rights, economic rent, and impact of regulations on resources such as forests, fisheries, land, and water.

ECON 372 ECONOMIC HISTORY OF THE US
S 3 cr. LEC 3
PREREQUISITE: ECON 101 or ECON 250.
- Interpretation of American economic growth in the context of economic theory. Examines specific issues in U.S. history while focusing on the question of how the U.S. has been able to sustain increases in per capita income.

ECON 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ECON 401 MICROECONOMIC THEORY
F 3 cr. LEC 3
PREREQUISITE: ECON 301.
- Advanced price theory. Objectives of this course include further development of students' intuitive understanding of price theory and learning how to use calculus in economics. Topics covered include comparative statics, consumer and producer theory, and pricing in competitive and non-competitive product and factor markets.

ECON 403 INTRODUCTION TO ECONOMETRICS
S 3 cr. LEC 3
PREREQUISITE: ECON 201 and STAT 216 and MATH 170.
- Statistical analysis and interpretation of quantitative data in economics. Focus on estimating economic relationships and conducting hypothesis testing in economics. Utilizes cutting-edge statistical software packages and real data to apply economic methods to problems in business, economics, and public policy.

ECON 406 INDUSTRIAL ORGANIZATION
F 3 cr. LEC 3
PREREQUISITE: ECON 301.
- Offers students the opportunity to use training in price theory by focusing on issues concerned with public policy toward business. The subject matter should appeal to students in pre-law and business as well as economics majors.

ECON 432R BENEFIT-COST ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: ECON 501.
- Senior capstone course. Applied welfare economics and methods and criteria for evaluating benefits and costs of public policies and investment. Applications include environmental and natural resource issues.

ECON 470 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.
ECON 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Determined by each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ECON 490 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: ECON 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ECON 490 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-8 cr. IND
PREREQUISITE: ECON 201, junior standing, and approval of instructor.
- Intended for upper division undergraduate research/undergraduate scholars program. The student will work closely with the supervising faculty.

ECON 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as dependent on the offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ECON 501 MICROECONOMIC THEORY
S 3 cr. LEC 3
PREREQUISITE: ECON 401.
- Economic models of optimization as they apply to consumer and firm decision making. Topics covered include comparative statics, theory of the firm and consumer, and consumer and producer surplus.

ECON 502 MACROECONOMIC THEORY
S 3 cr. LEC 3
PREREQUISITE: ECON 302.
- Systematic review of accepted macroeconomic theory and critical study of the functional relationships contained therein.

ECON 561 ECONOMETRICS I
F 3 cr. LEC 3
PREREQUISITE: ECON 301, STAT 216, MATH 251.
- The use of regression analysis in the estimation of economic relationships, with emphasis on development of the least squares technique, the properties of estimators, and hypothesis testing in the context of the regression model.

ECON 562 ECONOMETRICS II
S 3 cr. LEC 3
PREREQUISITE: ECON 561.
- Course consists of theoretical and applied econometrics of static and dynamic structural models, primarily using time-series data. Single equations and system of equations are evaluated. Estimation properties specific to statistical problems, dynamic adjustments to economic behavior, and model forecasting are emphasized.

ECON 568 RESEARCH METHODOLOGY
S 1 cr. LEC 1
PREREQUISITE: Graduate standing, ECON 301, ECON 302.
- The research process as a means of acquiring knowledge which is reliable and relevant to problems.

ECON 570 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, and approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

ECON 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ECON 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ECON 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ECON 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND May be repeated.
PREREQUISITE: Master's standing.

EDCI 120 IN-SCHOOL EXPERIENCE
F, S 1 cr. LAB 1
- Students will explore the profession of teaching by attending an orientation, conducting in-school observations and interviews, recording personal reflections in a portfolio, and participating in two seminar sessions to debrief/discuss their experiences.

EDCI 105 TEACHING THE GRAMMAR AND STRUCTURE OF THE ENGLISH LANGUAGE
F, S 3 cr. LEC 3
PREREQUISITE: EDCI 102
- This course explores the structure and function of the English language. In particular, study of grammar including the eight parts of speech, types of phrases and clauses, sentence structure and fluency, word order, and other language conventions will be addressed.

EDCI 200 EDUCATIONAL PSYCHOLOGY AND ADOLESCENT DEVELOPMENT
F, S, Su alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: HDCF 150 or HDCF 260 and one of the following:
- Corequisite: EDCI 102, HDCF 102, or AGED 251.
- An examination of theory and research related to the development, learning and motivation of middle and high school students. Implications for effective classroom teaching will be identified throughout the course.

EDCI 225 BASIC MEDIA PRODUCTION
F, S, Su 1 cr. IND 1
- A self-paced/self-instructional course in which students will learn to operate presentation and classroom equipment and produce instructional media materials.

EDCI 240D MULTICULTURAL EDUCATION
F, S 3 cr. LEC 3
- Examination of the school-society relationship in the United States and the many issues and variables embedded in this relationship, including equal opportunity, human diversity, ideology, politics and social change. Foundational perspectives (historical, political, social, and policy) will be explored.

EDCI 280 SPECIAL TOPICS
On Demand 1 - 5 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDCI 280R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-6 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EDCI 280R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

EDCI 320 FOUNDATIONS OF EDUCATIONAL TECHNOLOGY
F, S, Su 2 cr. LEC 1 LAB 1
PRE OR CO-REQUISITE: EDCI 208 or EDCI 209.
- Exploration of technology use in society and its effects on teaching and learning. Includes strategies for developing technology-rich curriculum and techniques for enhancing learning through integration of technology and 21st century skills.

EDCI 360 FOUNDATIONS OF ASSESSMENT
F, S, Su 2 cr. RCT 2
PREREQUISITE: EDCI 208 or EDCI 209.
- Fundamental concepts of differentiated educational assessment for classroom teachers including the alignment of assessment to curriculum standards and essential understandings, quality of assessment, principles of item construction, evaluation of student responses, interpretation of results, and improvement of techniques.
EDCI 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Senior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDCI 401 INTRODUCTION TO INSTRUCTIONAL LEADERSHIP FOR LITERACY EDUCATORS
S 5 cr. LEC 3
PREREQUISITE: EDCI 320, EDCI 304, and EDEL 305 or EDEL 405 or consent of instructor.
- This course will introduce students to the role and responsibilities of reading specialists in the professional school setting. Topics include collaborating with colleagues, parents, and the community, current practice in literacy professional development, and reading policy.

EDCI 402 EDUCATIONAL STATISTICS I
F, Su 3 cr. LEC 3
PREREQUISITE: STAT 216.
- The application of statistical processes to the analysis of educational data. Educational problems that require hypothesis testing, regression, estimation and the t-distribution, analysis of frequencies, and ANOVA in their solution will be included.

EDCI 406 YOUNG ADULT LITERATURE
F alternate years, to be offered every year 3 cr. RCT 3
PREREQUISITE: EDEL 304.
- Survey of materials for young adult readers. Includes literary analysis, pedagogy, electronic resources, and motivational strategies.

EDCI 425 TECHNOLOGY IN THE CLASSROOM
F 3 cr. LEC 2 LAB 1
- Hands on experiences in the production of advanced instructional media materials. Emphasis on exploration of techniques using current and cutting edge technologies. Appropriate for media specialists, teachers, trainers and communicators interested in using the new technology tools.

EDCI 427 MEDIA DESIGN: DYNAMIC CLASSROOM ENVIRONMENTS
S 3 cr. LEC 2 LAB 1
- To construct effective documents and classroom displays utilizing various materials, desktop publishing, and graphic design techniques. Excellent for those in education, library media, marketing, engineering, graphic design, and others requiring professional visual presentations.

EDCI 434 LITERACY ASSESSMENT AND INSTRUCTION
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: EDEL 305 or EDEL 405.
- Current theory and techniques in literacy assessment and individualization. Emphasis will be on specific instructional strategies that focus on independence in reading and writing. A practicum is included.

EDCI 450 EDUCATIONAL COMPUTING MANAGEMENT AND APPLICATION
F, S 1 - 3 cr. IND
PREREQUISITE: EDCI 320.
- A flexible format that allows the student to select hands-on learning modules based on student need and interest in educational technology and 21st century skills.

EDCI 460 APPLICATIONS OF EDUCATIONAL TECHNOLOGY
S 3 cr. LEC 1 RCT 1 LAB 1
PREREQUISITE: EDCI 320.
- The application of statistical processes to the maximization of student learning and strategies for development of standards-based technology integration to promote 21st century skills. Includes an Action Research component and classroom practice.

EDCI 462 METHODS OF TEACHING MODERN LANGUAGES
S 4 cr. LEC 4
PREREQUISITE: EDCI 560, 20 or more credits in subject area, and good standing in Teacher Education Program.
- COREQUISITE: EDSD 301 (for Teaching majors in this subject)
- Provides prospective foreign language instructors with a practical and theoretical foundation for planning (including lesson/unit), implementing teaching, and evaluating programs and learning for levels K-12. Content reading skills are also addressed. Includes classroom paraprofessional experience for majors only.

EDCI 469 PUBLIC SCHOOLING IN THE AMERICAN SOCIETY
F, S 2 cr. LEC 2
PREREQUISITE: EDCI 208 or EDCI 209 and junior standing.
- The organization, management, and evaluation of staff development programs in literacy that include ongoing training, assisting teachers with instruction, promoting and modeling flexible instructional strategies through regular conversations about learners, literacy theory and instruction.

EDCI 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

EDCI 474 LEADERSHIP IN LITERACY PROGRAMS
S 2 cr. LEC 2
PREREQUISITE: One of the following: EDSD 450, EDEL 505, or EDEL 405.
- The organization, management, and evaluation of staff development programs in literacy that include ongoing training, assisting teachers with instruction, promoting and modeling flexible instructional strategies through regular conversations about learners, literacy theory and instruction.

EDCI 476 INTERNSHIP
On Demand 2/3 cr. IND
PREREQUISITE: EDCI 560, consent of instructor, and approval of department head.
- An individualized assignment with a professional agency to provide a guided field experience.

EDCI 480 SPECIAL TOPICS
On Demand 1 - 5 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDCI 480R UNDERGRADUATE RESEARCH/Creative Activity Instruction
F, S 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: EDCI 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EDCI 490R UNDERGRADUATE RESEARCH/Creative Activity
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

EDCI 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing and as determined for each offering.
- Topics offered at the graduate level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDCI 502 EDUCATIONAL STATISTICS II
S 3 cr. LEC 3
PREREQUISITE: EDCI 402.
- The application of statistical processes to the analysis of educational data. Educational problems that apply multifactor ANOVA, multiple comparison techniques, ANCOVA, multiple regression, and factor analysis in their solution are included.

EDCI 504 ASSESSMENT AND EVALUATION IN EDUCATION
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Evaluation as an ongoing process in education. This course will engage students in a discussion regarding the construction, selection and use of criterion-referenced, norm-referenced, and alternative assessment methods. In addition, students will be involved in special projects which allow them to explore evaluation at the classroom, program, and/or institutional levels.

EDCI 505 FOUNDATION OF ACTION RESEARCH IN TEACHING AND LEARNING
S 3 cr. LEC 1 RCT 1 IND 1
PREREQUISITE: Graduate standing.
- A survey of the historical, political, philosophical, and socioeconomic foundations of American public schooling with an examination of the implications for our current context.

EDCI 506 APPLIED EDUCATIONAL RESEARCH
F, S, Su 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Students are introduced to systematic scientific inquiry, its purpose in an educational environment, the different approaches to conducting educational research, and the major components of an educational research study. Providing a foundation for further study of research methodologies, students will identify and evaluate existing literature on a topic and conduct an educational research study.

EDCI 507 QUALITATIVE EDUCATIONAL RESEARCH
S 3 cr. LEC 3
PREREQUISITE: Graduate standing and EDCI 506.
- This course explores the implications and application of the qualitative research paradigm to systematic inquiry within the field of education. Methods used in qualitative research including techniques of data collection, analysis, and reporting will be reviewed. Students will plan and complete a qualitative research project.
COURSE DESCRIPTIONS: EDCI 508 - EDCI 542

EDCI 508 ADVANCED
EDUCATIONAL PSYCHOLOGY
S 3 cr. LEC 5
PREREQUISITE: Graduate standing or permission of the instructor.
- An examination of theory and research related to learning and motivation for students from diverse cultural backgrounds. Practical implications for effective teaching will be identified throughout the course.

EDCI 509 IMPLEMENTING ACTION
RESEARCH IN TEACHING AND LEARNING
F 5 cr. LEC 1 RCT 1 IND 1
PREREQUISITE: EDCI 505 or another foundational course in action research.
- In this course, students will implement the research design created in EDCI 505 or in a similar course. This will include developing and refining techniques for gathering classroom data, using multiple strategies for data analysis, and communicating the results in a professional report and in presentation to more than one audience (e.g., other educators, community members).

EDCI 510 ISSUES & TRENDS
IN SOCIAL STUDIES INSTRUCTION
On Demand 3 cr. LEC 3
PREREQUISITE: EDEL 313, EDSD 358.
- Addresses teaching and learning of social studies in public schools. Specific focus is given to concept teaching, teaching for thinking and value education in a democratic society. There is emphasis on a reflective approach to social studies education within the course.

EDCI 511 IMPROVEMENT OF
INSTRUCTION IN HEALTH ENHANCEMENT
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: EDEL 410.
- Health enhancement curriculum content, integration concepts amongst instructional topics such as: skill acquisition, physical fitness, nutrition, cultural awareness, and mental health, sexuality and drug and alcohol education. Identification and development of appropriate value orientation and curriculum framework for health enhancement instructional design activities.

EDCI 512 WRITING AND ITS IMPROVEMENT
Su alternate years, to be offered odd years
5 cr. LEC 3
PREREQUISITE: EDEL 410.
- Advanced study in language arts pedagogy. Special attention is given to the writing process.

EDCI 513 MASTER TEACHING
STRATEGIES FOR SCIENCE EDUCATORS
F 3 cr. IND 5
PREREQUISITE: EDCI 325 or 335 or 466 or 461 or the equivalent.
- A professional development class for practicing science educators to learn master teaching strategies to engage grade 6 - 12 students learning science. Taught as a "gateway" online course for teachers interested in exploring an online course in consideration of the MSSE degree. Course an elective for the MSSE degree.

EDCI 520 VISUAL ARTS AND LEARNING
(Replaces EDEL 532)
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: EDEL 532, EDEL 410.
- Explores the importance of art in the lives of children and adolescents while finding ways to include art experiences in an integrated curriculum. Emphasizes philosophical and cultural foundations for teaching art, studio experiences and research potential.

EDCI 522 INFORMATION
RESOURCES AND SERVICES
S 3 cr. LEC 5
PREREQUISITE: Graduate standing.
- A course in the use of information resources in research, reference, integration, and online learning. Topics include the use and evaluation of traditional and electronic information resources, design and selection of information resources for classrooms and libraries. Restricted to BATE Library Media program students.

EDCI 525 IMPROVEMENT
OF INSTRUCTION IN SCIENCE
On Demand 3 cr. LEC 2 RCT 2
PREREQUISITE: EDEL 410 OR EDSD 466.
- This course focuses on theoretical and practical concerns in science education. Research, conceptual frameworks and policy issues will be introduced, as well as teaching and learning activities for elementary and secondary science classrooms.

EDCI 531 CONTEMPORARY
ISSUES IN EDUCATION
Su 3 cr. LEC 2 LAB 1
- An overview course designed to establish the necessary social, technical, conceptual, research, and pedagogical foundations for cohort groups in the masters degree program. This course will examine critical issues and trends in education, and will serve as an advance organizer for program content.

EDCI 532 GENERAL SCHOOL CURRICULUM
S alternate years, to be offered odd years
Su 3 cr. LEC 5
PREREQUISITE: Graduate standing.
- A survey of current curriculum issues including the relationship of school curriculum to educational philosophy, school policy decisions, the impact of learning, curriculum and teaching, and the supervision of curriculum changes.

EDCI 533 MIDDLE YEARS SCHOOL
Su alternate years, to be offered even years
2 cr. RCT 2
PREREQUISITE: EDEL 410 or EDSD 410, graduate standing.
- History, philosophy, and organization of Junior High and middle schools, emphasizing curriculum and instruction based on the characteristics and needs of 10 to 13 year olds.

EDCI 534 LITERACY
ASSESSMENT AND INSTRUCTION
Su alternate years, to be offered even years
3 cr. LEC 2 LAB 1
PREREQUISITE: EDEL 305, EDEL 405, teaching experience.
- Current theory and technique in assessment of reading. Emphasis on instructional strategies and assessment tools developing the literacy of all students. A practicum is included.

EDCI 535 NEEDS ASSESSMENT IN EDUCATION
On Demand 3 cr. LEC 2
(Formerly: EDEL 535)
PREREQUISITE: EDCI 532 or EDLD 540 or EDLD 501 or EDLD 505, graduate standing.
- Understanding the strategies and techniques for determining educational needs in a variety of settings, and disseminating and utilizing the data and information for program planning and development.

EDCI 536 CONSTRUCTION OF CURRICULUM
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: EDCI 532 or EDEL 510, graduate standing.
- The development and evaluation of curriculum based on psychological and social foundations of curriculum, curriculum theory, developmental requirements. Instruction pertains to the history of curriculum design and selection of information resources for classrooms and libraries. Restricted to BATE Library Media program students.

EDCI 537 CONTEMPORARY
ISSUES IN SCIENCE EDUCATION
Su 2 cr. LEC 1 IND 1
PREREQUISITE: Must be enrolled in graduate program in Education or related field.
- This seminar style course focuses on current problems and controversial issues in science education. Emphasis is placed on those issues which relate directly to science teaching, learning and curriculum. Students investigate a variety of issues especially as they relate to their own teaching practices and student learning in their classroom.

EDCI 540 AMERICAN INDIAN
STUDIES FOR EDUCATORS
Su,F 3 cr. DIS 3
PREREQUISITE: Graduate standing or permission of the instructor.
- To equip teachers with the skills, knowledge, and dispositions to meet Indian Education for All requirements. Instruction pertains to the history, traditions, customs, values, beliefs, and contemporary affairs of American Indians, particularly tribal groups in the Northern Plains Region.

EDCI 541 HISTORY &
PHILOSOPHY OF EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- In its classical obligation, philosophy meant "a love of learning." This course traces the growth of cultural and intellectual awareness in human civilization and examines how we humans learned to create tools for the mind. Teachers learn to see the nature of formal cultural systems in the way they developed, and to recognize the central concepts that are the key to learning any subject.

EDCI 542 CREATIVE
PROCESSES IN EDUCATION
S alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EDEL 410 or EDSD 410, teaching experience.
- Review historical and current issues in art education, aesthetic education and related areas which inform how we know our world and construct meaningful ways to pursue creative endeavors. Emphasizes documentation and research while acknowledging growth as teachers and artists.
EDCI 544 PHILOSOPHICAL ISSUES IN EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- An examination of contemporary educational issues using the perspectives of traditional and contemporary philosophical documents.

EDCI 545 ORGANIZATION OF INFORMATION IN SCHOOL LIBRARY MEDIA CENTERS
F, alternate years, to be offered every even years 3 cr. LEC 3
PREREQUISITE: EDCI 320 or equivalent and graduate standing.
- In this course students learn application of descriptive and subjective cataloging content and procedures including: Dewey Decimal Classification, Library of Congress headings, AACR II rules, and examine technology issues for automation and manual of library holdings. Restricted to BATE Library Media program students.

EDCI 546 THE SCHOOL LIBRARY MEDIA SPECIALIST
F, alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDCI 320 or equivalent and graduate standing.
- This course introduces graduate students in their professional role of the school library media specialist and how the library media center fits into the educational setting. Restricted to BATE Library Media program students.

EDCI 547 INFORMATION INQUIRY AND EDUCATIONAL CHANGE
F, alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDCI 320 or equivalent and graduate standing.
- This course presents prospective school library media specialists with content and strategies for working with teachers to incorporate information literacy and media literacy into a changing curriculum and explore information inquiry models. Also included are topics affecting change in libraries and education such as filtering, censorship, digital ethics, new technologies and other topics as relevant to inquiry and integration. Restricted to BATE Library Media program students.

EDCI 548 MANAGEMENT OF INFORMATION AND RESOURCES
S, alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: EDCI 320 or equivalent and graduate standing.
- Students learn the management, development, use, and evaluation of materials for building library collections in K-12 library media centers. Restricted to BATE Library Media program students.

EDCI 549 APPLICATIONS OF LITERATURE FOR CHILDREN AND YOUNG ADULTS
S, alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDCI 320 or equivalent and graduate standing.
- This course presents an overview of materials for educational, informational, and literary use by children and young adults (YA) with an emphasis on critical selection and analysis, knowledge of age-level developmental stages, and motivational techniques in libraries. Restricted to BATE Library Media program students.

EDCI 551 EDUCATIONAL TECHNOLOGY: CREATIVE INTEGRATION
Su alternate years, to be offered odd years 3 cr. LEC 1 LAB 2
PREREQUISITE: Graduate standing.
- Strategies to harness the power of technology to enhance teaching and learning while promoting 21st century skills, productivity, assessment and communication.

EDCI 552 SOCIOCULTURAL PERSPECTIVES IN LITERACY
S, Su to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDCI 551 and EDCI 505 or EDCI 507.
- This course introduces graduate students in education to contemporary theories and research in literacy studies, with a specific focus on critical literacy.

EDCI 554 THE COMPREHENSIVE PORTFOLIO
Su 3 cr. LEC 3
PREREQUISITE: For NPTT candidates: EDCI 552, EDCI 553, EDCI 554, EDCI 555, EDCI 556, EDCI 558, EDCI 559. For GJU Practitioners: EDCI 505, EDCI 509.
- This course provides advanced training on the preparation of a professional teaching portfolio for candidates in the NPTT program or final project portfolio of the practitioner stand of the master's degree in Curriculum & Instruction. Based upon the standards and practices established by the National Board of Professional Teaching Standards (NBPTS), the Interstate New Teacher Assessment and Support Consortium (INTASC), and the National Council for Accreditation of Teacher Education (NCATE) these portfolios are designed to provide comprehensive evidence of effectiveness in practice, the habit of reflection, and a command of the knowledge, skills, and dispositions expected of professional educators as developed in the student's graduate program. Portfolios developed in this course may in turn serve as the basis for the student's comprehensive exam.

EDCI 570 INDEPENDENT STUDY
On Demand 1-5 cr. IND May be repeated.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

EDCI 571 IN-SERVICE EDUCATION
On Demand 1-4 cr. RCT/DIS/LAB
PREREQUISITE: Graduate standing and employment by sponsoring school organization.
- An approved supervised group study of an educational problem within a local school supervised by a MSU faculty member which culminates in a special report to be filed with the local district and the Department of Education.

EDCI 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1-4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

EDCI 576 INTERNSHIP
F, Su 1-2 cr. IND 2-12
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

EDCI 577 INTERNSHIP OPI TEACHER CERTIFICATION
F, S, Su 1 IND 1
PREREQUISITE: Consent of instructor and approval of department head.
- An internship course restricted to OPI teacher certification students.

EDCI 580 SPECIAL TOPICS
On Demand 1-3 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDCI 588 PROFESSIONAL DEVELOPMENT
On Demand 1-3 cr. May be repeated; maximum 3 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

EDCI 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

EDCI 590 MASTER'S THESIS
F, S, Su 1-10 cr. IND May be repeated.
PREREQUISITE: Master's standing.

EDCI 607 QUANTITATIVE EDUCATIONAL RESEARCH
F, S 3 cr. LEC 3
PREREQUISITE: EDCI 502, EDCI 506, graduate standing.
- This course explores the implications of and application of the quantitative research paradigm to systematic inquiry within the field of education. The course includes quantitative designs, design-related data collection and management methodologies, appropriate data analysis and writing strategies, and the role of quantitative research in decision-support. Students will plan and complete a quantitative research project.

EDCI 690 DOCTORAL THESIS
F, S, Su 1-10 cr. IND May be repeated.
PREREQUISITE: Doctoral standing. Restricted Entry: Requires contract with major advisor.
**COURSE DESCRIPTIONS: EDEL 289R - EDEL 410**

**EDEL 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION**
F S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

**EDEL 298R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY**
F S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

**EDEL 501 PARAPROFESSIONAL EXPERIENCE**
F S Su 1-3 cr. LAB 1-3
PREREQUISITE: EDCI 560, good standing in Teacher Education Program.
- Students will be assigned to school classrooms to observe children, teachers, and teaching strategies and to serve as teacher aids. Students will teach lessons in subject areas corresponding to the methods classes in which they are currently enrolled.

**EDEL 503 METHODS OF TEACHING ELEMENTARY HEALTH ENHANCEMENT/PE**
F S 3 cr. LEC 2 LAB 1
PREREQUISITE: HDHL 106, EDCI 360, good standing in Teacher Education Program.
- The class is designed to provide the elementary education student with a conceptual understanding of school-age health enhancement (health and physical education), to include relationships between movement concepts and skill analysis, the ten comprehensive school health areas, and health-related behaviors.

**EDEL 504 CHILDREN'S LITERATURE**
F S 3 cr. LEC 3
PREREQUISITE: EDCI 208 or EDCI 209 and junior standing.

**EDEL 505 PRINCIPLES AND PRACTICES OF EMERGENT LITERACY K-3**
F S, Su alternate years, to be offered even years 4 cr. LEC 4
PREREQUISITE: EDEL 304, EDCI 360, and good standing in Teacher Education Program.
- Current theory concerning emergent literacy and developmentally appropriate classroom practices. Emphasis is on a balanced approach which includes phonics and other cue systems, use of authentic children's literature, and use of programmed reading materials.

**EDEL 507 TEACHING THE MULTICULTURAL CHILD**
On Demand 3 cr. RCT 3
PREREQUISITE: EDCI 208 and EDCI 240.
- To recognize the factors impacting minority language and ethnic group students in the elementary classroom with an emphasis on Native Americans, and to apply pedagogical principles to the teaching of reading and language arts in multicultural classrooms.

**EDEL 313R TEACHING SOCIAL STUDIES: GRADES K-8**
F S, Su alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Completion of social science core including POLS 206, one additional restricted social science elective course, and good standing in the Teacher Education Program.
- Identification of goals, objectives, and instructional strategies for elementary social studies.
- Concurrent paraprofessional experience registration during the academic year.

**EDEL 325 TEACHING ELEMENTARY SCIENCE**
F S, Su alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PHYS 103, EDCI 360, either BIOL 100 or MB 101, and good standing in Teacher Education Program.
- This course focuses upon methods of teaching science inquiry skills, content, and attitudes in the elementary classroom.

**EDEL 322 TEACHING ART AND THE ELEMENTARY CURRICULUM**
F S, Su alternate years, to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: ART 110 or ART 114, EDCI 360, and good standing in Teacher Education Program.
- Experiences which enhance student understanding of how children make art, appreciate historical aspects of art, and construct their place in a social world. Students explore these concerns through studio experiences, readings, written reports, and locating and gathering resources for teaching art.

**EDEL 333 TEACHING MATHEMATICS**
F S, Su alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: EDCI 360, MATH 151, and good standing in Teacher Education Program.
- Math methods and materials for the prospective elementary teacher. Classroom organization, operation, management, applied technology, evaluation, and current theory.

**EDEL 335 TEACHING HEALTH ENHANCEMENT**
F S 3 cr. LEC 3
PREREQUISITE: EDCI 360, good standing in Teacher Education Program.
- The theoretical and practical aspects of teaching health enhancement in the elementary schools.

**EDEL 336 TEACHING MUSIC**
F S, Su alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: EDCI 360, good standing in Teacher Education Program.
- Improving musical skills to incorporate methods of integrating music into the elementary classroom through signing, listening, instrument playing, creating, and movement in order to further the goals and standards of the elementary music program as well as the general elementary curriculum.

**EDEL 337 ELEMENTARY MUSIC METHODS**
S 3 cr. LEC 3
PREREQUISITE: MUS 204, MUS 206, MUS 250, EDCI 360, and good standing in Teacher Education Program.
- Corequisite: EDEL 301
- Elementary music methods for the music education majors; in-depth study and application of elementary music methods using singing, listening, instrument playing, creating, and movement; materials, management, sequencing, planning, and assessment for K-6 music classes.

**EDEL 401 EDUCATIONAL PLANNING AND MANAGEMENT**
F S Su 1 cr. RCT 1
PREREQUISITE: EDCI 360, good standing in Teacher Education Program.
- An introduction to the models of various management and discipline techniques. General control issues and problems associated with the paraprofessional practicum will also be explored and discussed.

**EDEL 402 EDUCATIONAL MANAGEMENT AND DISCIPLINE**
F S Su 1 cr. RCT 1
PREREQUISITE: EDEL 401, good standing in Teacher Education Program.
- An introduction to the models of various management and discipline techniques. General control issues and problems associated with the paraprofessional practicum will also be explored and discussed.

**EDEL 405 TEACHING LITERACY TO ESTABLISHED READERS (4-8)**
F S Su alternate years, to be offered odd years 4 cr. LEC 4
PREREQUISITE: EDCI 360, EDEL 304, and good standing in Teacher Education Program.
- Identification of goals, objectives, and instructional strategies for the prospective elementary teacher. Classroom organization, operation, management, applied technology, evaluation, and current theory.

**EDEL 406 TEACHING THE PRIMARY GRADES**
F S 3 cr. LEC 3
PREREQUISITE: EDCI 208, and either HDCF 150 or PSY 100.
- An introduction to the models of various management and discipline techniques. General control issues and problems associated with the paraprofessional practicum will also be explored and discussed.

**EDEL 410 STUDENT TEACHING**
F S, Su 5 - 12 cr. IND
PREREQUISITE: Senior standing, completion of all required EDEL methods courses, and good standing in Teacher Education Program.
- Corequisite: EDEL 414
- Observation and teaching in a classroom setting; preparation and delivery of lesson plans. The student teaching experience will occur under the supervision of experienced teachers and MSU staff supervisors.
### COURSE DESCRIPTIONS: EDEL 414 - EDLD 503

**EDEL 414 PROFESSIONAL ISSUES**
F, S 2 cr. LEC 2
PREREQUISITE: Senior standing, completion of all required EDEL methods courses, and good standing in Teacher Education Program.

**COREQUISITE:** EDEL 410. – Senior capstone course. Review the role of teachers and elementary school; school law; teacher contracts; certification; professional organizations; ethics; job seeking; job success; cooperative learning; and other critical issues for elementary education majors.

**EDLD 479 INDEPENDENT STUDY**
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

**EDLD 480 SPECIAL TOPICS**
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

**EDLD 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION**
F, S, Su 1 - 2 cr. RCT May be repeated: Max 4 cr.
COREQUISITE: EDEL 490. – Classroom instruction associated with directed undergraduate research/creative activity projects.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

**EDLD 500 SEMINAR**
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing and as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

**EDLD 565 CONTEMPORARY ISSUES IN CHILDREN'S LITERATURE**
Su alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDEL 504 and EDEL 505 and EDEL 410
- Examination and interpretation of the themes of current, award-winning children's literature and their relevance to today's children. Inquiry projects will focus on topics of critical literacy. Emphasis will be on classroom application.

**EDLD 566 ISSUES AND TRENDS IN LITERACY**
Su alternate years, to be offered 2006 3 cr. LEC 3
PREREQUISITE: EDEL 410.
- Contemporary issues in reading, addressed through advanced study of recent research, with a focus on standards-based classroom application. Topics include the reading/writing relationship and the complexities if the reading process.

**EDLD 510 ELEMENTARY SCHOOL CURRICULUM**
F alternate years, to be offered even years, Su 3 cr. LEC 3
PREREQUISITE: EDEL 410 or EDSD 410.
- Understandings, attitudes and skills for inservice teachers and administrators to be applied to selection and implementation of learning experiences for elementary school children.

**EDLD 532 VISUAL ARTS AND LEARNING (Replaced by EDGI 220)**
Su alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: EDEL 332, EDEL 410.
- Explores the importance of art in the lives of children and adolescents while finding ways to include art experiences in an integrated curriculum. Emphasizes philosophical and cultural groundings for teaching art, studio experiences and research potentials.

**EDLD 533 IMPROVEMENT OF MATHEMATICS INSTRUCTION**
Su alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: EDEL 333, EDEL 410.
- Stresses use of appropriate knowledge from mathematics education, learning theory, development, psychology, readiness, evaluation, curriculum development and individual differences in selecting, designing, organizing and presenting mathematical content for elementary school children.

**EDLD 570 INDEPENDENT STUDY**
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

**EDLD 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT**
F, S, Su 1 - 6 cr. IND Maximum 6 cr.
PREREQUISITE: EDGI 506, graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

**EDLD 576 INTERNSHIP**
On Demand 2 - 12 cr. IND Maximum credits unlimited
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

**EDLD 580 SPECIAL TOPICS**
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

**EDLD 588 PROFESSIONAL DEVELOPMENT**
On Demand 1 - 3 cr. May be repeated; maximum 3 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- Courses offered on a one-time basis to fulfill professional development needs of inservice educators. A specific focus is given to each course which is appropriately subtitled.

**EDLD 589 GRADUATE CONSULTATION**
F, S, Su 3 cr. IND Maximum credits unlimited
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

**EDLD 590 MASTER'S THESIS**
F, S, Su 1 - 10 cr. IND Maximum credits unlimited
PREREQUISITE: Master's standing.

**EDLD Educational Leadership**
Department of Education
(406) 994-3120

**EDLD 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION**
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: EDLD 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

**EDLD 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY**
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

**EDLD 500 SEMINAR**
On Demand 1 cr. SEM 1 Maximum 5 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Consent of instructor.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

**EDLD 501 FOUNDATIONS OF ADULT EDUCATION**
F alternate years, to be offered even years, Su On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- A survey of the field and profession of adult education as part of lifelong learning. Professionalism in adult education is approached through the study of: related adult education; historical and philosophical foundations; providers and programs; issues and trends.

**EDLD 503 COMMUNITY EDUCATION**
S On Demand 2 cr. LEC 2
PREREQUISITE: EDLD 501.
- Emphasis on the historical and philosophical development, understanding the concept, goals and objectives, emerging models and institutions and agencies of community education.
EDLD 504 TEACHING AND LEARNING IN ADULT EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This is a study of the adult learner, adult learning theories, and teaching strategies appropriate for adult education strategies. Practice teaching will be evaluated.

EDLD 505 HIGHER EDUCATION HISTORY AND PHILOSOPHY
S alternate years, to be offered odd years, Su On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This foundations course presents the historical and philosophical development of American higher education against the background of political, social, economic, cultural and intellectual issues from its founding to the present.

EDLD 507 FOUNDATIONS OF EDUCATIONAL LEADERSHIP
F alternate years, to be offered odd years, Su 3 cr. LEC 3
PREREQUISITE: Graduate standing, BA/BS in Education.
- This is the entry course for the K-12 Educational Leadership program. Topics included are leadership theory and practice, instructional leadership; basic organization theory; working with students, staff, parents, and community; creating a vision and a strategic plan for realizing the vision; and the identification and initial development of leadership skills, including a personal and professional code of ethics.

EDLD 508 SUPERVISION OF INSTRUCTION
S alternate years, to be offered even years, Su 3 cr. LEC 3
PREREQUISITE: Graduate standing, BA/BS in Education.
- This course emphasizes the improvement of teaching and learning. There is emphasis on supervision of instruction, professional development, creating a learning community, and leading schools to meet high academic standards. School and staff accountability is also included.

EDLD 509 ISSUES AND TRENDS IN HIGHER EDUCATION
S alternate years, to be offered even years, 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- An examination of pressing contemporary issues facing higher education administrators in the work place. The emphasis will be on analyzing issues and addressing situations arising from these issues.

EDLD 510 ORGANIZATION AND ADMINISTRATION OF HIGHER EDUCATION
S alternate years, to be offered even years, Su On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- In this course students will examine the different organizational structures that characterize and govern American higher education. In this introduction to the field of higher education governance, organization and change structures and influences will be examined.

EDLD 511 PLANNING PROGRAM ASSESSMENT
F alternate years, to be offered odd years, Su On Demand 3 cr. LEC 3
PREREQUISITE: EDLD 506 and graduate standing.
- This is a study of the literature, models, standards, strategies, and skills needed to plan and implement the assessment of post secondary educational programs, services, and administration for various internal and external clients including accrediting agencies.

EDLD 512 FINANCE AND ADMINISTRATION IN HIGHER EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: EDLD 505 or consent of instructor.
- The study of financial governance across higher education: from micro-systems (national and state governing boards) to micro-systems (university, college, and department). In the course, students assess the impact of various decisions and levels of funding on students and an institution's financial status.

EDLD 513 RESOURCE AND PROGRAM MANAGEMENT
S alternate years, to be offered odd years, Su On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- The study of program/department management in higher and adult education for both academic and administrative support units. Includes issues that deal with the management of faculty, support personnel, programs, facilities and budgeting.

EDLD 515 PLANNED CHANGE
F, Su alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: EDLD 540.
- A study of the change process as applied to schools. Includes the theory and process of change, research about change, roles and practice, change models and systems, and leadership in school improvement planning and implementation, and evaluation of changed systems.

EDLD 520 COMMUNITY & SCHOOLS IN A PLURALISTIC SOCIETY
S alternate years, to be offered odd years, Su 3 cr. LEC 3
PREREQUISITE: Graduate standing, BA/BS in Education.
- This course reviews the techniques for connecting the school with all parents in a diverse community. Students will learn various curriculum models that promote community involvement in teaching, community use of school facilities, responding to community interests, and using the news media. Developing effective communication with various cultural, ethnic, racial, and special interest groups in the community will be stressed along with issues of social justice.

EDLD 525 INSTRUCTIONAL LEADERSHIP IN THE ELEMENTARY SCHOOL
F alternate years, to be offered even years, 3 cr. LEC 3
PREREQUISITE: Graduate standing, BA/BS in Education.
- A study of principal leadership responsibilities in improving elementary school student achievement with focus on how principals impact their schools by shaping school goals, providing direction, structure, and organizational and social networks; by guiding school policies, procedures, curriculum and learning.

EDLD 529 COLLEGE TEACHING
S alternate years, to be offered odd years, Su On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Higher, Continuing, and Adult Education professionals will study the literature, strategies, and practices involved in delivering post secondary education at a distance.

EDLD 530 COLLEGE TEACHING
S alternate years, to be offered odd years, Su On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- The study of the learning-teaching nexus, traditional and non-traditional college-level teaching methods, the assessment of learning and teaching, and faculty as teacher-researchers.

EDLD 531 THEORETICAL FOUNDATIONS OF COLLEGE STUDENTS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course will introduce the theories which have been advanced regarding college students and the professional practice of student affairs. The course will examine the similarities and differences among college students and the impact which different environments and policies may have on student psycho-social development, learning attitudes, values, behaviors, and satisfaction with college.

EDLD 532 MONTANA SCHOOL LAW
F alternate years, to be offered even years, Su 3 cr. LEC 3
PREREQUISITE: Graduate standing, BA/BS in Education.
- A general examination of law and court decisions relative to the administration of K-12 schools. Specific attention is given to Montana school law.
EDLD 535 LAW AND POLICY IN HIGHER EDUCATION
F alternate years, to be offered even years;
Su On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Analysis and interpretation of landmark legislation
  affecting American higher education since 1960 and
  the resulting policies that govern the
  management of universities and colleges.
  Topics include: separation of church and state, access,
  collective bargaining, intercollegiate athletics, affirmative
  action, and relations with state and federal governments.

EDLD 555 STUDENT SERVICES
S alternate years, to be offered odd years;
Su On Demand 3 cr. LEC 3
PREREQUISITE: EDLD 510.
- Students will examine philosophical, organizational,
  and programmatic aspects of post secondary
  student services and the ethical and legal
  dimensions of student affairs professional practice.

EDLD 557 INSTITUTIONAL RESEARCH AND ASSESSMENT
S alternate years, to be offered odd years;
Su On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Students will explore the roles of institutional
  research and assessment in higher education
  identifying appropriate measures for academic
  and administrative assessment, internal and
  external data sources, analytic techniques, and the
  communication of information to academic and
  administrative decision makers.

EDLD 538 COLLEGE CURRICULUM
S alternate years, to be offered even years;
Su On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course considers the definition, philosophical
  and historical roots, disciplinary organization,
  current issues, designs, administration, and evaluation
  of the college curriculum.

EDLD 543 SOCIAL JUSTICE IN EDUCATION
Su even years, Su odd years 3 cr. LEC 3
PREREQUISITE: EDLD 410 or EDSD 410.
- Consideration of social equity issues in education
  to include disabilities, gender, ethnic, social, and
  economic issues.

EDLD 555 MONTANA SCHOOL FINANCE
S,F alternate years, to be offered even years;
Su 3 cr. LEC 3
PREREQUISITE: Graduate standing, BA in
Education.
- This course prepares school leaders to identify
  and analyze sources of fiscal and non-fiscal revenue
  and resources for schools and school districts,
  to manage financial and material assets, to develop an
  efficient budget planning process, and to perform
  a variety of budget management functions. Course
  emphasis is on Montana school finance.

EDLD 564 THE COMPREHENSIVE PORTFOLIO
S, Su 3 cr. LEC 3
PREREQUISITE: EDLD 507, EDLD 508,
EDLD 515, EDLD 520, EDLD 532, EDLD 555 and
EDLD 542 or EDLD 555.
- Students create a professional portfolio to
  evidence their vision of learning, the culture of
  teaching and learning, community/school
  relationships, and the social, cultural, ethical, legal,
  political, and economic context of schooling.

EDLD 570 IN-SERVICE EDUCATION
On Demand 1 - 4 cr. RCT/DIS/LAB
PREREQUISITE: Graduate standing and employment
by sponsoring school organization.
- A carefully supervised group study of an edu-
cational problem. The study will culminate in a
special report, syllabus, blueprint, course of study
or guide book to be filed with the local
administrator and with the Department of Educa-
tion.

EDLD 574 FIELD EXPERIENCE IN EDUCATION-
AL LEADERSHIP
F, S, Su 1-6 cr. LAB 1-6
PREREQUISITE: Graduate standing, consent of
instructor.
- This is a capstone course that offers students the
  opportunity for guided field experience as a
  principal or superintendent in K-12 schools.

EDLD 575 RESEARCH OR PROFESSIONAL
PAPER/PROJECT
F, S, Su 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project
dealing with a topic in the field. The topic must
have been mutually agreed upon by the student
and his or her major adviser and graduate com-
mitee.

EDLD 576 INTERNSHIP
On Demand 3 - 18 cr. IND Maximum credits may be
restricted by program.
PREREQUISITE: EDLD 507, EDLD 508,
EDLD 532. Graduate standing, consent of instruc-
tor and approval of advisor.
- The internship course is designed for those
required to include practical experience as part of
their degree. Course content is informed by
bridging theory with practice and the on-the-job
expectations and responsibilities.

EDLD 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and
others as determined for each offering.
- Courses not included in a regular course number.
- Courses not included in a regular course number.
- Courses not included in a regular course number.

EDLD 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated;
maximum 5 cr.
PREREQUISITE: Graduate standing, teaching
experience and/or current employment in a
school organization, consent of instructor and
Dean of Graduate Studies.
- Courses offered on a one-time basis to fulfill
professional development needs of in-service
educators. A specific focus is given to each course
which is appropriately subtitled.

EDLD 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master's standing and approval
of the Dean of Graduate Studies.
- This course may be used only by students who
  have completed all of their course work (and
  thesis, if on a thesis plan) but who need additional
  faculty or staff time or help.

EDLD 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

EDLD 610 LEADERSHIP AND ORGANIZATIONAL THEORY
F alternate years, to be offered odd years;
Su even years 3 cr. LEC 3
PREREQUISITE: MA in Educational Leadership,
or Principal's Certification, EDLD 507.
- The course will provide existing school leaders
with theories, concepts, and behaviors of effective
leadership that addresses the challenges of schools
today. The course encourages a deeper under-
standing of personal beliefs, style, values, and ethics
required of school leaders. The development of a
shared vision and strategic plan will be emphasized.

EDLD 620 THE SCHOOL SUPERINTENDENT
S alternate years, to be offered even years;
Su, 3 cr. LEC 3
PREREQUISITE: MA in Educational Leadership or
Principal's Certification, EDLD 520.
- This course focuses on the leadership skills
necessary for the school superintendent. There
is emphasis on superintendent relations with the
school board and the school community, and on
working with stakeholders to identify school priori-
ties. The development of effective and appropriate
communication strategies and interpersonal skills
that promote public confidence for schools is
stressed.

EDLD 630 SUPERVISION AND INSTRUCTIONAL LEADERSHIP
Su alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: MA in Educational Leadership or
Principal's Certification, and EDLD 508.
- The course focuses on increasing the knowledge
  and skills of supervising and leading instruction
  on a district or school system basis. Emphasis is
  given to dimensions of leadership at the district
  level including supervision of the leadership team,
  the development of effective and appropriate
  communication strategies and interpersonal skills
  that promote public confidence for schools is
  stressed.

EDLD 635 DATA DRIVEN DECISIONS
On Demand, 3 cr. LEC 3
PREREQUISITE: MA in Educational Leadership or
Principal's Certification, and EDLD 515. Consent
of instructor.
- The course focuses on acquiring, synthesizing,
  assessing, and using a variety of data to facilitate
  sound decision making as regards to student
  achievement and program improvement. Special
  attention will be paid to systems for collecting,
  analyzing, and using data to continuously improve
  school districts.

EDLD 645 PERSONNEL MANAGEMENT IN EDUCATION
F, alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: MA in Educational Leadership or
Principal's Certification.
- This course is designed to prepare educational
  leaders to apply effective job analysis procedures,
  to understand performance appraisal for in-
  structural and non-instructional staff, formulate
  professional growth plans, negotiate union agree-
  ments, and apply appropriate policies, criteria,
  processes for recruitment, selection, induction,
  and compensation of personnel with an emphasis
  on equity and diversity.
EDLD 650 RESOURCE MANAGEMENT: FINANCE AND FACILITIES
F alternate years, to be offered odd years; Su 3 cr. LEC 3
PREREQUISITE: MA in Educational Leadership or Principal's Certification, and EDLD 555.
- This course is designed to facilitate a more in-depth understanding of the efficient and effective use of finances, facilities, and other tangible and intangible resources at the school district level. An emphasis will be placed on equitable distribution of resources and the alignment of resources to strategic plans and district vision.

EDLD 655 LEGAL AND POLICY STUDIES
S, alternate years, to be offered odd years; Su 3 cr. LEC 3
PREREQUISITE: MA in Educational Leadership or Principal's Certification, and EDLD 555 and EDLD 582.
- This course is designed to facilitate a more in-depth understanding of legal issues relative to education and their policy implications. Students will increase their understanding of how legal decisions impact their school. They will explore policy analysis and implementation, and develop an understanding of how laws, policies, and systemic organizational life are intertwined.

EDLD 680 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IN per term. Maximum credits unlimited.
PREREQUISITE: Doctoral standing. Restricted Entry.

EDSD Education, Secondary
Department of Education
(406) 994-3120

EDSD 410 STUDENT TEACHING
F, S 5 cr. LEC 3
PREREQUISITE: Senior standing, completion of all required EDSD special methods courses, and good standing in Teacher Education Program.
COREQUISITE: EDSD 413.
- Observation and teaching in a classroom setting; preparation and delivery of lesson plans. The student teaching experience will occur under the supervision of experienced teachers and MSU staff supervisors. Observational participation at grades five and/or six also takes place.

EDSD 413 PROFESSIONAL ISSUES
F, S 2 cr. LEC 2
PREREQUISITE: Senior standing, completion of all EDSD special methods courses, and good standing in Teacher Education Program.
COREQUISITE: EDSD 410.
- Senior capstone course. Role of the teacher in the contemporary secondary school. Overview of salient issues to include applied evaluation, classroom management and discipline, cooperative learning, law, contracts, certification, professional organizations, ethics, resume, job seeking, and professionalism.

EDSD 450 CONTENT AREA READING
S 2 cr. LEC 2
PREREQUISITE: EDEL 305 or EDEL 405.
- Techniques, materials, organization, and theory in teaching effective reading skills in all content fields, grades 5-12.

EDSD 452 METHODS OF TEACHING VOCATIONAL AGRICULTURE & TECHNOLOGY EDUCATION
F 3 cr. LEC 3
PREREQUISITE: EDCI 360, 20 or more credits in subject area and good standing in Teacher Education Program.
COREQUISITE: EDSD 501 (for teaching majors in this subject).
- Problem solving approach to planning (including lesson/unit), teaching and evaluating vocational and technology education at the middle and secondary school levels. Content area reading will be investigated. Includes classroom paraprofessional experience.

EDSD 453 METHODS OF TEACHING ART
S 3 cr. LEC 2 LAB 1
PREREQUISITE: EDCI 360, 20 or more credits in subject area and good standing in Teacher Education Program.
COREQUISITE: EDSD 501 (for teaching majors in this subject).
- Emphasizes the teacher-artist as the essential resource for art experiences in the schools. Readings and written assignments, exploring curriculum content and program implementation, media, resources, content reading, lesson/unit planning and evaluation issues in art education. Includes classroom paraprofessional experience.

EDSD 457 METHODS OF TEACHING ENGLISH
S 3 cr. LEC 3
PREREQUISITE: EDCI 360, 20 or more credits in subject area and good standing in Teacher Education Program.
COREQUISITE: EDSD 501 (for teaching majors in this subject).
- Teaching strategies, methods and materials for planning (including lesson/unit); implementing and evaluating language arts instruction. Includes components on course design, writing, reading, literature, speaking and media instruction, and professional development. Includes classroom paraprofessional experience.

EDSD 458 METHODS OF TEACHING SOCIAL STUDIES
F 3 cr. LEC 3
PREREQUISITE: EDCI 360, 20 or more credits in subject area, and good standing in Teacher Education Program.
COREQUISITE: EDSD 501 (for teaching majors in this subject).
- Curriculum, materials, procedures and content reading for planning (including lesson/unit); implementing, teaching, and evaluating social studies programs in secondary schools. Includes classroom paraprofessional experience.

EDSD 459 METHODS OF TEACHING FAMILY AND CONSUMER SCIENCES
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EDCI 360, 20 or more credits in subject area, and good standing in Teacher Education Program.
COREQUISITE: EDSD 501 (for teaching majors in this subject).
- Effective techniques in presenting materials, and planning class activities (including lesson/unit). Methods of teaching and evaluating algebra, geometry, trigonometry, probability/statistics; application of current mathematics education research and reading in the content area of mathematics. Includes classroom paraprofessional experience.

EDSD 460 METHODS OF TEACHING SECONDARY HEALTH ENHANCEMENT
S 3 cr. LEC 3
PREREQUISITE: EDCI 360, 20 or more credits in subject area, and good standing in Teacher Education Program.
COREQUISITE: EDSD 501 (for teaching majors in this subject).
- Developing pedagogical content knowledge by focusing on research based instructional strategies, methods, materials, and content reading for planning, implementing, and evaluating health enhancement lessons, units, and programs in secondary schools. Includes classroom paraprofessional experience.

EDSD 462 PARAPROFESSIONAL EXPERIENCE
F, S 1 cr. LAB 1
PREREQUISITE: EDCI 360 and good standing in Teacher Education program.
COREQUISITE: Methods course in teaching major.
- Students will be assigned to school classrooms to observe children, teachers, and teaching strategies, and to serve as teacher aids. Students will teach lessons in the subject area corresponding to the methods class in which they are currently enrolled (45 contact hours required).

EDSD 463 MULTICULTURAL EDUCATION
F, S 1 cr. LEC 1
COREQUISITE: EDSD 462 and EDSD 464
- Provides students with an opportunity to reflect on their own culture/heritage as they explore the backgrounds and experiences of other cultural groups in this country. An emphasis is placed on democratic community building in a multicultural society.

EDSD 464 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDSD 466 METHODS OF TEACHING SECONDARY SCIENCE
F, S 3 cr. LEC 3
PREREQUISITE: EDCI 360, 20 or more credits in subject area, and admission to the Teacher Education Program.
COREQUISITE: EDSD 501 (for teaching majors in this subject).
- Focuses on methods of planning (including lesson/unit), teaching, and evaluating science inquiry skills, content, attitudes, and safety in the secondary classroom.

EDSD 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.
EDSD 471 METHODS OF TEACHING MIDDLE SCHOOL MATHEMATICS

S 3 cr. LEC 3
PREREQUISITE: EDG 360, 20 or more credits in subject area, and good standing in Teacher Education Program.
- Effective techniques in presenting materials, planning class activities, and creating good learning experiences. Methods of teaching and evaluating arithmetic, remedial mathematics, basic geometry, introductory algebra, and reading/writing mathematics.

EDSD 490 SPECIAL TOPICS

On Demand 1 - 5 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDSD 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION

F, S 1 - 2 cr. RCT may be repeated. Max 4 cr.
COREQUISITE: EDSD 490
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EE 206 CIRCUITS I

F, S 4 cr. LEC 3 LAB 1
PREREQUISITE: EE 101, MATH 182.
COREQUISITE: PHYSICS 211.
- Introduction to circuit analysis including Ohm's and Kirchhoff's Laws, nodal and mesh methods; network theorems; resistors, capacitors, inductors, independent and dependent sources, diodes; ideal OP-AMP and transistor circuits; RL, RC, and R-L-C responses; complex frequency and phasors; steady-state AC circuits.

EE 207 CIRCUITS II

S 4 cr. LEC 3 LAB 1
PREREQUISITE: EE 206, MATH 225.
- Complete response of R-L-C circuits to step and harmonic excitations, coupled inductors and ideal transformers, two port networks, network functions and Bode plots, frequency response of circuits with non-ideal OP-AMP and transistor based amplifiers, Laplace Transform and Fourier series.

EE 250 CIRCUITS, DEVICES, AND MOTORS

F, S 4 cr. LEC 3 LAB 1
PREREQUISITE: MATH 182 or MATH 176.
COREQUISITE: PHYS 212 or PHYS 206.
- Introduction for non-majors to electrical circuit principles, voltage and current laws, frequency response; introduction to electronic circuits including transistors, operational amplifiers, and power electronics; digital logic; introduction to electromechanical energy conversion devices, DC and AC machines, special purpose machines.

EE 261 INTRODUCTION TO LOGIC CIRCUITS

F, S 5 cr. LEC 3
COREQUISITE: MATH 181.
- An introduction to the fundamental concepts of classical digital design. Course covers design and implementation of combinational logic circuits, synchronous sequential circuits and information storage circuits. Basic concepts of programmable logic and computer-aided design tools are presented.

EE 262 LOGIC CIRCUITS LABORATORY

F, S 1 cr. LAB 1
PREREQUISITE: EE 261.
- Application of digital circuit theory and logic circuit design, utilizing both discrete and programmable logic. Design of IC timing circuits for digital clock applications.

EE 270 INDEPENDENT STUDY

On Demand 1 - 2 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

EE 280 SPECIAL TOPICS

On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EE 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION

F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EE 308 SIGNAL AND SYSTEM ANALYSIS

F 3 cr. LEC 3
PREREQUISITE: EE 207, MATH 224.
- Discrete and continuous time signals and systems. Properties, application, synthesis and analysis for the CT and DT Fourier Series, the Fourier transform, the DTFT, z and Laplace transform. Applications in differential and difference equations, sampling, feedback, and communications. Introduction to the DFT.

EE 317 ELECTRONICS

F 4 cr. LEC 3 LAB 1
PREREQUISITE: EE 207.
- This is an introductory course in electronics. It introduces diodes, bipolar junction transistors, field effect transistors and bipolar and MOS analog and digital circuits.

EE 321 INTRODUCTION TO CONTROLS

S 5 cr. LEC 3
PREREQUISITE: EE 308.

EE 334 ELECTROMAGNETIC THEORY I

F 3 cr. LEC 3
PREREQUISITE: PHYS 212, MATH 224.
- Basic electric and magnetic fields including transmission lines. The materials covered will include both static and dynamic fields, traveling waves, and transmission line concepts such as impedance, reflection coefficient, and transient response.

EE 335 ELECTROMAGNETIC THEORY II

S 3 cr. LEC 3
PREREQUISITE: EE 334.
- This course provides students the opportunity to gain more depth in EM fields topics such as Maxwell's equations, plane wave propagation, radiation and antennas, and the use of the Smith Chart.

EE 353 INDUSTRIAL ELECTRIC AND ELECTRONIC SYSTEMS

On Demand 3 cr. LEC 3
PREREQUISITE: PHYS 212 or PHYS 206 and MATH 182 or MATH 176.
- Electric industrial system overview and requirements, selection of electric industrial drives and associated power converters, industrial power systems, illumination, load estimation and feeder design, power quality and system security.
COURSE DESCRIPTIONS: EE 354 - EE 465

EE 354 ELECTRIC POWER APPLICATIONS
F 3 cr. LEC 2 LAB 1
PREREQUISITE: MATH 176 or MATH 181 and PHYS 206 or PHYS 212.
- An applied study of electricity and electrical power circuits, with laboratory experience, for that person not expected to deal with electronics or advanced circuit techniques. Topics covered include electrical circuit laws, power and energy, alternating current circuits; residential, commercial and industrial wiring; wire sizing, three-phase circuits; and application of transformers and electric motors.

EE 355 ENERGY CONVERSION DEVICES
S 4 cr. LEC 3 LAB 1
PREREQUISITE: EE 207.
- Introduction to electrical energy conversion devices such as DC and AC generators and motors, transformers, single phase and special purpose motors, and power electronic converters; three-phase circuits; introduction to power systems. Laboratory experience includes construction and demonstration of energy conversion circuits.

EE 367 LOGIC DESIGN
S 4 cr. LEC 3 LAB 1
PREREQUISITE: EE 262, EE 371.
- Advanced combinational, synchronous and asynchronous sequential logic system design including hardware descriptive languages. Laboratory experience in advanced logic circuit design using FPGAs.

EE 371 MICROPROCESSOR HARDWARE AND SOFTWARE SYSTEM
F 4 cr. LEC 3 LAB 1
PREREQUISITE: EE 261 and knowledge of a programming language or consent of instructor.
- Introduction to the structure of microprocessors, arithmetic and logic units, processor control, interrupts, memories, and input/output. Laboratory experience in assembly level programming of microprocessor applications.

EE 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 1 cr.
PREREQUISITE: Junior standing.
- Engineers from industry and others present weekly seminars about new developments in EE, research at MSU, law and the EE, starting companies, etc. The course is designed to expose students to different career options and present background in related areas.

EE 407 INTRODUCTION TO MICROFABRICATION
S 3 cr. LEC 2 LAB 1
PREREQUISITE: Junior standing and PHYS 212 or PHYS 206.
- Provide an introduction to clean room safety protocol and micro fabrication. Lectures will introduce micro fabrication methods, models and equipment. Laboratories will perform the steps to produce and characterize a metal-oxide-semiconductor transistor.

EE 409 MATERIAL SCIENCE
F 3 cr. LEC 3
PREREQUISITE: EE 317.
- Basic material properties of dielectrics, magnetic materials, conductors, and semiconductors. Practical applications of materials to semiconductor devices.

EE 411 ADVANCED ANALOG ELECTRONICS
S 3 cr. LEC 3
PREREQUISITE: EE 317.
- This course covers differential and multistage amplifiers, frequency response, feedback, analog integrated circuits, filters, and tuned circuits, analog to digital and digital to analog conversion, noise in electronics, current topics.

EE 412 ELECTRONIC INSTRUMENTATION DESIGN
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 317.
- Applications of integrated instrumentation amplifiers, comparators, sample and hold devices, and A/D and D/A converters. Design using electrical transducers, signal conditioning and filtering circuits, sample-and-hold elements, and ground-loop considerations. Lab experience in graphical programming applications for data acquisition and instrument control. Analog and digital I/O considerations to control processes and generate patterns for testing and communication with peripheral equipment.

EE 414 INTRODUCTION TO VLSI DESIGN
F 3 cr. LEC 3
PREREQUISITE: EE 262, EE 317.
- Introduction to the fundamentals of CMOS VLSI circuit design. This course covers CMOS device characteristics and timing, CMOS fabrication, CAD tools, design rules, simulation and layout, CMOS combinational and sequential logic, SRAM and DRAM memory, and dynamic logic design.

EE 415 ANALOG INTEGRATED CIRCUIT DESIGN
S 3 cr. LEC 3
PREREQUISITE: EE 414.
- Topics include passive components, parasite elements, component matching, IC layout techniques, combinational and sequential elements, and current sources, comparators, op amps, noise, switched capacitor circuits.

EE 417 ACOUSTICS AND AUDIO ENGINEERING
F alternate years, to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 317, EE 321, EE 355.

EE 422 INTRODUCTION TO MODERN CONTROL
F 3 cr. LEC 3
PREREQUISITE: EE 321.

EE 423 CONTROL SYSTEMS LAB
On Demand 1 cr. LAB 1
PREREQUISITE: EE 422.
- Laboratory experience in assembly level programming of microprocessors, introduction to power systems. Laboratory experience includes construction and demonstration of energy conversion circuits.

EE 431 ADVANCED ANALOG ELECTRONICS
S 3 cr. LEC 3
PREREQUISITE: EE 317.
- This course covers differential and multistage amplifiers, frequency response, feedback, analog integrated circuits, filters, and tuned circuits, analog to digital and digital to analog conversion, noise in electronics, current topics.

EE 432 INTRODUCTION TO MODERN CONTROL
F 3 cr. LEC 3
PREREQUISITE: EE 321.

EE 433 PLANAR MICROWAVE CIRCUIT DESIGN
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 354.
- An introductory course on microwave circuits emphasizing the design, fabrication and measurement of planar circuits (matching networks, filters, couplers, mixers, etc.) for frequencies above 1 GHz. Students will learn to use state-of-the-art CAD tools and a vector network analyzer.

EE 445 TELECOMMUNICATIONS SYSTEMS
S 5 cr. LEC 3
PREREQUISITE: EE 308, EE 317.
- Analog and digital communication systems performance in noisy environments; noise characterization; bandwidth considerations; probability of error; analog and digital modulation; frequency domain analysis; matched filter applications.

EE 446 TELECOMMUNICATIONS LAB
S 1 cr. LAB 1
PREREQUISITE: EE 445.
- Fourier analysis and use of spectrum analyzers. Experiment involving modulation and demodulation of analog and digital signals, sampling theory, and aliasing.

EE 447 MOBILE WIRELESS COMMUNICATIONS
F 3 cr. LEC 3
PREREQUISITE: EE 445.
- Characteristics of the radio environment, propagation, cellular concepts, channel allocation, modulation techniques, multiple access techniques, Shannon's Capacity Theorem, error-correcting codes, data compression, spread spectrum modulation, current wireless communication systems.

EE 451 POWER ELECTRONICS
S alternate years, to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 317, EE 321, EE 355.
- Solid-state power devices; topologies, operating principles, and control methods of solid-state power converters; applications of solid-state power converters in different electric systems.

EE 454 ELECTRIC POWER SYSTEMS
F 3 cr. LEC 3
PREREQUISITE: EE 355.
- Power system components, transmission system design, power flow studies, automatic generation control, symmetrical components, faulted power systems, protection, introduction to transient stability.

EE 461 DIGITAL SYSTEM DESIGN
S, alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: EE 308 and EE 354 and EE 371.
- Analysis and design of high speed digital systems including chip-level circuit design, state-of-the-art simulation tools, and measurement techniques using Time Domain Reflectometry (TDR).

EE 465 REAL TIME MICROCONTROLLER APPLICATIONS
S 4 cr. LEC 2 LAB 2
PREREQUISITE: EE 371.
- Lecture/laboratory exposure to micro controller hardware and software applications, serial and parallel I/O, timing, interrupts LCDs, keypads, A to D conversion, and a project realizing a real time control problem.
COURSE DESCRIPTIONS: EE 466 - EE 538

EE 466 COMPUTER ARCHITECTURE AND SYSTEM ORGANIZATION
S 3 cr. LEC 3
PREREQUISITE: EE 371.
- Design of computer system instruction sets, data path, storage, and memory systems. Cost and speed relations, tradeoffs between hardware and software architectures including CISCs and RISCs, multiprocessors, and distributed processors. Control and implementation tradeoffs.

EE 467 ADVANCED EMBEDDED SYSTEMS LAB
S 1 cr. LAB 1
PREREQUISITE: EE 467, CS 201.
COREQUISITE: EE 466.
- Principles and applications of embedded systems using FPGAs. Students will implement micro controllers, soft processors, and custom logic in FPGAs.

EE 470 INDEPENDENT STUDY
On Demand 1 - 2 cr. IND Maximum 4 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

EE 475 HARDWARE AND SOFTWARE ENGINEERING FOR EMBEDDED SYSTEMS
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 371 and CS 201.
- Topics in embedded system design, real-time operating systems, high level language programming of embedded systems, software and hardware tradeoffs, and laboratory experience with embedded systems.

EE 476 INTERNSHIP
F, S, Su 1-2 cr. IND Maximum 3 cr.
PREREQUISITE: Sophomore standing and consent of instructor.
- On-site, one semester practicum under guidance of employer designated mentor.

EE 477 DIGITAL SIGNAL PROCESSING
S 4 cr. LEC 3 LAB 1
PREREQUISITE: EE 508.
- Analysis and design of discrete-time systems, including frequency response. Sampling and reconstruction of continuous signals. Analysis, design, and applications of FIR and IIR digital filters. Properties and applications of the discrete Fourier transform. Laboratory experiments implementing off-line and real-time digital signal processing algorithms.

EE 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given off a trial basis to determine acceptability and demand before requesting a regular course number.

EE 482 ELECTRO-OPTICAL SYSTEMS
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 334 or PHYS 317 or equivalent.
- Provides an overview of electro-optic systems and components. Lectures cover ray optics, scalar wave optics, laser and Gaussian beam optics, optical polarization and polarization devices, light sources, detectors, and electro-optic and acoustic-optic photonic devices. Laboratory experiments introduce basic photonic instrumentation and measurement techniques.

EE 483 FIBER AND OPTICAL COMMUNICATIONS
S alternate years, to be offered odd years
3 cr. LEC 2 LAB 1
PREREQUISITE: PHYS 213 AND EE 334 or PHYS 318.
- This introduction to fiber and integrated optics components for telecommunications systems includes: ray tracing, graded index lenses, single mode and multimode optical fiber, fiber Bragg gratings, wave guides, WDM components, light sources and detectors, optical link design, link budgets and optical system architectures.

EE 484 LASER ENGINEERING
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: PHYS 312.
- The laser engineering course provides a basic understanding of the design and operational principles of lasers. Discussions of design and operation of several types of lasers will be covered including solid state lasers, gas lasers, and semiconductor lasers.

EE 489R UNDERGRADUATE RESEARCH/CREATIV ACTIVITY INSTRUCTIONS
F, S, Su 1-6 cr. IND Maximum 3 cr.
- On-site, one semester practicum under guidance of employer designated mentor.

EE 490R UNDERGRADUATE RESEARCH/CREATIV ACTIVITY
F, S, Su 1-6 cr. IND May be repeated. Max 6 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

EE 492R ELECTRICAL ENGINEERING DESIGN II
F, S 3 cr. SEM 1 LAB 2
PREREQUISITE: ENGR 310.
- Senior capstone course. A design project culminates with the actual construction and demonstration of the results. Design team report progress to the design supervisor periodically. Students are required to write a technical paper, participate in a Design Fair, and generate complete technical documentation for the project.

EE 495 PROFESSIONALISM, ETHICS AND ENGINEERING PRACTICES
S 1 cr. LEC 1
PREREQUISITE: Junior standing.
- Engineers from industry and others give presentations on professionalism, ethics, and engineering practices. Included are specific well-known, historical engineering ethics cases and professional practices of engineering, intellectual property issues, and new developments.

EE 498 CO-OP EXPERIENCE
F, S, Su 3 cr.
PREREQUISITE: Junior standing, GPA of 3.00 or better.
- On-site cooperative work experience for electrical engineering students.

EE 503 ADVANCED ANALOG CIRCUIT DESIGN
F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 317.
- Solid state device models, spice and other computer simulations, single and multiple state amplifier design, current sources, operation amplification design, frequency response, feedback and feed forward amplifier analysis, noise and distortion in electronics.

EE 505 MEMS SENSORS AND ACTUATORS
S alternate years, to be offered odd years
3 cr. LEC 2 LAB 1
PREREQUISITE: EE 400.
- Micro fabrication of electrical and mechanical devices. Theory of various mechanical transducers and physical sensors including optical MEMS, RF MEMS, and Bio/Chemical MEMS.

EE 522 ADAPTIVE CONTROL
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: EE 422.
- On-line parameter estimation, self tuning regulators, model reference adaptive controls. Robust control.

EE 525 SYSTEM IDENTIFICATION
F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 422.

EE 526 SEQUENTIAL STATE ESTIMATION
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: EE 422.
- Sequential state estimation, with emphasis on Kalman filtering and smoothing. Continuous and discrete time.

EE 528 ADVANCED TOPICS - CONTROLS & SIGNALS
On Demand 3 cr. LEC 3 Max 6 cr.
PREREQUISITE: EE 422 or equivalent.
- Reading, discussion and exploration of original source material on advanced control systems and signal processing. Topics selected to compliment current interest and existing courses; for example, computational statistical methods, estimation, modeling, compression, advanced analytical techniques, multi-dimensional systems, spectral analysis, and implementation.

EE 533 ANTENNA ENGINEERING
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: EE 422 or equivalent.
- Introduction to the electromagnetic theory and practice of antenna design and analysis. Common antenna structures are studied, including dipoles, arrays, horns, and reflectors. Applications will be explored in wireless communication, remote sensing, and related fields. Numerical electromagnetic simulation techniques are used for antenna modeling.

EE 538 ADVANCED TOPICS IN ELECTROMAGNETICS AND OPTICS
On Demand 3 cr. LEC 3 MAX 6 cr.
PREREQUISITE: None.
- Advanced topics in applied electromagnetics and optics, chosen to represent current research in this field.
## EE 541 ADVANCED COMMUNICATION THEORY

F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: EE 445.
- Signal spectrum analysis, random processes, correlation functions, functional transformations of random variables, optimal linear filtering and estimation, statistical analysis of digital and analog modulation systems, orthogonality and related signals: time, bandwidth, and dimensionality.

## EE 542 ADVANCED ELECTRICAL POWER

F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 451.
- Power system elements, fast dynamic stability, and reactive power flow, application of FACTS devices and FACTS-based control systems.

## EE 543 ADVANCED TELECOMMUNICATIONS SYSTEMS

F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 445.
- Digital and analog switching systems, packet and circuit telecommunication transmission networking and media selection (fiber optics, cable, microwave and satellite), network configuration, network technologies, equipment selection, system design examples and project.

## EE 544 ADVANCED DISTRIBUTED GENERATION SYSTEMS

F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: Upper division courses and approval of instructor, approval of department head and Dean of Graduate Studies.
- Representation of power system elements, fast-active/reactive power flow, voltage control, load-frequency control, control of active and reactive power flow, application of FACTS devices in power flow control, electrical faults and contingency calculations, transient stability, dynamic stability.

## EE 545 ADVANCED TOPICS IN COMMUNICATIONS SYSTEMS

F alternate years, to be offered odd years
5 cr. SEM 5 Max 6 cr.
PREREQUISITE: EE 543 or equivalent.
- Reading and discussion of original source material on advanced communications systems topics including digital communications systems, optical technologies and systems, packet networks, IP networking, wireless systems, ad hoc networks.

## EE 546 ADVANCED TOPICS IN ELECTRICAL POWER ON DEMAND

F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 454 or equivalent.
- Reading, discussion and exploration of advanced electrical power topics including power system operation and control, power dynamics, power markets, protection, electric drives, or power electronics.

## EE 547 PARALLEL PROCESSING

F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 466.
- Architecture and applications of parallel processors, major design issues, fault tolerant computing, performance measures of parallel systems, and issues in concurrent programming.

## EE 548 ADVANCED TOPICS IN COMMUNICATIONS SYSTEMS

F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: EE 477.
- Advanced topics in digital signal processing. Review of LTI discrete-time systems; signal and coefficient quantization; sample rate conversion and multirate filter structures; time-varying and adaptive systems; fast algorithms; system implementation alternatives; DSP applications in current research.

## EE 549 SPEECH SIGNAL PROCESSING

F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: EE 477.
- Digital signal processing techniques that are used to analyze, code, and manipulate speech signals. Topics include modification, coding, enhancement, and recognition of speech signals.

## EE 550 SPECIAL TOPICS

On Demand 1 - 10 cr. IND
PREREQUISITE: Master's standing.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

## EE 551 GRADUATE CONSULTATION

F, S, Su 1 - 3 cr. TUT
PREREQUISITE: Master's standing.
- Design, analysis, and calibration of electromagnetic remote sensing systems. Combines an introduction to atmospheric radiative transfer and wave propagation principles with detailed coverage of radiometry and optical detectors to analyze remote sensing systems. The course considers the full electromagnetic spectrum, but emphasizes optical systems at ultraviolet, visible, and infrared wavelengths, including cameras, spectrometers, radiometers, polarimeters, multispectral and hyperspectral imagers, laser radars, etc.

## EE 552 REMOTE SENSING SYSTEMS

F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 334 or PHYS 317 or equivalent.
- Design, analysis, and calibration of electromagnetic remote sensing systems. Combines an introduction to atmospheric radiative transfer and wave propagation principles with detailed coverage of radiometry and optical detectors to analyze remote sensing systems. The course considers the full electromagnetic spectrum, but emphasizes optical systems at ultraviolet, visible, and infrared wavelengths, including cameras, spectrometers, radiometers, polarimeters, multispectral and hyperspectral imagers, laser radars, etc.

## EE 553 FOURIER OPTICS AND IMAGING THEORY

F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 454 or consent of instructor.
- Optical propagation and diffraction using scalar wave approach and Fourier Theory of imaging. Introduces concepts of pupil function, point and line spread function and optical transfer function, image formation with coherent and incoherent light, holography and diffractive optical elements.

## EE 554 OPTICAL DESIGN

F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 482 or PHYS 426.
- Optical design using geometric optics and computer raytracing software. Introduces ray and wave front aberrations, control of aberrations in optical systems, designing for system requirements, and analytic tools including the modulation transfer function for describing the imaging and dim-conditioning properties of typical optical systems, including lenses, mirrors, cameras, and telescopes.

## EE 555 REMOTE SENSING SYSTEMS

S alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 334 or PHYS 317 or equivalent.
- Design, analysis, and calibration of electromagnetic remote sensing systems. Combines an introduction to atmospheric radiative transfer and wave propagation principles with detailed coverage of radiometry and optical detectors to analyze remote sensing systems. The course considers the full electromagnetic spectrum, but emphasizes optical systems at ultraviolet, visible, and infrared wavelengths, including cameras, spectrometers, radiometers, polarimeters, multispectral and hyperspectral imagers, laser radars, etc.

## EE 556 ADVANCED TOPICS IN ELECTRICAL POWER

F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 451.
- Mathematical modeling of switching power converters, advanced power converter topologies, design constraints and control methods, design-oriented analysis techniques for applications in electro-mechanical systems, power systems, transportation systems, etc.

## EE 557 REMOTE SENSING SYSTEMS

F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 477.
- Advanced topics in digital signal processing. Review of LTI discrete-time systems; signal and coefficient quantization; sample rate conversion and multirate filter structures; time-varying and adaptive systems; fast algorithms; system implementation alternatives; DSP applications in current research.

## EE 558 SPECTRAL SENSORS

F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 454 or equivalent.
- Upper division courses and others as determined for each offering.

## EE 559 SPECIAL TOPICS

F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: EE 477.
- Digital signal processing techniques that are used to analyze, code, and manipulate speech signals. Topics include modification, coding, enhancement, and recognition of speech signals.

## EE 560 SPECIAL TOPICS

On Demand 1 - 12 cr. Maximum credits unlimited.
PREREQUISITE: Master's standing.
- Master's standing and approval of the Dean of Graduate Studies.

## EE 561 DOCTORAL THESIS

F, S, Su 1 - 10 cr. IND
PREREQUISITE: Master's standing.
- This course considers the full electromagnetic spectrum, but emphasizes optical systems at ultraviolet, visible, and infrared wavelengths, including cameras, spectrometers, radiometers, polarimeters, multispectral and hyperspectral imagers, laser radars, etc.
PREREQUISITE: PHYS 205, EM 205 MECHANICS
- Force systems in equilibrium and applications to structural trusses and frames; section properties; distributed force systems; shear and moment distributions in beams; basic particle dynamics.

EM 215 STRENGTH OF MATERIALS
F, S 3 cr. LEC 3
PREREQUISITE: EM 205.
- Equilibrium and deformation of structural elements; concepts of stress and strain and interrelationship; energy conversion and transformation of combined stress states; axial, torsional and flexural stresses and deformation; column buckling.

EM 251 STATICS AND PARTICLE DYNAMICS
F, S, Su 3 cr. LEC 3
PREREQUISITE: PHYS 211.
COREQUISITE: MATH 224.
- Equilibrium of particles and rigid bodies; analysis of structures, Coulomb friction, kinematics, kinetics, work-energy for particles.

EM 253 RIGID BODY MECHANICS
F, S, Su 3 cr. LEC 3
PREREQUISITE: EM 251.
- Mass centers and centroids, moments and products of inertia, kinematics, kinetics, work-energy, impulse-momentum for rigid bodies, vibration of rigid bodies, and beams.

EM 255 MECHANICS OF MATERIALS
F, S 3 cr. LEC 3
PREREQUISITE: EM 251.
- Stress and strain, Hooke’s Law, thermal strain, torsion, bending of beams, combined stress, limit analysis, energy methods, virtual work, column theory.

EM 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EM 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

EM 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.
ENGL 118 INTRODUCTION TO COLLEGE READING AND WRITING  
F, S 4 cr. LEC 3 RCT 1  
- Introduces students to critical reading practices by focusing on textual analysis of non-fiction works and writing for academic purposes by focusing on sentence and paragraph development. Offered in partnership with the COT in Bozeman.

ENGL 119 CRITICAL READING AND WRITING  
F, S 4 cr. LEC 3 RCT 1  
- Offers a bridge for students to advance into college writing by providing an opportunity to develop paragraphs and short essays and introduces students to critical reading practices by focusing on textual analysis of non-fiction works. Offered in partnership with the COT in Bozeman.

ENGL 121W COLLEGE WRITING I  
F, S, Su 3 cr. RCT 3  
- Studies in the discovery and written expression of ideas, stressing organization, support, audience awareness, clarity, and persuasive presentation. Taught around a particular topic or theme varying each offering.

ENGL 123H INTRODUCTION TO LITERARY STUDY  
F, S 3 cr. RCT 3  
- Introduction to basic concepts including but not limited to: plot, character, theme, symbol, and the primary literary modes of poetry, fiction, and drama. Students will be introduced to terms through a standard handbook which should accommodate all future English courses.

ENGL 210D MYTHOLOGIES  
F, S 5 cr. RCT 3  
- The study of specific cultural mythologies to explore the nature, function, and theory of myth.

ENGL 211BIBLICAL FOUNDATIONS OF LITERATURE  
F 3 cr. LEC 3  
PREREQUISITE: ENGL 123.  
- Study of the Bible and related texts and how this tradition has influenced subsequent literature.

ENGL 213 CLASSICAL FOUNDATIONS OF LITERATURE  
S 3 cr. LEC 3  
PREREQUISITE: ENGL 123.  
- Study of the literature of Classical Greece and Rome and how this tradition has influenced subsequent literature.

ENGL 214D REGIONAL LITERATURE  
F, S 3 cr. RCT 3  
- Examination of American literary regions in the context of critical multiculturalism. Analyzes topics such as the development of local color writing, borderlands/transnational studies, and the concept of the frontier as contact zone. May focus on a specific regional literature or adopt a comparative approach.

ENGL 216 SURVEY OF BRITISH LITERATURE I  
F, S 3 cr. LEC 3  
PREREQUISITE: ENGL 123.  
- A survey of selected works and writers of British literature from the Old English period through the 18th century in the context of cultural, historical, and social patterns.

ENGL 217 SURVEY OF BRITISH LITERATURE II  
F, S 3 cr. LEC 3  
PREREQUISITE: ENGL 123.  
- A survey of selected works of British literature from the 18th century to the present in the context of cultural, historical, and social patterns.

ENGL 218 SURVEY OF AMERICAN LITERATURE I  
F, S 3 cr. LEC 3  
PREREQUISITE: ENGL 123.  
- Survey of selected works and authors in the American literary tradition from the early period to 1865. Taught within the contexts of historical, social, and cultural developments.

ENGL 219 SURVEY OF AMERICAN LITERATURE II  
F, S 3 cr. LEC 3  
PREREQUISITE: ENGL 123.  
- Survey of selected works and authors in the American literary tradition from 1865 to the present. Taught within the contexts of historical, social and cultural developments.

ENGL 221 COLLEGE WRITING II  
F, S 3 cr. RCT 3  
PREREQUISITE: ENGL 121.  
- Study and practice of strategies and devices of expository and argumentative prose. Builds upon writing skills learned in ENGL 121.

ENGL 223 TECHNICAL WRITING  
F, S 3 cr. RCT 3  
PREREQUISITE: ENGL 121.  
- Focuses on kinds of writing done in technical or business environments: business letters, proposals, formal reports, technical presentations, user manuals, etc. Prepares students for technical writing in a range of disciplines and with attention to the social implications of technology.

ENGL 233H INTRO TO LANGUAGE & LINGUISTICS  
F, S 3 cr. LEC 3  
- Examines the nature and function of linguistic systems, the psychology of language, the relationship between language and culture, usage patterns, linguistic variety and change, and levels of linguistic analysis.

ENGL 238 THE STRUCTURE AND FUNCTION OF LANGUAGE  
F 3 cr. LEC 3  
- Focus on how meaning is made in the English language, primarily through grammar. From parts of speech to sentence construction, this course will assist students in evaluating literary writing styles as well as improving their own.

ENGL 270 INDEPENDENT STUDY  
On Demand 1 - 6 cr. IND Maximum 6 cr.  
PREREQUISITE: Consent of instructor and approval of department head.  
- Directed research and study on an individual basis.

ENGL 280 SPECIAL TOPICS  
On Demand 1 - 4 cr. Maximum 12 cr.  
PREREQUISITE: None required but some may be determined necessary by the department.  
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ENGL 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION  
F, S 1-5 cr. RCT may be repeated  
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ENGL 300 SURVEY OF LITERARY CRITICISM  
F, S 3 cr. RCT 3  
PREREQUISITE: ENGL 123 and one other literature course.  
- Historical survey of principles, problems, and strategies of literary criticism.

ENGL 304 STUDIES IN CHILDREN'S AND YOUNG ADULT LITERATURE  
F alternate years, to be offered every year 3 cr. RCT 3  
PREREQUISITE: ENGL 123 and one other literature course.  
- Studies in selected literary works for children and young adults. The course may focus on genres, authors, themes, and/or critical approaches.

ENGL 308 MULTICULTURAL LITERATURE  
S 3 cr. RCT 3  
PREREQUISITE: ENGL 123 and one other literature course.  
- Designed specifically for English Education students. Focuses on literature by American minorities, women, and ethnic subcultures. Includes young adult literature, popular literature, and the work of one or more Montana Native American writers.

ENGL 326 ADVANCED COMPOSITION  
F 3 cr. RCT 3  
PREREQUISITE: ENGL 221, junior standing.  
- Advanced composition with attention to research writing, academic standards of evidence, logic, and development of style.

ENGL 350 WOMEN AND LITERATURE  
F alternate years, to be offered odd years 3 cr. RCT 3  
PREREQUISITE: ENGL 123.  
- A study of the relationship between women and literature, with some attention to feminist approaches to critical interpretation.

ENGL 357 ORAL TRADITIONS  
S 3 cr. LEC 3  
PREREQUISITE: ENGL 123 and one other literature course.  
- An examination of oral poetic/story traditions with emphasis on theory and primary materials. Students will be expected to make oral presentations based on class research.
ENGL 338 LANGUAGE FOR TEACHERS  
S 3 cr. RCT 3  
PREREQUISITE: ENGL 121.  
- Designed to provide English Teaching option students with an overview of linguistic systems, such as phonetics, phonemics, and semantics, and an intensive study of the structure of American English.

ENGL 339 TEACHING COMPOSITION, RHETORIC & SPEECH  
F 3 cr. RCT 3  
PREREQUISITE: ENGL 121.  
- This course explores practical and theoretical issues around writing instruction (introducing several approaches to composition pedagogy and working with student texts), rhetoric (attending to, for example, theories of argument and audience), and speech (focusing on preparing students for oral presentation).

ENGL 340 STUDIES IN BRITISH LITERATURE: OLD/MIDDLE ENGLISH  
F alternate years, to be offered even years  
S 3 cr. RCT 3  
PREREQUISITE: ENGL 216.  
- Intensive studies in selected Old English and/or Medieval literary works, with attention to historical and cultural context.

ENGL 341 STUDIES IN BRITISH LITERATURE: 16TH/17TH CENTURIES  
F alternate years, to be offered odd years  
S 3 cr. RCT 3  
PREREQUISITE: ENGL 216.  
- Intensive studies in selected literary works of the 16th and 17th centuries, with attention to historical and cultural context.

ENGL 342 STUDIES IN BRITISH LITERATURE: RESTORATION/18TH CENTURY  
S alternate years, to be offered odd years  
F 3 cr. RCT 3  
PREREQUISITE: ENGL 216 or ENGL 217.  
- Intensive studies in selected literary works by writers of the Restoration period and 18th-century England, with attention to historical and cultural context.

ENGL 343 STUDIES IN BRITISH LITERATURE: 19TH CENTURY  
S alternate years, to be offered even years  
F 3 cr. RCT 3  
PREREQUISITE: ENGL 216.  
- Intensive studies in selected literary works by 19th-century British writers, with attention to historical and cultural context.

ENGL 350 STUDIES IN AMERICAN LITERATURE: EARLY AMERICAN  
S alternate years, to be offered even years  
F 3 cr. RCT 3  
PREREQUISITE: ENGL 218.  
- Intensive studies in early American literature, with attention to development of a distinct national literature and culture.

ENGL 351 STUDIES IN AMERICAN LITERATURE: 19TH CENTURY  
F alternate years, to be offered odd years  
S 3 cr. RCT 3  
PREREQUISITE: ENGL 218 or ENGL 219.  
- Intensive studies in selected literary works by 19th-century American writers, with attention to historical context, particularly America's evolving national culture.

ENGL 371 STUDIES IN BRITISH/AMERICAN LITERATURE: 20TH CENTURY  
F alternate years, to be offered even years  
F 3 cr. RCT 3  
PREREQUISITE: ENGL 217 or ENGL 219.  
- Intensive study of selected English literary works by British and American authors, and in various genres written between the end of the 19th century and World War II, with attention to historical and cultural contexts and current literary trends and issues.

ENGL 372 CONTEMPORARY BRITISH/AMERICAN LITERATURE  
S alternate years, to be offered odd years  
S 3 cr. RCT 3  
PREREQUISITE: ENGL 217 or ENGL 219.  
- Intensive studies in English literary works by British and American authors and in various genres written since World War II with attention to historical and cultural contexts and current literary trends and issues.

ENGL 385 HISTORY OF THE ENGLISH LANGUAGE  
S alternate years, to be offered even years  
F 3 cr. LEC 3  
PREREQUISITE: ENGL 236, or ENGL 238, or ENGL 298.  
- Development of the English language from Old English to contemporary English, with focus on structure, phonology, dialects, and external influences. Readings in Old and Middle English.

ENGL 414 LITERATURE OF PLACE  
F 3 cr. RCT 3  
PREREQUISITE: ENGL 123.  
- Examines the relationship between environment and literary production. Variable topics.

ENGL 420 CRITICAL THEORY  
S alternate years, to be offered even years  
F 3 cr. RCT 3  
PREREQUISITE: ENGL 500.  
- An intensive study of one or more of the major themes, issues, schools, or critics related to literary theory.

ENGL 426 CREATIVE WRITING  
F, S 3 cr. RCT 3 Maximum 6 cr.  
PREREQUISITE: ENGL 121.  
- Intensive study of one or more of the major literary genres written since World War II with attention to historical and cultural context.

ENGL 429 PROFESSIONAL WRITING  
S alternate years, to be offered even years  
F 5 cr. RCT 3  
PREREQUISITE: ENGL 221.  
- Selected literary works in translation from non-English cultures and/or from English speaking cultures outside the United States and Britain.

ENGL 429H SHAKESPEARE  
S 3 cr. RCT 3  
PREREQUISITE: ENGL 123.  
- Senior capstone course for literature majors.

ENGL 431H STUDIES IN EMERGENT LITERATURES  
S 3 cr. LEC 3 Maximum 6 cr.  
PREREQUISITE: ENGL 123 and at least one other literature course.

ENGL 442 STUDIES IN IMAGINATIVE GENRES  
F alternate years, to be offered even years  
S 3 cr. RCT 3 Maximum 6 cr.  
PREREQUISITE: ENGL 221.  
- Senior capstone course for senior English school instruction through unit plans and videotaped mini-lessons. Class will include close analysis of issues and tasks central to the preparation of secondary teachers.

ENGL 450 HISTORY AND THEORY OF RHETORIC/COMPOSITION  
F alternate years, to be offered even years  
S 3 cr. RCT 3 Maximum 6 cr.  
PREREQUISITE: ENGL 217 or ENGL 219.  
- Intensive study of one or more of the major issues and tasks central to the preparation of English teachers. Consent of instructor.
ENGL 476 INTERNSHIP
On Demand 1-12 cr. IND
PREREQUISITE: Junior standing, consent of instructor and approval of department chair.
- An individual assignment arranged with an agency, business or other organization to provide guided experience in the field.

ENGL 480 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ENGL 480R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-2 cr. RCT May be repeated. Max 4 cr.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ENGL 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-4 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

ENGL 510 STUDIES IN CRITICAL THEORY AND PRACTICE
S 3 cr. RCT 3
PREREQUISITE: Graduate standing and upper division literary theory courses.
- Topics in critical theory and practice. Explores how historical and contemporary theories of literature have shaped the ways readers, teachers, and critics have thought about such fundamental questions as canon formation, pedagogical practice, and the goals and purposes of literary studies as a field.

ENGL 530 STUDIES IN WRITING THEORY AND PRACTICE
F 5 cr. RCT 3
PREREQUISITE: Graduate standing and upper division writing courses.
- Topics in rhetoric and composition. Examines a variety of models that have historically governed theories of criticism and writing practice.

ENGL 540 STUDIES IN THEORY AND PRACTICE OF LITERARY HISTORY
F alternate years, to be offered even years 3 cr. RCT 3
PREREQUISITE: Graduate standing and upper division literary theory courses.
- Topics in the theory and practice of literary history. Examines debates in the discipline on topics such as the production and reception of literary texts, the practice of periodization, and the relationship between literary studies and historiography.

ENGL 550 FOCUSED RESEARCH SEMINAR
SF alternate years F odd years 3 cr. SEM Maximum 6 cr.
PREREQUISITE: Graduate standing. Course prerequisites as determined for each offering.
- Topics offered at the graduate level not covered in the required courses. Involves directed research resulting in paper, as well as participation in preparing and presenting discussion material. Topics will vary.

ENGL 570 INDEPENDENT STUDY
On Demand 1-4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department chair and Dean of Graduate Studies.
- Directed research and study on an individual basis.

ENGL 575 PROFESSIONAL PAPER
F, S 1-4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ENGL 576 INTERNSHIP
On Demand 1-12 IND
PREREQUISITE: Graduate standing, consent of instructor, approval of the department chair, and completion of 15 credits of graduate work in English.
- An individualized assignment arranged with an agency, business, school, or other organization to provide guided experience in the field.

ENGL 580 SPECIAL TOPICS
On Demand 1-4 cr. SEM Maximum 9 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Advanced study of topics in the discipline, in courses not required in any curriculum, including experimental offerings of visiting professors, trial offerings of new courses, or one-time offerings of current topics.

ENGL 588 PROFESSIONAL DEVELOPMENT
On Demand 1-2 cr. SEM Required, 2 cr. total
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course, which is appropriately subtitled.

ENGL 590 MASTER'S THESIS
F, S 1-10 cr. IND
PREREQUISITE: Graduate standing.
- A thesis dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ENGR 125C TECHNOLOGY, INNOVATION, AND SOCIETY
F, S 1 cr. LEC 3
- This course explores the innovative engineering processes that connect the creative elements of science and engineering with solving problems of everyday life. Topics include understanding the role of creativity, public safety and ethics in creating technological solutions. Case studies are investigated, including applying critical thinking to exploring how innovation can help society.

ENGR 200 DESIGNING OUR COMMUNITY
F, S 1 cr. SEM 1
- This course is designed to explore issues in engineering and college academics for American Indian students in the Designing Our Community Program. The course will provide a learning community among students to ensure success in achieving their professional goals. Spring semester focuses on service learning projects.

ENGR 310R INTRODUCTION TO ENGINEERING DESIGN
F, S 3 cr. LEC 2 RCT 1
PREREQUISITE: Junior standing in an Engineering curriculum or consent of instructor.
- Introduces engineering students to topics such as design process, creative design, project management, teamwork, and technical leadership while highlighting the skills needed to work in a multi-disciplinary environment.

ENGR 480 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ENGR 490R EJNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 3 cr. RCT 3
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- An individual assignment arranged with an instructor, approval of the department chair, and completion of 15 credits of undergraduate work in English.

ENGR 499 ENGINEERING PROGRAM ASSESSMENT
F, S 0 cr. IND 0
PREREQUISITE: Must be in final two semesters of program.
- Student participation in engineering program assessment. Requirement to complete the Fundamentals of Engineering (FE) examination or the Major Field Test in Computer Science (CS majors only). Applications for the exams must be obtained from the students' departments. Application deadlines: fall semester - May 15th; spring semester - December 15th.

ENGR 600 SEMINAR
S 1-2 cr. SEM Required, 2 cr. total
PREREQUISITE: Doctoral standing or consent of instructor.
- Seminar experience. For students enrolled before 8/07, initial enrollment immediately follows completion of ENGR 610. First time students will present and defend their thesis topics (1 credit). The second enrollment will be taken the semester prior to scheduling the comprehensive exam where they will prepare and defend a formal research proposal (1 credit). For students enrolling after 8/07, ENGR 600 will be taken once as a two credit class the semester prior to scheduling the comprehensive exam; the course is designed to help the student prepare their proposal.
ENGR 610 RESEARCH AND METHODS IN ENGINEERING
F 3 cr. LEC 3
PREREQUISITE: Doctoral standing.
- Exploration of experimental design, statistical methods, models, and teaching issues. Methods of modern information access will also be covered.

ENTO Entomology
Land Resources and Environmental Sciences
(406) 994-7060

ENTO 500 SEMINAR
F, S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate preparing and presenting discussion material.

ENTO 510 INSECT ECOLOGY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BIOL 100 and one of the following: STAT 410, STAT 412.

ENTO 514 BEHAVIORAL ECOLOGY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: One of the following: BIOL 303, BIOL 403, BIOL 405, ENTO 416.
- Functional and evolutionary aspects of the behavior of insects and vertebrates, concentrating on the structure and tests of present-day theory; optimal foraging theory, habitat selection, mating systems, parental investment, game theory and social behavior.

ENTO 516 BIOSYSTEMATICS
F alternate years, to be offered odd years 3 cr. LEC 2 LAB 1
PREREQUISITE: One of the following: ENTO 492, BIOL 290, BIOL 415, BIOL 418, BIOL 419, BIOL 453, BIOL 454, BIOL 456.

ENTO 520 INSECT PHYSIOLOGY
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: ENTO 492 and one of the following: BIOL 312, BIOL 492, BIOL 411, BIOL 413, BIOL 430, ENTO 301, ENTO 492, ENTO 514, or ENTO 525.
- Principles of insect physiology and insect physiological ecology; digestive, respiratory, and circulatory processes; neurophysiology, endocrinology, reproductive systems, muscular systems and locomotion, defensive mechanisms, thermoregulation and water balance.

ENTO 525 INSECT MORPHOLOGY
S alternate years, to be offered even years 2 cr. LEC 1 LAB 1
PREREQUISITE: ENTO 204 and one of the following: BIOL 510, BIOP 403, ENTO 401, ENTO 452, ENTO 510, ENTO 514, ENTO 516, or ENTO 520.
- The principles of insect morphology and the evolutionary principles behind the diversity of form and function of the major insect and arthropod groups.

ENTO 590 MASTER'S THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

ENVE Environmental Engineering
Department of Civil Engineering
(406) 994-2111

ENVE 443 AIR POLLUTION CONTROL
F alternate years, to be offered 2008 5 cr. LEC 3
PREREQUISITE: EM 355, CHEM 151 and ME 524 or equivalent.
- Fundamentals of air quality management with emphasis on the design of processes and equipment for controlling gaseous and particulate emissions.

ENVE 444 HAZARDOUS WASTE MANAGEMENT
S alternate years, to be offered 2010 5 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: CHEM 215 or EM 355.
- Introduction to the technologies, regulations, political and social issues, and environmental impacts of hazardous wastes. Management approaches are developed through fundamental studies and review of case histories.

ENVE 445 HAZARDOUS WASTE TREATMENT
F alternate years, to be offered 2009 5 cr. LEC 3
PREREQUISITE: CE 540 or equivalent.
- Principles, theory, and practice of treating hazardous materials.

ENVE 534 ENVIRONMENTAL ENGINEERING INVESTIGATIONS
F 3 cr. LEC 3
PREREQUISITE: CE 549 and one of the following: CE 431, BREN 454, CE 455.
- Laboratory and field investigations for design and analysis of environmental engineering systems.

ENVE 535 HAZARDOUS WASTE MANAGEMENT
On demand 3 cr. LEC 3
PREREQUISITE: ENVE 580 (Bioremediation) or previous graduate level courses in environmental engineering.
- Examination of the technologies, regulations, political and environmental impacts of hazardous wastes. Management approaches are developed through fundamental studies of case histories.

ENVE 550 ENVIRONMENTAL ENGINEERING PROCESSES
F 2 cr. LEC 2
PREREQUISITE: CE 540.
- Physical, chemical, and biological processes in water quality management.

ENVE 561 ENVIRONMENTAL ENGINEERING REACTOR THEORY
F 2 cr. LEC 2
PREREQUISITE: CE 540.
- Theory and mathematics of reactors commonly used in water and wastewater operations.

ENVE 562 WATER TREATMENT PROCESSES & DESIGN
S 3 cr. LEC 3
PREREQUISITE: ENVE 560, ENVE 561.
- Principles, theory, and practice of water treatment plant design.

ENVE 563 WASTEWATER TREATMENT PROCESSES & DESIGN
S 3 cr. LEC 3
PREREQUISITE: ENVE 560, ENVE 561.
- Principles, theory, and practice of wastewater treatment plant design.

ENVE 564 ENVIRONMENTAL ENGINEERING APPLICATIONS LABORATORY
On Demand 5 cr. LAB 3
PREREQUISITE: Graduate standing or equivalent.
- The laboratories will be modular units based on environmental engineering application areas such as bioremediation, water and wastewater treatment, and biofilm systems. Students will learn analytical methods for determining chemical and biological components and will become familiar with laboratory and pilot scale reactors. Where appropriate, students will cooperate with field investigations.

ENVE 565 CHEMICAL SENSORS AND INSTRUMENTATION FOR ENVIRONMENTAL BIOTECHNOLOGY
S alternate years, to be offered 2010 2 cr. LEC 2
PREREQUISITE: CE 540 or consent of instructor.
- The course provides the knowledge necessary to design, manufacture, and use chemical sensors in the area of environmental biotechnology. Principles of manufacture and examples of application of chemical sensors along with the principles of measurement, signal conditioning, and data acquisition are presented to an extent that is necessary for the operation of sensors. The measurement techniques are preceded with an adequate theoretical introduction. Demonstrations of the sensors are organized at the Center for Biofilm Engineering.

ENVE 566 FUNDAMENTALS OF BIOFILM ENGINEERING
F 3 cr. LEC 3
PREREQUISITE: MATH 225.
- Development of quantitative descriptions of processes of microbial growth, diffusive and convective solute transport, and cell attachment and detachment. Integration of these processes in mathematical models of biofilm accumulation and activity. Application of these approaches to the analysis of biofilms in diverse industrial and natural environments.

ENVE 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies.
- Directed research and study on an individual basis.
ENVE 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND
Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

ENVE 576 INTERNSHIP
On Demand 2 cr.
PREREQUISITE: Graduate standing, consent of instructor and approval of Department Head.
- An individual assignment arranged with an agency, business or other organizations to provide guided experience in the field.

ENVE 580 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ENVE 589 GRADUATE CONSULTATION
On Demand 5 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ENVE 590 MASTER’S THESIS
On Demand 1 - 10 cr. IND
May be repeated.
PREREQUISITE: Master’s standing.

ESCI
Earth Science
Department of Earth Sciences
(406) 994-3331

ESCI 111N PHYSICAL GEOLOGY
F, S, Su 4 cr. LEC 3 LAB 1
- Examination of basic geologic processes, Earth and planets through geologic time, internal geosystems, and surficial geosystems.

ESCI 112N PHYSICAL GEOGRAPHY
F, S 4 cr. LEC 3 LAB 1
- Weather and climate, soils, vegetation, land forms, and water with emphasis on their interdependence and distribution.

ESCI 211RN YELLOWSTONE: A SCIENTIFIC LABORATORY
F 4 cr. LEC 3 RCT 1
- The Yellowstone region is an unparalleled laboratory for earth scientists. The volcanic, glacial, climatic, and ecological processes that shaped the region will be introduced through lecture, discussions, and projects. Recitation sections and field trips provide additional hands-on experiences.

ESCI 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ESCI 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-5 cr. RCT may be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ESCI 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND
May be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

ESCI 507 PRINCIPLES OF GEOMORPHOLOGY
F 4 cr. LEC 3 LAB 1
PREREQUISITE: ESCI 111 and ESCI 112; familiarity with spreadsheets and word-processing is assumed. Junior standing.
- Framework, process, system, and time as factors which control the generation of land forms. Laboratories involve field trips and map interpretation, and computer modeling.

ESCI 510 AERIAL PHOTO INTERPRETATION
F 4 cr. LEC 3 LAB 1
PREREQUISITE: Junior standing and ESCI 111 and ESCI 112.
- Interpretation of aerial photographs to obtain quantitative and qualitative information about the physical and cultural features on earth's surface.

ESCI 439R SURFACE-WATER RESOURCES
F alternate years, to be offered odd years 3 cr. LEC 3 LAB 2
PREREQUISITE: Junior standing, ESCI 112 and STAT 216 or STAT 352 and PHYS 205 or PHYS 211.
- Physical analysis of the surface portion of the hydrologic cycle: climate, evapotranspiration, precipitation, runoff, flooding, stream channels, sediment production, sediment transport and drainage basins. The surface-water resource in terms of regional supply and human use and intervention. Laboratory fee required.

ESCI 440G GROUND-WATER RESOURCES
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: Junior standing, MATH 170 or MATH 182; CHEM 152, PHYS 205 or PHYS 211, ESCI 111 and ESCI 112.
- The relationship between ground-water and other parts of the hydrologic cycle: ground-water availability, movement, chemistry, exploration, geology, and aquifer tests. The ground-water resource in terms of regional supply and human use and intervention.

ESCI 450R SNOW DYNAMICS & ACCUMULATION
S 3 cr. LEC 1 LAB 2
PREREQUISITE: Junior or Senior standing; STAT 216; ability to ski at intermediate level in alpine terrain; PHYS 205 or 211 and ESCI 112 or consent of instructor.
- Senior capstone for the Snow Science Option. The accumulation, redistribution, and metamorphism of snow as related to humans. Avalanche, recreation, agriculture, silviculture, runoff, and the alpine environment. Field studies are conducted on a regular basis under rigorous field conditions.

ESCI 455 PHYSIOGRAPHY OF THE UNITED STATES
S, alternate years to be offered every even year 3 cr. LEC 3 LAB 1
PREREQUISITE: Junior standing, ESCI 307.
- The physiographic provinces of the United States, their physical characteristics, evolution, and identification.

ESCI 476 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ESCI 499R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: ESCI 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ESCI 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND
May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

ESCI 495 SENIOR THESIS
F, S 3 cr. RCT 3
PREREQUISITE: Senior standing; minimum 3.0 cum gpa; faculty recommendation.
- Senior thesis provides an opportunity to conduct research under the supervision of a faculty member leading to the production of a research paper ("mini-thesis") and an oral presentation to the department or at a professional meeting. Excellent preparation for graduate school and professional work.

ESCI 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ESCI 502 FLUVIAL GEOMORPHOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: ESCI 307 or other introduction to fluvial systems or instructor permission.
- This course provides a foundation for understanding fluvial processes, interpreting fluvial forms, and teaches basic tools for use in watershed and river assessment. Course will cover drainage networks, channel form, and apply these concepts to a river assessment problem.
ESCI 505 GEOMICROBIOLOGY
S alternate years, to be offered even years 3 cr. SEM
- The course will examine geochemical and microbial interactions that control earth surface processes and ultimately major biogeochemical cycles. The course will study integrated approaches to research problems using geochemistry, stable isotope geochemistry, culture-based and molecular microbial techniques.

ESCI 512 MOUNTAINS AND PLAINS RIPARIAN PROCESSES
Su On Demand 2 cr. SEM 2
PREREQUISITE: Introductory geology (ESCI 111), secondary teaching certification plus two years teaching experience; recommended ESCI 511 and access to the world wide web.
- Riparian hydrologic and geomorphic processes with examples drawn from the mountains and plains. Ground-water recharge and discharge; Horton overland flow; partial variable runoff areas; riparian best management practices; sapping, types of springs, sediment from slopes. K-12 riparian science education.

ESCI 516 NORTHERN ROCKY MOUNTAIN GEOLOGY
Su 2 cr. SEM 1 LAB 1
PREREQUISITE: Introductory geology (ESCI 111), introductory physical geography (ESCI 112), historical geology (GEOL 210); graduate standing; secondary teaching certification plus two years teaching experience; a computer with modem.
- Geologic history of Northern Rocky Mountains, and landscapes from Archean to present. Structural, tectonic, and surficial elements. Field examination of geologic evidence for history of the Gallatin Range, Bridger Range, and Yellowstone National Park. Exploration and development of teaching methods and resources for the K-12 classroom.

ESCI 517 ELECTRONIC HYDROLOGY
Su On Demand 2 cr. SEM 2
PREREQUISITE: ESCI 111, ESCI 112; secondary teaching certification plus two years teaching experience; access to the world wide web linked with telnet. Recommended ESCI 511 or ESCI 519.
- Electronic acquisition, analysis, and interpretation of hydrologic data for K-12 teachers. Data acquired through the world wide web and telnet. Students will learn to download, analyze and interpret data including rainfall, snowfall, precipitation probability, temperature, stream flow, flood frequency, evapotranspiration, and reservoir capacity.

ESCI 519 HYDROLOGY OF STREAMS AND LAKES
Su On Demand 3 cr. SEM 3
PREREQUISITE: Introductory geology/physical geography; two years K-12 teaching experience; recommended ESCI 516, and a basic course in physics.
- Streams lakes in the mountains and plains, drainage basin analysis, stream hydraulics, slope, channel plan, channel cross section, channel types, geomorphic processes, ground water exchange/discharge. Applications in the K-12 science classroom (habits of a scientific mind).

ESCI 576 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ESCI 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ESCI 582 QUERNARY PALEOECOLOGY & VEGETATION HISTORY
F alternate years, to be offered odd years 5 cr. SEM 3
PREREQUISITE: BIOL 503, GEOL 502, GEOL 509, GEOL 581 or equivalent coursework, or consent of instructor.
- Course examines the history and development of modern biomes and the causes and consequences of long-term ecological change.

ESCI 583 TOPICS IN PALEOECOLOGY
S 3 cr. SEM 3
PREREQUISITE: BIOL 503, GEOL 502, GEOL 581 or equivalent coursework, basic Paleontology or consent of the instructor.
- Course examines important themes in paleoecology. Topics change on a yearly basis addressing needs and interests of current students and it is intended for students with an interest in ecology, paleontology and environmental history.

ESCI 584 QUERNARY ENVIRONMENTS OF THE WESTERN UNITED STATES
F to be offered even years 3 cr. SEM 3
PREREQUISITE: GEOL 445, GEOL 581, ESCI 307, GEOG 502 or equivalent coursework, or consent of the instructor.
- This graduate course examines current research and recent developments in Quaternary paleoclimatology in the western U.S. The seminar will be centered around weekly discussions of the primary literature, hands-on experience with international data bases, and class paper and presentation.

ESCI 585 ADVANCES IN GEOBIOLOGY
F, to be offered every even years 1 cr. SEM 1
- Discussion of recent developments in paleoecology, paleogeography, biogeochemistry, and biogeography based on current literature and presentation of faculty and student works in progress.

ESCI 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

ESCI 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

ESCI 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

ESCI 600 DOCTORAL SEMINAR
F, S, Su 1 - 3 cr. SEM Maximum 6 cr.
PREREQUISITE: Doctoral candidate standing.

ESCI 689 GRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 3 cr. RGT Maximum 3 cr.
PREREQUISITE: Doctoral candidate standing.
- Directed doctoral research/creative activity projects; may include reading research publications in the field in preparation for beginning dissertation research.

ESCI 690 DISSERTATION RESEARCH
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral candidate standing.

ESL
English as a Second Language
A.C.E. Language Institute
(406) 585-9832
The A.C.E. Language Institute, affiliated with Montana State University, offers a full range of English as a Second Language classes. The Institute is located at 1106 South 6th (across the street from Hannon Hall). Please contact the A.C.E. Language Institute director for a complete list of classes and registration information.

F&W/L
Fish & Wildlife Management
Department of Ecology
(406) 994-4548
F&W/L 201 INTRODUCTION TO FISH & WILDLIFE
F 1 cr. SEM 1
- An introduction to the issues, ethics, challenges, and opportunities associated with management of wildlife and fisheries. For Fish and Wildlife Majors or those interested in the field.

F&W/L 301 PRINCIPLES OF FISH & WILDLIFE MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: BIOL 101 and BIOL 102.
- Overview of history and ecological principles underlying fish and wildlife management. In-depth discussion of current issues.

F&W/L 401 FISHERY & WILDLIFE TOPICS
S 2 cr. LEC 1 LAB 1
PREREQUISITE: F&W/L 301.
- Senior capstone course. Course emphasizes solving problems related to management of fish and wildlife. Students will be introduced to field techniques, analysis approaches, and scientific literature used to develop management plans for terrestrial and aquatic vertebrates. For Fish and Wildlife Majors.
F&WL 409R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-3 cr. IND May be repeated. Max 6 cr.
PREREQUISITES: Consent of instructor and approval of department head.
– An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

F&WL 410 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, 1-4 cr. IND May be repeated. Max 12 cr.
– Research and study on an individual basis.

F&WL 411 ADVANCED STREAM ECOLOGY
S alternate years, to be offered every even year 3 cr. LEC 3
PREREQUISITES: BIOL 404, BIOL 415, F&WL 301.
– Classroom instruction associated with directed undergraduate research/creative activity projects.

FIN 200 INTRODUCTION TO FINANCIAL INVESTING
F, S 3 cr. LEC 1 RCT 2
PREREQUISITE: None required but some may be determined necessary by each offering.
– Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

FIN 241 PERSONAL FINANCE
S 3 cr. LEC 3
PREREQUISITE: Completion of University Core mathematics courses.
– Financial concepts as they apply to daily life.
– Basics of consumer credit, personal investment, insurance, and personal financial planning. This course may not substitute for any required business course.

FIN 270 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of Associate Dean.
– Directed research and study on an individual basis.

FINANCE
College of Business (406) 994-4423

FIN 251 PERSONAL FINANCE
On Demand 3 cr. LEC 3
PREREQUISITE: Completion of University Core mathematics courses.
– Financial concepts as they apply to daily life.
– Basics of consumer credit, personal investment, insurance, and personal financial planning. This course may not substitute for any required business course.

FIN 270 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of Associate Dean.
– Directed research and study on an individual basis.

FIN 289 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering.
– Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

FIN 290 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT 1
– Classroom instruction associated with directed undergraduate research/creative activity projects.

FIN 290 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND May be repeated.
– Directed undergraduate research/creative activity which may culminate in a written work or other creative projects.

FIN 352 INTERMEDIATE FINANCE
F, S 3 cr. RCT 3
PREREQUISITE: Junior standing and BUS 351.
– Study of corporate finance issues confronting entrepreneurial firms. Focus is on financial forecasting and assessing financial needs. Students utilize fundamental financial principles to make small-business decisions. Topics include: strategic financing, financing alternatives, financial contracting, venture valuation, real options, and risk-sharing.

FIN 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
– Topics offered at the upper-division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

FIN 409 INTRODUCTION TO APPLIED INVESTING
F, S 1 cr. REC 1
PREREQUISITE: Junior standing. For business majors: Formal admission to the College of Business.
– Students gain hands-on experience by managing a real portfolio, thereby learning how to trade in securities, how the securities business operates, and how to apply various techniques and theories of finance.
FIN 453 FINANCIAL STATEMENT ANALYSIS  
F 3 cr. RCT 3  
PREREQUISITE: FIN 552. For business majors:  
Formal admission to the College of Business. Cross-listed with ACCT 453.  
- Analysis with emphasis on how managers'  
investing and financing decisions have financial  
statement implications. Coverage includes: revenue  
recognition methods, cash flow analysis, ratios,  
inventory analysis, capitalization vs. expensing, de-  
preciation, leasing vs. buying, and overall financial  
health and earnings quality of the firm.

FIN 455 INVESTMENTS  
F 3 cr. RCT 3  
PREREQUISITE: FIN 552 (required for finance  
option students) or ACCT 327. For business  
majors: Formal admission to the College of  
Business.  
- Course provides foundation for students to  
comprehend the objectives, policies, concepts, analyses,  
techniques, practices, and theories in investments,  
both within the U.S. financial markets and globally.

FIN 456 INVESTMENTS MANAGEMENT  
S 3 cr. RCT 3  
PREREQUISITE: FIN 455. For business majors:  
Formal admission to the College of Business.  
- Security and portfolio analyses, using fundamental  
and technical indicators, with evaluation of  
financial and economic environments. In-depth  
study of stocks, bonds, and derivatives. Risk  
hedging for both individual investors and portfolio  
managers, using analyses of embedded risk and  
returns.

FIN 457R FINANCIAL  
INSTITUTIONS AND MARKETS I  
F 3 cr. RCT 3  
PREREQUISITE: FIN 552. For business majors:  
Formal admission to the College of Business.  
- Builds upon basic financial principles by devel-  
opling a sound understanding of why financial  
institutions and markets exist, what they do, and  
how financial risk is managed most effectively.  
Focuses on applied analysis of financial institution  
risk, market operation, and products.

FIN 458 FINANCIAL  
INSTITUTIONS AND MARKETS II  
S 3 cr. LEC 3  
PREREQUISITE: FIN 457. For business majors:  
Formal admission to the College of Business:  
- Concepts of managerial finance are applied to  
the internal operations of financial institutions  
with in-depth banking simulation. Builds on FIN  
457 through exploration of increasingly complex  
financial markets and products such as foreign  
exchange, futures, options, swaps, and other deriva-  
tive securities.

FIN 459 CURRENT TOPICS/INVESTMENTS  
On Demand 3 cr. SEM 3 May be repeated.  
Max 6 credits  
PREREQUISITE: FIN 552, FIN 453, FIN 455, FIN  
457, and senior standing. For business majors:  
Formal admission to the College of Business.  
- Investigation of key issues which will determine  
future practices in finance.

FIN 470 INDEPENDENT STUDY  
On Demand 1-3 cr. IND Maximum 6 cr.  
PREREQUISITE: Junior standing, consent of  
instructor, and approval of Associate Dean. For  
business majors: Formal admission to the College  
of Business.  
- Directed research and study on an individual  
basis.

FIN 480 SPECIAL TOPICS  
On Demand 1-4 cr. Maximum 12 cr.  
PREREQUISITE: Course prerequisites as deter-  
minted for each offering. For business majors:  
Formal admission to the College of Business.  
- Courses not required in any curriculum for which  
there is a particular one-time need, or given on a  
trial basis to determine acceptability and demand  
before requesting a regular course number.

FIN 489R UNDERGRADUATE RESEARCH/  
CREATIVE ACTIVITY INSTRUCTION  
On Demand 1-2 cr. RCT May be repeated.  
Max 4 cr  
COREQUISITE: FIN 490. For business majors:  
Formal admission to the College of Business.  
- Classroom instruction associated with directed  
undergraduate research/creative activity projects.

FIN 490R UNDERGRADUATE RESEARCH/  
CREATIVE ACTIVITY  
On Demand 1-6 cr. IND May be repeated.  
Max 12 cr.  
- Directed undergraduate research/creative activity  
which may culminate in a research paper, journal  
article, or undergraduate thesis.

FIN 570 INDEPENDENT STUDY  
On Demand 1-3 cr. IND Maximum 6 cr  
PREREQUISITE: Graduate standing consent of  
instructor, approval of Associate Dean and Dean of  
Graduate Studies.  
- Directed research and study on an individual  
basis.

FIN 580 SPECIAL TOPICS  
On Demand 1-4 cr. Maximum 12 cr.  
PREREQUISITE: Upper-division courses and  
or other as determined for each offering. For  
business majors: Formal admission to the College  
of Business.  
- Courses not required in any curriculum for which  
there is a particular one-time need, or given on a  
trial basis to determine acceptability and demand  
before requesting a regular course number.

GEOG Geography  
Department of Earth Sciences  
(406) 994-3331  
GEOG 105D WORLD REGIONAL GEOGRAPHY  
F, S, Su 3 cr. LEC 3  
- Resume of major world regions; their cultures,  
populations, resources, utilization of land;  
emphasis on regions outside Anglo-America.

GEOG 201D HUMAN GEOGRAPHY  
F 3 cr. LEC 3  
- Global geographies of population and economic  
development; patterns of language and religion;  
global distributions of agriculture, industry, and  
urban landscapes; use of human geography to  
alalyze selected world problems.

GEOG 211 INTRODUCTION TO  
GEOGRAPHIC INFORMATION SCIENCE  
F, S 3 cr. LEC 2 LAB 1  
PREREQUISITE: CS 150: Computer Literacy or  
equivalent knowledge.  
- Concepts of spatial thinking; understanding  
spatial relationships and interaction in the natural  
and built environment. Spatial data principles,  
data models, relational database concepts, con-  
temporary digital cartography, map design and  
composition, spatial data conversion, introduction  
to spatial analysis and synthesis.

GEOG 280 SPECIAL TOPICS  
On Demand 1-4 cr. Maximum 12 cr.  
PREREQUISITE: None required but some  
may be determined necessary by each offering  
department.  
- Courses not required in any curriculum for which  
there is a particular one-time need, or given on a  
trial basis to determine acceptability and demand  
before requesting a regular course number.

GEOG 289R UNDERGRADUATE RESEARCH/  
CREATIVE ACTIVITY INSTRUCTION  
F, S 1-3 cr. RCT may be repeated  
- Classroom instruction associated with directed  
undergraduate research/creative activity projects.

GEOG 290R UNDERGRADUATE RESEARCH/  
CREATIVE ACTIVITY  
F, S 1-6 cr. IND may be repeated  
- Directed undergraduate research/creative activity  
which may culminate in a written work or other  
creative project.

GEOG 302 BIOGEOGRAPHY  
S alternate years, to be offered odd years  
5 cr. LEC 5  
PREREQUISITE: GEOG 210 or BIOL 101.  
- Factors affecting the geography of plants and  
animals in space and time.

GEOG 303 WEATHER AND CLIMATE  
F 3 cr. LEC 3  
PREREQUISITE: ESCI 112.  
- The climates of the continents, and their clas-  
sification, characteristics and interrelationships  
with other factors of the physical and human  
environment.

GEOG 305 ADVANCED  
GEOGRAPHIC INFORMATION SCIENCE  
F, S 3 cr. LEC 2 LAB 1  
PREREQUISITE: GEOG 211.  
- Advanced data model concepts in the context  
of spatial analysis, Spatial overlay analysis and syn-  
Data modeling and database design principles to  
support analysis and modeling applications.

GEOG 315 CULTURAL GEOGRAPHY  
F alternate years, to be offered odd years  
5 cr. LEC 3  
PREREQUISITE: GEOG 201.  
- American cultural landscape evolution; origins  
and diffusions of American culture traits; evolution  
of American culture regions.

GEOG 330 GEOGRAPHICAL PLANNING  
S 3 cr. LEC 3  
PREREQUISITE: GEOG 105 and GEOG 201.  
- Main factors, elements, principles, methods,  
tools, organization, and issues of urban and rural  
planning in a geographical context; Integration of  
physical and human variables into the planning  
process.
GEOG 331 URBAN GEOGRAPHY
S alternate years, to be offered every even years 3 cr. LEC 3
PREREQUISITE: GEOG 201 or GEOG 234
- Historical evolution and spatial patterns of urban phenomenon; human-environment interaction in urban area; distribution of economic and social activities in the city; spatial structure of urban system in national and regional background.

GEOG 332 ECONOMIC GEOGRAPHY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: GEOG 201.
- Contemporary research questions and methodologies in economic geography; geographical distribution of economic activities; principles of spatial interaction; application of locational theory in urban and rural settings.

GEOG 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics at the upper division level not covered in regular courses. Students participate in preparing and presenting discussion material.

GEOG 401 HISTORICAL GEOGRAPHY
S alternate years, to be offered every even years 3 cr. LEC 3
PREREQUISITE: GEOG 201.
- Past geographies of North America. Political, cultural, economic, and urban evolution of North American regions from the colonial era to 1900.

GEOG 405 GEOGRAPHIC THOUGHT
S 3 cr. LEC 3
PREREQUISITE: Senior standing in Geography program.
- A senior capstone course for the geography option. The exploration of the history of geographic thought; the emergence and evolution of modern academic and applied geography. Contemporary trends and issues in geography.

GEOG 41R APPLIED GIS AND SPATIAL ANAYSIS
S 3 cr. LEC 2 LAB 1
PREREQUISITE: GEOG 211 and GEOG 305.
- Advanced spatial analysis, synthesis and modeling concepts and methods. Semester projects apply theory and concepts to a project related to student's discipline. Students learn to develop GIS applications to address a variety of issues.

GEOG 425 TOURISM PLANNING
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: GEOG 211 and GEOG 350.
- A geographical, economic and planning perspective about the contemporary tourism and recreation of international, national and local scales. Topics include evolution, dynamics, types and patterns, analysis tools, planning issues and policies.

GEOG 45R MOUNTAIN GEOGRAPHY
F 4 cr. LEC 2 LAB 2
PREREQUISITE: ESCI 112 or BIOL 101
- Local, regional, and global importance of mountains. Geomorphology, climatology, plants and animals of mountain environments, and their relationship to human activities.
GEOL 100 IN - GEOL 419

COURSE DESCRIPTIONS:

**GEOL 100 IN DINOSAURS**
F alternate years, to be offered odd years
3 cr. LEC 2 RCT 1
- This course provides an introduction to dinosaur paleontology. Students will learn how hypotheses about extinct animals are formulated and tested, with comparisons to modern sedimentary environments and living animals. Recitation sections allow discussion of current research and hands-on experience with sedimentary rocks and fossils. Field trips provide additional education opportunities.

**GEOL 102 CS ENVIRONMENTAL GEOLOGY**
F 4 cr. LEC 3 LAB 1
- Application of geologic principles to topical problems in environmental and resource geology. Topics include analysis of environmental issues such as earthquake disaster preparedness, landslides, land use, floods and human occupation, ground water withdrawal and contamination issues, volcanic and coastal hazards, and the response of landscapes and people to resource development (minerals/air/water/energy). Laboratories will be used to analyze and debate data relevant to environmental problems from a geologic perspective.

**GEOL 204 R MINERALOGY**
F 5 cr. LEC 2 LAB 1
PREREQUISITE: ESCI 111, CHEM 182.
- Identification, properties, occurrence, and associations of the rock-forming minerals; introduction to crystallography (crystal classes, lattice types, and external morphology) and crystal chemistry (bonding and crystal structure types); analytical techniques including mineral optics, x-ray, and SEM analysis. Laboratory fee included.

**GEOL 210 HISTORICAL GEOLOGY**
S 3 cr. LEC 5
PREREQUISITE: ESCI 111.
- Evolution of the earth and its life from origin to present configuration. Role of plate tectonic processes in the geologic development of the continents and ocean basins. Major evolutionary developments and crises in the history of life.

**GEOL 280 SPECIAL TOPICS**
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

**GEOL 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION**
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

**GEOL 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY**
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

**GEOL 302 METAMORPHIC PETROLOGY**
S 3 cr. LEC 2 LAB 1
PREREQUISITE: GEOL 204.
- Introduction to the principles of metamorphic petrology; metamorphic facies, reactions, phase equilibria, processes, petrographic analysis, deformation, and interpretation of metamorphism in the context of global tectonics.

**GEOL 303 SEDIMENTATION AND STRATIGRAPHY**
S 4 cr. LEC 3 LAB 1
PREREQUISITE: GEOL 210, GEOL 307, MATH 182.
- Physical, chemical, and biological processes and their effects on sediment dispersal, deposition, and diagenesis. Geometry and lateral and vertical relationships between sedimentary rock bodies. Labs emphasize the description and analysis of sedimentary rock bodies.

**GEOL 310 INVERTEBRATE PALEONTOLOGY**
F alternate years, to be offered odd years
3 cr. LEC 2 LAB 1
- Investigation of invertebrate organisms and their evolution through time as preserved in the sedimentary rock record. Emphasis is on the morphology, paleoecology, evolution, and stratigraphic and environmental significance of important fossil groups. Labs stress fossil recognition.

**GEOL 312 DINOSAUR PALEONTOLOGY**
F alternate years, to be offered odd years
3 cr. LEC 2 SEM 1
PREREQUISITE: GEOL 306 or GEOL 307, MATH 182.
- Detailed analysis and interpretation of the mineralogy, fabric, and genesis of terrigenous clastic and carbonate sedimentary rocks. Use of thin-section microscopy, the scanning electron microscope, and x-ray diffraction techniques are emphasized in the laboratory.

**GEOL 313 MACROEVOLUTION AND THE FOSSIL RECORD**
S alternate years, to be offered even years
3 cr. LEC 2 LAB 1
PREREQUISITE: GEOL 310 or GEOL 312 or BIOL 301.
- This course traces the history of vertebrates from the earliest chordates to synapsids, dinosaurs, and hominids. Lectures and labs emphasize phylogeny, anatomy, novel adaptations, and major evolutionary events responsible for the conquest of land, flight, and mass extinctions.

**GEOL 314 TAPHONOMY: FOSSIL PREPARATION**
F alternate years, to be offered even years
3 cr. SEM 5
PREREQUISITE: GEOL 310 or GEOL 312 or BIOL 301.
- Macroevolution explores major trends in evolution through geologic time. The course examines such topics as whether communities evolve, clade-genesis, mass extinctions, rates of speciation and extinction, controls of biodiversity, and the role of sex and body size in evolution.

**GEOL 315 STRUCTURAL GEOLOGY**
S alternate years, to be offered odd years
3 cr. SEM 3
PREREQUISITE: GEOL 306 or GEOL 307, MATH 181.
- Discussion of current research and hands-on experience with structural geology. Topics at the upper division level not covered in other courses. Consent of instructor for non-majors.

**GEOL 316 COMPARATIVE VERTEBRATE ANATOMY**
S 4 cr. LEC 2 LAB 2
PREREQUISITE: BIOL 101.
- A comparative study of organ systems of vertebrates. Laboratory utilizes representative vertebrate types. Cross-listed with BIOL 310.

**GEOL 325 PALEONTOLOGY LABORATORY AND RESEARCH TECHNIQUES**
F alternate years, to be offered odd years
2 cr. LEC 1 LAB 1
- Provides laboratory and research experience in vertebrate paleontology, including: training in fossil preparation, identification of osteological specimens, documentation (photographic and scientific illustration), molding and casting, specimen cleaning, and other skills necessary for professional presentation of research.

**GEOL 400 SEMINAR**
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics at the upper division level not covered in regular courses. Students participate in preparing and presenting discussion material.

**GEOL 411 VERTEBRATE PALEONTOLOGY**
F alternate years, to be offered even years
3 cr. LEC 2 LAB 1
PREREQUISITE: GEOL 111, GEOL 210, BIOL 101.
- This course traces the history of vertebrates from the earliest chordates to synapsids, dinosaurs, and hominids. Lectures and labs emphasize phylogeny, anatomy, novel adaptations, and major evolutionary events responsible for the conquest of land, flight, and mass extinctions.

**GEOL 413 MACROEVOLUTION AND THE FOSSIL RECORD**
S alternate years, to be offered even years
3 cr. SEM 3
PREREQUISITE: GEOL 310 or GEOL 312 or BIOL 301.
- Macroevolution explores major trends in evolution through geologic time. The course examines such topics as whether communities evolve, clade-genesis, mass extinctions, rates of speciation and extinction, controls of biodiversity, and the role of sex and body size in evolution.

**GEOL 417 TAPHONOMY: FOSSIL PREPARATION**
F alternate years, to be offered even years
3 cr. SEM 5
PREREQUISITE: GEOL 310 or GEOL 312 or BIOL 301.
- Scattered dinosaur bones lie entombed in a rock; what do they mean? Taphonomy examines the processes that act on an organism from the time of its death until its discovery and how these processes bias or help in fossil interpretation.

**GEOL 419 FIELD PALEONTOLOGY**
Su alternate years, to be offered even years
3 cr. LEC 1 LAB 1
PREREQUISITE: GEOL 210 or GEOL 307.
- Consent of instructor for non-majors.
- This two-week class provides field experience in vertebrate paleontology, including sedimentology, facies analysis, measuring stratigraphic sections, microsite screening, field identification of vertebrate and invertebrate fossils, excavation of fossil specimens, and taphonomic data collecting.
GEOL 423 FIELD GEOLOGY
Su 6 cr. LAB 6
PREREQUISITE: ESCI 307, GEOL 210, GEOL 307, GEOL 309, GEOL 315. Must receive a minimum grade of "C" in these areas. - A senior capstone course for the geology, geohydrology and paleontology options. Early summer field course with application of field procedures and mapping techniques to a variety of field problems and exercises. Extensive hiking and outdoor physical challenges require that students be physically fit. A fee for supplies, transportation, and other logistical expenses is required.

GEOL 435 TECTONICS
F 5 cr. LEC 3
PREREQUISITE: GEOL 315.
- History of tectonic theory; modern view of plate tectonics; in-depth case studies of orogenic belts; neotectonics; geophysics.

GEOL 437 GEOPHYSICS
On Demand 3 cr. LEC 3
PREREQUISITE: GEOL 204, GEOL 210, MATH 181.
PREREQUISITE: PHYS 206.
- Geophysical surveying, seismology, gravity, isostasy, magnetism and paleomagnetism, electrical methods, radioactivity, geothermics, applications of geophysics.

GEOL 440 VOLCANOLOGY
F alternate years, to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: GEOL 306.
- Overview of current ideas concerning volcanic eruptions and their resulting deposits, concentrating on examination of processes as elucidated from the study of modern volcanic environments. Required weekend field trip and field trip fee.

GEOL 445 GLACIAL GEOLOGY
S alternate years, to be offered odd years 3 cr. LEC 1 LAB 1 SEM 1
PREREQUISITE: ESCI 307
- In-depth study of the processes of glaciation and the resulting landforms. Includes class and library readings, quantitative laboratory exercises and modelling, and field examination of features of mountain and continental glaciation.

GEOL 451 GEOLOGY INSTRUCTION
F, S, Su 1-2 cr. LAB
PREREQUISITE: Junior or senior standing in geology and consent of instructor and Department Head.
- Student works as a tutor and undergraduate teaching assistant in a teaching laboratory under close academic supervision. Weekly meeting focuses on geology, teaching, organization of class materials, and student supervision. Weekly lab emphasis on applying active learning concepts in a geologic laboratory context.

GEOL 470 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

GEOL 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

GEOL 489R UNDERGRADUATE RESEARCH /
CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: GEOL 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

GEOL 490R UNDERGRADUATE RESEARCH /
CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

GEOL 500 SEMINAR
F, S, Su 1 cr. SEM 1 cr.
PREREQUISITE: Graduating senior or by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

GEOL 508 DEPOSITIONAL SYSTEMS
S alternate years, to be offered odd years 3 cr. LEC 2 LAB 1
PREREQUISITE: GEOL 309.
- Facies models for terrestrial and marine depositional environments and their application to interpreting the stratigraphic record.

GEOL 510 IGNEOUS GEOCHEMISTRY
On Demand 5 cr. LEC 5
PREREQUISITE: GEOL 306, consent of instructor.
- Major element, trace element, and isotopic distribution in igneous rocks obtained from natural and experimental systems. Emphasis on models describing the origin of compositional diversity in rock suites.

GEOL 515 STRUCTURAL GEOLOGY
S alternate years, to be offered even years 5 cr. LEC 2 LAB 1
PREREQUISITE: GEOL 315 or equivalent.
- Techniques of modern structural analysis, including strain analysis, folds and fractures, and applications of continuum mechanics.

GEOL 521 HELL CREEK PALEONTOLOGY
Su 2 cr. LEC 2
PREREQUISITE: ESCI 111 and consent of instructor.
- This course is an introduction to Dinosaur Paleontology and Hell Creek Formation of Eastern Montana. It will provide information and hands-on experience in field techniques used in vertebrate paleontology, including interpretation of sedimentary environments and taphonomy.

GEOL 530 TECTONICS
S alternate years, to be offered even years 3 cr. SEM 3
PREREQUISITE: GEOL 307 and GEOL 309 and GEOL 315.
- This course examines the plate tectonic setting and controls on development of modern and ancient sedimentary basins. Includes investigation of sediment provenance, facies patterns, methods of basin analysis, and subsidence history.

GEOL 533 TECTONICS
F 3 cr. LEC 3
PREREQUISITE: GEOL 315.
- History of tectonic theory; modern view of plate tectonics; in-depth case studies of orogenic belts; neotectonics; geophysics. Graduate students will be required to present a term paper and oral presentation on a topic chosen in consultation with the instructor.

GEOL 535 ADVANCED STRATIGRAPHY
F alternate years, to be offered even years 3 cr. LEC 3 LAB 1
PREREQUISITE: Graduate standing.
- Weekly lecture and lab, including one-week field excursion, examines different approaches in stratigraphy used to reconstruct ancient terrains. Course emphasizes advanced correlation techniques and interpretation methods applied in sedimentary geology.

GEOL 548 COMPARATIVE OSTEOLOGY
On Demand 3 cr. SEM 3
PREREQUISITE: BIOL 310, GEOL 316, Biol 504.
- Fossil bone histology and comparative osteology including enchondral ossification, epiphyseal ontogeny, cortical ossification, bone remodeling, special bone tissues, fossil bone content, bone architecture and biomechanics, bone chemistry and diagenesis, comparative bone morphology, and functional anatomy.

GEOL 570 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

GEOL 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

GEOL 581 QUATERNARY ENVIRONMENTS
S alternate years, to be offered even years 3 cr. LEC 2 RCT 1
PREREQUISITE: ESCI 307.
- The last two million years of earth history as interpreted from geologic, biologic, and pedologic proxy data. Includes both global and regional analyses of changing climates and their effects on earth surface processes and land forms.

GEOL 583 APPLIED GEOLICAL GEOLOGY
On Demand 5 cr. LEC 2 LAB 1
PREREQUISITE: Graduate standing or ESCI 440.
- Application of ground-water principles to ground-water resource, contamination and remediation problems.
HDCF
Human Development, Child & Family
Department of Health & Human Development
(406) 994-3242

HDCF 138 SURVEY OF FAMILY FINANCE AND CONSUMER ISSUES
F 3 cr. LEC 3
- If you need to make dollars last throughout the semester, this class is for you! The course combines some basic economics with how to's of becoming financially literate. Covers earning, using credit, spending plans, avoiding fraud, and financial planning.

HDCF 150IS LIFESPAN HUMAN DEVELOPMENT
F, S, Su on demand 3 cr. LEC 3
- Cognitive, physical, social, and emotional domains in human growth and development from conception through adulthood, aging, and death. Emphasis on classical and contemporary theory, current research, and practical applications for practitioners, teachers, and parents.

HDCF 160 EARLY CHILDHOOD THROUGH ADOLESCENT DEVELOPMENT
F 3 cr. LEC 3
- This course focuses on the development of children in early childhood, middle childhood and adolescence. Cognitive, psychosocial, moral and physical domains are examined in addition to developmental processes related to culture, gender, SES, ethnicity and education. Theory, research and application for practitioners are emphasized.

HDCF 218 FASHION AND TEXTILES
S alternate years, offered even years 3 cr. LEC 2 LAB 1
- Methods of teaching textiles and apparel; wardrobe management: planning, selection, and purchase; design principles including color, lines, and emphasis; and the care of clothing and types and characteristics of fibers, production and properties of fabrics.

HDCF 219 APPAREL CONSTRUCTION
S alternate years, offered odd years 3 cr. LEC 1 LAB 2
- Students will learn how to construct basic apparel. Emphasis will be placed on pattern reading and state-of-the-art construction techniques. A second emphasis will be on pedagogy techniques related to the construction of apparel and other items.

HDCF 239 CONTEMPORARY CONSUMER ISSUES
F 3 cr. LEC 3
PREREQUISITE: HDCF 138.
- Theories of consumer economics will be introduced and applied to current consumer issues such as housing, food, health care, and energy.

HDCF 290 SIGNING EXACT ENGLISH I
F 3 cr. LEC 3
- Examines the rationale and structure of S.E.E. and provides Level 1 skill acquisition in sign language to meet federal demand for inclusion practices in ECE and public school settings for hearing impaired, cognitive and language disorders, pervasive developmental disorders, etc.

HDCF 293 RELATIONSHIPS AND FAMILY SYSTEMS
F 3 cr. LEC 3
PREREQUISITE: Sophomore standing.
- Relationship development across the life cycle from a family systems perspective. Relationship dynamics through major relationship transitions including couple formation, cohabitation, marriage, parenthood, death, divorce, and remarriage will be examined. The diversity of family experiences will be emphasized.

HDCF 270 INDEPENDENT STUDY
On Demand 1- 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

HDCF 271 PARaprofessional EXPERIENCE
F, S, Su 1 cr. LAB 1 May be repeated.
PREREQUISITE: Sophomore standing in major.
- Participation in a professional work situation related to career choice.

HDCF 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDCF 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1- 5 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

HDCF 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1- 6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

HDCF 319 THEORIES AND SKILLS FOR HELPING RELATIONSHIPS
F, S 3 cr. LEC 3
PREREQUISITE: Junior standing in Health and Human Development major or consent of instructor.
- An introduction to various family, consumer science, and counseling theories, skills, and modalities. An overview of the helping profession. Development of interpersonal and professional skills for working with others.

HDCF 355 PROGRAM PLANNING IN FAMILY AND CONSUMER SCIENCES
S 3 cr. LEC 2 LAB 1
PREREQUISITE: EDSD 459.
- How to plan, develop, teach, supervise, and evaluate programs in family and consumer sciences education. A second focus will be to learn about responsible actions and decision making as leaders in family, community, and work settings through the use of FCCLA.

HDCF 338 PERSONAL AND FAMILY FINANCE I
F 3 cr. LEC 3
PREREQUISITE: HDCF 138, Math core, or permission of instructor.
- Planned use of financial resources to meet the goals of individuals and families. Concepts include time value of money concepts, credit, budgeting, risk management, taxation and basic investments.

HDCF 339 PERSONAL AND FAMILY FINANCE II
S 3 cr. LEC 3
PREREQUISITE: HDCF 338.
- In-depth analysis for individuals and families in risk management, retirement planning, estate planning, and investment and portfolio management.

HDCF 342 FAMILY FINANCIAL COUNSELING
S 3 cr. LEC 3
PREREQUISITE: HDCF 138 or permission from instructor.
- A survey course of housing issues from families and consumers. Among the topics to be covered are: housing design for human needs, affordability and availability issues, safety issues, and demographic influences on housing choices.

HDCF 350 RELATIONS AND MANAGEMENT IN EARLY CHILDHOOD EDUCATION
F 3 cr. LEC 3
PREREQUISITE: HDCF 160 and HDCF 271 for majors; HDCF 150 or EDGI 208 for Education majors.
- Current research, theory, and practice related to relationship and management principles in early childhood settings with respect to the following: teacher and child relationships, environments in early childhood settings, nurturing diversity and social justice, promoting positive guidance, family and school relationships, ethics and professionalism. Observations in early childhood programs are required.

HDCF 352 CURRICULUM IN EARLY CHILDHOOD EDUCATION
S 4 cr. LEC 3 LAB 2
PREREQUISITE: HDCF 350
- Curriculum planning, implementation, and evaluation in early childhood settings. Laboratory experience in an early childhood setting from birth to age 8 is required.

HDCF 356 EXCEPTIONAL CHILDREN 0-21
F, S, Su 3 cr. LEC 3
PREREQUISITE: HDCF 160, HDCF 271 and junior standing in major; HDCF 150 or EDGI 208 or EDGI 209 and junior standing for Education majors.
- Historical, societal, familial and educational attitudes regarding disabilities; exceptionality in a family, school, cultural, and community context; legal requirements of IDEA and subsequent amendments, ADA and 504; categories of exceptionality; appropriate identification and intervention techniques.
COURSE DESCRIPTIONS: HDCF 357 - HDCF 470

HDCF 357 EXCEPTIONAL CHILDREN LABORATORY
F, S 1 cr. LAB 1
PREREQUISITE: HDCF 356.
COREQUISITE: HDCF 356.
Direct experience with children and young adults with special needs in infant-preschool settings, public schools (K-12), and community-based settings.

HDCF 360 ADULT DEVELOPMENT AND AGING
S 3 cr. LEC 3
PREREQUISITE: HDCF 160 for majors and social science core for nonmajors.
- Focus on the adult stages of the life span and families with adult children; issues include inter-generational relationships; gender differences in individual, family, and career development; and the demographic and economic consequences of an aging population.

HDCF 371 RESEARCH METHODS
F, S 3 cr. LEC 3
PREREQUISITE: STAT 216 or an equivalent statistics course, and junior standing.
- Basic social science research principles and application to solution of health and human development problems. Emphasis on types of abstracting, research design, and the research process.

HDCF 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Senior standing.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting class materials.

HDCF 425R FAMILY LAW AND PUBLIC POLICY
(R core effective Fall, odd years)
S 3 cr. LEC 3
PREREQUISITE: HDCF 263, HDCF 371 or equivalent, junior standing or permission of instructor.
- An in-depth review of current laws and public policies impacting family well-being including marriage, domestic partnership, divorce, child custody, welfare, foster care, ICWA, and adoption. The impact of workplace and health care policies on families is also examined.

HDCF 429 SMALL BUSINESS OPERATIONS IN HHD
S 3 cr. LEC 3
PREREQUISITE: HDCF 138.
- This course introduces basic finance, accounting, marketing, and management concepts for owning and operating a successful small family-owned business. Special attention is given to small, family-owned businesses involving areas of study in health and human development.

HDCF 432 SOCIAL COMPETENCE IN EARLY CHILDHOOD
F odd years, alternate years, 3 cr. REC 3
PREREQUISITE: HDCF 350 or consent of instructor.
- Understanding social competence in young children in relation to familial, social and cultural contexts. Development of social skills, self concept, peers and friendships, emotional development and resiliency.

HDCF 437 MANAGING WORK AND FAMILY
S 3 cr. LEC 3
PREREQUISITE: HDCF 371.
- This course focuses on how families acquire and use resources from work and the household to meet family goals and demands. Special attention to managing the dual demands of work and family in relation to the family's time, money, marital, and child-rearing responsibilities.

HDCF 440 PARENTING
S, Su on demand 3 cr. LEC 3
PREREQUISITE: HDCF 263 and HDCF 371.
- Examines parenting processes and parent-child relationships based on scientific study of child development and family relations. Diverse parenting issues (e.g., parenting through divorce; parental stress and adaptation) will be explored across the lifespan using family systems and ecological frameworks.

HDCF 442 LITERACY IN EARLY CHILDHOOD
S, alternate years, even years 3 cr. REC 3
PREREQUISITES: HDCF 350 and HDCF 352.
- The course will focus on the development of literacy from birth to five by integrating early childhood education and adult literacy into a unified approach that supports early childhood education and family literacy

HDCF 447 FAMILY LIFE EDUCATION
F 3 cr. RCT/DS 3
PREREQUISITE: HDCF 371 and junior standing in the major.
- Students will gain an understanding of the general philosophy and broad principles of family life education in conjunction with the ability to plan, implement, and evaluate such educational programs. This course will be taught in accordance with the guidelines from the National Council of Family Relations on becoming a Certified Family Life Educator.

HDCF 454 PRACTICUM IN EARLY CHILDHOOD TEACHING
F, S 3 cr. LEC 3 LAB 1
PREREQUISITE: HDCF 371 and student standing in major and student teaching applicant screening required.
- Supervised experience in programs for young children. Students will be responsible for planning, presenting, supervising, and evaluating early childhood activities in a child development laboratory setting.

HDCF 455 ADMINISTRATION OF HUMAN SERVICE PROGRAMS
(R core effective Fall, odd years)
F 3 cr. LEC 3
PREREQUISITE: HDCF 371 and senior standing.
- Knowledge and skills necessary for establishing and administering various human service programs including early childhood, youth, family, and agency settings. Students will design a program including preparation of a grant application.

HDCF 456 CREATIVITY AND THE YOUNG CHILD
Su On Demand 3 cr. LEC 3
- Introduction to the history, framework, concepts, and terms of Reggio Emilia, project approach, and documentation in early childhood education; to acquaint the student with recent trends in research, theory, and practice; to provide experiences in planning, implementing, and evaluating the three approaches to early childhood education.

HDCF 458 ASSESSMENT AND INTERVENTION
F, S 4 cr. LEC 3 LAB 1
PREREQUISITE: HDCF 160, HDCF 271, HDCF 356 and senior standing in the HHD major; HDCF 150, EDCI 208 or EDCI 209, HDCF 356, and senior standing in major for Education majors.
- Knowledge, application and interpretation of data related to formal and informal assessment instruments; formal report writing; CST, IEP, 504 and IFSP procedures, parent and professional roles. Intervention model and practices for the child in family, educational, human service, and community settings.

HDCF 459 CHEMICAL DEPENDENCY TREATMENT
F, S 3 cr. LEC 3
PREREQUISITE: Senior standing.
- This course will present an overview of philosophical and procedural components as well as practical applications for providing additions services; professional characteristics, ethical and legal issues, care options, helping processes, case styles, and case management.

HDCF 463 FAMILY STRESS AND CRISIS
F, S 3 cr. LEC 3
PREREQUISITE: HDCF 263, HDCF 371 or equivalent, and junior standing.
- Family's response to stressful circumstances such as changing finances, parenthood, abuse, chronic illness, divorce, and death. Stress and crisis theories will be utilized and crisis intervention techniques introduced.

HDCF 464 GENDER, RACE, CLASS, AND FAMILY DIVERSITY
S 3 cr. LEC 3
PREREQUISITE: HDCF 263, HDCF 371 or equivalent, and junior standing.
- Family's response to stressful circumstances such as changing finances, parenthood, abuse, chronic illness, divorce, and death. Stress and crisis theories will be utilized and crisis intervention techniques introduced.

HDCF 468 HEALTH & MOVEMENT IN EARLY CHILDHOOD
S alternate years, odd years 3 cr. LEC 3
- Directed research and study on an individual basis.
HDCF 472 PROGRAM EVALUATION
F 3 cr. LEC 3
PREREQUISITE: HDCF 371
- Provide a working knowledge of process and outcome evaluation techniques used to assess programs in health and human development. The course is designed to develop a conceptual basis for conducting program evaluations and enable the student to actually implement program evaluations for private and public organizations.

HDCF 474 SENIOR SEMINAR-PROFESSIONAL ISSUES
F, S, Su 4 cr. LEC 1 LAB 5
PREREQUISITE: HDCF 371 and screening procedures as specified on the Health and Human Development web site.
- Senior capstone course. Establishing a professional identity and transitioning to a career in the field of family and consumer sciences. The lab section of this course will entail the scientific application of family and consumer sciences theory and methods. In consultation with course instructor, students will participate in a lab assignment.

HDCF 480 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDCF 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-2 cr. RCT 1
- Classroom instruction associated with directed undergraduate research/creative activity projects.

HDCF 490R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY
F, S, Su 1-6 cr. IND May be repeated.
Maximum 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

HDCF 500 SEMINAR
F, S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

HDCF 554 DEVELOPMENTAL THEORY & CONCEPTUALIZATION
F 3 cr. LEC 3
PREREQUISITE: HDCO 521 and HDCF 571.
- An introduction to the complex developmental relationships among individuals in the family across the life span. Systems, developmental, learning and personality theories across the life span are surveyed. Contextual variables on developmental processes are stressed.

HDCF 555 CURRENT RESEARCH IN CHILD AND ADOLESCENT DEVELOPMENT
On demand 3 cr. RCT 3
PREREQUISITE: Graduate standing.
- Current research, issues and trends in child and adolescent development are examined.

HDCF 556 EARLY CHILDHOOD EDUCATION: A CONSTRUCTIVIST PERSPECTIVE
F 3 cr. LEC 3
PREREQUISITE: Upper division course work in early child education or elementary education.
- To introduce the history, framework, concepts, and critiques of constructivism in early childhood education; to understand recent trends in constructivist early childhood research, theory, and practice; to apply practices in early childhood education to program planning, implementation, and evaluation.

HDCF 565 MULTICULTURAL AWARENESS
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course explores the relationships between social organizations, processes of historical change, social stratification (race, gender, sexuality), individuals and family structure.

HDCF 570 INDEPENDENT STUDY
On Demand 1-5 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Division of Graduate Education.
- Directed research and study on an individual basis.

HDCF 572 PROFESSIONAL PRACTICUM
F, S 2-6 cr. LAB Maximum 9 cr.
PREREQUISITE: HDCF 554, HDCF 555, graduate standing and consent of instructor.
- Practicum experience in the field of human development.

HDCF 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1-4 cr. IND, Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

HDCF 576 INTERNSHIP
On Demand 2-12 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

HDCF 580 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDCF 588 PROFESSIONAL DEVELOPMENT
On Demand 1-5 cr. May be repeated;
Maximum 5 cr.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

HDCF 589 GRADUATE CONSULTATION
F, S, Su 1-3 cr. TUT 1-3 cr.
PREREQUISITE: Master’s standing and approval of the Dean of Division of Graduate Education.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

HDCF 590 MASTER’S THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.
- Directed graduate research/creative activity.

HDCO
Human Development, Counseling
Department of Health & Human Development
(406) 994-3242

HDCO 460 STUDENT LEADER TRAINING
S 2 cr. LEC 1 RCT 1
PREREQUISITE: Orientation leader status; restricted entry.
- Knowledge and skills necessary for interaction, presentation, and facilitation with regard to new student group leading, peer advising, and campus representation.

HDCO 463 STUDENT ASSISTANT TRAINING
F 1 cr. RCT 1
PREREQUISITE: Resident Assistant candidate status; restricted entry.
- Course includes training in various aspects related to the performance of the Resident Advisor position duties. It includes areas such as self-understanding, interpersonal skills, intervention techniques, and perspectives on college students and the campus environment, which are fundamental to the effective functioning of Resident Assistants.

HDCO 464 STUDENT ASSISTANT CANDIDATE TRAINING
S 1 cr. RCT 1
PREREQUISITE: Resident Assistant candidate status; pass/fail grading; restricted entry.
- Course includes training to college student development theories, advising, and communication skill development areas within a residence hall setting. Emphasis is given to working with individuals and groups in a peer counseling/educational role. Resident Advisor roles and responsibilities are also addressed.

HDCO 500 SEMINAR
F, S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing in counseling program or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

HDCO 502 COUNSELING ETHICS AND PROFESSIONAL ORIENTATION
Su 2 cr. RCT 2
PREREQUISITE: Graduate standing in counseling program.
- This course will prepare the student with a strong orientation to professional and ethical issues as they apply to counseling. Content of the course will examine historical aspects of counseling professions, professional counseling roles, professional organizations, consultation models, professional preparation standards, and credentialing. It will also introduce appropriate ethical codes for conduct and study case studies representing ethical dilemmas a counselor may face in schools, agencies, and private practice.
HDCO 503 PROFESSIONAL ISSUES IN COUNSELING
F 3 cr. SEM 3
PREREQUISITE: Graduate standing in counseling program.
- This course focuses on providing students with an understanding of the professional identity and roles of the counselor in prevention, consultation, specialization, public policy, legal and ethical issues unique to working with schools, families, and community organizations.

HDCO 505 PROFESSIONAL ISSUES IN SCHOOL COUNSELING
F 3 cr. RCT 3
PREREQUISITE: Graduate standing in counseling program.
- presents professional and ethical issues in school counseling. Group discussion and various experiential activities will provide students with numerous opportunities to understand current issues and trends in the field of school counseling.

HDCO 506 SCHOOL COUNSELING PROGRAMS
Su 3 cr. LEC 3
PREREQUISITE: Graduate standing in counseling program.
- Foundations of the school counseling profession including historical and conceptual perspectives of the field, and the knowledge and skills necessary to be a professional school counselor. Particular emphasis will be placed on a thorough understanding of planning, design, implementation, and evaluation of comprehensive school counseling programs.

HDCO 508 COUNSELING THEORIES I
Su 3 cr. LEC 3
PREREQUISITE: Graduate standing in counseling program.
- This course will acquaint the student with a wide range of counseling theories used in the diagnosis and treatment of children and families with an emphasis on approaching presenting problems from a system's theoretical base. Various forms of therapy will be presented along with suggestions as to how each can be applied to treatment of children, premarital and marital couples, and entire families to include family of origin. Case management and consultation with families, school systems, and other professionals will also be presented.

HDCO 510 COUNSELING THEORIES II
F 3 cr. LEC 3
PREREQUISITE: Graduate standing in counseling program.
- This course provides an overview of the major counseling theories and practical applications with various populations. Teaching modalities will include lecture, class discussion, study of taped counseling sessions, and small group interaction.

HDCO 521 COUNSELING SKILLS LAB
F 1 cr. LAB 1
PREREQUISITE: Graduate standing in counseling program.
COREQUISITE: HDCO 510
- Practice and application of basic counseling skills across a variety of professional settings. Students will experience the role of client as well as counselor.

HDCO 522 GROUP COUNSELING
F 3 cr. LEC 2 LAB 1
PREREQUISITE: Graduate standing in counseling program.
- The following information will be covered in relation to group counseling: theories, research, developmental stages, therapeutic factors, leadership functions, consultation, and ethics. Use of leadership skills in structured and unstructured groups will be practiced.

HDCO 525 THEORY AND PRACTICE OF ADDICTIONS
Su 2 cr. RCT 2
PREREQUISITE: HDCO 510 and graduate standing in counseling program.
- This course is designed to review current developments in the field of addictions, as well as, evaluate research and treatment trends within addiction practice. Students will be required to synthesize addiction theories and apply it to practice cases.

HDCO 524 CONSULTATION: THEORY AND PRACTICE
Su 2 cr. RCT 2
PREREQUISITE: Graduate standing in counseling program.
- The study of consultation theories, strategies, and models. Includes specific applications related to collaboration among schools, mental health agencies, and private practitioners.

HDCO 525 COUNSELING CHILDREN AND ADOLESCENTS
S 3 cr. RCT 3
PREREQUISITE: Graduate standing in counseling program.
- Application of counseling theories and techniques to preschool and school age (K-12) children and their families. A special emphasis will be placed on implementing appropriate intervention strategies according to age, developmental level, and the counseling setting.

HDCO 526 ADVENTURE COUNSELING
On Demand 3 cr. RCT 3
PREREQUISITE: Graduate standing in counseling program.
- An introduction to the theory and practice of adventure-based counseling and experiential learning. The course will focus on the goals, concepts, and techniques of adventure work. Students will learn numerous adventure games, problem-solving initiatives, and how to design adventure programs.

HDCO 529 MIND-BODY MEDICINE AND THE ART OF SELF-CARE
S 3 cr. LEC 1 LAB/STU 2
PREREQUISITE: Graduate standing or consent of the instructor and HDCO 510.
- The objective of this course is two-fold: 1) designed to familiarize students with mind-body interventions; 2) course provides practical methods for health care providers to engage in self-care.

HDCO 551 APPRAISAL
Su 3 cr. LEC 2 LAB 1
PREREQUISITE: EDCI 402, Graduate standing in counseling program.
- Study includes test standardization, reliability and validity, developing understanding of appraisal instruments and needs assessment used with individuals and systems; using information derived from selected appraisal instruments.

HDCO 556 SEXUALITY COUNSELING
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: HDCO 510, Graduate standing in counseling program.
- Exploration of sexual issues and the counseling process. Examination of foundations needed to respond to clients' sexual concerns.

HDCO 558 CAREER COUNSELING
Su 2 cr. LEC 2
COREQUISITE: Graduate standing in counseling program.
- This course will prepare the student in the area of career guidance and counseling. Emphasis will be placed on the understanding of career development theories, use of occupational informational sources including computer programs, assessment of the individual and various working environments, and the design of career development programs from elementary school through retirement. The student will also be introduced to the impact social issues have on work, leisure and families.

HDCO 559 DIAGNOSIS AND MENTAL HEALTH
S 3 cr. LEC 3
PREREQUISITE: Graduate standing in counseling program.
- This course will provide students with conceptual understanding of mental disorders within physiological, developmental, familial, and social cultural contexts. Students will learn how to use DSM diagnosis and mental status examinations in appraisal and differential diagnosis of mental disorders.

HDCO 560 MARRIAGE AND RELATIONSHIP COUNSELING
F 3 cr. LEC 2 RCT 1
PREREQUISITE: HDCO 508, graduate standing in counseling program and permission of instructor.
- Theoretical foundations and interventions for working with marital and intimate relationships. Includes promotion of healthy couple relationships and treatment of couples in crisis and/or transition. Emphasizes gender roles, sexuality, and issues related to intimacy from a systemic perspective.

HDCO 566 SEXUAL ISSUES
On demand 1 cr. RCT 1
PREREQUISITE: Graduate standing in counseling program.
- Theory and practice regarding sexual issues with clients.

HDCO 568 MENTAL HEALTH METHODS & TREATMENT
S 3 cr. LEC 3
PREREQUISITE: HDCO 510 and graduate standing in counseling program.
- Mental health counseling methods for treatment of mental disorders, including adults with serious mental illness and severely emotionally disturbed children. Appraisal, treatment planning, theory-based interventions, medications, crisis intervention, case management, consultation, referral, and professional issues/ethics in treatment of DSM disorders.
HDCO 569 ADVANCED FAMILY COUNSELING
S 3 cr. RCT 5
PREREQUISITE: HDCO 508, graduate standing in counseling program and permission of instructor.
- Advanced theoretical foundations and interventions for the practice of family therapy. Includes current research regarding family therapy and treatment. Emphasizes assessment and interventions for families dealing with mental health diagnoses, substance abuse, sexual abuse, violence, divorce/remarriage, and child/adolescent issues.

HDCO 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing in counseling program, consent of instructor, approval of department head and Dean of Division of Graduate Education.
- Directed research and study on an individual basis.

HDCO 571 PROFESSIONAL COUNSELING PRACTICUM
F, S, Su 3 cr. LAB 3 Max repeat 15 cr.
PREREQUISITE: HDCO 508 or HDCO 521 and graduate standing in counseling program and consent of instructor.
- Supervised clinical practice with individuals, children, families, and groups. Weekly individual and group supervision.

HDCO 574 ADVANCED COUNSELING PRACTICUM/CONSULTATION
F, S, Su 1 - 5 cr. LAB
PREREQUISITE: HDCO 571 and graduate standing in counseling program and consent of instructor.
- Supervised experience in the application of advanced counseling techniques and/or consultation. Credit hours and specific requirements are tailored to meet individual needs.

HDCO 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing in counseling program.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

HDCO 576 INTERNSHIP
F, S, Su 2 - 12 cr. IND
PREREQUISITE: HDCO 571 and graduate standing in counseling program and clinical review.
- An individualized assignment arranged with an agency, school or other organization to provide guided experience in the field.

HDCO 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 6 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDCO 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 5 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a counseling organization, consent of instructor and Dean of Division of Graduate Education.
- Courses offered on a one-time basis to fulfill professional development needs of in-service educators or counselors. A specific focus is given to each course which is appropriately-substituted.

HDCO 599 GRADUATE CONSULTATION
F, S, Su 1 - 3 cr. TUT 1 - 3 cr.
PREREQUISITE: Graduate standing in counseling program and approval of the Dean of Division of Graduate Education.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

HDFN 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Graduate standing in counseling program and consent of instructor.
- A research or professional paper or project which may culminate in a written work or other creative project.

HDFN 280R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

HDFN 280R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1 - 6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

HDFN 321 LIFE CYCLE NUTRITION
F 3 cr. LEC 3
PREREQUISITE: HDFN 221.
- Nutritional needs and health concerns during the different stages of life: pregnancy, lactation, infancy, preschool years, middle childhood, adolescence, adulthood, and later maturity. Special reference to agencies offering nutrition services.

HDFN 322 CULINARY SKILLS AND MANAGEMENT
F alternate years, offered odd years 3 cr. LEC 3
PREREQUISITE: HDFN 221, HDFN 226, and HDFN 227.
- Principles of quantity food procurement, production, and presentation. Emphasizes food safety and sanitation principles and organizational management in dietetics professions.

HDFN 323 CULINARY MANAGEMENT PRACTICUM
S alternate years, offered even years 3 cr. LEC 3
PREREQUISITE: HDFN 221, HDFN 226, HDFN 227, and HDFN 322.

HDFN 351 NUTRITION AND SOCIETY
S 3 cr. LEC 3
PREREQUISITE: HDFN 221.
- Factors in the community influencing nutritional status, techniques to assess community nutritional needs, and methodology for planning, implementing, and evaluating community nutrition programs. Cultural food diversity emphasized. Major community nutrition project completed for a public or private agency.

HDFN 400 SEMINAR
F 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Senior standing.
- Senior capstone course for food and nutrition students in the dietetics program. Emphasis on establishing a professional identity, preparing a portfolio, and transitioning to a career in the field of human services. Includes dietetic internship application preparation.

HDFN 401 NUTRITIONAL ASSESSMENT AND COUNSELING
S 3 cr. LEC 3
PREREQUISITE: HDFC 319 and HDFN 321.
COURSE DESCRIPTIONS: HDFN 411 - HDFN 590

HDFN 411 NUTRITION FOR SPORTS AND EXERCISE
F 3 cr. LEC 3
- PREREQUISITE: HDFN 221 and HDPE 221, or BIOL 207/208 plus junior standing.
  - Nutrition for physical activity, sport performance, health and fitness. Nutritional needs are discussed for endurance, strength, low-body weight, team sport athletes and other physically active people. Energy balance and weight management examined.

HDFN 421 MACRONUTRIENT METABOLISM
S 5 cr. LEC 3
- PREREQUISITE: HDFN 221, BCHM 540, BIOL 208.
  - Digestion, absorption, and metabolism of macronutrients, metabolic pathways utilizing carbohydrates, fats, and proteins, and changes that occur in metabolism under different physiological conditions.

HDFN 422 MICRONUTRIENT METABOLISM
F 5 cr. LEC 3
- PREREQUISITE: HDFN 421, and HDFN 425.
  - Digestion, absorption, and metabolism of micronutrients, metabolic roles of vitamins and minerals, and changes that occur in metabolism under different physiological conditions.

HDFN 425 MEDICAL NUTRITION THERAPY I
F 5 cr. LEC 3
- PREREQUISITE: HDFN 401.
  - Examination of metabolic and physiological changes in selected conditions and implications for medical nutrition therapy. Extensive case studies utilized to facilitate critical thinking for appropriate nutritional care.

HDFN 426 MEDICAL NUTRITION THERAPY II
S 3 cr. LEC 2 LAB 1
- PREREQUISITE: HDFN 425.
  - Application of principles of clinical nutrition. Supervised practice in a hospital for one week under the supervision of a registered dietitian (requires relocation for one week).

HDFN 451R SUSTAINABLE FOOD SYSTEMS
S alternate years, to be offered even years 3 cr. LEC 3
- PREREQUISITE: HDFN 221, HDFN 371 or consent of instructor.
  - This course examines the connections among the food industry, agriculture, and the environment and considers the sustainability of food choices. Students gain a systems perspective on current nutrition problems such as hunger, obesity, and disordered eating. Students conduct independent research.

HDFN 470 INDEPENDENT STUDY
On Demand 1 - 10 cr. LEC
- PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
  - Directed research and study on an individual basis.

HDFN 480 SPECIAL TOPICS
On Demand 1 - 10 cr. Maximum 12 cr.
- PREREQUISITE: Course prerequisites as determined for each offering.
  - Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDFN 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. IND May be repeated. Max 4 cr.
- COREQUISITE: HDFN 490.
  - Classroom instruction associated with directed undergraduate research/creative activity projects.

HDFN 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

HDFN 500 SEMINAR
On Demand 1 cr. LEC 1 Maximum 4 cr.
- PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
  - Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

HDFN 511 EXERCISE METABOLISM AND NUTRITION
S 3 cr. LEC 3
- PREREQUISITE: BIOL 207 or BIOL 208, HDFN 411, BCHM 122.
  - The aim of this course is to examine the elements of nutrient metabolism that are affected by exercise. Specific goals are to examine carbohydrates, amino acids, lipids, vitamins, and minerals from perspectives such as utilization during exercise and recovery from exercise, how exercise changes the need for each of the nutrients, the need for nutrient balance, how specific conditions alter nutrient metabolism in response to exercise.

HDFN 514 NUTRITION AND DISEASE
F alternate years, to be offered every even years 3 cr. LEC 3
- PREREQUISITE: HDFN 221 and BCHM 540.
  - This course will investigate the contribution of carbohydrate, protein, fat, and other nutrient pathophysiology to the development and treatment of major human diseases.

HDFN 521 METABOLIC ROLES OF NUTRIENTS
F alternate years, to be offered odd years 3 cr. LEC 3
- PREREQUISITE: HDFN 421 and BCHM 540.
  - Homeostatic integration of the micro nutrients in the human cell and in various organ systems.

HDFN 525 NUTRITION FOR FITNESS AND PERFORMANCE
F 3 cr. LEC 3
- PREREQUISITE: HDFN 221, BIOL 208N, CHEM 121N BCHM 540.
  - Examine energy metabolism and physical activity. Use nutrition strategies to meet the energy, power output, and nutrient demands of exercise, and athletic performance. Examine behavioral relationships that affect fitness and health, including disordered eating and the female athlete triad, evaluation of nutrition information and dietary supplements, with extensive use of internet resources.

HDFN 545 EXPLORATION OF FOOD BIOTECHNOLOGY
On Demand 2 cr. LEC 2
- PREREQUISITE: HDFN 370.
  - This course will delve into the history, techniques, applications and ethical concerns associated with the rapidly growing areas of biotechnology in food production, food processing and agriculture. All course participants will receive food biotechnology curriculum materials for incorporation into the high school biology classroom.

HDFN 551 GLOBAL FOOD PERSPECTIVES
S alternate years, to be offered odd years 3 cr. LEC 3
- Explores the making of the American diet by examining the impact of global historical events, cultural trends, economic pressures and political activities. Students think critically about the relationship between health and the food supply, proposing solutions to common food problems.

HDFN 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
- PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Division of Graduate Education.
  - Directed research and study on an individual basis.

HDFN 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 5 cr. IND Maximum 6 cr.
- PREREQUISITE: Graduate standing.
  - A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

HDFN 576 INTERNSHIP
On Demand 1 - 12 cr. IND
- PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
  - An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

HDFN 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
- PREREQUISITE: Upper division courses and others as determined for each offering.
  - Courses not offered in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDFN 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. LEC
- PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Division of Graduate Education.
  - Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subtitled.

HDFN 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND
- PREREQUISITE: Master's standing.
  - Directed graduate research/creative activity.
HDFP 505 FAMILY SYSTEMS
F S cr. LEC 3
PREREQUISITE: Graduate standing.
- This class explores the family as a system within the broader context of society. The developmental stage of the family will be the framework for studying the family system over the family life cycle and for exploring critical aspects of the family such as communication, economics, relationship quality, and interaction with other systems. We will also explore how Family Science approaches different issues and what scientists choose to study about families. This course is offered as a distance-delivered course from North Dakota State University.

HDFP 510 FUNDAMENTALS OF FINANCIAL PLANNING
F S cr. LEC 3
PREREQUISITE: Graduate standing.
- This course provides an overview of family financial planning by integrating concepts and issues with planning and counseling applications. Students will be introduced to the key concepts of family financial planning, including: insurance, tax investments, retirement, and estate planning. The family financial planning process is introduced with an emphasis on the integration and application of concepts in meeting individual and family financial goals and objectives. Other topics presented include an ethics overview, compensation trends within the industry, and regulatory frameworks. This course is offered as a distance-delivered course from Kansas State University.

HDFP 515 INSURANCE PLANNING FOR FAMILIES
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- The course covers risk management concepts, tools, and strategies for individuals and families, as well as ethical consideration. Case studies provide experience in selecting insurance. This course is offered as a distance-delivered course from the University of Nebraska.

HDFP 520 INVESTING FOR THE FAMILY'S FUTURE
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course covers various aspects of financial planning, including the application to family financial planning. Topics include risk analysis, risk reduction, expected returns of various investments, and the nature of securities markets and investment companies. This course is offered as a distance-delivered course from Iowa State University.

HDFP 525 RETIREMENT PLANNING, EMPLOYEE BENEFITS AND THE FAMILY
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course covers retirement planning for the individual and the family. Topics include qualified retirement plans, nonqualified plans, IRAs and other plans that offer tax advantages to the individual and family. This course is offered as a distance-delivered course from the University of Nebraska.

HDFP 530 ESTATE PLAN FOR FAMILY
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Course covers the basics of estate planning for families including understanding the basic elements of estate planning, analyzing case studies of estate planning situations, and developing skills to work with families on estate planning problems.

HDFP 540 PERSONAL INCOME TAXATION
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Course covers the basics of personal income taxation including taxation terminology, taxation issues in investments, taxes and retirement, financial calculations related to home ownership, tax implications in marriage and other close relationships, and other tax topics related to family financial well-being.

HDFP 545 FAMILY ECONOMICS
Su 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course will cover the major issues relative to the economics of families, including household production and human capital development. It will also cover the economics of crises, public policy and family life cycle spending, saving and borrowing. A theoretical and research perspective will be used to illuminate the concepts in the course. This course is offered as a distance-delivered course from South Dakota State University.

HDFP 550 HOUSING-REAL ESTATE
Su 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- An overview of the role of housing and real estate in the financial planning process from a theoretical perspective. Taxation, legal aspects, mortgages, and financial calculations related to home ownership and real estate investments are included. New and emerging issues in the context of housing and real estate will be emphasized. The role of ethics in financial planning with housing and real estate will also be included. This course is offered as a distance-delivered course from Oklahoma State University.

HDFP 555 FINANCIAL COUNSELING
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course emphasizes the development of professional skills for assisting individuals and families to become responsible financial managers through the financial counseling process. Professionals with financial counseling preparation may assist in preventing, alleviating, and/or eliminating financial problems. This course is offered as a distance-delivered course from North Dakota State University.

HDFP 560 PROFESSIONAL PRACTICES IN FAMILY FINANCIAL PLANNING
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course will cover the professional practice of financial planning including the process of planning and counseling. Ethics of professional practice, types of organizations offering planning and counseling services, and the evaluation of effectiveness in planning and counseling. This course is offered as a distance-delivered course from Kansas State University.

HDFP 572 FINANCIAL PLANNING-CASE STUDIES
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course is a capstone course in the FFP masters and involved the analysis and presentation of case studies that require the application of all material gained in the masters courses to the financial planning process for families. This course is offered as a distance-delivered course from Kansas State University.

HDFP 575 PROFESSIONAL PAPER
F, S, Su 1-4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

HDFP 576 PROFESSIONAL PRACTICUM IN FAMILY FINANCIAL PLANNING
F, S, Su 3 cr. LEC 3
PREREQUISITE: Graduate standing and consent of instructor.
- Practicum experience in the field of family financial planning.

HDHL 106 DRUG HEALTH ISSUES FOR EDUCATORS
F, S, Su on demand 3 cr. LEC 3
- Drug education and health concerns for educators of school-aged children. Covers topics required by Office of Public Instruction for health-related teacher education.

HDHL 221 FIRST EMERGENCY RESPONSE
F 1 cr. LEC 1
PREREQUISITE: Concurrent enrollment in HDHL 222.
- American Red Cross first aid procedures and skills, including certification in community CPR and responding to emergencies.

HDHL 222 FIRST EMERGENCY RESPONSE LAB
F 1 cr. LEC 1
- Practical application of procedures, skills, and safety for responding for an emergency.

HDHL 230 DRUGS AND SOCIETY
F, S 3 cr. LEC 3
- Individual and social implications of psychoactive drug use. Basic pharmacological concepts, legal issues, common pharmaceutical preparations, and over-the-counter products are studied.

HDHL 240 HUMAN SEXUALITY
F, S Su on demand 3 cr. LEC 3
- A study of all aspects of human sexuality including the sexual reproductive systems, sexual behaviors, contraception, gender roles, sexual functioning, and sexually transmitted diseases.
HDHL 270 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

HDHL 276 INTERNSHIP
On Demand 2 - 12 cr. IND Maximum 12 cr.
PREREQUISITE: Consent of instructor.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

HDHL 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDHL 280R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY INSTRUCTION
F, S 1-5 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

HDHL 280R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY
F, S 1-4 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

HDHL 410 HUMAN RESPONSE TO STRESS
F 3 cr. LEC 3
PREREQUISITE: PSY 100, junior standing.
- Analysis of human response to stress in relation to a variety of biopsychosocial factors; techniques for managing stress are also investigated.

HDHL 440 PRINCIPLES OF EPIDEMIOLOGY
S 3 cr. LEC 2 RCT 1
PREREQUISITE: STAT 216 and a research methods course.
- Senior capstone course. The goal of this course is to provide an introduction to epidemiologic concepts (e.g. incidence, prevalence, bias) and methods (e.g. study designs and measures).

HDHL 445 PROGRAM PLANNING IN HEALTH
F 5 cr. LEC 2 RCT 1
PREREQUISITE: HDCF 471, HDCF 472, HDPE 425.
- Senior capstone course. Health program planning and evaluation with emphasis on applications in Montana communities.

HDHL 451 HEALTH AND HEALING
F, Su on demand 3 cr. LEC 3
PREREQUISITE: PSY 100.
- A comparative study of different systems of health and healing. Systems include Allopathic (Western), Ayurvedic (East Indian), Chinese, and Native American. This course includes in and out of class practice components (e.g. Qi Gong, Yoga, Meditation).

HDHL 452 HEALTH DISPARITIES
F 3 cr. LEC 3
PREREQUISITE: HDCF 571.
- Examines what contributes to health disparities, which are inequalities in death, disease, disability, and well-being. Focuses on the epidemiologic evidence, theories of why health disparities exist, and current strategies for ameliorating health disparities.

HDHL 455 THE ETHIC OF CARE
F 3 cr. LEC 3
PREREQUISITE: PSY 100 or SOC 100 or HDCF 150.
- This course, intended for students interested in working in human service professions (education, health, social work, counseling, human relations and resources) will focus on understanding and applying the theory of the ethic of care in real world situations. Theoretical support for the ethic of care found in diverse areas of philosophy, social justice, education, feminism, parenting, nursing, theology, and medicine will be explored. Utilizing a service learning approach, students will be engaged in understanding theories related to the ethic of care through both in-class lecture and discussion and outreach in the community.

HDHL 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

HDHL 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDHL 480R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

HDHL 489R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY
F, S, Su 1 - 2 cr. RCT May be repeated
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

HDHL 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Division of Graduate Education.
- Directed research and study on an individual basis.

HDHL 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.

HDHL 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 5 cr. May be repeated;
Maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Division of Graduate Education.
- Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately submitted.

HDHL 590 MASTER'S THESIS
F, S 1 - 10 cr. IND
PREREQUISITE: Master's standing.
- Directed graduate research/creative activity.

HDPE
Human Development,
Physical Education
Department of
Health & Human Development
(406) 994-5242

HDPE 102 PARAPROFESSIONAL EXPERIENCE I
S 1 cr. LAB 1
- Observation of teaching and data collection in elementary, middle, and high school physical education/health enhancement classes. Placement of students to assist in youth coaching or intramural programs.

HDPE 105 LIFE SKILLS FOR STUDENT ATHLETES
F, S 2 cr. LEC 2
- This course is designed to introduce student athletes to psychological and educational theories and models associated with learning, self-management, personal and career development, and stress, coping and health. Through this course, student athletes will identify and address issues that pertain to learning and development among college students and issues that are unique to you as a student athlete.

HDPE 184 VARSITY ATHLETICS
F, S 1 cr. LAB 1 Maximum repeat 2 cr.
- The participation in an intercollegiate sport which requires a minimum of two to three hours of meeting/participation per week per athletic season.

HDPE 202 PARAPROFESSIONAL EXPERIENCE II
F 1 cr. LAB 1
PREREQUISITE: HDPE 102.
- Assisting in instruction in physical education activity classes, Young at Heart, Employee Wellness programs, and placement in the public school setting.

HDPE 210 EXERCISE PROGRAMMING FOR OLDER ADULTS
S 3 cr. LEC 2 LAB 1
- Students will examine the special exercise-related needs of older adults and learn how to safely and effectively meet those needs. The lab will provide practical experience working with older adults in the MSU "Young at Heart" exercise program for seniors.
ANATOMY AND PHYSIOLOGY
This course will focus on the key elements of anatomy and physiology necessary for students in allied health professions, specifically those who will work in the areas of community health, health enhancement education, health promotion, and kinesiology. The aim of this course is for students to demonstrate working knowledge of the muscular, skeletal, nervous, cardiovascular, and respiratory systems, and to demonstrate an understanding of the endocrine and digestive systems and body metabolism.

HDPE 222 FOUNDATIONS OF EXERCISE SCIENCE
S 3 cr. LEC 3
- The aim of this course is to integrate the subdisciplines of exercise science (functional anatomy, biomechanics, exercise physiology, motor control, and exercise psychology) from the perspectives of definitions, basic science, and application to health, fitness, and athletic performance.

HDPE 224 METHODS OF TEACHING MOVEMENT EXPLORATION
S 3 cr. 2 LEC 1 LAB
- Practice skills in music fundamentals; teaching and learning folk, square, social, and various types of rhythmic activities and movement exploration.

HDPE 251 TEACHING FITNESS AND PHYSICAL ACTIVITY CONCEPTS
S 3 cr. LEC 3
- Teaching practices for physical activity and fitness concepts appropriate for children and adolescents in school and recreational programs. Content includes pedagogical methods, strategies, styles, and techniques that encourage individuals to participate in and adhere to physical activity programs.

HDPE 252 TEACHING FOR SEQUENTIAL SKILL DEVELOPMENT
S 3 cr. LEC 3
- Introduction to motor skills teaching from novice to advanced performer. Includes techniques and technologies used in skill analysis, correction, and feedback to enhance and assess performance. Students will improve community their own performance as they learn to teach skills progressively.

HDPE 253 TEACHING GAME CONCEPTS AND TACTICS
F 3 cr. LEC 3
PREREQUISITES: HDPE 251 or HDPE 252.
- Teaching progressions for game concepts and tactics. Emphasis will be placed on sequential development of temporal and spatial concepts through progressively more complex offensive and defensive strategies using modified games.

HDPE 267 INTRODUCTION TO COACHING
F 3 cr. LEC 3
- Introductory coaching course which will cover basic information from the beginning level in the American Coach Effectiveness Program.

HDPE 270 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

HDPE 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDPE 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

HDPE 298R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

HDPE 302 PARAPROFESSIONAL EXPERIENCE III
S 1 cr. LAB 1
PREREQUISITE: HDPE 102, HDPE 202 COREQUISITE: EDS3 465
- This course will provide an in-school health enhancement teaching experience at the middle or high school level.

HDPE 304 TECHNOLOGY APPLICATIONS IN HEALTH ENHANCEMENT
S 3 cr. LEC 3
- Skills, knowledge, and applications necessary for integrating technology into developmentally appropriate teaching practices in Health Enhancement. Identifies theories, principles, and strategies for the integration of technology into physical education, physiological responses associated with training and participation in strength and endurance sports and activities. Lecture and lab emphasize explaining common observations and practices from the physiological viewpoint.

HDPE 305 LEADERSHIP FOR STUDENT ATHLETES
S, to be offered every 2 cr. LEC 2
PREREQUISITE: HDPE 105 and Junior standing
- Intended for student athletes and will focus on understanding and applying principles of leadership to performance. This course will enhance the student's ability to understand fundamental principles of leadership and apply those principles to their academic, athletic, and professional career. Specific attention will be paid to understanding individual strengths of student personality and translating those strengths into leadership positions.

HDPE 314 HEALTH ENHANCEMENT FOR ATYPICAL POPULATIONS
S 3 cr. LEC 3
PREREQUISITE: HDPE 221
- Health enhancement (physical education and health) issues for school-aged populations who have physical, mental, and/or emotional disabilities. This course is specifically for future teachers in the public schools.

HDPE 316 FOOTBALL COACHING THEORY
F alternate years, to be offered odd years 2 cr. LEC 2
- Basic fundamentals and techniques used in coaching football.

HDPE 317 BASKETBALL COACHING THEORY
F alternate years, to be offered odd years 2 cr. LEC 2
PREREQUISITE: HDPE 267.
- This course is set up to provide the student a working knowledge of basketball coaching techniques and philosophies. The course should assist the student in developing his/her own basketball coaching philosophy.

HDPE 318 SOCCER COACHING THEORY
F alternate years, to be offered even years 2 cr. LEC 2
PREREQUISITE: HDPE 267.
- A working knowledge of soccer coaching tactics and techniques.

HDPE 319 VOLLEYBALL COACHING THEORY
S alternate years, to be offered even years 2 cr. LEC 2
PREREQUISITE: HDPE 267.
- A working knowledge of volleyball coaching tactics and techniques.

HDPE 320 ANATOMICAL KINESIOLOGY
F 4 cr. LEC 3 4 LAB 1
PREREQUISITE: BIOL 207 or HDPE 221, and Math core or permission of instructor.
- A kinesiology course is designed for health enhancement, and health and human performance students. Topics include structure and function of the musculoskeletal system and qualitative movement analysis. Emphasis is placed on applying foundational anatomy in evaluation of human movement.

HDPE 322 EXERCISE PHYSIOLOGY
F 4 cr. LEC 3 3 LAB 1
PREREQUISITE: Grade of "C" or better in BIOL 207 or HDPE 221, or permission of instructor.
- Topics include factors and mechanisms involved with causing changes and adaptations in the physiological responses associated with training and participating in strength and endurance sports and activities. Lectures and labs emphasize explaining common observations and practices from the physiological viewpoint.

HDPE 325R BIOMECHANICS
S 4 cr. 3 LAB 2
PREREQUISITE: MATH 160 or MATH 170, BIOL 207, PHYS 205 and HDPE 290.
- A biomechanics course designed for exercise science and pre-physical therapy students. Topics include kinematics and kinetics of human motions, function of the musculoskeletal system and mechanical analysis of movement. Emphasis is placed on biomechanical analysis of normal and pathological movement.

HDPE 352 TRACK & FIELD THEORY
F 2 cr. LEC 1 LAB 1
PREREQUISITE: HDPE 267.
- The technique of all track and field events. Emphasis on teaching progressions in all events. Classroom sessions include development of training schedules, tactics, strategy, philosophy, meet organization, and officiating: A "Learn by Doing" approach used in the lab.

HDPE 357 COACHING APPLICATION
F, S 1 cr. RCT 1 Maximum 3 cr.
PREREQUISITE: HDPE 267.
- Assignment of prospective coaches to specific sports. Discussion and feedback on planning and implementation in practical setting.
HDPE 453 CURRICULUM DESIGN IN HEALTH ENHANCEMENT
S 3 cr. LEC 3
PREREQUISITE: HDPE 224 and HDPE 267.
- Course designed to introduce strength training concepts to students preparing to be Health Enhancement Educators and for coaches. Strength training principles will be applied to a variety of student populations and ages, be combining anatomy, physiology, biomechanics, pathology, and kinesiology.

HDPE 460 EXERCISE TESTING AND PRESCRIPTION
S 4 cr. LEC 3 LAB 1
PREREQUISITE: HDPE 322, BIOL 206, STAT 216, with grade "C" or better in each course, or permission of instructor.
- Students are familiarized with the hands-on training and theoretical background needed to competently assess levels of health/fitness in an "apparently healthy" population. Lecture/lab content is structured to prepare students for taking the ACSM Health/Fitness exam.
HDPE 467 ADVANCED CONCEPTS IN COACHING
F, S 3 cr. LEC 3
PREREQUISITE: HDPE 267; HDPE 367 or coaching experience.
- The primary goal of this course is to implement the content of an advanced coach certification curriculum in cooperation with the Montana School for Coaching Education. The class is intended for experienced coaches who wish to examine current issues in coaching such as the female athlete, sportspersonship, or coach/parent relationships in detail.
HDPE 470 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.
HDPE 475 SENIOR SEMINAR - PROFESSIONAL ISSUES
F, S 1 cr. LEC 1
- Corequisite: HDPE 476.
- Senior capstone course for majors in exercise, wellness, and athletic training. Establishing a professional identity and transitioning to a career in the field of human services.
HDPE 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
HDPE 489R UNDERGRADUATE RESEARCH/ CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Maximum 4 cr.
- Classroom instruction associated with directed undergraduate research/creative activity projects.
HDPE 490R UNDERGRADUATE RESEARCH/ CREATIVE ACTIVITY
F, S 1 cr. SEM 1 Maximum 4 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.
HDPE 500 SEMINAR
F, S 1 cr. SEM 1 Maximum 1 cr.
Corequisite: HDPE 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.
HDPE 506 EXERCISE AND CHRONIC DISEASE
S alternate years odd years and SU alternate years even years 3 cr. LEC 3
PREREQUISITE: HDPE 314, graduate standing.
- Theory and practice in the effects of exercise on various diseases, disabilities, and atypical conditions.
HDPE 509 CURRICULUM DESIGN
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- This course provides an overview of the curriculum design process necessary to create traditional and non-traditional curricular models currently popular in health enhancement, health promotion, and community health.
HDPE 540 BIOMECHANICAL ANALYSIS OF HUMAN MOVEMENT
F alternate years, to be offered even years 3 cr. LEC 5
PREREQUISITE: Graduate standing, prerequisite biomechanics or consent of instructor.
- This course covers the concepts and procedures of using mechanics in the analysis of human movement. Topics will include: anthropometry, kinesiology, kinetics, and electromyography. Clinical and sport applications will be examined.
HDPE 541 INSTRUMENTATION IN BIOMECHANICS
F alternate years, to be offered odd years 3 cr. LEC 5
PREREQUISITE: Graduate standing, prerequisite biomechanics or consent of instructor.
- This course introduces students to instrumentation used in biomechanical research. Topics include the design and use of instrumentation used in kinematic and kinetic analyses. Instrumentation will include 2D and 3D motion analysis, force platforms, and electromyography.
HDPE 545 GRADUATE EXERCISE PHYSIOLOGY
F 3 cr. LEC 3
PREREQUISITE: Graduate standing, prerequisite exercise physiology.
- This course defines and explains a conceptual mechanistic-driven model that explains the basis for maximizing human performance. The instructor relies heavily on readings from the current research literature and student participation to understand the plethora of topics covered.
HDPE 567 PROFESSIONAL ISSUES IN COACHING
S, Su 3 cr. LEC 5
PREREQUISITE: HDPE 267, HDPE 367 or three years of successful coaching in public schools.
- In-depth examination of at least one sub-topic from the Montana High School Coach Certification curriculum - i.e., prevention, care and rehabilitation of injuries, risk management in sport, sociological and psychological aspects of coaching; coaching the female athlete.
HDPE 570 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor and approval of department head and Dean of Division of Graduate Education.
- Directed research and study on an individual basis.
COURSE DESCRIPTIONS: HDPE 575 - HIST 110D

HDPE 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

HDPE 576 INTERNSHIP
On Demand 2 - 12 cr. IND Maximum credits unlimited
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

HDPE 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDPE 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 3 cr. May be repeated; maximum 3 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Division of Graduate Education.
- Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

HDPE 589 GRADUATE CONSULTATION
F, S, Su 1-3 cr. TUT 1-3 cr.
PREREQUISITE: Master's standing and approval of the Dean of Division of Graduate Education.
- This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

HDPE 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND May be repeated.
PREREQUISITE: Master's standing.
- Directed graduate research/creative activity.

HHD
Health & Human Development
Department of Health & Human Development
(406) 994-3242

HHD 100 SPECIAL ACTIVITY
On Demand 1 cr. LAB 1 May be repeated
- Special Activity classes offered as needed using the unique skills of the instructional faculty in any given semester.

HHD 105 AKIKDO FUNDAMENTALS
On Demand 1 cr. LAB 1 Maximum 2 cr.
- The fundamentals of Japanese Aikido as taught by the World Aikido Headquarters will be explored.

HHD 110 POCKET BILLIARDS
On Demand 1 cr. LAB 1
- Pocket billiard fundamentals, most popular games, and appropriate rules will be stressed. Fee required.

HHD 117 BOWLING FUNDAMENTALS
On Demand 1 cr. LAB 1
- Bowling fundamentals will be stressed along with bowling etiquette and equipment. Fee required.

HHD 128 DANCE, SOCIAL
F, S 1 cr. LAB 1
- Traditional and popular styles of ballroom dancing, including jitterbug, polka, waltz, cha cha, western dance, and fox trot.

HHD 145 FLY FISHING
On Demand 1 cr. LAB 1
- Instruction at all levels of skill from beginner to advanced. Transportation, tickets, and equipment not included.

HHD 205D DANCE AS CULTURAL COMING OF FASHION
S 3 cr. LEC 3
- Dance in a variety of cultures will be identified and examined taking into consideration many of the factors that have influenced its development (geography, climate, music, sociological values, and customs).

HHD 207A DANCE APPRECIATION
F, S 5 cr. LEC 5
- Dance as a performing art; its historical development; the way dance makes statements about man and the environment through the use of music, art, movement, literature, and theater.

HHD 261 SKIING, CROSS COUNTRY
S 1 cr. LAB 1
- The course provides instruction in preparation and execution of the various skills involved in cross country skiing from the beginner through advanced depending on the student's ability and skill level. Fee required.

HHD 276 INTERNSHIP
On Demand 2 - 12 cr. IND Maximum 12 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience within the field.

HHD 501 PROFESSIONAL COMMUNICATION SKILLS
F 2 cr. LEC 2
PREREQUISITE: Admission to graduate program at MSU.
- Students will develop writing and oral communication skills as they relate to scholarly pursuits in the areas of health and human development. They also gain a working knowledge of the various types of grants and their applications within public and private settings. Students will develop skills needed to write a successful grant concept paper and will have a working knowledge of the various components of a grant proposal and research papers and their thesis.

HHD 512 RESEARCH DESIGN IN HEALTH AND HUMAN DEVELOPMENT
5 alternate years, to be offered odd years 3 cr. LEC 3
- A study of the tools necessary to conduct research in the movement sciences and health fields. Includes the writing of a research proposal.

HIST
History
Department of History & Philosophy
(406) 994-4395

HIST 105H ORIGINS OF WESTERN CIVILIZATION
F, S, Su 4 cr. LEC 3 RCT 1
- Survey of the ancient Near East, Greece, Rome, and the European world to the end of Reforma tion. Emphasis on social, economic, and cultural history.

HIST 107H WESTERN CIVILIZATION: 1600 TO PRESENT
F, S 4 cr. LEC 3 RCT 1
- Survey of European history from 1600 to the present.

HIST 185D MODERN ASIA
S 4 cr. LEC 3 RCT 1
- The history of Latin America from the Pre-Columbian period to the present day, focused primarily on the period since Independence in the 1820's. The course examines the origins and legacies of economic and political inequalities both within Latin America and the "first world", with attention to questions of class, race, ethnicity, and gender.
HIST 115D HISTORY OF JAPAN
F, Su 4 cr. LEC 3 RCT 1
- The political and cultural development of Japan from earliest times to the present. Special attention will be given to Japanese relations with Asia and the West.

HIST 155IH AMERICA AND THE WORLD BEFORE 1865
F, Su 4 cr. LEC 3 RCT 1
- European exploration, Pre-Columbian Native Americans, the American Colonial, Revolutionary, Early National, Jacksonian, and Civil War periods, in the context of world history.

HIST 15DH THE AMERICAN WEST
F alternate years, to be offered 2007
4 cr. LEC 3 RCT 1
- History 157. The American West, examines the conquest, settlement and development of the territory west of the Mississippi River. Readings, discussion and lecture focus on the diversity of peoples who came to the West and the ways in which race and gender shaped their experiences.

HIST 160D WORLD HISTORY
F 4 cr. LEC 3 RCT 1
- Introduction to themes important for understanding the world in the 20th century through an examination of commodities from 1000 - present: world systems, global interconnections, identity and difference, the rise of mass society, technology and the environment.

HIST 291D RELIGION IN LATIN AMERICA
S alternate years, to be offered 2009 3 cr. SEM 3
- This course examines the history of religion in Latin America from pre-conquest times to the present and traces the mutual influences of indigenous, African, and Iberian traditions. We will emphasize "popular" beliefs, symbols, and rituals and their relationship with elite religion and state power.

HIST 290CS SCIENCE, TECHNOLOGY, AND RISK
On Demand 3 cr. LEC 3
- Examines the history, science, and ethics of risk, focusing on the complex relationship of science, technology, and risk in modern age. Includes exploration of knowledge production in science and technology; case studies such as industrial health and safety, the atomic age, "natural" disasters, and global warming to understand how risk has been defined, perceived, and remedied; and team research projects on such topics as automobile safety, earthquakes, and maquiladores.

HIST 290CS SCIENCE AND TECHNOLOGY IN WORLD HISTORY
On Demand 3 cr. LEC 3
- Surveys the role of science and technology in relation to social, political, and economic change in the West. Special attention is given to the historical development of scientific and technological knowledge, the ways different societies have linked ideas of progress and science, and how this can provide valuable perspective to contemporary debates over potentially revolutionary scientific and technological practices.

HIST 259H RESEARCH IN AMERICAN SLAVERY
S 3 cr. SEM
PREREQUISITE: CLS 101, or US 101, or BUS 101, or UH 201.
- This course focuses on helping non-history majors to understand and apply various research methods in the discipline of history. The topical focus is slavery, an institution which shaped American society in the past and present. Students will learn to analyze accounts of historians as first-hand reports written by slaves and owners.

HIST 259H SCIENCE, ENVIRONMENT, TECHNOLOGY, SOCIETY: COMMON EXPERIENCE
On demand 3 cr. LEC
- Science and technology have become pervasive investigators of social change. This course aims to understand the nature, causes, and consequences of the growth of science and technology from a humanistic perspective, including recent advances in stem-cell research, the human genome, atomic energy and weapons, and space technology. We will explore the immense social, cultural, political, and economic consequences of these advances and how they have affected our relationship to the natural world.

HIST 280 SPECIAL TOPICS
On demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HIST 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

HIST 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

HIST 305 MEXICO
On Demand 3 cr. LEC 3.
PREREQUISITE: Take one of the following: HIST 105, HIST 107 or HIST 110.
- This course examines the historical processes that resulted in the creation of Modern Mexico: pre-Columbian civilization, European conquest, colonialism, and the struggle over nation building since independence in 1821.

HIST 311 EARLY AMERICA
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 155.
- The development of the British American colonies and the establishment of the U.S. before 1800. Topics include pre-Columbian Native Americans, the European invasion and settlement of America, the social, economic and political evolution of the colonies, the American Revolution, and the establishment of the new nation.

HIST 312 CIVIL WAR AND RECONSTRUCTION
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 155 or HIST 156.
- Political, economic, and social developments leading to sectional division. Breakdown of political accommodation, Civil War, and Reconstruction.

HIST 313 THE Gilded AGE TO 1940
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 155 or HIST 156.
- This course explores the social, economic, and political development of the U.S. from 1877 to 1940, including the rise of big business, urbanization, progressive reform, the Great Depression, and the New Deal.

HIST 316 HISTORY OF RUSSIA TO 1917
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HIST 105 or HIST 107.
- Emergence of Russia as a modern nation and developments which led to the Bolshevik Revolution.

HIST 318 HISTORY OF ANCIENT GREECE
On Demand 3 cr. LEC 3
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Origins to Alexander the Great, with special attention to life in classical Athens. Emphasis on reading ancient sources in translation.

HIST 319 HISTORY OF ANCIENT ROME
On Demand 3 cr. LEC 3
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Political, cultural, and economic history of the U.S. since the end of World War II.

HIST 320 UNITED STATES SINCE 1940
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 156.
- Political, cultural, and economic history of the U.S. since the end of World War II.

HIST 325 19TH CENTURY EUROPE
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HIST 105 or HIST 107.
- Political, intellectual, and social history of Europe during the 17th and 18th centuries.

HIST 325 20TH CENTURY EUROPE
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HIST 105 or HIST 107.
- Ideas and events in Britain and on the continent from the Congress of Vienna to the outbreak of World War I. Social and intellectual ideas as well as political and economic events.

HIST 326 20TH CENTURY EUROPE
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HIST 105 or HIST 107.
- Events and forces in 20th century Europe from World War I to the present. The rise of fascism, communism, and the interwar crisis along with post-World War II developments.
HIST 333 EARLY BRITAIN: PREHISTORY TO 1714
On Demand 3 cr. LEC 3
PREREQUISITE: Sophomore standing and HIST 107.
- History of the British Isles from prehistory to 1714. Topics of study include the Reformation, Civil War, unification of Scotland and England, and rise of Britain as a world power.

HIST 334 MODERN BRITAIN
On Demand 3 cr. LEC 3
PREREQUISITE: Sophomore standing and one of the following: HIST 160, HIST 107 or HIST 333
- The emergence and fall of Britain as a world power. Topics of study include industrialization, the slow emergence of democracy in Britain, the role of the family in Victorian Britain, and the impact of the empire within Britain.

HIST 335 HISTORY OF THE MIDDLE EAST IN THE 20TH CENTURY
On Demand 3 cr. LEC 3
PREREQUISITE: One of the following: HIST 160, HIST 105, HIST 107 or POLS 241.
- Investigate major diplomatic, economic, cultural and religious themes from the Middle East in the 20th century. Students will choose topics and countries of interest for specific, instructor-guided research. The Arab-Israeli conflict will be one case study.

HIST 336 HISTORY OF MODERN FRANCE
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HIST 160, HIST 105 or HIST 107.
- An interdisciplinary course which focuses on the construction of the modern French nation-state.

HIST 337 MODERN GERMANY
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HIST 105 or HIST 107.
- An in-depth look at the economic, social, and political developments of modern Germany.

HIST 338 TWENTIETH CENTURY WAR
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HIST 160, HIST 105 or HIST 107.
- This course examines the history of U.S. military activity in the Pacific Rim from the Philippine-American War to Vietnam, investigating the geopolitical, economic, social, and cultural factors that culminated in the nation's longest war: Vietnam.

HIST 339 THE WORLD AT WAR: WORLD WAR I
F, alternate years, to be offered Fall 2008 5 cr. LEC 3
PREREQUISITE: HIST 105, or HIST 107, or HIST 155, or HIST 156, or HIST 160.
- The First World War examined through political, military, technological, and social history, in the contexts of the early decades of the 20th century and consequences up to the present.

HIST 341 AGE OF THE SHOGUNS
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 109 or HIST 115
- Exploration of the political, cultural, and diplomatic issues involved in the development of the Tokugawa state.

HIST 342 JAPAN'S LONG 19TH CENTURY
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 109 or HIST 115
- Investigates the revolutionary changes that Japan underwent between the 1770's and 1910.

HIST 343 MODERN CHINA
F 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HIST 160, HIST 107 or HIST 109.
- Social, political, and economic history of the People's Republic of China.

HIST 344 MODERN INDIA, PAKISTAN, AND BANGLADESH
S 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HIST 160, HIST 107 or HIST 109.
- Social, economic, political, and intellectual history of India, Pakistan, and Bangladesh during the 19th and 20th centuries.

HIST 401R SEMINAR IN HISTORICAL METHODOLOGY F, S 3 cr. SEM 3
PREREQUISITE: Senior standing, HIST 160, HIST 105 or HIST 107 and HIST 155 or HIST 156.
- Senior capstone course. History majors practice sound research and writing methods, using appropriate bibliographical tools and in light of contemporary historiography.

HIST 402 TRANS-MISSISSIPPI WEST
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 155 or HIST 156.
- Exploration of major themes in the development of the American West, including conquest and settlement, economic development, racial and ethnic diversity, urbanization, and popular culture.

HIST 403 GENDER IN THE U.S. & CANADIAN WEST
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 155 or HIST 156 or HIST 408.
- An examination of the experiences of women in the western U.S. and Canada. Focus on topics of race and ethnicity, families and intimacy, politics and the law, paid and unpaid work, art and culture.

HIST 404 MONTANA AND THE WEST
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 155 or HIST 156.
- A survey of Montana history which will cover the development of the territory and state, and will examine the social, economic, cultural, and political patterns that connect Montana with the rest of the American West.

HIST 405 ANTI-COMMUNISM IN THE TRUMAN-EISENHOWER YEARS
S 3 cr. SEM 3
PREREQUISITE: HIST 155 or HIST 156.
- Analysis of the ways the Truman and Eisenhower administrations dealt with anti-communism, with a focus on McCarthyism.

HIST 406 ANTI-COMMUNISM IN THE TRUMAN-EISENHOWER YEARS
S 3 cr. SEM 3
PREREQUISITE: HIST 155 or HIST 156.
- An analysis of the ways the Truman and Eisenhower administrations dealt with anti-communism, with a focus on McCarthyism.

HIST 407 COLONIAL LATIN AMERICA
F 3 cr. SEM 3
PREREQUISITE: HIST 110 and Junior standing or permission of instructor.
- This seminar-style course examines the colonial period in Latin America, from 1492-1821. Important themes include cross-cultural contact and conflict, the development of a colonial economy, religious and cultural change, institutional and political history, and the organization of colonial society.

HIST 408 GENDER IN AMERICA
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 155 or HIST 156.
- History of women in America from colonial times to the present. Analysis of gender relations, the family, the struggle by women to achieve civil rights and social reform, the problems of working women, and the rise of feminism.

HIST 409 JAPANESE WOMEN'S HISTORY
On Demand 3 cr. SEM 3
PREREQUISITE: HIST 110.
- The role of women in Japanese history from ancient time to the present.

HIST 410 LATINO AMERICAN SOCIAL HISTORY
On Demand 3 cr. SEM 3
PREREQUISITE: HIST 110.
- Social history of Latin America from colonial times to the present with a focus on social history methodology, theories of economic development and social change, and on the experiences of Latin America's diverse popular classes.

HIST 412 RACE AND CLASS IN AMERICA
S 3 cr. LEC 3
PREREQUISITE: HIST 155 or HIST 156.
- Race in the history of the U.S. from early European and Native American contact until the present. Considers issues of racism, race relations, slavery, African-American culture, the modern Civil Rights movement, and current policy and racial questions.

HIST 413 RACE IN LATIN AMERICA
On Demand 3 cr. SEM 3
PREREQUISITE: One of the following: HIST 110, HIST 155 or HIST 156.
- This course explores the history of race relations in Latin America, focusing on the traditional links between "race" and power. Topics include examinations of Indigenous, African, and European cultures/ethnicities, from the Conquest to the present day.

HIST 414 LATIN AMERICAN PERSPECTIVES: HISTORY, CULTURE, AND IDENTITY IN THE TWENTIETH CENTURY
S 3 cr. LEC 3
PREREQUISITE: HIST 110.
- This course approaches historical developments, literature, and constructions of identity in twentieth-century Latin America. Taught in English with Spanish reading/writing option. Focus will vary by professor.

HIST 415 FAMILY, GENDER AND LAW IN ANCIENT GREECE AND ROME
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HIST 105, HIST 318 or HIST 319.
- Marriage, family life, and the position of women from Homer to Saint Augustine. Special emphasis on private law. Reading and discussion of ancient sources in translation.

HIST 422 HISTORY OF THE AMERICAN CONSTITUTION
On Demand 4 cr. LEC 4
PREREQUISITE: HIST 155 or HIST 156.
- Development of American Constitutional theory and practice.
HIST 423 PROTESTANT REFORMATION
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HIST 105 or HIST 107.
- The rise of Protestantism, 1500-1640, and its impact on European society. Emphasis on Germany and France.

HIST 425 GENDER, SEXUALITY, AND SOCIAL CHANGE IN LATIN AMERICAN HISTORY
On Demand 3 cr. LEC 3
PREREQUISITE: Background in Latin American and/or Women's Studies.
- An exploration of the ways in which transformations in the historical construction of gender and sexuality shaped and were shaped by broader processes of socioeconomic, political, and cultural change in Latin American history.

HIST 426 THE RENAISSANCE
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HIST 105 or HIST 107.
- Emphasis on the transition from medieval to early modern society in England, Italy, France, and Germany, 1300-1525.

HIST 430 SCIENCE & MEDICINE IN CHINA
F, to be offered alternate years, 2008 3 cr. LEC 3
PREREQUISITE: HIST 109 or HIST 115 or consent of instructor.
- An exploration of the transformations of medicine, technology, and natural knowledge in imperial and modern China.

HIST 431 SCIENCE, TECHNOLOGY & SOCIETY: 1500-1800
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HIST 105, HIST 325, HIST 423 or HIST 424.
- The Scientific Revolution in Europe. Topics of study include the relationships between religion and science, science and gender, and technological change and the structure of society.

HIST 432 MODERN SCIENCE
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HIST 105, HIST 156, HIST 325, HIST 326, or HIST 466.
- The emergence of modern science in Europe and America. Topics of study include the relationships between science, gender, ethnicity, and race.

HIST 433 CREATURES: ART AND BIOLOGY FROM EARLY MODERNITY TO NOW
S, alternate years, to begin even year 3 cr. LEC 3
PREREQUISITE: Lower division history course and Junior standing, or consent of instructor.
- Explores the intersection between the arts and life sciences since early modernity.

HIST 447 HISTORY OF THE NORTH AMERICAN INDIAN
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 155 or HIST 156.
- Indian affairs in America from 1600-1970. Emphasis on white reaction to the American Indians and the effect of the European invasion on Indian culture.

HIST 448 GENDER AND TECHNOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 107 or HIST 156 or consent of instructor.
- Why are technologies gendered? How do technologies affect gender? This class explores the relationship between gender and technology in comparative cultural, social, and historical perspectives. Specific topics addressed include gender and industrialization; identity, masculinity, and technology; gender, sex, and technology.

HIST 449 GENDER AND ENVIRONMENT IN JAPAN
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: HIST 109 or HIST 115.
- Traces the role of images of nature and the natural environment in the formation of Japanese political, cultural, and economic practice from ancient times to the present.

HIST 455 HISTORY OF AMERICAN TECHNOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HIST 155 or HIST 156.
- This course investigates fundamental questions about the role of technological change in U.S. history, focusing on issues of the environment, concepts of progress, consumerism, power, work, and freedom. In addition to standard historical sources, the course uses popular films, novels, and art to discuss the changing meaning and significance of technology in America.

HIST 456 AMERICAN THOUGHT AND CULTURE
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HIST 155 or HIST 156.
- The fundamental purpose of this course is to show the interconnectedness of science, philosophy, literature, and religion in shaping the American intellectual tradition from the Puritan founding to the present.

HIST 457 MUSEUM HISTORY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Junior standing.
- An examination of the development of American museums and their relationship to other exhibitionary forms including wild west shows and world's fairs. The course also introduces students to theoretical arguments about the nature and function of cultural representations.

HIST 458 CABINETS OF CURIOSITY: TRAVELS OF EXOTICA IN THE EARLY MODERN WORLD
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: Lower division history course and Junior standing, or consent of instructor.
- Exotic objects and travels in early modern history. The course explores the trade, collection, display, and literature of material objects in early modern world history. We will pay special attention to the creation of the ideas of "natural", "artificial", and "exotic".

HIST 460 EUROPEAN INTELLECTUAL HISTORY
On Demand 3 cr. LEC 3
PREREQUISITE: Junior standing and HIST 105 or HIST 107.
- The ideologies and major thinkers who have influenced European history from the French Revolution to the present day.

HIST 464 HISTORY OF YELLOWSTONE NATIONAL PARK
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 155 or HIST 156.
- Historical analysis of changing perceptions of nature on development of Yellowstone and of the park's place in the context of a modernizing American nation.

HIST 466 UNITED STATES ENVIRONMENTAL HISTORY
On Demand 3 cr. LEC 3
PREREQUISITE: HIST 155 or HIST 156.
- Survey of changing perceptions and uses of the natural world from the colonial era to the present.

HIST 467 GENDER IN ASIA
S 3 cr. LEC 3
PREREQUISITE: Junior standing and one of the following: HIST 160, HIST 105, HIST 107 or HIST 109.
- Analysis of gender relations, the family, the struggle by women in Asia to achieve civil rights and social reform, the problems of working women and various alternatives to western feminism. Focus on the 19th and 20th centuries.

HIST 468 ANIMAL HISTORIES
F, S alternate years, 3 cr. LEC 3
PREREQUISITE: Junior standing or consent of instructor.
- An intensive and creative research experience, this course allows students to explore the multidisciplinary side of history by investigating the interrelationship of human and non-human animals in a historical setting.

HIST 469 WORLD ENVIRONMENTAL HISTORY
F, S alternate years, 3 cr. LEC 3
PREREQUISITE: HIST 160,107,115,109 or 110.
- This course examines the intersection of the natural world with major themes in world history and places typical subjects in environmental history, including diseases, agriculture, pollution, and environmentalism in global context.

HIST 470 INDEPENDENT STUDY
On Demand 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

HIST 476 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

HIST 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HIST 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Maximum 4 cr.
PREREQUISITE: HIST 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.
HIST 490R UNDERGRADUATE RESEARCH/Creative Activity
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Junior standing in History and consent of department head.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

HIST 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

HIST 502 PUBLIC HISTORY
F On Demand 3 cr. SEM 3
PREREQUISITE: HIST 540 or equivalent. May be repeated. Maximum 6 cr.
- Advanced readings and discussion in the practice of public history, including oral history, historic preservation, and museum studies.

HIST 503 HISTORY OF AMERICA BEFORE 1860
F 4 cr. SEM 4 adding may be repeated, not to exceed 8 credits.
PREREQUISITE: HIST 511 or HIST 412.
- Topics in the social, cultural, economic, and political history of Early America in the Atlantic world.

HIST 504 TOPICS IN ENVIRONMENTAL HISTORY
On demand 3 cr. SEM 3 May be repeated. Maximum 6 cr.
PREREQUISITE: HIST 466 or equivalent.
- Advanced readings and discussions in environmental history.

HIST 505 U.S. HISTORY 1860 TO PRESENT
S 4 cr. LEC 4 May be repeated. Maximum 6 cr.
PREREQUISITE: Graduate Standing
- Graduate research and analysis of important issues in recent American history.

HIST 506 TOPICS IN HISTORY OF SCIENCE, TECHNOLOGY, & SOCIETY
On demand 3 cr. SEM 3 May be repeated. Maximum 6 cr.
PREREQUISITE: HIST 451 or equivalent.
- Advanced readings and discussion in the history of science, technology and society.

HIST 507 HISTORICAL WRITING
On demand 3 cr. SEM 3
PREREQUISITE: HIST 540 or equivalent.
- Advanced seminar in contemporary historiography, historical theory, and narrative style.

HIST 512 TOPICS IN WORLD HISTORY
F 3 cr. SEM 3
PREREQUISITE: Graduate standing. May be repeated. Maximum 6 cr.
- Examination of topics of current scholarly concern in history other than United States.

HIST 513 TOPICS IN SOCIAL AND CULTURAL HISTORY
S 3 cr. SEM 3
PREREQUISITE: Graduate standing. May be repeated. Maximum 6 cr.
- Examination of topics in social and cultural history of current scholarly concern.

HIST 515 THE AMERICAN WEST
S 3 cr. LEC 3
PREREQUISITE: HIST 402 or equivalent. May be repeated. Maximum 6 cr.
- Directed readings and analysis of major problems in the history of the American West.

HIST 540 HISTORICAL METHODS
F 3 cr. LEC 3 May be repeated. Maximum 6 cr.
- Consideration of historical thinking, the uses of evidence and historical methodology.

HIST 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head, and Dean of Graduate Studies.
- Directed research and study on an individual basis.

HIST 575 PROFESSIONAL PAPER
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing. 
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

HIST 576 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

HIST 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HIST 585 PROFESSIONAL DEVELOPMENT
On Demand 1-3 cr. May be repeated; maximum 3 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

HIST 589 GRADUATE CONSULTATION
F, S, Su 5 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

HIST 590 MASTER’S THESIS
F, S, Su 1-10 cr. IND May be repeated.
PREREQUISITE: Master’s standing.

HIST 601 DISSERTATION WORKSHOP
F 1 cr. SEM 1
- Presentation and discussion of dissertation research and writing.

HIST 689 DOCTORAL READING AND RESEARCH
On Demand 5-6 cr. IND May be repeated; maximum 15 cr.
- Presentation and discussion of dissertation research and writing.

HIST 690 DOCTORAL THESIS
On Demand 1-10 cr. IND May be repeated.

HUM Humanities
Department of History & Philosophy
(406) 994-4395

HUM 204 GENDER & SEXUALITY
On Demand 3 cr. 3 LEC
- The role of gender in human culture - in social organizations, views of nature, perception of self and arts, and technologies. Sexuality as paradigmatic image.

HUM 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

I&ME Industrial & Management Engineering
Department of Mechanical & Industrial Engineering
(406) 994-2203

I&ME 101 INTRODUCTION TO INDUSTRIAL ENGINEERING
F 1 cr. LEC 1
PREREQUISITE: Must be taken the first year enrolled in IE program.
- Overview of the industrial engineering profession. Lectures will concentrate on tools and methods of industrial engineering, and their application in manufacturing and service industries.

I&ME 142 INTRODUCTION TO PRODUCTION SYSTEMS
S 2 cr. LEC 1 LAB 1
PREREQUISITE: Must be taken the first year enrolled in IE program.
- Introduction to system design and improvement methods. Lectures concentrate on data gathering; diagramming; facility layout with flow time and inventory relationships. Diagramming software used. Case studies and plant tours may be part of lab activities.

I&ME 264 INTRODUCTION TO MODELS AND COMPUTERS IN INDUSTRIAL ENGINEERING
S 3 cr. LEC 3
PREREQUISITE: CS 160, MATH 182.
- Introduction to model formulation and numerical solution methods in industrial engineering. Emphasis on decisions, constraints, and objectives in problem solving. Introduction to relational database design and computer decision support.
I&ME 271 MICROCOMPUTERS IN INDUSTRY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: CS 160 or equivalent.
— Basic skills in the programming and application of fundamental automation technologies, including digital logic, programmable logic controllers, microprocessors, robotics and flexible manufacturing systems. Laboratories are "mini" design problems where theory is implemented via software and hardware control of industrial devices.

I&ME 290 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
— Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

I&ME 300 PROFESSIONAL PRACTICE AND RESPONSIBILITY
F 2 cr. SEM 2
PREREQUISITE: Junior standing in IE.
— Transition to professional practice. Career planning, professional ethics, social responsibility, communications, job interviewing, and related professional topics.

I&ME 313 WORK DESIGN & ANALYSIS
S 3 cr. LEC 2 LAB 1
PREREQUISITE: ENGL 121W; ME 115 or ME 117 or instructor approval; I&ME 142 for IE majors.
— Design and analysis principles of occupational designs with emphasis on work standards development, productivity improvement, and industrial safety. Principles covered include operations and methods analysis, time and motion study, work sampling, synthetic time standards, human factors, and ergonomics.

I&ME 325 ENGINEERING ECONOMY
F, S, Su 3 cr. LEC 3
PREREQUISITE: Junior standing, MATH 181 or MATH 175, ENGL 121, COM 110 or CLS 101; or instructor approval.
— Methods for comparing and evaluating capital investment alternatives. Concepts include the time value of money, rates of return, cash flows, incremental analysis, depreciation, influences of taxes, inflation and deflation, and replacement analysis. Emphasis is placed upon evaluating various engineering alternatives. Some open-ended design problems are included.

I&ME 344 CONCURRENT ENGINEERING
On Demand 3 cr. LEC 3
PREREQUISITE: Engineering or Technology Junior or Senior standing.
— The business environment, process management, design process, manufacturability, life cycle design, quality, collaborating the design-to-market cycle, process integration, communication, world class design, manufacturing, and marketing.

I&ME 350 APPLIED ENGINEERING DATA ANALYSIS
F, S, Su 3 cr. LEC 2
PREREQUISITE: MATH 170 or MATH 182.
— An overview of data variability and applied statistical experimental design with analysis techniques for a broad range of engineering disciplines. Topics include statistical probability distributions, experimental design strategies, hypothesis testing, and regression with applications to traditional engineering functions.

I&ME 354 ENGINEERING PROBABILITY AND STATISTICS I
F 3 cr. LEC 3
PREREQUISITE: MATH 182, junior standing, or instructor approval.
— Understanding the statistical nature of engineering processes. Emphasis on proper data collection and classification, characteristics of variables and their distributions, joint probability distributions, and establishing hypotheses and statistical significance over engineering design specifications.

I&ME 355 ENGINEERING STATISTICS LAB
F 1 cr. LAB 1
PREREQUISITE: MATH 182, junior standing, or instructor approval.
— Laboratory experience emphasizing the design and analysis of engineering data. Includes Excel applications software.

I&ME 364 PRINCIPLES OF OPERATIONS RESEARCH I
F 3 cr. LEC 3
PREREQUISITE: MATH 221 or MATH 224, I&ME 364.
— Formulation of models and optimization techniques to facilitate engineering management decisions. Resource allocation, transportation and multiple goals via networks, line, and integer programming with primal-dual emphasis. Introduction to EOQ and probabilistic inventory models.

I&ME 373 PRODUCTION INVENTORY COST ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: One of the following: Math 170, MATH 175, MATH 181.
— Industrial cost systems, accounting processes, and cost estimation; cost analysis of manufacturing processes, economic decision making and uses of cost information in making product design and product line decisions.

I&ME 413 ERGONOMICS & SAFETY I
F 3 cr. LEC 3
PREREQUISITE: Junior standing, I&ME 315 for IE majors only.
— Fundamentals of ergonomics and safety engineering. Topics include principles of anthropometry, biomechanics, work physiology, psychophysics, and engineered safety applied to common problems faced by engineers and industrial health professionals. Emphasis on design and analysis of occupational systems and consumer products which best "fit" job tasks or user requirements to human capabilities. Issues regarding regulatory environments (e.g., OSHA) are also covered.

I&ME 422 INTRODUCTION TO SIMULATION
F 3 cr. LEC 3
PREREQUISITE: CS 160 or equivalent, I&ME 354 or equivalent, I&ME 364 for IE majors.
— Discrete simulation modeling methodology; random number generation, sampling, output analysis, validation, and verification; application to varied systems design and analysis problems. Cross-listed with CS 422.

I&ME 425 ENTREPRENEURSHIP AND ECONOMIC FEASIBILITY
F 3 cr. LEC 3
PREREQUISITE: I&ME 325 or consent of instructor.
— In-depth analysis of managerial decision-making methods culminating in a comprehensive economic feasibility study. Emphasis on entrepreneurship, sensitivity analysis, cost-volume-profit analysis, taxation, and computer application. Applications are demonstrated in a design project.

I&ME 434 PROJECT AND ENGINEERING MANAGEMENT
F 3 cr. LEC 3
PREREQUISITE: I&ME 325 or consent of instructor.
— Fundamental principles of planning, estimating, budgeting, scheduling, implementing, evaluation, and controlling engineering and research projects. Common engineering management concerns such as labor scheduling, human resources management, and related governmental compliance also explored.

I&ME 442 FACILITY AND MATERIAL HANDLING SYSTEMS DESIGN
F 3 cr. LEC 2 LAB 1
PREREQUISITE: I&ME seniors in their last full academic year, I&ME 313, ME 116, ME 255.
COREQUISITE: I&ME 360.
— Senior capstone course. The first course in the senior capstone sequence. Principles and techniques for planning and designing production facilities and material handling systems. Product and process analysis, requirements, layout and support facilities. Computer-aided analysis and design.

I&ME 444R SENIOR DESIGN PROJECT
S 2 cr. LEC 1 RCT 1
PREREQUISITE: I&ME 442 and I&ME 454.
COREQUISITE: I&ME 458.
— Senior capstone course. Second course in senior capstone sequence. A comprehensive open-ended team design project emphasizing the use of computers to plan and evaluate facility designs, their location, and materials handling systems. Technical and economic feasibility studies. Oral and written communication emphasized.

I&ME 445R INDEPENDENT SENIOR DESIGN
S 1 cr. IND 1
COREQUISITE: Concurrent enrollment in I&ME 444R required.
— Senior capstone course. Independent study associated with I&ME 444R.

I&ME 454 ENGINEERING PROBABILITY AND STATISTICS II
S 3 cr. LEC 3
PREREQUISITE: I&ME 354 and I&ME 355.
— Identification, characterization, and analysis of variation in engineering data. Includes inferential statistics, goodness of fit, applications of non-parametric statistics, curve fitting, regression, and the design of engineering experiments. A team design project is required.
I&ME 458 PRODUCTION
AND ENGINEERING MANAGEMENT
3 cr. LEC 3
PREREQUISITE: I&ME 264.
- Design and management of efficient production/delivery systems for goods and services, emphasizing quantitative analysis and systems approaches.
- Topics include forecasting, inventory management, production planning, scheduling, material planning, and lean manufacturing systems; plus introduction to organization and management theory.

I&ME 464 PRINCIPLES
OF OPERATIONS RESEARCH II
3 cr. LEC 3
PREREQUISITE: I&ME 354 and I&ME 364.
- Advanced formulation of models, optimization techniques, simulation, system design, and operations management decision making.
- Nonlinear and integer programming algorithms.
- Stochastic models including advanced queueing and general Markov processes. Integration of models and relational databases for decision support.

I&ME 470 INDEPENDENT STUDY
On Demand 1-3 cr. IND Max: 3 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of IE faculty and department head.
- Directed research and study on an individual basis.

I&ME 471 COMPUTER
INTEGRATED MANUFACTURING
3 cr. LEC 2 LAB 1
PREREQUISITE: I&ME 271 or ME 515, ME 255; or consent of instructor.
- Computers and their applications to computer-integrated manufacturing systems. Fundamentals of manufacturing, automation, numerical control production systems, robotics, design of experiment, control systems, advanced functions for handling and storage, flexible manufacturing systems, CAD/CAM, and future automated factories. Laboratories include software design and implementation, as well as the application of “off the shelf” software emphasizing creativity in the control of industrial machines.

I&ME 477 QUALITY ASSURANCE
3 cr. LEC 3
PREREQUISITE: I&ME 554 or I&ME 530 or consent of instructor.
- Statistical and non-statistical aspects of quality assurance assessment. Includes classical SPC and process improvement via control charts. Also includes product and process design through planned experimentation and simple experimental designs (ANOVA). Limited use of case studies. A design project or course capstone paper demonstrating significant elements of the course is required.

I&ME 480 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

I&ME 488R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: I&ME 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

I&ME 490R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

I&ME 501 ADVANCED DESIGN &
CONTROL OF MANUFACTURING SYSTEMS
5 cr. LEC 3
PREREQUISITE: I&ME 564, and I&ME 442 or equivalent; or consent of instructor.
- Analysis and design of modern manufacturing systems; control, scheduling, facilities layout and location, inventory, production control, models, algorithms, and computerized design and analysis software.

I&ME 509 SYSTEMS SIMULATION
5 cr. LEC 3
PREREQUISITE: CS 160, I&ME 354, I&ME 422; or consent of instructor.
- Systems exhibiting randomness are modeled and statistically analyzed using a state-of-the-art simulation language. Graphical model animation, and advanced output analysis are emphasized. Applications include improvement of existing and design of new production and service systems.

I&ME 513 ERGONOMICS & SAFETY II
On Demand 3 cr. LEC 3
PREREQUISITE: I&ME 413, and I&ME 454 or I&ME 554; or equivalent.
- Advanced topics and methods in ergonomics and human factors engineering. Basic and applied research issues in ergonomics and safety are explored with emphasis on problem solving through designed experimentation with proper assessment methods and instrumentation technologies.

I&ME 525 ECONOMIC &
MULTI-ATTRIBUTE ANALYSIS OF
ADVANCED MANUFACTURING SYSTEMS
F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: I&ME 525.
- Advanced economic analysis topics, including examination of assumptions in standard engineering economy approaches, cost of capital determination, treatment of risk and uncertainty, sensitivity analysis, advanced modeling techniques, and multi-attribute methods. Special emphasis is given to decision making in modern manufacturing and service systems.

I&ME 534 DESIGN &
DECISION SUPPORT SYSTEMS
5 cr. LEC 3
PREREQUISITE: I&ME 364 or equivalent, CS 160; or equivalent.
- Design and decision making; decision support system design for engineering and management. Computer aided design and decision making; decision support system hardware and software architectures; data management, models, search, and user interfaces.

I&ME 540 LOGISTICS AND
SUPPLY CHAIN MANAGEMENT
5 cr. LEC 3
PREREQUISITE: CS 160 or equivalent, and MATH 221 or I&ME 364; or consent of instructor.
- Introduction to logistics and supply chain management problems, performance measures, system design and operation methods; fleet management, vehicle routing, crew scheduling and related problems.

I&ME 548 PLANNING AND SCHEDULING
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: CS 160 or equivalent, and MATH 221 or I&ME 364; or consent of instructor.
- Statistical analysis for managerial decision-making as applied to engineering and industry. Hypotheses testing, multi-factor ANOVA, randomized complete block designs, full-blown and fractional factorial designs, blocking and confounding, random factors experiments, and introductions to nested and split-plot designs.

I&ME 554 APPLICATION & DESIGN
OF INDUSTRIAL EXPERIMENTS
F alternate years, to be offered even years
5 cr. LEC 3
PREREQUISITE: I&ME 454 or I&ME 554.
- Statistical analysis for managerial decision-making as applied to engineering and industry. Hypotheses testing, multi-factor ANOVA, randomized complete block designs, full-blown and fractional factorial designs, blocking and confounding, random factors experiments, and introductions to nested and split-plot designs.

I&ME 555 MANAGERIAL
FORECASTING & DECISION ANALYSIS
On Demand 3 cr. LEC 3
PREREQUISITE: I&ME 354 or I&ME 454.
- Time series analysis through classical approaches including regression, smoothing models, and advanced topics and methods in managerial decision-making and introductions to nested and split-plot designs.

I&ME 557 OPTIMIZATION TECHNIQUES
3 cr. LEC 3
PREREQUISITE: I&ME 364, CS 160 or equivalent.
- Classical principles of differential calculus are applied in solving nonlinear optimization problems. Search strategies for identifying local and global optima are developed for presentation as algorithms. Motivates the use of more accurate nonlinear models for cost revenue, design, etc.

I&ME 570 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head, and Dean of Graduate Studies.
- Directed research and study on an individual basis.
I&ME 571 ADVANCED MANUFACTURING AUTOMATION
F alternate years, to be offered odd years
3 cr. LEC 2 LAB 1
PREREQUISITE: I&ME 471, or instructor approval.
- Introduction to advanced manufacturing automation including numerical control machining, rapid prototyping, flow line analysis, group technology, process planning, flexible manufacturing systems, industrial robotics, inspection technologies, computer integrated manufacturing, and concurrent engineering.

I&ME 574 MANAGEMENT ENGINEERING SYSTEMS
F alternate years, to be offered even years
3 cr. SEU 3
PREREQUISITE: I&ME 458, or instructor approval.
- Students will explore various facets of designing effective organizational and management systems. Topics will include: classical and open system organization theory, socio-technical systems theory, congruence, technology and innovation management, knowledge management, and continuous improvement in organizations. Students will complete an independent research project in addition to course readings and in-class discussion.

I&ME 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1-6 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student, major advisor, and graduate committee.

ICS 480 SPECIAL TOPICS
On Demand 1-10 cr. IND
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ICS 580 SPECIAL TOPICS
On Demand 1-10 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

ICS 590 MASTER’S THESIS
F, S 1-10 cr. IND
PREREQUISITE: Master’s standing.

ICS 690 DOCTORAL THESIS
F, S 1-10 cr. IND
PREREQUISITE: Doctoral standing.

I&ME 579 GRADUATE CONSULTATION
F, S 1-3 cr. IND
PREREQUISITE: Consent of instructor and approval of department head.
- Independent study on topics related to intercultural and/or global issues.

I&ME 589 GRADUATE CONSULTATION
F, S Su 1-3 cr. IND
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

ICS 270 INDEPENDENT STUDY
On Demand 1-3 cr. IND
PREREQUISITE: Consent of instructor and approval of department head.
- Independent study on topics related to intercultural and/or global issues.

ICS 280 SPECIAL TOPICS
On Demand 1-4 cr. IND Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ICS 290 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ICS 490 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

ICS 270 INDEPENDENT STUDY
On Demand 1-3 cr. IND
PREREQUISITE: Consent of instructor and approval of department head.
- Independent study on topics related to intercultural and/or global issues.

ICS 280 SPECIAL TOPICS
On Demand 1-4 cr. IND Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ICS 290 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ICS 490 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

INTD

Interior Design
School of Architecture
(406) 994-4255

INTD 457 INTERIOR DESIGN V
On Demand 5 cr. LEC 2 STU 3
PREREQUISITE: INTD 356.
- Large multifunction design problems are given that require an increased understanding of programming and an efficient design process. Complete synthesis of design, function, and building systems integration is expected.

INTD 458 SENIOR PROJECT
On Demand 7 cr. STU 7
PREREQUISITE: INTD 457.
- An interior design project chosen by the student and subject to approval by senior project advisor and coordinator. Advanced study, research, and data collection leading to the development of the graphic and three dimensional materials required to illustrate the design process and the project solution. Passing grade of C or better is required.

INTD 499 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-2 cr. RCT May be repeated. Max 4 cr.
PREREQUISITE: INTD 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

INTD 499 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.
LIBR 121 ELECTRONIC LIBRARY RESEARCH SKILLS
F, S 2 cr. RCT 2
- Electronic Library Research Skills is a course focusing on both the concepts and skills needed to conduct library research with an emphasis on electronic information sources. The purpose of the course is to provide individuals with a basic understanding of the library research process and the skills by which they can successfully find information for research, presentations, and other class assignments. This course may be taught solely online or as hybrid course that contains both classroom and online components.

LIBR 221 INFORMATION LITERACY
F, S 2 cr. LEC 2
- Decisions we make are affected by information we read, hear, or watch. Viewing information as a commodity, we all develop skills required to become effective information consumers who apply critical thinking and evaluation processes to all types of information resources.

LIBR 280 SPECIAL TOPICS
On Demand 1 - 3 cr. Max 12 cr.
- Information literacy involves the capacity to recognize when information is needed and the ability to locate, evaluate, and use it effectively. Students in this course will learn to find information of increasing degrees of complexity in print and electronic formats.

LIBR 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

LIBR 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

LIBR 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: HIST 156
- Internship for archival arrangement and description.

LIBR 476 INTERNSHIP
On Demand 1 - 12 cr. IND.
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head
- An individual assignment arranged with an agency, business or other organization to provide guided experience in the field.

LIBR 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: LIBR 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

LIBR 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

LRES Land Resources & Environmental Sciences
Department of Land Resources & Environmental Sciences
(406) 994-7060

LRES 110 LAND RESOURCES & ENVIRONMENTAL SCIENCES
F 3 cr. LEC 5
- Introduction to land resource assessment and environmental science associated with managed landscapes. Students will learn how to identify scientific questions from issues, and how to develop scientifically-based objective information for answering environmental and land management questions. The class is a survey of agroecology, environmental biology, land rehabilitation, land resource analysis, and soil and water science. Students must be proficient in basic algebra and have an understanding of biological principles.

LRES 291N SOIL RESOURCE MANAGEMENT
F 3 cr. LEC 2 LAB 1
PREREQUISITE: MATH 103 or equivalent.
- Soils and their properties as components of landscapes and ecosystems. Application of soils knowledge to problems in environmental sciences and management of agricultural, wildland, and urban landscapes.

LRES 244CS INTRODUCTION TO WATER RESOURCES
F 3 cr. LEC 5
- An introduction to the science, uses, policy, and management of fresh water resources, including hydrologic and ecologic processes, and related historic, policy, law and socioeconomic aspects. The course is intended for majors in the sciences, social sciences, and other disciplines.

LRES 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

LRES 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required, but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

LRES 290R UNDERGRADUATE RESEARCH
F, S, Su 1 - 4 cr. IND May be repeated. Maximum 12 cr.
PREREQUISITE: Freshman or sophomore standing and approval of instructor.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or other creative project.

LRES 310 PROFESSIONAL PREPARATION
S 1 cr. LEC 1
PREREQUISITE: Junior standing.
- Preparation for graduate school and the professions. Creating a professional portfolio, goal, and plan; ethics; resume and cover letter; citizenship; graduate school requirements and procedures; finding job; internships; interactions with professionals; learning and contributing to one's discipline.

LRES 344 WATER QUALITY
S 3 cr. LEC 3
PREREQUISITE: CHEM 121 OR CHEM 131 and college-level algebra or equivalent.
- Physical, chemical and biological water quality parameters and their applications to diverse water systems. The course provides a scientific overview of the spectrum of water quality parameters important in surface water systems.

LRES 351 NUTRIENT CYCLING
S 3 cr. LEC 3
PREREQUISITE: LRES 201, CHEM 192.
- Soil characteristics and processes that control biogeochemical nutrient cycling, availability to plants, nutrient transport, and environmental impact of nutrients. Principles of plant nutrition, nutrient requirements, fertilizer materials, and practices for management of agricultural, forestry, horticultural, and rangeland systems.

LRES 355 SOIL & ENVIRONMENTAL CHEMISTRY
S alternate years, to be offered odd years 3 cr. LEC 2 REC 1
PREREQUISITE: CHEM 215, LRES 201.
- Survey course covering behavior of inorganic and organic constituents in soil and water systems. Applications will focus on integration of chemical and biological processes that govern biogeochemical cycling, bioremediation, bioavailability, and transport of chemicals in managed, natural, and contaminated systems. Problem solving, team projects, and discussion of current literature will be emphasized in recitation.

LRES 357 GPS FUNDAMENTALS & APPLICATIONS IN MAPPING
F, S 3 cr. LEC 1, LAB 2
PREREQUISITE: LRES 201 and GEOG 211.
- Theory and application of the global positioning system to mapping in natural resource and land management sciences. Lab and term mapping project include hands-on experience with GPS receivers and work with Pathfinder Office and ArcGIS software. Students must be proficient with basic computer and file management skills and must be proficient with the latest version of ArcGIS software.

LRES 401 INTEGRATED PEST MANAGEMENT
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: BIOL 204; and one of the following: BIOL 100, BIOL 101, or BIOL 102.
- Management of insects and other pests via an integration of control strategies. Emphasis on chemical, cultural, and biological control; pest plant resistance; sampling; use of economic principles; and new biotechnological developments in pest management. ID and biology of key insect pests.
LRES 415 MICROBIAL DIVERSITY, ECOLOGY & EVOLUTION
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: BCHM 340, MB 301 or consent of instructor.
- The diversity of procaryotic and eucaryotic microorganisms will be explored from both classical phenotypic and contemporary genotypic perspectives. The linkage between microbial diversity and evolutionary origins, and its ecological value will be emphasized. Cross listed with MB 415.

LRES 421 HOLISTIC THOUGHT & MANAGEMENT
S 4 cr. LEC 4
PREREQUISITE: Junior standing.
- Application of holistic and systems thinking to natural and human resource management issues. Use of Holistic Management for decision-making, research, and policy formation. Use of real case studies involving BioRegions Program work in Greater Yellowstone, Japan, Mongolia, Nepal, or other locations.

LRES 436 REMOTE SENSING AND DIGITAL IMAGE PROCESSING
F 3 cr. LEC 2 LAB 1
PREREQUISITE: Junior standing or consent of instructor.
- Theory and application of remote sensing, the electromagnetic spectrum, earth-energy interactions, photographic and photogrammetric principles, and operation of multispectral sensors. Applications include basic photo interpretation and satellite image analysis for agriculture, environmental assessment, forestry, geology, rangeland, urban, wildlife, and others.

LRES 438 CROPPING SYSTEMS & SUSTAINABLE AGRICULTURE
S alternate years, to be offered odd years
3 cr. LEC 5
PREREQUISITE: LRES 201 and either PSPP 341 or PSPP 342.
- Senior capstone course. Conventional cropping systems in the Northern Plains are analyzed, integrating land management and crop production knowledge. Sustainable agriculture issues are raised and alternative management strategies are explored, emphasizing no-till and organic systems. Students will gain a solid understanding of crop diversity, including effects on nutrient and water cycling, and crop pest management. The agronomic challenges of implementing alternative cropping systems will be featured in instructional methods. Students will gain "hand-on" research experience by completing an agronomy experiment during the semester.

LRES 442 CAPSTONE 2-FIELD APPLICATIONS
F 3 cr. LEC 3
PREREQUISITE: LRES 441.
- Senior capstone course, second of two required semesters. Provides disciplinary and interdisciplinary knowledge, experiences, and skills related to Land Resource and Environmental Sciences. Topic will be current land management issue in local area, and students will conduct laboratory analyses to provide information to local agencies. Course emphasizes field measurement and analysis techniques related to soils, plants, water, and microclimate, writing and presentation skills, and application of basic science to land management decisions.

LRES 443 WEED ECOLOGY & MANAGEMENT
F 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 305, LRES 201, MATH 170, PSPP 102, STAT 216
- The principles of weed ecology including plant population demographics, biotic and abiotic regulating mechanisms, and plant community temporal and spatial dynamics in managed ecosystems. Weed population model construction, spreadsheet calculations and thorough assessment of pest threshold theory. The study of ecologically-based weed management approaches including cultural, mechanical, biological, and chemical control practices.

LRES 444 WATERSHED HYDROLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: ESCI 112, LRES 110, LRES 201 (or equivalent understanding.) - Introduction to watershed hydrology. The course will examine how rainfall and snowmelt become streamflow, evapotranspiration, and groundwater with an emphasis on hydrological processes. Discussion will involve arid land state of the science, linkages to other disciplines, and management implications. Topical areas include: water balances, snow hydrology, hydrogeology, hyporheic zones, riparian zones, runoff process, and biogeochemical budgets.

LRES 445 WATERSHED ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: LRES 444 and STAT 216 or PSPP 318 or permission of instructor.
- Conceptual and quantitative analysis of watershed processes with an emphasis on modeling surface water hydrology and water resources management. Watershed modeling concepts including analysis of time series, spatially variable data, model calibration, and uncertainty analysis will be studied and demonstrated.

LRES 452 SOIL & ENVIRONMENTAL MICROBIOLOGY
S alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: CHEM 132, LRES 201, and MB 301.
- Microorganisms in soil environments: Emphasis on soil microbial ecology, plant-microbe interactions, biotransformations of inorganic or organic contaminants.

LRES 453 SOIL & ENVIRONMENTAL PHYSICS
F alternate years, to be offered odd years
3 cr. LEC 2 LAB 1
PREREQUISITE: LRES 201 recommended, MATH 170 or equivalent, computer literacy.
- Soil physical properties and processes governing distribution and transport of water, heat, and soluble chemicals. Topics include water content and potential, infiltration, surface energy balance, evaporation, temperature and heat flow, saturated and unsaturated water and chemical flow. Laboratory stresses measurements and analyses.

LRES 454 LANDSCAPE PEDOLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: LRES 201.
- Principles leading to the formation and spatial distribution of soils on the landscape. Describing, classifying, and mapping soils. Management issues related to organic and mineral soil materials. The course includes a substantial hands-on field component.

LRES 457 ADVANCED GPS MAPPING FOR GIS
F 3 cr. LAB 3
PREREQUISITE: LRES 201, GEOG 211 and LRES 357.
- Advanced topics and techniques in GPS/GIS data collection, emphasizing data quality and documentation. Advanced datalogging options, complex offsets, external sensors, carrier phase data collection, mobile Internet, hyperlinks, Internet map applications and base station setup. Course emphasizes topic research and presentation, and service-learning project work.

LRES 458 TEACHING APPLICATIONS IN LRES
F 1 cr. RCT 1
PREREQUISITE: LRES 201.
- Application of teaching philosophies and methods through classroom, laboratory, and field teaching experiences.

LRES 460 SOIL REMEDIATION
S 5 cr. LEC 3
PREREQUISITE: LRES 201 or permission of instructor.
- Principles of soil remediation in impacted landscapes. Soil reconstruction practices are presented for drastically disturbed lands. Treatment science is presented to repair soil systems contaminated by metals and salt as a result of resource extraction and landscape disturbance by man. Protection of water resources are examined as related to sediment loss control, acid rock drainage science and treatment, and selective handling of geologic stratum. A field trip to a contaminated landscape will demonstrate on-going soil remediation practices.

LRES 461 RESTORATION ECOLOGY
F 3 cr. LEC 3
PREREQUISITE: BIOL 101, and either ARNR 240 or BIOL 303.
- Restores ecosystem structure and function, and community and population processes in intact systems, along with the effects of major disturbances on natural systems. Restoration amendments will be discussed in terms of their effects on ecosystem structure and function. The course includes local, regional, and national case studies, and students will write a restoration plan.
COURSE DESCRIPTIONS: LRES 470 - LRES 556

LRES 470 INDEPENDENT STUDY
On demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

LRES 476 INTERNSHIP
On demand 2 - 4 cr. IND Maximum 12 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

LRES 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

LRES 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1 - 4 cr. IND Maximum 12 cr.
PREREQUISITE: Junior or Senior standing and approval of instructor.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. USP scholarships or project support grants are available in many cases.

LRES 500 SEMINAR
F, S 1 or 2 cr. SEM Maximum 6 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Students prepare, present, and critique scientific presentations.

LRES 507 BIOLOGICAL RISK ASSESSMENT
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BIOL 101, BIOL 305, STAT 401.
- Principles of risk analysis, including risk assessment, perception, communication, and management. Emphasis on human toxicology, ecotoxicology, dose-response relationships, exposure analysis, environmental fate, and deterministic and probabilistic risk assessment. Case studies will include examples from pesticides, biotechnology, and invasive species.

LRES 515 MICROBIAL ECOLOGY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: LRES 415.
- Critical review of literature on the distribution and activity of microorganisms in natural microbial communities based on microbial adaption and physical, chemical and biological features of the microenvironment. A critical discussion of literature and approaches. Cross-listed with MB 515.

LRES 525 APPLIED REMOTE SENSING
S 3 cr. LEC 2 LAB 1
PREREQUISITE: LRES 426 or consent of instructor.
- Applications of remote sensing for graduate students, including advanced studies of multispectral and hyperpectral sensors and image processing algorithms. Emphasis is on using remote sensing technologies for solving applied land resource issues. Students will participate in discussions of current remote sensing literature.

LRES 526 BRIDGING PRINCIPLES AND PRACTICES OF SUSTAINABLE CROPPING SYSTEMS
F alternate years, to be offered odd years 1 cr. REC 1
PREREQUISITE: Any graduate student or under-graduate student with approval from the instructor.
- The course goal is to elevate agricultural students' awareness of peer-reviewed literature that demonstrates application of principles to address issues of sustainability in cropping systems. The course will use a student-led discussion format to highlight issues and principles in a series of papers that the class will read. The course will emphasize the practical interaction among agronomy, ecology, economics, and sociology to create an awareness of the interdisciplinary issues associated with sustainability in agriculture.

LRES 530 NATURAL RESOURCE LAW
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: none
- The course examines major natural resources laws, emphasizing the federal model. A modified case study approach is used to review legislation and related court cases governing natural resources, including water, minerals, timber, range, wildlife, recreation, and wilderness.

LRES 535 TECHNIQUES OF SPATIAL ANALYSIS
F alternate years, to be offered even years 3 cr. LEC 2 LAB 1
PREREQUISITE: STAT 410 or consent of instructor.
- Exploration and understanding of analytical techniques needed to deal with spatially correlated data. Emphasis is placed on practical applications within geographic information systems and image processing.

LRES 543 AGROECOLOGY/APPLIED PLANT ECOLOGY
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: BIOL 303, MATH 181, LRES 443, STAT 216
- Focus on the principles and theories of population and community ecology as they relate to invasive plant species in natural and agroecosystems. Measuring plant interference and assessing population interactions and dynamics through empirical and theoretical models. Review theory and methodology concerning plant population demographics, dispersal, and natural trait selection. Emphasize the role of biodiversity and evolution in determining sustainable management of ecosystems.

LRES 544 WATERSHED ANALYSIS
F 5 cr. LEC 2 LAB 1
PREREQUISITE: LRES 444 and STAT 216 or PSPP 318
- Conceptual and quantitative analysis of watershed processes with an emphasis on modeling surface water hydrology and water resources management. Watershed modeling concepts including analysis of time series, spatially variable data, model calibration, and uncertainty analysis will be studied and demonstrated. The course will employ critical analysis of current hydrologic computational methods and hands-on use of watershed models.

LRES 552 ADVANCED SOIL & ENVIRONMENTAL MICROBIOLOGY
S alternate years, to be offered even years 3 cr. LAB 3
PREREQUISITE: Graduate standing or consent of instructor.
- Advanced laboratory course. Microorganisms are targeted for isolation and characterization, emphasizing those not normally encountered in general microbiology laboratory. Biogeochemical cycling, contaminant biodegradation, extremophiles, and plant-microbe interactions are typical topics modeled. Students try new classic and novel cultivation approaches, identifying microbes based morphologically, physiologically, and phylogenetically. Cross-listed with MB 552.

LRES 553 PLANT & SOIL WATER RELATIONSHIPS
S alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: BIOL 450/PSPP 450 recommended.
- Status and transport of water in the soil-plant-atmosphere continuum, including cellular and whole plant water relations, root and plant interactions with the environment, plant canopy biophysics, measurements and instrumentation, advanced current topics of particular interest.

LRES 554 SOIL-LANDSCAPE MODELING
S alternate years, to be offered odd years 5 cr. LEC 2 LAB 1
PREREQUISITE: LRES 454 and STAT 410.
- Quantitative soil-landscape modeling with an emphasis on multi-variate spatial statistics, digital terrain modeling, and processes. The course is built around "hands-on" projects and discussions of peer-reviewed literature.

LRES 555 SOIL AND AQUATIC CHEMISTRY
S alternate years, to be offered odd years 5 cr. LEC 2 REC 1
PREREQUISITE: CHEM 215, CHEM 228, LRES 201N or equivalent.
- Advanced coverage of aqueous geochemistry in terrestrial and aquatic systems including chemical processes such as complexation, precipitation-dissolution, sorption-desorption, partitioning, oxidation-reduction and gas-water equilibria. Applications of these principles will be demonstrated in subject areas including biogeochemical cycling, bioremediation, contaminant fate and transport, salt-affected soils and wetland processes. Recitation will focus on current literature, applied problems, and case studies.

LRES 556 ENERGETICS IN AQUATIC SYSTEMS
S On demand 2 cr. LEC 2
PREREQUISITE: BCHM 122 or BCHM 340, MATH 170, BIOL 404, and BIOL 497.
- Covers advanced aspects of heat flow, light penetration, advection, and diffusion dynamics of gases and nutrients within a liquid, and gas transfer at the air/water interface. Examines how aquatic microorganisms (bacteria and algae) reciprocate with each other and with their surrounding environment. Particular emphasis is placed on physiological adaptations by organisms to changing environmental conditions. The course stresses how these processes relate to the biological component of aquatic systems.
LRES 557 THERMAL BIOLOGY
IN YELLOWSTONE NATIONAL PARK
Su 2 cr. LEC 1 LAB 1
PREREQUISITE: B.S. Science/Science Education;
Graduate standing
- A survey of the ecology of important organisms common
in thermal habitats of Yellowstone National Park, including
a review of different life forms (prokaryotes and eukaryotes)
and their modes of metabolism, and the physical, and
chemical habitats that define their environment.
Course includes lecture, laboratory, and field components.
Students will be asked to design curricula
for K-12 audiences.

LRES 560 ENVIRONMENTAL REGULATION
& LAND RECLAMATION DESIGN ANALYSIS
S alternate years, to be offered even years
3 cr. LEC 5
PREREQUISITE: LRES 460, LRES 461.
- State of federal legislation and regulation influence
on land rehabilitation procedures and project design.
Advanced land rehabilitation problem solving and design
including data quality control, erosion control, landscape assessment using
spatial analysis, wetland evaluation, management of toxic soil, and repair of contaminated riparian zones.

LRES 561 BELOWGROUND PLANT ECOLOGY
S alternate years, to be offered odd years
5 cr. LEC 5
PREREQUISITE: STAT 401 or equivalent;
BIOL 503 or equivalent; BIOL 450, PSPP 450 or
equivalent.
- Application of basic ecological principles to
belowground interactions of plant communities.
Topics include plant competition, belowground herbivory, plant-microbe interactions including
mycorrhiza, and diversity/productivity links in soil systems. Case studies will include invasive species, plants growing on metal-contaminated substrates, and grassland species interactions.

LRES 562 LAND REHABILITATION FIELD PROBLEMS
Su alternate years, to be offered odd years
2 cr. LAB 2
PREREQUISITE: LRES 460, LRES 461.
- Extended field trip to numerous drastically disturbed sites across the Northern Plains. On-site
review of land rehabilitation problems, solutions, and methodologies. Participation by industry, regulatory agency staff, and rehabilitation professionals will occur at most sites.

LRES 569 ECOLOGY OF INVASIVE PLANTS IN THE GYE
Su 2 cr. LEC 1 LAB 1
- Current theories on what makes species invasive
and what ecosystem conditions invite or resist
non-indigenous plant species will be considered.
Direct involvement in field research associated with
testing methodology for monitoring the invasive potential of several exotic species in the otherwise pristine mountain environments.

LRES 570 INDEPENDENT STUDY
On demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of
instructor, approval of department head, and Dean of Graduate Studies.
- Directed research and study on an individual basis.

LRES 575 PROFESSIONAL RESEARCH PAPER
On Demand 1-4 IND Maximum 6 cr.
PREREQUISITE: Graduate standing
- A research or professional paper or project dealing with a topic in the field. The topic must
have been mutually agreed upon by the student, the major advisor, and graduate committee.

LRES 576 INTERNSHIP
On demand 2 - 4 IND Maximum 12 cr.
PREREQUISITE: Graduate standing, consent of
instructor and approval of department head, and
Dean of Graduate Studies.
- An individualized assignment arranged with an
agency, business or other organization to provide
guided experience in a field of study.

LRES 580 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and
others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need or given on a trial basis to determine acceptability and demand
before requesting a regular course number.

LRES 580 GRADUATE CONSULTATION
F, S 3 cr. LEC 3
PREREQUISITE: Master's standing and approval
of the Dean of Graduate Studies.
- This course may be used only by students who have
completed all of their coursework (and thesis, if on a thesis plan), but who need additional faculty or staff time or help.

LRES 590 MASTER'S THESIS
F, S 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

LRES 690 DOCTORAL THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

LS
Liberal Studies
(406) 994-7835
LS 101 US WAYS OF KNOWING
F 3 cr. SEM 3
- Introduction to the processes of academic
inquiry, through examination of topics in disciplines encompassed by the Fine Arts, Humanities, Natural Sciences, and Social Sciences.

LS 102 INTRO TO LIBERAL STUDIES
S 1 cr. SEM 1
PREREQUISITE: University Seminar (US Course)
or consent of instructor.
- An introduction to the history and philosophy of liberal education and a review of the Fine Arts, Humanities, Social and Natural Science disciplines.
The LS degree components and options will be explained, as well career opportunities.

LS 299R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

LS 299R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY
F, S 1-6 cr. IND May be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

LS 301 INTEGRATIVE SEMINAR
F, S 1 cr. SEM 1 Maximum 3 cr.
PREREQUISITE: University Seminar and sophomore standing.
- The integration of knowledge, theories, and concepts across different disciplines in the Fine Arts, Humanities, Natural Sciences, and Social Sciences.

LS 401 SENIOR PROJECT
F, S 4 cr. SEM 4
PREREQUISITE: CLS 101 or LS 101 and LS 301.
- Senior capstone course. Opportunity for Liberal Studies majors to apply knowledge and experiences acquired throughout the program in researching and designing solutions to contemporary public policy issues.

LS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
- Directed research and study on an individual basis.

LS 480 SPECIAL TOPICS
On Demand 1-4 cr. SEM Maximum 12 cr.
PREREQUISITE: Course prerequisites are
dependent on the offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a
trial basis to determine acceptability and demand
before requesting a regular course number.

LS 489R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: LS 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

LS 490R UNDERGRADUATE RESEARCH/
CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

MAS
Military Aerospace Studies
Air Force ROTC
Department of Military Aerospace Studies
(406) 994-4022
MAS 105 SELF DEFENSE I
F, S 1 cr. LAB 1
- This course is an introduction to the current military hand-to-hand combat system. Students will
be introduced to basic combative stances, striking, takedowns and grappling, and have the opportunity
to practice these skills in a realistic fashion.

MAS 105 SELF DEFENSE II
F, S 1 cr. LAB 1
COURSE DESCRIPTIONS: MAS 106 - MAS 316

MAS 106 SELF DEFENSE II
S 1 cr. LEC 1
PREREQUISITE: MAS 105.
- This course is the intermediate level military hand-to-hand combat course. Students will train in advanced throws, proper striking techniques, grappling, joint locks and submission techniques. Techniques against attackers armed with handguns, rifles and knives will be covered.

MAS 110 FOUNDATIONS OF THE AIR FORCE I
F 1 cr. LEC 1
COREQUISITE: MAS 115.
- A study of the organization and mission of the U.S. Air Force with emphasis in oral/written communication, and leadership.

MAS 111 FOUNDATIONS OF THE AIR FORCE II
S 1 cr. LEC 1
COREQUISITE: MAS 116.
- Continuing study of the organization and mission of the U.S. Air Force with emphasis in oral/written communications, and leadership.

MAS 115 LEADERSHIP LABORATORY 115
F 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
COREQUISITE: MAS 110.
- Laboratory exercises introduce: uniform wear, drill and ceremonies, physical fitness training, and military customs and courtesies.

MAS 116 LEADERSHIP LABORATORY 116
S 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of Department Head.
COREQUISITE: MAS 111.
- Laboratory exercises introduce: uniform wear, drill and ceremonies, physical fitness training, and military customs and courtesies.

MAS 209 FIELD TRAINING, 5 WEEK
Su 3 cr. LAB 3
PREREQUISITE: Approval of Department Head.
- Substitute for the General Military Course. Selection during Fall or Spring semester by head of department. Conducted on an Air Force base. Study of U.S. Air Force mission and organization, career opportunities, customs and courtesies, drill and ceremonies, survival, physical fitness training and small arms training.

MAS 210 THE EMPLOYMENT OF AIR & SPACE POWER I
F 1 cr. LEC 1
COREQUISITE: MAS 215.
- Focuses on factors contributing to the development of air power from its earliest beginnings through the Korean war; the evolution of air power competencies, functions, and doctrine, with emphasis in communication skills.

MAS 211 THE EMPLOYMENT OF AIR & SPACE POWER II
S 1 cr. LEC 1
COREQUISITE: MAS 216.
- Continuing study of development of air power from the Vietnam conflict through present day, with emphasis in communication skills.

MAS 212 FLIGHT GROUND SCHOOL
S 2 cr. LEC 2
PREREQUISITE: Approval of instructor. (This MAS course is available only through Burns Telecom Center under separate registration).
- Basics required for learning to fly single-engine land type aircraft. Covers material tested on the FAA Private Pilot written exam, to include performance, the science of flight, meteorology, FAA regulations, navigation, and the physiology of flight.

MAS 215 FLIGHT TRAINING
F 1 cr. LEC 1
PREREQUISITE: Approval of instructor. (This MAS course is available only through Burns Telecom Center under separate registration).
- Practical application of material taught in MAS 212. Flight training from an MSU-approved instructor to include all that is required to achieve solo flight (15 hours flying). Fee will include tuition and flight instruction; students must pay for their own aircraft rental.

MAS 214 INSTRUMENT GROUND SCHOOL
S 2 cr. LEC 2
PREREQUISITE: Private Pilot Certificate or permission of instructor. (This MAS course is available only through Burns Telecom Center under separate registration).
- An introduction to flight under IFR conditions. Course includes basic instrument flying, flight instruments, IFR charts and approach plates, IFR regulations and procedures, ATC clearances and IFR flight planning. Completion of the course will prepare the student for the Instrument Knowledge Exam.

MAS 215 LEADERSHIP LABORATORY 215
F 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
- Laboratory exercises include group leadership problems, drill and ceremony, customs and courtesies, physical fitness training, and field training preparation activities.

MAS 216 LEADERSHIP LABORATORY 216
S 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
COREQUISITE: MAS 211.
- Laboratory exercises include group leadership problems, drill and ceremony, customs and courtesies, physical fitness training and field training preparation activities.

MAS 260 USAF AEROSPACE WEAPONS
S 2 cr. LEC 2
- The study of the weapons systems employed by the United States Air Forces. It also presents the basics of their integration and employment at the operations level.

MAS 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of the director.
- Directed research and study on an individual basis.

MAS 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MAS 281 LEADERSHIP AND FITNESS
F, S 2 cr. LAB 2
- An introduction to leadership principles and practicum through organized group fitness. Leadership and Fitness uses group fitness workouts as a means to improve personal fitness, examine leadership techniques, and give students a hands-on leadership experience by personally leading the group.

MAS 309 FIELD TRAINING, 4 WEEK
Su 2 cr. LAB 2
PREREQUISITE: MAS 110, MAS 111, MAS 210, MAS 211 and junior standing.
- Required for all AFROTC cadets except those who have completed MAS 209. Orientation on an Air Force base, flying orientation, survival and small arms training, physical training, drill and ceremonies.

MAS 310 AIR FORCE LEADERSHIP AND MANAGEMENT I
F 3 cr. LEC 3
COREQUISITE: MAS 315.
- Study of leadership and quality management fundamentals, professional knowledge and leadership ethics, with emphasis in communication skills.

MAS 311 AIR FORCE LEADERSHIP AND MANAGEMENT II
S 3 cr. LEC 3
COREQUISITE: MAS 316.
- Continuation of the study of leadership and quality management fundamentals, professional knowledge and leadership ethics, with emphasis in communication skills.

MAS 315 LEADERSHIP LABORATORY 315
F 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
COREQUISITE: MAS 310.
- Laboratory includes advanced group leadership problems, planning and orchestrating cadet corps activities.

MAS 316 LEADERSHIP LABORATORY 316
S 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
COREQUISITE: MAS 311.
- Laboratory includes advanced group leadership problems, planning and orchestrating cadet corps activities.
MATH 410 NATIONAL SECURITY AFFAIRS/ PREPARATION FOR ACTIVE DUTY I
F 3 cr. LEC 3
PREREQUISITE: Approval of department head (for students not pursuing a commission in the U.S. Air Force)
COURSE: MAS 415.
- Examination of need for national security, analyzes the evolution and formulation of the American defense policy, strategy, and joint doctrine; methods for managing conflict; overviews of regional security, arms control, and terrorism. Also focus on the military as a profession, officership, military justice system, and current issues affecting military professionalism. Communication skills are emphasized.

MAS 411 NATIONAL SECURITY AFFAIRS/ PREPARATION FOR ACTIVE DUTY II
S 3 cr. LEC 3
PREREQUISITE: MAS 410, approval of department head (for students not pursuing a commission in the U.S. Air Force)
COURSE: MAS 416.
- Continuation of MAS 410.

MAS 415 LEADERSHIP LABORATORY 415
F 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
COURSE: MAS 410.
- Laboratory component includes advanced group leadership problems and commanding and supervising all cadet corps activities.

MAS 416 LEADERSHIP LABORATORY 416
S 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
COURSE: MAS 411.
- Laboratory component includes advanced group leadership problems and commanding and supervising all cadet corps activities.

MAS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

MAS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MATH 405 COLLEGE ALGEBRA
F, S, Su 3 cr. LEC 3
PREREQUISITE: MATH 103 or Math Placement Test within the past 12 months.
- Further development of algebraic skills through the study of linear, quadratic, polynomial, exponential, and logarithmic functions.

MATH 407 FOR ELEMENTARY TEACHERS I
F, S, Su 4 cr. LEC 4
PREREQUISITE: MATH 103 or Math Placement Test within the past 12 months.
- An introduction to problem solving, sets, functions, logic, numeration systems as a mathematical structure, introductory number theory, rational, and irrational numbers and probability for prospective elementary school teachers.

MATH 410 NATIONAL SECURITY AFFAIRS/ PREPARATION FOR ACTIVE DUTY I
F, S, Su 4 cr. LEC 4
PREREQUISITE: MATH 103 or Math Placement Test within the past 12 months.
- An introduction to problem solving, sets, functions, logic, numeration systems as a mathematical structure, introductory number theory, rational, and irrational numbers and probability for prospective elementary school teachers.

MATH 415 LEADERSHIP LABORATORY 415
F 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
COURSE: MAS 410.
- Laboratory component includes advanced group leadership problems and commanding and supervising all cadet corps activities.

MAS 416 LEADERSHIP LABORATORY 416
S 0 cr. LAB 0
PREREQUISITE: Consent of instructor and approval of department head.
COURSE: MAS 411.
- Laboratory component includes advanced group leadership problems and commanding and supervising all cadet corps activities.

MAS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

MAS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
MATH 175Q CALCULUS FOR TECHNOLOGY I
F, S 3 cr. LEC 3
PREREQUISITE: MATH 160 or Math Placement Test within the past 12 months.
- Calculus with emphasis on problems of interest to engineering technologists. Includes analytic geometry, differentiation, and introduction to integration.

MATH 176Q CALCULUS FOR TECHNOLOGY II
F, S 3 cr. LEC 3
PREREQUISITE: MATH 175.
- Calculus with emphasis on problems of interest to engineering technologists. Includes integration, infinite series, and differential equations.

MATH 181Q CALCULUS & ANALYTIC GEOMETRY I
F, S, Su 4 cr. LEC 4
PREREQUISITE: MATH 160 or Math Placement Test within the past 12 months.
- Functions, elementary transcendental functions, limits and continuity, differentiation, applications of the derivative, curve sketching, and integration theory.

MATH 182Q CALCULUS & ANALYTIC GEOMETRY II
F, S, Su 4 cr. LEC 4
PREREQUISITE: MATH 181.
- Methods of integration, applications of the integral, Taylor's theorem, infinite sequences and series, polar coordinates.

MATH 191Q HONORS CALCULUS & ANALYTIC GEOMETRY I
F 4 cr. LEC 4
PREREQUISITE: Math 160 with an "A" grade, 700 on the SAT Math exam, 31 on the ACT Math exam, or consent of the instructor.
- Topic coverage parallels Math 181 but with a greater emphasis on theory and more difficult problems.

MATH 192Q HONORS CALCULUS & ANALYTIC GEOMETRY II
S 4 cr. LEC 4
PREREQUISITE: Math 182 with an "A" grade, AP Calculus BC exam with a 5, or consent of the instructor.
- Topic coverage parallels Math 182 but with a greater emphasis on theory and more difficult problem solving.

MATH 224Q HONORS CALCULUS OF FUNCTIONS OF SEVERAL VARIABLES
S 4 cr. LEC 4
PREREQUISITE: MATH 192 with a "B" grade, MATH 182 with an "A" grade, AP Calculus BC exam with a 5, or consent of the instructor.
- Honors section of MATH 224. Topic coverage parallels MATH 224 but with a greater emphasis on theory and more difficult problem solving.

MATH 225 INTRODUCTION TO DIFFERENTIAL EQUATIONS
S 4 cr. LEC 4
PREREQUISITE: MATH 192 with a "B" grade, MATH 224 with an "A" grade, or consent of the instructor.
- Honors section of MATH 225. Topic coverage parallels MATH 225 but with a greater emphasis on theory and more difficult problem solving.

MATH 235 HONORS INTRODUCTION TO HIGHER MATHEMATICS
F, S 3 cr. LEC 3
PREREQUISITE: MATH 192 with a "B" grade, MATH 224 with an "A" grade, or consent of the instructor.
- Honors section of MATH 235. Topic coverage parallels MATH 235 but with a greater emphasis on theory and more difficult problem solving.

MATH 256 INTRODUCTION TO LINEAR ALGEBRA
F 3 cr. LEC 3
PREREQUISITE: None required but some may be determined necessary.
- Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MATH 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MATH 329 MODERN GEOMETRY
S 3 cr. LEC 3
PREREQUISITE: MATH 328.
- Euclidean, hyperbolic, spherical, projective, finite, and fractal geometries; linear transformations and their matrix representations; computer and telecommunications tools for geometry, NCTM Standards.

MATH 330 HISTORY OF MATHEMATICS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: MATH 224 and MATH 225 or consent of instructor.
- Topics will be selected from the entire span of history from Egyptian, Babylonian, and Greek times through the 20th century. The course may focus on milestones that lead to the development of modern mathematics as well as the contributions of great mathematicians from ancient times until today. Some ideas will require mathematical sophistication at the upper division level.

MATH 333 LINEAR ALGEBRA
F 3 cr. LEC 3
PREREQUISITE: MATH 221.

MATH 348 TECHNIQUES OF APPLIED MATHEMATICS I
F 3 cr. LEC 3
PREREQUISITE: MATH 224 and MATH 225.
- An introduction to advanced analytical techniques frequently used by scientists and engineers to study ordinary differential equations and two-point boundary value problems. Topics include series solution techniques, method of Frobenius, Laplace transforms, Fourier series, and boundary value problems.

MATH 349 TECHNIQUES OF APPLIED MATHEMATICS II
S 3 cr. LEC 3
PREREQUISITE: MATH 224.
- Science and engineering majors often encounter partial differential equations in the study of heat flow, vibrations, electric circuits, and similar areas. Topics include Sturm-Liouville theory, partial differential equations boundary value problems, and Laplace Transform methods.
MATH 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.

- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting material.

MATH 416 MODERN ALGEBRA
S 3 cr. LEC 3
PREREQUISITE: MATH 353.

- Senior capstone course. The integers, integers modulo n, the Euclidean algorithm. Groups, subgroups, normal subgroups, quotient groups, homomorphism and isomorphism theorems, and abelian groups. Rings, ideals, homomorphism and isomorphism theorems. Integral domains, fields, and fields of quotients.

MATH 429 GEOMETRY, MEASUREMENT, AND DATA IN THE MIDDLE GRADES
On Demand 5 cr. LEC 5
PREREQUISITE: MATH 256 or EDSD 461 or EDSD 471, or MATH 131 and 3 credits from elementary math option.

- Develop content knowledge necessary to teach the new middle school mathematics curriculum. Investigate the underlying conceptual structure of topics in geometry, measurement and data analysis appropriate to middle school. Explore the use of manipulative materials and technologies, and discuss related pedagogical issues and national standards.

MATH 424 ALGEBRAIC THINKING AND NUMBER SENSE IN THE MIDDLE GRADES
Su alternate even years, and on demand 3 cr. LEC 3
PREREQUISITE: MATH 256 or EDSD 461 or EDSD 471, or MATH 131 and 3 credits from elementary math option.

- Develop algebraic knowledge necessary to teach the new middle school mathematics curriculum. Investigate the underlying conceptual structure of topics in algebra and number appropriate to middle school. Explore the use of manipulative materials and technologies, and discuss related pedagogical issues and national standards.

MATH 476 INTERNSHIP
F, S, Su 2 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.

- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MATH 449 INTRODUCTION TO COMPLEX ANALYSIS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: MATH 224.

- An introduction to the techniques of complex analysis that are frequently used by scientists and engineers. Topics include complex numbers, analytic functions, Taylor and Laurent expansions, Cauchy's theorem, and evaluation of integrals by residues.

MATH 450 APPLIED MATHEMATICS II
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: MATH 224.

- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discusses material.

MATH 451 APPLIED MATHEMATICS II
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: MATH 224.

- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discusses material.

MATH 452 NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS
S 3 cr. LEC 3
PREREQUISITE: MATH 221 and MATH 225.


MATH 454 INTRODUCTION TO DYNAMICAL SYSTEMS I
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: MATH 224 and MATH 225.

COURSE DESCRIPTIONS: MATH 503 - MATH 534

MATH 503 ADVANCED LINEAR ALGEBRA
S 3 cr. LEC 3
PREREQUISITE: MATH 333 or consent of instructor.
Topics include abstract vector spaces, diagonalization, Schur's Lemma, Jordan canonical form and spectral theory for finite dimensional operators.

MATH 504 ABSTRACT ALGEBRA
S 3 cr. LEC 3
PREREQUISITE: MATH 416 or consent of instructor.
The theory of groups, rings and fields with particular emphasis on finite groups, polynomial rings and fields of characteristic zero.

MATH 505 PRINCIPLES OF MATHEMATICAL ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: MATH 362 or consent of instructor.
Principles of analysis in Euclidean spaces and metric spaces.

MATH 511 GENERAL TOPOLOGY
F 3 cr. LEC 3
PREREQUISITE: MATH 362 or consent of instructor.
Definition of a topology, relative topology, metric topology, quotient topology, and the product topology. Connectedness, local connectedness, components and path components. Compactness and local compactness, countability and separation axioms, the Urysohn Lemma, metrization and compactification.

MATH 512 GEOMETRIC & ALGEBRAIC TOPOLOGY
S 3 cr. LEC 3
PREREQUISITE: MATH 511 or consent of instructor.
Topics in continua theory, topics in dimension theory, covering spaces and the fundamental group, simplicial complexes, topics in homology and cohomology theory.

MATH 516 THE LANGUAGE OF MATHEMATICS: AN ADVANCED PERSPECTIVE
S alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.
The features of the language of mathematics, particularly as they apply to high school and middle school curricula. Includes grammar, syntax, vocabulary, synonyms, negation, sentence structure, paragraph structure, logic, and proof. Comparison of oral and written modes of communication.

MATH 517 ADVANCED MATHEMATICAL MODELING FOR TEACHERS
S alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.
Hands-on focus on the use of modeling to solve real-world problems. Topics include the modeling process, an overview of relevant technology, strategies to initiate modeling in the secondary classroom, and classroom assessment of modeling activities. Extensive use of mathematics to explore application areas, leading to the construction of original models.

MATH 518 STATISTICS FOR TEACHERS
Su 3 cr. LEC 3 Distance format.
PREREQUISITE: Graduate standing in mathematics or science, teaching endorsement in mathematics or science, or consent of instructor.
Stochastic concepts including probabilistic under- pinnings of statistics, measures of central tendency, variability, correlation, distributions, sampling, and simulation. Exploratory data analysis including experiments, surveys, measures of association and inferential statistics. Discussion of methods for teaching statistics in secondary mathematics and science.

MATH 520 STANDARDS-BASED MATHEMATICS: CONCEPTS AND METHODS
On Demand 3 cr. LEC/RCT
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor.
Study of key content themes and connections in algebra, geometry, probability/data analysis, number, and measurement with a focus on the NCTM process standards. Exploring, extending, designing, and teaching standards-based classroom activities for middle/high school students and reflecting on student outcomes.

MATH 521 THEORY OF LEARNING MATH
S alternate years, to be offered odd years 3 cr. LEC/RCT 3 Distance format
PREREQUISITE: EDS 461 and graduate standing in mathematics education, or consent of instructor.
Examine theories of learning as they apply to the mathematics classroom. The course focuses on theories of and research about learning, human development, personality and motivation. The theories and research are used (a) to understand mathematical learning among students of all cultural, linguistic and socioeconomic backgrounds, and (b) to formulate effective teaching and learning strategies.

MATH 522 ASSESSMENT IN THE MATHEMATICS CLASSROOM
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDCI 560 or Equivalent.
Assessment strategies, assessment and models to teachers' practice through classroom observations and hand-on activities. Focus on research on assessment practices consistent with standard-based mathematics, classroom assessment of student learning, evaluation of mathematics programs and curricula, and standardized testing practices.

MATH 523 NUMBER STRUCTURE FOR TEACHERS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: EDS 410
Develop the relationship and distinction between mathematics behind the structure of number and learning and teaching of number structure in schools. Educational ideas of representation and abstraction examined via relevant and timely research about learning about the structure of number.

MATH 524 LINEAR ALGEBRA FOR TEACHERS
Su alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: MATH 224 or MATH 328, EDS 561.
Algebraic systems, special matrices, determinants, vector spaces, linear programming with applications, graph theory, transportation, economics and engineering using computer software such as MATLAB.

MATH 525 ANALYSIS FOR TEACHERS
Su alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: MATH 224 and EDS 561.
A study of calculus reform and concepts from graphical, numerical and algebraic perspectives. Extensive use of activities and projects. Modeling and technology are incorporated throughout the course.

MATH 526 DISCRETE MATHEMATICS FOR TEACHERS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: MATH 256 or MATH 516, EDS 561 or EDS 571 or equivalent, and K-14 teaching experience.
Investigations of paradigm problems from the history of math.

MATH 527 GEOMETRY FOR TEACHERS
S alternate years, to be offered even years 3 cr. LEC 3 Distance format
PREREQUISITE: MATH 520 and EDS 561.
Geometry of transformations including Euclidean motions and similarity, projective geometry, geometric topology and geometry of inversion.

MATH 528 CURRICULUM DESIGN
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: MATH 522 or EDCI 552 or equivalent.
Focuses on the design and evaluation of curriculum in mathematics and science. Historical changes in mathematics and science curriculum as well as research results are studied in depth. This course is an on-line course.

MATH 529 ASSESSMENT MODELS AND ISSUES
S alternate years, to be offered even years 5 cr. LEC 3
Examiners critical K-12 issues including; alignment and interaction of assessment with standards, curriculum, and instruction; role of assessment systems at local, state, and national levels; evaluation of assessment tools and programs; equity considerations in assessment. This is an online course.

MATH 533 HISTORICAL STRATEGIES AND THE TEACHING OF MATHEMATICS
F alternate years, to be offered odd years 5 cr. LEC 3
- Advanced teaching strategies in the field of middle grades, secondary and college level mathematics, with a focus on the history of mathematics as a context for classroom instruction. Course content includes the changing nature of mathematics, historical problems and processes, and the development of teaching units that incorporate the history of mathematics.

MATH 534 RESEARCH IN MATHEMATICS EDUCATION
F alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: EDCI 506.
Quantitative and qualitative research methodology in mathematics education. Review of the literature. Writing for publication and proposals.
MATH 540 INTRODUCTION TO CALCULUS ON MANIFOLDS
F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: MATH 503 and MATH 505 or consent of instructor.
- An introduction to: manifolds and their atlases, fiber bundles, vector fields, tensor fields and differential forms, the exterior and Lie derivatives, Stokes Theorem, and de'Rham cohomology.

MATH 544 PARTIAL DIFFERENTIAL EQUATIONS I
F alternate years, to be offered odd years
5 cr. LEC 3
PREREQUISITE: MATH 503 and MATH 505 or consent of instructor.
- Course not required in any curriculum for which there is a specific focus given to each course which is appropriately subtitled.

MATH 545 PARTIAL DIFFERENTIAL EQUATIONS II
S alternate years, to be offered even years
F, S, Su 1 - 6 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor and Dean of Graduate Studies.
- A continuation of topics from MATH 544.

MATH 547 REAL ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: MATH 562 or MATH 505.
- Courses offered on a one time basis to fulfill professional development needs of inservice educators. A specific focus is given to each course which is appropriately subtitled.

MATH 551 COMPLEX ANALYSIS
PREREQUISITE: MATH 505.
- Analytic functions and conformal maps, contour Rouche's theorem and the argument principle.
- Series. Classification of singularities, the residue integrals, Cauchy's theorem, Cauchy's integral formula, maximum modulus theorem, harmonic functions, Taylor's theorem and Laurent series. Classification of singularities, the residue theorem and evaluation of definite integrals, Rouche's theorem and the argument principle.
MATH 589 GRADUATE CONSULTATION
F, S, Su 3 cr. IND
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and
thesis, if on a thesis plan) but who need additional faculty or staff time or help.

MATH 590 MASTER'S THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

MATH 591 TOPICS IN APPLIED MATHEMATICS I
F, S, Su 3 cr. IND
PREREQUISITE: Graduate standing and consent of instructor.
- Topics may include numerical solution of linear and nonlinear problems, integra- 
tion methods, numerical optimization, computational mechanics, spectral 
methods, bifurcation theory, invariant manifold theory, index theory, 
nonlinear analysis, reaction-diffusion equations, nonlinear oscillations, 
symptotic methods and perturbation methods.

MATH 592 TOPICS IN APPLIED MATHEMATICS II
S 3 cr. IND
PREREQUISITE: Graduate standing and consent of instructor.
- Topics may include numerical solution of linear and nonlinear problems, integra- 
tion methods, numerical optimization, computational mechanics, spectral 
methods, bifurcation theory, invariant manifold theory, index theory, 
nonlinear analysis, reaction-diffusion equations, nonlinear oscillations, 
symptotic methods and perturbation methods.

MATH 595 DYNAMICAL SYSTEMS I
F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: MATH 503.
- Topics in differential equations including existence and uniqueness, continuous dependence on parameters, extendability, the existence and stability of equilibria and limit cycles and the Poincare-Bendixon theorem.

MATH 596 DYNAMICAL SYSTEMS II
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: MATH 595.
- Topics include Hartman's theorem, invariant manifold theory, Smale-Birkhoff theorem, horseshoe chaos, and the Melnikov method. Topics in discrete dynamical systems may also be covered.

MATH 597 TOPICS IN MATHEMATICS I
F 3 cr. LEC 3
PREREQUISITE: Graduate standing and consent of instructor.
- Topics selected from: differential topology, differential geometry and complex dynamics.

MATH 598 TOPICS IN MATHEMATICS II
S 3 cr. LEC 3
PREREQUISITE: Graduate standing and consent of instructor.
- Topics selected from: continuum theory, symbolic dynamics, ergodic theory and low dimensional topology.

MATH 589 DOCTORAL READING & RESEARCH
F, S, Su 5 - 15 cr. IND Maximum 15 cr.
PREREQUISITE: Doctoral standing.
- This course may be used by doctoral students who are reading research publications in the field in preparation for beginning doctoral thesis research.

MATH 690 DOCTORAL THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

MB Microbiology
Department of Microbiology
(406) 994-2903

MB 100 CAREERS IN MICROBIOLOGY
F 1 cr. LEC 1
- The course introduces students to educational and career opportunities in the fields of medical, molecular, ecological, and environmental microbiology. The course introduces students to the various options in the microbiology degree program. It will emphasize the differences in the options and the employment opportunities in each once a degree has been obtained.

MB 101 UNSEEN UNIVERSE: MICROBES GOOD AND BAD
F, S 3 cr. LEC 3 LAB 2
- Fundamentals of cellular and molecular immunology including consideration of structure, genetics and function of immunoglobulins, T-cell receptors and major histocompatibility antigens; regulation of the immune response; transplantation and immunological diseases.

MB 105CS MOLECULES OF LIFE
S 5 cr. LEC 5
- Introduction to uses of biological molecules for improving health and agriculture. Gene therapy and DNA fingerprinting are discussed in relation to social/moral issues. Intent of course is to help students develop a rational approach to evaluate cost/benefits of biotechnology to society.

MB 110CS INTRODUCTION TO BIOTECHNOLOGY
F 3 cr. LEC 3 SEM 1
- Introduction to an ever growing industry. Course is designed to demonstrate the current significance of biotechnology. Course is a multi-lecturer series dealing with ethics, business, and scientific technology. Cross-listed with VTMB 101 and PS 101.

MB 201 INFECTIOUS DISEASES
F, S 3 cr. LEC 3
- Introduction to the world of microorganisms; prokaryotic cell structure, function and genetics; the immune response; eutrophication, epidemiology, treatment and control of important infectious diseases of humans.

MB 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MB 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

MB 501 GENERAL MICROBIOLOGY
F, S 5 cr. LEC 3 LAB 2
PREREQUISITE: BIOL 102.
COREQUISITE: CHEM 215 or CHEM 311.
- An introduction to major topics and subdisciplines in microbiology including microbial diversity and classification, microbial anatomy and physiology, microbial genetics, microbial ecology, medical microbiology and immunology, epidemiology and public health, and biotechnology.

MB 400 SEMINAR
F, S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: MB 501 and junior standing.
- Senior capstone course. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material. When taken in the senior year, this course fulfills the senior capstone course requirement.

MB 401 IMMUNOLOGY
F 5 cr. LEC 3
COREQUISITE: CHEM 215 or CHEM 311.
- Fundamentals of cellular and molecular immunology including consideration of structure, genetics and function of immunoglobulins, T-cell receptors and major histocompatibility antigens; regulation of the immune response; transplantation and immunological diseases.

MB 402 IMMUNOLOGY LABORATORY
F 2 cr. LAB 2
PREREQUISITE: MB 401 (may be taken as corequisite).
- A laboratory study of basic and clinical immunology.

MB 403 VIROLOGY
F 4 cr. LEC 3 LAB 1
PREREQUISITE: BCHM 540.
- Fundamentals of virology with emphasis on animal viruses. Consideration of the molecular aspects of structure, multiplication, and host response to viral infection. The laboratory emphasizes principles and laboratory applications of molecular virology.

MB 405 HEMATOLOGY
S 5 cr. LEC 3
PREREQUISITE: BIOL 102, BIOL 207 or BIOL 208, MB 401 and BCHM 540 are recommended.
COREQUISITE: MB 406.
- A study of the function, biochemistry, cell biology, and pathology of blood and its constituents.

MB 406 HEMATOLOGY LABORATORY
S 1 cr. LAB 1
PREREQUISITE: BIOL 207 or BIOL 208.
COREQUISITE: MB 405.
- Methods of examining white blood cells, red blood cells, and platelets. Also included is the examination of abnormal blood cells, hemostasis, and fluorescent antibody cell sorting analysis.
The educational objectives of this course are to provide advanced, upper division undergraduates and graduate students with a basic introduction to molecular evolution. The study of molecular evolution encompasses the origin and evolution of life on earth at the molecular level.

**MB 407 MICROBIOLOGY INSTRUCTING**
F, S, Su 2 cr. LEC 2
PREREQUISITE: MB 450.
- Instruction and practice in effective teaching methods; practice in preparing laboratory materials, assisting a class and grading.

**MB 408 GENERAL PARASITOLOGY**
S alternate years, to be offered odd years
3 cr. LEC 2 LAB 1
- Study of the life cycles, biochemistry, molecular parasitology, pathogenesis, identification and treatment of the major parasitic groups, including parasitic methods, monogeneans, digeneans, cestodes, nematodes, acanthocephalans, and parasitic arthropods.

**MB 415 MICROBIAL DIVERSITY, ECOLOGY & EVOLUTION**
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: MB 301, BCHM 340, or consent of instructor.
- The diversity of procaryotic and eucaryotic microorganisms will be explored from both classical phenotypic and contemporary genotypic perspectives. The linkage between microbial diversity, its evolutionary origins, and its ecological value will be emphasized. Cross-listed with LRES 415.

**MB 420 MICROBIAL PHYSIOLOGY**
F 3 cr. LEC 3
PREREQUISITE: BCHM 340, MB 301.
- An in-depth examination of microbial cell structure and function, bioenergetics, intermediary metabolism and its control, and the orchestration and regulation of cellular functions that enable microbes to adapt to and survive in their environment.

**MB 430 MEDICAL BACTERIOLOGY**
S 3 cr. LEC 3
PREREQUISITE: MB 301.
- Epidemiology and etiology of bacterial and viral diseases in humans with emphasis on biologic mechanisms; host defenses and responses to infections, chemotherapy, prevention, and control of bacterial and viral diseases.

**MB 431 MEDICAL BACTERIOLOGY LAB**
S 2 cr. LAB 2
PREREQUISITE: MB 430.
- Laboratory exercises designed to teach techniques used in culturing and identifying bacterial pathogens and normal flora from clinical specimens. Procedures used to test the antibiotic susceptibility of pathogenic bacteria.

**MB 433 APPLIED AND ENVIRONMENTAL MICROBIOLOGY**
S 4 cr. LEC 3 LAB 1
PREREQUISITE: MB 301.
- The course introduces students to complex concepts in water microbiology, food microbiology, sterility and disinfection, the use of microorganisms in manufacturing processes and in the degradation of contaminants in the environment.

**MB 437 MOLECULAR EVOLUTION**
F 3 cr. LEC 3
PREREQUISITE: BIOL 102 or permission of instructor.
- The educational objectives of this course are to provide advanced, upper division undergraduates and graduate students with a basic introduction to molecular evolution. The study of molecular evolution encompasses the origin and evolution of life on earth at the molecular level.

**MB 441 EUKARYOTIC PATHOGENS**
S 4 cr. LEC 3 LAB 1
PREREQUISITE: BCHM 340 or equivalent.
- The study of fungal structure, physiology and taxonomy, disease and host-parasite relationships; and procedures used to isolate and identify pathogenic fungi. Also, the study of biology, pathogenesis, diagnosis and treatment of medically important parasites.

**MB 449 MICROBIAL GENETICS**
S 3 cr. LEC 3
PREREQUISITE: MB 301, BCHM 340.
- The students will become familiar with concepts in microbial genetics, including DNA replication, RNA, and protein biosynthesis. Other concepts covered in the course include bacteriophage and plasmid biology, gene regulation, mobile genetic elements, and the fundamentals of genetic engineering.

**MB 450 RESEARCH METHODS IN MICROBIOLOGY**
S 4 cr. LEC 5 LAB 1
PREREQUISITE: BCHM 340.
- Fundamentals of research methodology for undergraduate and graduate students in microbiology and related disciplines. Theory and application of techniques, reagents, and instrumentation will be emphasized in the lecture and laboratory. The emphasis in the course will be on recombinant DNA methodology, and the safe and effective use of radioisotopes.

**MB 452 CLINICAL IMMUHOHEMATOLOGY I**
Su 2 cr. LEC 1 LAB 1
PREREQUISITE: Acceptance in professional training program.
- Topics include in blood banking. Topics to be included are: ABO/Rh typing, antibody identification, transfusion therapy and reactions, donor collection and component preparation.

**MB 453 CLINICAL HEMATOLOGY & BODY FLUIDS I**
Su 2 cr. LEC 1 LAB 1
PREREQUISITE: Acceptance in professional training program.
- Topics include a review of normal hematopoiesis; red blood cell, white blood cell and platelet disorders; body fluid overview; and an introduction to hematology instrumentation.

**MB 454 CLINICAL MICROBIOLOGY I**
Su 3 cr. LEC 1 LAB 1
PREREQUISITE: Acceptance in professional training program.
- Topics include review of medical microbiology, virology, mycology, parasitology, and clinical laboratory testing procedures.

**MB 455 CLINICAL CHEMISTRY I**
Su 3 cr. LEC 1 LAB 1
PREREQUISITE: Acceptance in professional training program.
- Topics include an introduction to theories and principles with emphasis on all body systems, and the role of instrumentation in the clinical chemistry laboratory.

**MB 456 ESSENTIALS OF CLINICAL LAB PRACTICE**
Su 2 cr. LEC 2
PREREQUISITE: Acceptance in professional training program.
- Provides an orientation to the program, safety information, phlebotomy training, and an overview of management practices. Also includes instruction in hemostasis, molecular diagnostics and urinalysis.

**MB 460 CLINICAL LABORATORY SCIENCE SUMMER PRACTICUM**
Su 12-15 cr. LEC LAB
PREREQUISITE: To take this course, students must be accepted into the professional training program.
- MB 460 is a clinical laboratory science course, which will be conducted at affiliate hospitals during the summer of a student’s senior year. It includes student lecture and laboratory training in clinical immunohematology, clinical chemistry, phlebotomy, clinical hematology, clinical microbiology, and urinalysis, clinical body fluids, transfusion techniques, and clinical microbiology.

**MB 461 CLINICAL LABORATORY SCIENCE PROFESSIONAL TRAINING I**
F 12-15 cr. LEC LAB
PREREQUISITE: MB 460.
- MB 461 is the first semester of professional training at a clinical laboratory affiliate. Students will review basic and advanced information in immunohematology, clinical chemistry, clinical hematology, clinical microbiology, clinical immunology, medical mycology, and phlebotomy techniques. Students will perform patient laboratory testing under the guidance of trained professionals.

**MB 462 CLINICAL LABORATORY SCIENCE PROFESSIONAL TRAINING II**
S 12-15 cr. LEC LAB
PREREQUISITE: MB 461.
- MB 462 is the second semester of professional training at a clinical laboratory affiliate. Students will learn financial and quality management information of the clinical laboratory and study advanced immunohematology, clinical chemistry, clinical microbiology, and clinical hematology. During this course, students will perform actual patient laboratory testing under the guidance of trained professionals.

**MB 463 LAB PRACTICE II**
F 1 cr. LAB 1
PREREQUISITE: Students must be accepted to the MMLS training program.
- Essential skills for performing phlebotomy, laboratory specimen collection, handling and preparing samples for laboratory analysis and interpersonal communication skills will be emphasized.

**MB 464 CLINICAL HEMATOLOGY II**
F 2 cr. LAB 2
PREREQUISITE: Students must be accepted to the MMLS training program.
- Blood cell identification, manual and automated procedures for the assessment of hematologic disease will be emphasized. Students will begin to learn to assess, interpret and correlate hematologic data with disease.
Laboratory skills using manual and automated procedures will be emphasized. Students will assess, interpret and correlate data as it relates to normal and abnormal hemostasis and anticoagulant therapy.

**MB 466 CLINICAL MICROBIOLOGY II**  
F 5 cr. LAB 5  
PREREQUISITE: Students must be accepted to the MMLS training program.  
- The ability to differentiate pathogens from commensals and perform identification procedures and antimicrobial susceptibility testing are emphasized along with an introduction to specialized and automated testing.

**MB 467 CLINICAL CHEMISTRY II**  
F 3 cr. LAB 3  
PREREQUISITE: Students must be accepted to the MMLS training program.  
- Manual and automated procedures for determining chemical analytes in blood and body fluids and the associated disease conditions will be emphasized along with an introduction to specialized testing.

**MB 468 CLINICAL IMMUNOHEMATOLOGY II**  
F 2 cr. LAB 2  
PREREQUISITE: Students must be accepted to the MMLS training program.  
- Maintenance of blood components and performing routine and basic problem solving procedures in the blood bank will be emphasized. Correlation of immunohematology theory and disease with testing and transfusion practices and patient care will be covered.

**MB 469 CLINICAL IMMUNOLOGY/SEROLOGY II**  
F 1 cr. LAB 1  
PREREQUISITE: Students must be accepted to the MMLS training program.  
- Assessment, interpretation and clinical significance of immunology principles and techniques and their correlation to laboratory data and patient disease will be emphasized.

**MB 470 INDEPENDENT STUDY**  
On Demand 1-3 cr. IND  
Maximum 6 cr.  
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.  
- Directed research and study on an individual basis.

**MB 480 SPECIAL TOPICS**  
On Demand 1-4 cr. Maximum 12 cr.  
PREREQUISITE: Course prerequisites as determined for each offering.  
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

**MB 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY**  
F, S, Su 1-6 cr. IND  
May be repeated. Max 12 cr.  
PREREQUISITE: Senior standing.  
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

**MB 500 SEMINAR**  
F, S 1 cr. SEM 1  
Maximum 4 cr.  
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.  
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material. There are separate sections for departmental seminar, general/environmental and biomedical microbiology journal clubs and graduate reading; consult the Department of Microbiology Graduate Student Handbook for specific requirements.

**MB 501 PRINCIPLES & TECHNIQUES OF ANIMAL EXPERIMENTATION**  
S 3 cr. LEC 1 LAB 1  
PREREQUISITE: MB 501.  
- Ethical, humane, anatomical, physiological, environmental and legal considerations involved in the use of laboratory animals will be discussed and information on non-animal alternatives provided. Bio-methodological procedures, including anesthetic and surgical techniques will be demonstrated and/or practiced in the laboratory.

**MB 515 ADVANCED MICROBIAL ECOLOGY**  
S alternate years, to be offered odd years  
3 cr. LEC 3  
PREREQUISITE: MB415/LRES 415.  
- Critical review of literature on the distribution and activity of microorganisms in natural microbial communities based on microbial adaption and physical, chemical and biological features of the microenvironment. A critical discussion of literature and approaches. Cross-listed with LRES 515.

**MB 525 ADVANCED IMMUNOLOGY**  
S alternate years, to be offered even years  
5 cr. LEC 3  
PREREQUISITE: MB 401 or MB 403 or MB 430, or the equivalent.  
- Recent advances in immunology, immunogenetics, immunopathology, molecular and cellular immunology. Cross-listed with VTMB 501.

**MB 528 ADVANCED GENETICS**  
S alternate years, to be offered odd years  
3 cr. LEC 3  
PREREQUISITE: MB 420 or equivalent.  
- Recent advances in microbial genetics with an emphasis on molecular genetics and eukaryotic gene expression.

**MB 535 GENOMIC ANALYSIS**  
F 4 cr. LEC 3 LAB 1  
PREREQUISITE: Permission of instructor needed.  
- The quantity of sequence information deposited into databases necessitates that scientists train in both discovery and hypothesis-based research that utilizes these resources. This course will cover experimental design, database searching and management, sequence alignment, molecular pattern recognition, and phylogenetics.

**MB 556 EXPLORING MICROBIOLOGY**  
S 3 cr. IND  
PREREQUISITE: MB 501 and one of MB 415, MB 420, or MB 449 or equivalent  
COREQUISITE: BS in Biology.  
The course covers the biology of microorganisms, the life and death of microorganisms, the microbial world, microorganisms in their environments, how microbiology can be applied in daily life, and biotechnology and complex issues such as the origins of life. This course is intended for practicing teachers and those in the MSSE program.

**MB 557 ADVANCES IN MOLECULAR EVOLUTION**  
F 2 cr. LEC 3  
PREREQUISITE: MB 420 or 449 or 450 or 528 or 536 or BIOL 402 or BCHM 540 or BCHM 441 or VTMB 421.  
The educational objectives of this course are to provide graduate students with a basic introduction to molecular evolution. The study of molecular evolution encompasses the origin and evolution of life on earth at the molecular level.

**MB 558 CELL AND MOLECULAR BIOLOGY**  
Su 2 cr. LAB 2  
PREREQUISITE: MB 501, BCHM 540 or BIOL 402, MB 536, or the equivalent.  
COREQUISITE: Graduate standing or petition approval from the Vice Provost of Graduate Education.  
- An inquiry-based laboratory in prokaryotic and eukaryotic M&MB provides training in microbiological techniques: recombinant DNA, phylogenetic analyses, growth, cell cycle regulation, gene expression, protein purification, and immunooassays. Current literature and laboratory discussions cover molecular approaches for investigating complex cellular mechanisms.

**MB 559 INFECTION AND IMMUNITY**  
Su alternate years, to be offered even years  
5 cr. IND  
PREREQUISITE: MB 401 or MB 403 or MB 430.  
COREQUISITE: Graduate standing or petition approval from the Vice Provost of Graduate Education.  
- An inquiry-based study of recent advances in understanding the etiology, pathogenesis, chemotherapy and prevention of infectious disease which includes analysis of current literature, case histories, and online sources of information. This course is intended for practicing teachers and those in the MSSE program.

**MB 560 ENVIRONMENTAL MICROBIOLOGY**  
S 3 cr. IND  
PREREQUISITE: MB 536 or MB 415 or MB 420 or MB 433 or MB 449.  
COREQUISITE: Graduate standing or petition approval from the Vice Provost of Graduate Education.  
The course will cover environmental microbiology and microbial ecology. Through reading, assignments and discussions, participants will learn how these sciences allow us to use beneficial microorganisms and control harmful ones, and how microorganisms maintain the biosphere in a balanced state. This course is intended for practicing teachers and those in the MSSE program.
COURSE DESCRIPTIONS: MB 541 - MBSP 563

MB 541 MICROBIAL GENETICS
Su alternate years, to be offered odd years
3 cr. LEC 3
- Prokaryotes provide much of the understanding of fundamental genetics for all organisms, especially through in vivo and in vitro genetic tools. Transcription, translation, mutation and recombination are considered, so that science teachers understand of fundamentals of genetics. This course is intended for practicing teachers and those in the MSEE program.

MB 552 ADVANCED SOIL & ENVIRONMENTAL MICROBIOLOGY
S alternate years, to be offered even years
3 cr. LAB 3
PREREQUISITE: LRES 452 or consent of instructor.
- Advanced laboratory course. Microorganisms are targeted for isolation and characterization, emphasizing those not normally encountered in general microbiology laboratory. Biochemical cycling, contaminant biodegradation, extremophiles, and plant-microbe interactions are typical topics is investigated. Students employ classic and novel cultivation approaches, identifying microbes based morphology, physiology, and phylogeny. Cross-listed with LRES 552.

MB 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

MB 575 PROFESSIONAL PAPER
F, S, Su 1-4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing and committee approval.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

MB 576 INTERNSHIP
On Demand 2 - 12 cr. IND Maximum credits unlimited
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

MB 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MB 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

MB 590 MASTER’S THESIS
F, S, Su 1-10 cr. IND Maximum 20 crs.
PREREQUISITE: Master’s standing.

MB 690 DOCTORAL THESIS
F, S, Su 1-10 cr. IND Maximum 30 crs.
PREREQUISITE: Doctoral standing.

MBEH Microbiology Environmental Health
Department of Microbiology
(406) 994-2903

MBEH 210RN PRINCIPLES OF ENVIRONMENTAL HEALTH SCIENCE
F 4 cr. LEC 3 LAB 1
- Environmental programs and activities concerned with identification and control of physical-chemical, biological factors that impact human health; water pollution and treatment, food protection, air pollution, hazardous waste disposal, vectorborne disease control, community sanitation, hazard control in institutional and occupational environments. The course emphasizes how human health is linked to the health of the environment.

MBEH 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

MBEH 475 FIELD PROJECT
F, S, Su 1 - 4 cr. IND Maximum 4 cr.
PREREQUISITE: Consent of instructor and department head.
- Research and field experience in some aspect of environmental health science.

MBEH 476 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MBEH 480R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MBEH 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MBEH 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

MBSP Molecular Biosciences Program
Division of Graduate Education
(406) 994-6652

MBSP 500 MOLECULAR BIOSCIENCES PROGRAM SEMINAR
F, S 1 cr. SEM 1
- This course will fulfill the seminar requirement of the first year Molecular Biosciences Program (MBSP) doctoral fellows. The fellows (students) will attend three seminars sponsored by the MBSP focused on molecular biosciences research. Students will also attend twelve additional departmental or research center-based seminars from the participating MBSP centers and departments. Each student will write a summary of the fifteen attended seminars and turn it into the instructor by the last day.

MBSP 561 MOLECULAR BIOSCIENCES PROGRAM LAB ROTATION I
F, S 1 cr. LAB 1
- Each Molecular Biosciences Program graduate student will complete three laboratory rotations during their first year of graduate study. Each Laboratory Rotation provides students with a six-week period of active research experimentation, time. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research projects. Extensive bench research time will be required to obtain meaningful results.

MBSP 562 MOLECULAR BIOSCIENCES PROGRAM LAB ROTATION II
F, S 1 cr. LAB 1
- Each Molecular Biosciences Program graduate student will complete three laboratory rotations during their first year of graduate study. Each Laboratory Rotation provides students with a six-week period of active research experimentation, time. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research projects. Extensive bench research time will be required to obtain meaningful results.

MBSP 563 MOLECULAR BIOSCIENCES PROGRAM LAB ROTATION III
F, S 1 cr. LAB 1
- Each Molecular Biosciences Program graduate student will complete three laboratory rotations during their first year of graduate study. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research projects. Extensive bench research time will be required to obtain meaningful results.
ME 101 INTRODUCTION TO MECHANICAL ENGINEERING
F 1 cr. LEC 1
- The mechanical engineering profession, logical process of problem solving and design, professionalism, ethics.

ME 102 ENGINEERING COMPUTER APPLICATIONS
F, S 1 cr. LAB 1.
PREREQUISITE: ME majors only. MATH 182.
- Computer methodology, use of various computer software packages in mechanical engineering applications.

ME 115 ENGINEERING DESIGN GRAPHICS
F, S 1 cr. LEC 1
- Introductory course developing freehand sketching for engineering design graphics. Skills will be developed for sketching and interpreting dimensioned multi-view drawings, pictorials, sections, and assemblies.

ME 116 ENGINEERING DESIGN GRAPHICS LABORATORY
F, S 1 cr. LAB 1
COREQUISITE: ME 115 or consent of instructor.
- Hands-on laboratory experience in two dimensional computer-aided design (CAD) for engineering design graphics.

ME 117 MECHANICAL ENGINEERING DESIGN GRAPHICS
F, S 1 cr. LEC 1
PREREQUISITE: ME 116 or ME majors only, or consent of instructor.
- Introductory course developing freehand sketching and computer-aided modeling techniques for mechanical engineering design graphics. Skills will be developed for sketching and interpreting dimensioned multi-view drawings, tolerancing, specifications, pictorials, and assemblies for mechanical designs.

ME 118 MECHANICAL ENGINEERING DESIGN GRAPHICS LABORATORY
F, S 1 cr. LAB 1
PREREQUISITE: ME and MET majors only, or consent of instructor.
COREQUISITE: ME 117, or ME 115 or consent of instructor.
- Hands-on laboratory experience in three-dimensional and parametric constraint-based modeling for mechanical engineering design.

ME 250 MECHANICAL ENGINEERING MATERIALS
On Demand 3 cr. LEC 3
PREREQUISITE: CHEM 121 or CHEM 131.
COREQUISITE: MATH 175 for MET majors only; MATH 181 for ME majors.
- Properties of metallic, ceramic, and polymeric materials as related to their structures. Material selection for engineering applications.

ME 251 ME MATERIALS SCIENCE LABORATORY
F, S 1 cr. LEC 1.
PREREQUISITE: ME majors only.
COREQUISITE: ME 102 and CHBE 213.
- This course is intended to supplement current materials lecture course offerings. Provides students with hands-on lab experience to identify and quantify physical, electrical, and mechanical properties of metallic and non-metallic materials via experimental measurements. Experimental procedures and reporting are emphasized.

ME 255 MANUFACTURING PROCESSES
F, S 3 cr. LEC 3
PREREQUISITE: ME 250 or CHBE 213.
- Basic methods of processing materials to change shapes, dimensions, and finishes; special attention to attendant forces, temperature, and property changes.

ME 257 MANUFACTURING PROCESSES LABORATORY
F, S 1 cr. LEC 1.
COREQUISITE: ME 255.
- Course will supplement lecture materials covered in ME 255. Provides students with hands-on experience for performing and analyzing a broad spectrum of manufacturing processes including metal casting, injection molding, powder metalurgy, metal forming, metal removal, inspection, and measurement and welding.

ME 270 INDEPENDENT STUDY
On Demand 1-3 cr. IND 1-3 Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

ME 280 SPECIAL TOPICS
On Demand 1-1 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ME 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ME 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

ME 315 ENGINEERING ANALYSIS
F, S 4 cr. LEC 4
PREREQUISITE: ME 102, MATH 224, MATH 225.
COREQUISITE: EM 253.
- Course focuses on enhancing the appreciation of mathematics in ME and advancing the knowledge of mathematical methods in engineering analysis. Topics include introduction to mathematical methods of engineering systems, linear algebra techniques, numerical methods, method of Laplace transformation, Fourier analysis, with classic and modern engineering applications.

ME 320 THERMODYNAMICS I
F, S 3 cr. LEC 3
PREREQUISITE: MATH 224, EM 251.
- Basic thermodynamic concepts, first and second laws, open and closed systems, properties of ideal and real substances, work, heat, irreversibility, and availability.

ME 321 THERMODYNAMICS II
F, S 5 cr. LEC 5
PREREQUISITE: ME 320.
- Vapor, gas power, and refrigeration cycles; mixtures and combustion.

ME 324 ENGINEERING THERMODYNAMICS
S 3 cr. LEC 3
PREREQUISITE: PHYS 205 or PHYS 211.
COREQUISITE: MATH 176 or MATH 182.
- General treatment of the basic laws of thermodynamics and engineering applications with introduction to heat transfer for curricula not requiring ME 320/ME 321 series.

ME 325 FUNDAMENTALS OF HEAT TRANSFER
F, S 4 cr. LEC 4
PREREQUISITE: EM 335, ME 320.
COREQUISITE: Concurrent enrollment in or prior completion of ME 515.
- Mechanisms of energy transport due to a temperature difference in materials. Conduction, convection, and radiation formulations. Introduction to heat transfer equipment.
COURSE DESCRIPTIONS: ME 341 - ME 463

ME 341 INTRODUCTION TO MACHINE DESIGN
F, S 4 cr. LEC 3 RCT 1
PREREQUISITE: ENGL 121, COM 110 or CLS 101, ME 102, ME 251, EM 253, MATH 225, and ME 118 or consent of instructor.
COREQUISITE: Concurrent enrollment in or prior completion of ME 257, ME 315 and I&M 350.
- Static yield theories, introduction to fracture mechanics, analysis of fatigue, thick-walled pressure vessels, strain energy, Castigliano’s theorem, application to engineering design analysis problems.

ME 342 MECHANICAL COMPONENT DESIGN
F, S 4 cr. LEC 4
PREREQUISITE: ME 341, EM 252.
COREQUISITE: Concurrent enrollment in or prior completion of ME 315.
- Analysis of components used in mechanisms and machines. Topics include kinematics and dynamics of machines; bolts, welds, springs, bearings, gears, belted chains, motors, and hydraulic elements.

ME 345 MECHANICAL STRUCTURES
On Demand 3 cr. LEC 3
PREREQUISITE: EM 252, EM 253, MATH 225, ME 102, ME 117 or equivalent, ME 315, ME 541.
- Numerical analysis of skeletal structures by the stiffness method including strain energy and Castigliano’s theorem. Introduction to finite element method.

ME 355 COMPUTER-AIDED MANUFACTURING
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: ME 110 or ME 111, ME 255; CS 120 or some familiarity with computers and programming.
- Programming, operation, and application of computer-controlled manufacturing and assembly for product/process design including multi-axis CNC, robotics, and integrated manufacturing systems.

ME 360 MEASUREMENT AND INSTRUMENTATION
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: EE 250, ENGL 121, COM 110 or CLS 101; ME 320 and EM 355 for ME majors.
- Measurement and application of engineering measurement concepts, focusing on dynamic mechanical/electrical systems with an emphasis on computerized data acquisition. Lecture and laboratory content includes function and operation of transducers, calibration, statistical analysis, sampling, signal conditioning, as well as dynamic response.

ME 404R MECHANICAL ENGINEERING DESIGN II
F, S 2 cr. LEC 1 RCT 1
PREREQUISITE: ENGR 310, ME 326.
COREQUISITE: Concurrent enrollment in or prior completion of ME 360, ME 321, ME 445.
- First semester of senior capstone design experience in Mechanical Engineering. Students, under the guidance of a faculty supervisor, solve real-world design problems.

ME 405R MECHANICAL ENGINEERING DESIGN III
F, S 2 cr. LAB 1 END 1
PREREQUISITE: ME 404.
- Second semester of the senior capstone design experience in Mechanical Engineering. Students, under the guidance of a faculty supervisor, implement their ME 404 design projects.

ME 411 ADVANCED ENGINEERING GRAPHICS AND COMPONENT SPECIFICATION
On Demand 3 cr. LEC 1 LAB 2
PREREQUISITE: Instructor’s consent for non-ME/MET majors; junior standing.
- Development of the ability to use solid and parametric modeling to design and document machine parts. Geometric dimensioning and tolerancing, auxiliary views, analysis of models, advanced modeling techniques and customization are covered through hands-on experiences.

ME 422 INTRODUCTION TO MICROELECTROMECHANICAL SYSTEMS
F 3 cr. LEC 2 LAB 1
PREREQUISITE: Senior standing; EE 250 and EM 255; or consent of instructor.
- Introduction to the basic sensors and actuators and their working principles. MEMS (microelectromechanical systems) fabrication procedures. MEMS Materials and their mechanical properties. Mechanical Behavior of Microsystems. MEMS Packaging and thermal-mechanical stresses in MEMS packages. Reliability Issues in MEMS.

ME 426 DYNAMICS OF FLUIDS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 255, CHBE 213 or ME 250; junior standing and instructor consent for non-ME/IM&ME majors.
- Survey of welding and machine tool practices, including existing fabrication methods and their limitations.

ME 445 MECHANICAL VIBRATIONS
F, S 5 cr. LEC 3
PREREQUISITE: ME 252, EM 253, ME 315.
- Vibration problems of single and multiple degree of freedom systems. Introduction to vibration of continuous bodies. Analysis of free and forced vibration problems. Effects of damping.

ME 448 DESIGN FOR MANUFACTURING AND TOOLING
S 3 cr. LEC 2 LAB 1
PREREQUISITE: ME 255, MET 256 or ME 257, MET 314; or instructor approval.
- Overview of production systems and lean manufacturing fundamentals and principles. Introduction to design for assembly and design for manufacturing principles. Fundamentals of tool design, including tooling materials, workholding principles, jig and fixture design, assembly tool design, design of tools for inspection and gaging, and tool fabrication techniques. Practical lab experiences will enhance the course material. Cross-listed with MET 449.

ME 450 METALLIC MATERIALS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 250 or equivalent.
- Advanced consideration of the structure and behavior of metals.

ME 451 WELDING, MACHINING, AND FABRICATION PRACTICES
On Demand 3 cr. LEC 2 LAB 1
PREREQUISITE: ME 255, CHBE 213 or ME 250; junior standing and instructor consent for non-ME/IM&ME majors.
- Refrigeration and heating, ventilating and air-conditioning (HVAC) for comfort and industrial applications. Psychrometrics, physiological factors in cooling, HVAC load calculations; modern refrigeration cycles; air distribution and fan-duct analysis, design/selection of HVAC equipment and control systems. Cross-listed with MET 454.

ME 454 AIRCRAFT STRUCTURES
F 3 cr. LEC 3
PREREQUISITE: ME 321 or ME 324.
- Overview of aircraft design, analysis, and certification with examples. Static and dynamic load condition analysis.

ME 461 ME SENIOR LABORATORY
F, S 2 cr. LAB 2
PREREQUISITE: ME 321, ME 326, ME 360.
- Execution of engineering experiments.

ME 463 COMPOSITE MATERIALS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHBE 213.
- Structure and properties of composite materials and design procedures for composite structures. Cross-listed with CHBE 463.
ME 464 MECHANICAL BEHAVIOR OF MATERIALS
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: CHBE 213.
- Theory, analysis, and application of mechanical behavior of materials. Constitutive behavior, plasticity, and fracture mechanics of engineering materials such as metals, polymers, ceramics, and composites are analyzed. High temperature behaviors of materials are presented. Toughening mechanisms, fatigue, and damage tolerant design with modern engineering materials are emphasized.

ME 465 INTRODUCTION TO FINITE ELEMENT ANALYSIS
F 4 cr. LEC 3 RCT 1
PREREQUISITE: ME 326 or instructor approval.
COREQUISITE: Concurrent enrollment in or prior completion of ME 342.
- Introduction to the finite element method emphasizing the fundamental principles of FEA. Various finite element formulations for applications to structural analysis, thermal/fluids analysis, and design. Practical computational experience using a commercial finite element computer code.

ME 468 INTRODUCTION TO WAVE PROPAGATION AND ULTRASONICS
On Demand 4 cr. LEC 3 LAB 1
PREREQUISITE: ME 300, or equivalent, and ME 315, or equivalent.
COREQUISITE: ME 445, or equivalent.
- Analysis of wave phenomena in elastic solids including propagation, reflection, transmission, dispersion, impedance, etc. Development of the governing equations describing the propagation of waves in strings, rods, and two-dimensional solids. Application of the basic principles to ultrasonic testing of materials.

ME 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

ME 474 MECHANICAL ENGINEERING CONSULTATION
On Demand 1 - 5 cr. IND Maximum 9 cr.
PREREQUISITE: Sophomore standing in ME/MET curriculum and consent of supervising faculty.
- Students enrolled in this class will provide technical support for selected ME/MET courses.

ME 476 INTERNSHIP
On Demand 1 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ME 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ME 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. May be repeated. Max 4 cr.
COREQUISITE: ME 400.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ME 498R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

ME 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting the discussion material.

ME 510 ADVANCED ENGINEERING ANALYSIS I
F 3 cr. LEC 3
PREREQUISITE: ME 315 or consent of instructor.
- Mathematical modeling of engineering systems, physical interpretation of ordinary and partial differential equations and methods of solution. This course is cross-listed with CHBE 522.

ME 511 ADVANCED ENGINEERING ANALYSIS II
S 3 cr. LEC 3
PREREQUISITE: ME 315 or consent of instructor.
- Analytical and numerical methods in engineering.

ME 520 ADVANCED THERMODYNAMICS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 521.
- First and second laws of thermodynamics, uniform flow and general open systems, real gases, mixtures, reacting processes, phase and chemical equilibrium.

ME 521 STATISTICAL THERMODYNAMICS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 520.
- Kinetic theory of gases, distribution functions, thermodynamic properties in terms of partition functions, reactions, phase transition.

ME 525-CONDUCTION HEAT TRANSFER
F 3 cr. LEC 3
PREREQUISITE: ME 526.
COREQUISITE: ME 510.
- Advanced topics in conduction heat transfer with emphasis on analytical techniques including separation of variables, Duhamel's theorem, two-phase problems, and numerical techniques.

ME 526 CONVECTION HEAT TRANSFER
On Demand 3 cr. LEC 3
PREREQUISITE: ME 526.
- Advanced topics in convection heat transfer including both internal flows and external flows, introduction to the theory of laminar boundary layer stability, determination of turbulent transition, and analytical models of turbulent flows.

ME 527 RADIATION HEAT TRANSFER
On Demand 3 cr. LEC 3
PREREQUISITE: ME 526.
- Advanced topics in radiation heat transfer including detailed specification of radiative properties, development of energy equations for diffuse grey enclosure and multidiffuse nongray enclosures, development of energy equations for combined modes of heat transfer, introduction to Monte Carlo method.

ME 530 ADVANCED FLUID MECHANICS I
On Demand 3 cr. LEC 3
PREREQUISITE: EM 335 or CHBE 322.
COREQUISITE: EM 525 or consent of instructor.
- Review of conservation equations, laminar and turbulent internal flows, potential flows, and Stokes flow.

ME 531 ADVANCED FLUID MECHANICS II
On Demand 3 cr. LEC 3
PREREQUISITE: ME 521.
- Modern turbulence theory, turbulence modeling.

ME 532 TURBULENCE
On Demand 3 cr. LEC 3
PREREQUISITE: ME 531.
- Comprehensive treatment of mass, momentum, and energy transport. This course is cross-listed with ChE 530.

ME 534 VISCOS FLUID DYNAMICS
On Demand 3 cr. LEC 3
PREREQUISITE: EM 335.
- Cross-listed. See CHBE 533 for description.

ME 535 APPLIED FLUIDS & THERMODYNAMICS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 521.
- Theory, analysis and performance characteristics of propulsion and advanced energy conversion systems.

ME 536 COMPUTATIONAL FLUID MECHANICS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 531.
- Numerical solutions of fluid flows, discretization methods, solution algorithms, aspects of turbulent flows.

ME 539 PHYSICAL ACOUSTICS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 501.
- Advanced topics in radiation heat transfer including detailed specification of radiative properties, development of energy equations for diffuse grey enclosure and multidiffuse nongray enclosures, development of energy equations for combined modes of heat transfer, introduction to Monte Carlo method.

ME 550 ADVANCED MECHANICAL VIBRATIONS
On Demand 3 cr. LEC 3
PREREQUISITE: ME 526.
- Advanced topics in mechanical vibrations. Multidegree of freedom systems, continuous systems, generalized coordinates. Introduction to nonlinear vibrations.
ME 550 FAILURE OF MATERIALS
Odd years, S 3 cr. LEC 3
PREREQUISITE: One of the following: CHBE 463, EM 415, ME 450.
- Cross-listed. See CHBE 550 for description.

ME 551 ADVANCED COMPOSITE MATERIALS
Even years, S 3 cr. LEC 3
PREREQUISITE: CHBE 463.
- Cross-listed. See CHBE 551 for description.

ME 570 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

ME 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and faculty advisor and graduate committee. This course can be used toward fulfilling the requirements for the Master of Science in Mechanical Engineering for non-thesis option students.

ME 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ME 580 GRADUATE CONSULTATION
F, S, Su 1 - 3 cr. IND
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ME 590 MASTER'S THESIS
F, S, Su 1-10 cr. IND May be repeated.
PREREQUISITE: Master’s standing.

ME 690 DOCTORAL THESIS
F, S, Su 1-10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

MEDS
Medical Science
Department of Medical Science/WWAMI
(406) 994-4411

MEDS 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: WWAMI medical student or consent of the WWAMI Medical Program and Dean of the Division Graduate Education.
- Yearly conference dealing with topics related to Montana's colorful medical history.

MEDS 502 SPANISH FOR HEALTHCARE PROFESSIONALS
S 1 cr. LEC 1
PREREQUISITE: WWAMI medical student or consent of the WWAMI Medical Program and Dean of the Division Graduate Education.
- Learn basic and intermediate Spanish in a medical setting; the vocabulary needed to perform a review of systems and physical exams; and how to feel less uncomfortable with a patient who only speaks Spanish.

MEDS 503 MEDICINE & LITERATURE: THE POETICS OF HEALING
S 1 cr. LEC 1
PREREQUISITE: WWAMI medical student or consent of the WWAMI Medical Program and Dean of the Division Graduate Education.
- Learn basic and intermediate Spanish in a medical setting; the vocabulary needed to perform a review of systems and physical exams; and how to feel less uncomfortable with a patient who only speaks Spanish.

MEDS 513 INTRODUCTION TO CLINICAL MEDICINE I
F 2 cr. LEC 1 LAB 1
PREREQUISITE: WWAMI medical student.
- Communication skills and interview techniques to form the basis for the doctor-patient relationship and for the skill of communicating with patients.

MEDS 514 BIOCHEMISTRY AND MOLECULAR BIOLOGY
F 5 cr. LEC 4 RCT 1
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division Graduate Education.
- Coordinated course covering classical molecular and cellular biochemistry and molecular genetics. Metabolic interrelationships as they occur in the individual are stressed and related to disturbances in disease states.

MEDS 516 CLINICAL PRECEPTORSHIP
F 1 cr. LAB 1
PREREQUISITE: WWAMI medical student.
- Opportunity to gain personal experience with primary care medical practice by observation of selected physicians in the Bozeman area.

MEDS 517 MICROSCOPIC ANATOMY (HISTOLOGY)
F 3 cr. LEC 2 LAB 1
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division Graduate Education.
- Study of the structure and function of human cells, tissues and organs as a basis for understanding the alterations in structure and function seen in human disease.

MEDS 522 INTRODUCTION TO CLINICAL MEDICINE II
S 2 cr. LEC 1 LAB 1
PREREQUISITE: WWAMI medical student.
- Communication skills and interview techniques to form the basis for the doctor-patient relationship and for the skill of communicating with patients.

MEDS 525 IMMUNOLOGY & HUMAN DISEASE
F 2 cr. LEC 1 LAB 1
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division Graduate Education.

MEDS 531 HEAT & NECK ANATOMY
S 4 cr. LEC 2 LAB 2
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division Graduate Education.
- Gross anatomy of head and neck. Relation of head and neck anatomy to disease of the nasal passages, throat, eyes and oral cavity. Relation to physical examination (including skull, pharynx, and larynx).
MEDS 532 NERVOUS SYSTEM
S 6 cr. LEC 4 LAB 2
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division Graduate Education.
- Integrated approach to the normal structure and function of the human nervous system, basic neuropathological concepts and an introduction to the clinical evaluation of typical neurological lesions. Laboratory includes dissection of human brain and histologic study of brain stem cross sectional anatomy.

MEDS 533 SYSTEMS OF HUMAN BEHAVIOR I
F 3 cr. LEC 3
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division Graduate Education.
- Overview of conceptual systems and models of behavior, normality and abnormality, environment and social learning, conditioning, learning in the autonomic nervous system, catecholaminergic behavior, illness behavior, feelings, emotion and cognition, physician-patient interaction and disease and techniques of behavior change.

MEDS 540 CLINICAL PRACTICUM
F, S, Su 1 cr. LAB 1
PREREQUISITE: Graduate level standing and acceptance into Post-Bacc Pre-Med program.
- A practical course for students going into the medical field to work in their hospital departments while observing and learning about the services provided by different health care professionals at various stages of patient care.

MEDS 551 MEDICAL MUSCULOSKELETAL ANATOMY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: WWAMI medical student or consent of the Director of the WWAMI Medical Program and Dean of the Division of Graduate Education.
- Dissection study of the anatomy of the extremities and back, including correlations with clinical material such as diseases, disorders, trauma, imaging methods, and physical examinations.

MEDS 570 INDIVIDUAL PROBLEMS
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of the Director of the WWAMI Medical Program and Dean of Graduate Studies.
- Directed research and study on an individual basis.

MEDS 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MEDS 591 MEDICAL INFORMATION & DECISION MAKING
F 1 cr. LEC 1
PREREQUISITE: WWAMI medical student or consent of Director of the WWAMI Medical Program and Dean of the Division Graduate Education.
- This course is designed to provide an introduction to medical information. Evidence-Based Medicine and use of medical information in patient care. This will include an introduction to methods for identifying and retrieving high quality evidence electronically, using the Internet and other resources. The course will also present methods to evaluate the quality of primary research studies, or preventive interventions. The course will also describe the challenges of applying medical information to decision making. The course will utilize lectures, discussion sessions and computer lab sessions.

MET Mechanical Engineering Technology
Department of Mechanical & Industrial Engineering
(406) 994-2203

MET 101 INTRODUCTION TO MECHANICAL ENGINEERING TECHNOLOGY
F 1 cr. LEC 1
- A seminar course surveying the mechanical engineering technology profession. Topics include an overview of career opportunities, problem solving processes, an introduction to the basic engineering design process, professionalism, professional registration, and ethics.

MET 119 TECHNICAL GRAPHICS COMMUNICATION
S 2 cr. LAB 2
PREREQUISITE: MET majors or consent of instructor.
- Communication through engineering graphics. The course topics include drawing utilizing sketching, 2-D CAD and 3-D solid modeling software, drawing standards, fits, and tolerances.

MET 201 MECHANICAL ENGINEERING TECHNOLOGY COMPUTER APPLICATIONS
F, S 1 cr. LAB 1
COREQUISITE: MATH 176 - Computer methodology, and use of various computer software packages in mechanical engineering technology applications.

MET 211 GRAPHICS FOR DESIGN
S 3 cr. REC 2 LAB 1
PREREQUISITE: MET 119
- Course emphasizes the design process as it pertains to manufacturability, and the role of graphics to communicate design intent to production. Using 3-D software, design methods, C.D.J.T, and data management techniques, students will create drawings that communicate their designs.

MET 251 MATERIALS SCIENCE LAB
F 1 cr. LAB 1
PREREQUISITE: MET majors only.
COREQUISITE: CHBE 213 or equivalent, MET 201.
- Specific hands-on experience with material properties experiments that parallel the lecture portion of CHBE 213. Students will analyze mechanical and physical properties of various materials. Students will use various testing apparatus and will conduct both destructive and non-destructive evaluations (NDE).

MET 256 MANUFACTURING PROCESS LABORATORY
S 1 cr. LAB 1
PREREQUISITE: MET majors only; non-majors required to obtain approval.
COREQUISITE: ME 255.
- Hands-on applications of the fundamentals of basic manufacturing processes.

MET 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

MET 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MET 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MET 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

MET 303 CAT TOOLS IN MECHANICAL DESIGN
S 3 cr. RCT 2 LAB 1
PREREQUISITE: MET 211.
- Emphasizes the use of computer aided engineering tools in the design process: understanding proper use and interpretation, gaining experience in how to use them through exercises and projects, modeling for analysis, rapid prototyping, and computer aided manufacturing techniques.

MET 314 MACHINING TECHNOLOGY AND INDUSTRIAL SAFETY
F 3 cr. LEC 1 LAB 2
PREREQUISITE: MET 211 or equivalent, or TE 250 for non-majors, or instructor approval.
COREQUISITE: MET 256.
- Introduction to modern machining technology and the key principles of industrial safety, material properties related to machining practices, design, and specifications. Semi-precision and precision layout are covered. An introduction to computer numerically controlled (CNC) technology and operations is included. Specific hands-on experiences included in laboratory.
MET 315 WELDING TECHNOLOGY
S 3 cr. LEC 1 LAB 2
PREREQUISITE: MET 119 or equivalent, or TE 230 for non-major, or instructor approval.
COREQUISITE: MET 256.
- Introduction to modern science of welding technology, as well as a detailed examination of metallurgy and materials properties as related to welding processes. Welding specification and symbology are introduced as well as modern welding code usage. Weld design, set-up, preparation, application, and test are emphasized. Specific hands-on experiences in OAW, SMAW, GMAW, GTAW, common separating processes, as well as destructive and non-destructive testing are included in laboratory.

MET 325 HEAT TRANSFER FOR ENGINEERING TECHNOLOGY
S 3 cr. LEC 3
PREREQUISITE: ME 324 or equivalent.
COREQUISITE: EM 215, MET 201.
- Study of the basic mechanisms of heat transfer and its applications. Introduction to equipment that utilize these mechanisms.

MET 340 MECHANISMS
F 3 cr. LEC 2 LAB 1
PREREQUISITE: MATH 176 or equivalent.
COREQUISITE: EM 215, MET 201.
- Introduction to mechanisms and machine elements used in the design and synthesis of mechanical devices.

MET 345 MACHINE DESIGN
S 4 cr. LEC 3 LAB 1
PREREQUISITE: MET 340 or equivalent.
- Application of mechanisms fundamentals, strength of materials, material selection, and tolerances and fits to the design of machines and machine systems. Specific hands-on experiences included in laboratory.

MET 401 MECHANICAL ENGINEERING TECHNOLOGY SENIOR SEMINAR
F 1 cr. SEM 1
COREQUISITE: MET 456.
- A seminar course focusing on career path development. Students will meet with current industry professionals to discuss specific careers, as well as meet with former students to share undergraduate experiences.

MET 417 ADVANCED WELDING AND MACHINE TOOL APPLICATIONS
On Demand 3 cr. LEC 1 LAB 2
PREREQUISITE: MET 314 and MET 315.
- Advanced applications of welding and machine tool technology. Computer numerical control, multi-axis machining set-up, gas tungsten arc welding, and gas metal arc welding.

MET 430 FLUID POWER TECHNOLOGY
F 3 cr. LEC 2 LAB 1
PREREQUISITE: EM 205, EE 250, EM 331, PHYS 205, or equivalent; or consent of instructor.
- An introduction to the fundamentals and application of fluid power in industry today. Coverage includes: flow and pressure relationships, fluid properties, heat, filtration, selection of components, electro-hydraulic and electro-pneumatic systems, controls, design of hydraulic and pneumatic circuits, and troubleshooting. Cross-listed with ME 435.

MET 449 DESIGN FOR MANUFACTURING AND TOOLING
S 5 cr. LEC 2 LAB 1
PREREQUISITE: ME 255, MET 256 or MET 257, MET 314; or instructor approval.
- Overview of production systems and lean manufacturing fundamentals and principles. Introduction to design for assembly and design for manufacturing principles. Fundamentals of tool design, including tooling materials, workholding principles, jig design, fixture design, assembly tool design, design of tools for inspection and gaging, and tool fabrication techniques. Practical lab experiences will enhance the course material. Cross-listed with ME 448

MET 454 REFRIGERATION AND HVAC
F 3 cr. LEC 3
PREREQUISITE: ME 321, ME 326 or ME 324, MET 325.
- Refrigeration and heating, ventilating and air-conditioning (HVAC) for comfort and industrial applications. Psychrometrics, physiological factors in cooling, HVAC load calculations; modern vapor compression, absorption, low temperature refrigeration cycles; air distribution and fan-duct analysis, design/selection of HVAC equipment and control systems. Cross-listed with ME 454.

MET 455 HEATING, VENTILATION, AND AIR CONDITIONING LAB
On Demand 1 cr. LAB 1
PREREQUISITE: ME 360, MET majors only; non-majors require instructor approval.
COREQUISITE: ME 454.
- Laboratory experiences enforcing topics covered in ME 454.

MET 456 MECHANICAL ENGINEERING TECHNOLOGY CAPSTONE EXPERIENCE I
F 3 cr. RCT 1 LAB 1
PREREQUISITE: MET 303, MET 314, MET 315, MET 345, for MET majors only.
COREQUISITE: MET 360, ENGR 310, MET 401, MET 410, I&M/EE 325.
- First course in senior capstone sequence. Students, under the guidance of faculty supervisors, design, plan, and schedule a product for fabrication/manufacture. Lectures will address fundamental principles of planning, estimating, budgeting, scheduling, and controlling engineering projects, plus review of CAD software.

MET 457R MECHANICAL ENGINEERING TECHNOLOGY CAPSTONE EXPERIENCE II
S 5 cr. RCT 1 LAB 1
PREREQUISITE: MET 456, for MET majors only.
- Second course in senior capstone sequence. Manufacturing, scheduling, and construction of the project initiated.

MET 465 BUILDING SYSTEMS
F 3 cr. LEC 3
PREREQUISITE: PHYS 206 and junior standing.
- A survey of the systems and equipment for water supply, sanitation, fire protection, electrical service, heating and air conditioning of buildings.

MET 466 THERMAL PROCESSES LAB
S 1 cr. LAB 1
COREQUISITE: ME/MET 454, MET 325.
- Laboratory experiences covering topics in heat transfer, thermodynamics, and HVAC areas in support of MET 325, ME 324, and ME/MET 454.

MET 470 INDEPENDENT STUDY
On Demand 1 - 6 cr. IND 415
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

MET 476 INTERNSHIP
On Demand 1 - 12 cr. IND 415
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MET 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MET 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-2 cr. RCT 1
PREREQUISITE: Course prerequisites as determined for each offering.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MET 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-2 cr. Maximum 8 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

MGMT
Management
College of Business
(406) 994-4423

MGMT 103 SUPERVISION AND LEADERSHIP
On Demand 3 cr. LEC 2 RCT 1
- Management principles as they apply to first-line supervision and to the function of leadership and motivation in any organization. This course may not substitute for any required business course.

MGMT 204 INTRODUCTION TO BUSINESS
F, S 3 cr. LEC 3
- Explores the application of business principles and functions including forms of business ownership, management and leadership, marketing, finance, accounting, economics, and social responsibility. Intended for students transferring into the College of Business and non-majors interested in business.

MGMT 231S BUSINESS RESEARCH METHODS
On Demand 3 cr. LEC 3
PREREQUISITE: STAT 216, BUS 211 as pre- or co-requisite.
- Introduction to the methods of knowledge and knowing regarding business activities and business organizations. Focused on disciplined inquiry using statistics and quantitative analysis; providing the intellectual foundation for further exploration of the business discipline.
COURSE DESCRIPTIONS: MGMT 245D - MGMT 462

MGMT 245D CULTURAL DIMENSIONS OF INTERNATIONAL BUSINESS
3 cr. RCT 3
- The course will help students recognize the importance cultural differences play in conducting international business transactions. They will analyze the nature and impact of some common problems resulting from not understanding how to deal appropriately with cultural differences.

MGMT 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of Associate Dean.
- Directed research and study on an individual basis.

MGMT 290 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MGMT 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MGMT 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

MGMT 314 BUSINESS WEB SITE DESIGN
F 3 cr. LEC 3
PREREQUISITE: BUS 311. For business majors: Formal admission to the College of Business.
- Students acquire skills necessary to create and implement effective business web sites. Best practices in web site design, HTML, CSS, host site selection and introductory programming are covered. Project-based course includes creating web sites for businesses or non-profit organizations.

MGMT 315 NETWORKS AND TELECOMMUNICATIONS
S 3 cr. LEC 3
PREREQUISITE: BUS 311. For business majors: Formal admission to the College of Business.
- Students acquire skills necessary to understand the role that telecommunications play in organizations, how networks facilitate competitive advantage, and how to integrate technology into a corporate culture. Students create business cases for value-adding networks and telecommunications systems.

MGMT 368 MANAGERIAL ANALYSIS AND ACTION I
S 3 cr. LEC 3
PREREQUISITE: Junior Standing, BUS 301. For business majors: Formal admission to the College of Business.
COREQUISITE or PREREQUISITE: BUS 561.
- Part of an integrated, two-course sequence which will build knowledge and skills appropriate for the challenges faced by managers. This course will deal with such operations/first-line supervision issues as human resources, team building, leadership, ethics, technology, and law.

MGMT 400 SEMINAR
On Demand 1-3 cr. SEM 1-3 Maximum 6 cr.
PREREQUISITE: Junior standing and as determined for each offering. For business majors: Formal admission to the College of Business.
- Topics offered at the upper-division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

MGMT 402 LEADERSHIP IN BUSINESS ORGANIZATIONS
F 3 cr. LEC 3
PREREQUISITE: BUS 301 or permission of the instructor. For business majors: Formal admission to the College of Business.
- Theories, issues, and current topics related to the area of business and personal leadership. Focus on leadership behaviors and processes in businesses organizations. Emphasis placed on examination of how individual and organizational leadership capacity is developed.

MGMT 405 HUMAN RESOURCES MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: BUS 301. For business majors: Formal admission to the College of Business.
- The functions and tools used in procurement, development, compensation, integration, and maintenance of human resources and their impact on the effective attainment of organizational goals.

MGMT 406 NEGOTIATION AND DISPUTE RESOLUTION
F 3 cr. RCT 3
PREREQUISITE: BUS 301 or consent of instructor. For business majors: Formal admission to the College of Business.
- Introduction to negotiation theories and skills to help students practice and improve this essential skill. Focus of the course is on the effective attainment of organizational goals.

MGMT 411 COMPUTER APPLICATIONS
On Demand 3 cr. LEC 3
PREREQUISITE: ACCT 205 or BUS 311. For business majors: Formal admission to the College of Business.
- Business applications for computers. Accounting inventory, planning, and financial analysis are among the topics covered. End-user programming and prototyping will be emphasized.

MGMT 412 DESIGN OF E-COMMERCE SITES
S 3 cr. LEC 3
PREREQUISITE: BUS 311. For business majors: Formal admission to the College of Business.
- Study of methods and tools a system analyst uses in development of e-commerce web sites including best practices and performance metrics. Design done on networked microcomputers. Final solutions presented orally, in writing, and on the web.

MGMT 413 CONTEMPORARY SUPPORT SYSTEMS
F 3 cr. LEC 3
PREREQUISITE: BUS 311. For business majors: Formal admission to the College of Business.
- Integrates theory, application and development of information systems to support managerial decision making in semi-structured and unstructured situations. Considers spreadsheet, expert system, and/or web-based software applications to support decision making. Uses cases and project-based assignments.

MGMT 414 DATA-DRIVEN BUSINESS WEB SERVICES
S 3 cr. LEC 3
PREREQUISITE: MGMT 314. For business majors: Formal admission to the College of Business.
- This course prepares students to design and create data-driven, web-based applications commonly found in electronic-commerce applications by combining database design and use with interactive web site creation.

MGMT 415 MANAGEMENT OF INFORMATION TECHNOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: MGMT 411, MGMT 412, and BUS 301. For business majors: Formal admission to the College of Business.
- Course integrates content from the courses in the Management of Information Technology minor. The course will unite the technical knowledge and skills acquired by students with behavioral knowledge and skills necessary to effectively manage business applications of information technology.

MGMT 433 MANAGING QUALITY AND PRODUCTIVITY
On Demand 3 cr. LEC 3
PREREQUISITE: BUS 381. For business majors: Formal admission to the College of Business.
- An in-depth study of the theoretical foundations of quality management along with applications of the quantitative and qualitative tools used in improving organizational quality and productivity. Coverage will include the principles promoted by major quality experts and a review of the requirements for corporate quality certification.

MGMT 460 BUSINESS TUTORIAL
F 3 cr. LEC 1 SEM 2
PREREQUISITE: By application. For business majors: Formal admission to the College of Business.
- Provides selected upper-division students an opportunity to develop leadership and mentoring skills through involvement with the BUS 101US First Year Seminar course. Students work closely with faculty to enhance the academic, cultural, and social experiences of students in the seminar course.

MGMT 461 SMALL BUSINESS MANAGEMENT
S 3 cr. LEC 3
PREREQUISITE: BUS 222, BUS 301, BUS 341, BUS 351, and Senior standing. For business majors: Formal admission to the College of Business.
- Focus on the process of starting and managing a small business, with an emphasis on businesses owned and operated by one individual or family. Topics covered will include typical funding sources and all phases of small business management from startup to exit.

MGMT 462 ENTREPRENEURSHIP
F 3 cr. RCT 3
PREREQUISITE: BUS 222, BUS 301, BUS 351, and Senior standing. For business majors: Formal admission to the College of Business.
- Evaluation of small business entrepreneurial opportunities, start-up problems, tax aspects, legal forms, forecasts, feasibility studies, venture financing, and promotion. Students develop own business plans.
MGMT 463 THE ENTREPRENEURIAL EXPERIENCE
F, S 3 cr. LEC 3.
PREREQUISITE: BUS 222, BUS 301, BUS 341, BUS 351 and Senior standing. For business majors: Formal admission to the College of Business. Non-Business majors may register with permission of instructor. This course is designed to give students real-world experience in projects that will assist area entrepreneurs. Students will work with these new ventures to solve their management, marketing, finance and other business problems. The content of the problems will depend on the situation of the client businesses.

MGMT 464 INTERNATIONAL MANAGEMENT
S 3 cr. LEC 3.
PREREQUISITE: BUS 301 and senior standing. For business majors: Formal admission to the College of Business. - Description of the challenges which the global context poses to business managers. Examination of the elements of international environments and illustration of their effects on management practices and how management deals with such forces.

MGMT 465 INTERNATIONAL PRACTICUM
On Demand 1-12 cr. IND
PREREQUISITE: By application. For business majors: Formal admission to the College of Business. - Intensive study of culture, customs, politics, history, and business practices of another country. Program culminates with extended visit to location for lectures, and other relevant activities.

MGMT 466 MANAGERIAL ANALYSIS AND ACTION II
F 3 cr. LEC 3.
PREREQUISITE: BUS 311, BUS 351, BUS 351 and MGMT 366. For business majors: Formal admission to the College of Business. - Part of an integrated, two-course sequence which will build knowledge and skills appropriate for the challenges faced by managers. This course will deal with issues faced by middle managers at the functional level of the organization.

MGMT 468 BUSINESS, ETHICS AND SOCIETY
On Demand 3 cr. LEC 3.
PREREQUISITE: Senior standing or permission of the instructor. For business majors: Formal admission to the College of Business. - The relationship between business and society in the social, ethical and natural environment. A focus on issues of business responsibility and ethics with emphasis on practical business problems of leadership and accountability.

MGMT 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of Associate Dean. For business majors: Formal admission to the College of Business. - Directed research and study on an individual basis.

MGMT 472 LEGAL AND SOCIAL FRAMEWORK OF BUSINESS REGULATION
On Demand 3 cr. LEC 3.
PREREQUISITE: BUS 361 or consent of instructor. For business majors: Formal admission to the College of Business. - Study of legal and social basis for government regulation of business. Topics include environmental regulation, employment and labor law, securities regulation, antitrust, and international trade. Students research and make class presentation on regulatory issues.

MGMT 473 MODERN MANAGEMENT OF WESTERN RESOURCES
F 3 cr. LEC 3.
PREREQUISITE: BUS 361 or consent of instructor. For business majors: Formal admission to the College of Business. - Study of the decision making process of managers of large tracts of Western land. Real world cases will be used to explore the variables impacting their decision such as: production versus subdivisions, conservation easements, inheritance taxes and wildlife based business plans.

MGMT 475R MANAGEMENT PRACTICUM
F, S 3 cr. RCT 5.
PREREQUISITE: Senior standing or permission of instructor. For business majors: Formal admission to the College of Business. - Teams do major projects such as substantive community service project, research paper, small business experience case, business plan, or strategic analysis. Practical experience with project and/or team management where performance is measured by delivered product. No credit for previous experience.

MGMT 476 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: Junior standing. Formal admission to the College of Business, and consent of the instructor. - An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MGMT 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering. - Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MGMT 489R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY INSTRUCTION
On Demand 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MGMT 490. For business majors: Formal admission to the College of Business. - Classroom instruction associated with directed undergraduate research/creative activity projects.

MGMT 490R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY
On Demand 1-6 cr. IND May be repeated. Max 12 cr. - Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

MGMT 505 THE STRATEGIC MANAGEMENT OF TECHNOLOGICAL INNOVATION
On Demand 3 cr. LEC 3.
PREREQUISITE: Graduate standing in Business, Engineering or Agriculture or consent of instructor. - To prepare students to strategically manage the innovation of technology by bringing together students from several disciplines and have them work together to integrate strategy and technology. The students will be given cases and other problems throughout the semester that require them to use and integrate these concepts.

MGMT 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing consent of instructor, approval of Associate Dean and Dean of Graduate Studies. - Directed research and study on an individual basis.

MGMT 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper-division courses and others as determined for each offering. - Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MKTG Marketing
College of Business
(406) 994-4423

MKTG 241 SALES
On Demand 3 cr. LEC 3.
- Principles of sales for non-business majors. Focus is on selling in retail and service environments. This course may not substitute for any required business course.

MKTG 242D INTRODUCTION TO GLOBAL MARKETS
F, S 3 cr. RCT 5.
- Explores the global range of human differences and how factors including cultures, nations and political economies interact in an evolving world order brought about by globalization and an interdependent and integrated world economy. Economic systems, international business structures and the dynamic complexities of international relations are introduced in the context of real world issues and the social, political and economic conflicts that result from them.

MKTG 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of Associate Dean. - Directed research and study on an individual basis.

MKTG 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department. - Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
MKTG 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MKTG 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

MKTG 542R MARKET RESEARCH
F, S 3 cr. RCT 5
PREREQUISITE: STAT 217 or MGMT 231; and BUS 341. For business majors: Formal admission to the College of Business.
- The application of scientific research methods to marketing problems. The emphasis is on survey design and data analysis for market segmentation studies.

MKTG 543 CONSUMER BEHAVIOR
F, S 3 cr. LEC 3
PREREQUISITE: BUS 341. For business majors: Formal admission to the College of Business.
- Application of behavioral science to understanding human behavior in the marketplace. Emphasis on culture and subculture, social class, reference group, family, attitudes, perception, motivation, personality, and learning theory on consumer and marketing management decisions.

MKTG 400 SEMINAR
On Demand 1 cr. SEM 1
PREREQUISITE: Junior standing and as determined for each offering. For business majors: Formal admission to the College of Business.
- Topics offered at the upper-division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

MKTG 441 INTERNATIONAL MARKETING
S 3 cr. LEC 5
PREREQUISITE: BUS 341. For business majors: Formal admission to the College of Business.
- International economic, financial, cultural, political, and legal environment; marketing research, market segmentation and positioning issues analyzed primarily from a global perspective. Global strategies and organizational designs described and analyzed as related to foreign market entry, sourcing, product development, pricing, promotion, logistics and distribution, and export-import management.

MKTG 443 PROMOTION
F 3 cr. LEC 5
PREREQUISITE: Senior standing, BUS 341. For business majors: Formal admission to the College of Business.
- Explores the use of advertising, sales promotion, Internet, electronic media, and personal selling as methods for promoting goods and services. Taught from the perspective of the marketing manager, with emphasis on the theory, strategy, and tactics of promotion.

MKTG 444 RETAIL MANAGEMENT
F 3 cr. LEC 3
PREREQUISITE: Senior standing, BUS 341. For business majors: Formal admission to the College of Business.
- The application of marketing theory to retail management problems. Topics include structure of the retail industry and nature of competition; merchandise planning, budgeting and control; and pricing and location theory.

MKTG 445 PROFESSIONAL SELLING
F 3 cr. LEC 3
PREREQUISITE: BUS 341. For business majors: Formal admission to the College of Business.
- Personal selling techniques applied to outside sales. Sales organization including structure, training, motivation, and compensation. Evaluation of sales goals and individual performance.

MKTG 446 MARKETING FOR ENTREPRENEURS
F 3 cr. LEC 3
PREREQUISITE: BUS 341. For business majors: Formal admission to the College of Business.
- This course examines the unique marketing challenges faced by startup organizations. New firms are often resource constrained. As a result, penetrating markets dominated by larger competitors with new and innovative products and services requires different marketing tactics. Markets are defined and establishing primary demand for a new product category may be required.

MKTG 447 MARKETING MIX DESIGN
F, S 3 cr. RCT 5
PREREQUISITE: Senior standing, MKTG 342 and approval of instructor. For business majors: Formal admission to the College of Business.
- Student teams will apply their expertise in marketing to practical business problems encountered by firms in the community and surrounding area. The problems have their basis in any of the marketing mix elements such as identifying market potential, developing a promotional campaign, or development of a new product.

MKTG 449 MARKETING MANAGEMENT
F, S 3 cr. LEC 3
PREREQUISITE: Senior standing, MKTG 542, MKTG 443 and MKTG 445. For business majors: Formal admission to the College of Business.
- The content of previous marketing courses is applied using the case method to solve marketing problems. Emphasis is on marketing strategy and implementation.

MKTG 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of Associate Dean. For business majors: Formal admission to the College of Business.
- Directed research and study on an individual basis.

MKTG 476 INTERNSHIP
On Demand 2 - 12 cr. IND
PREREQUISITE: For business majors: Formal admission to the College of Business and consent of instructor.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MKTG 480 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering. For business majors: Formal admission to the College of Business.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MKTG 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
On Demand 1 - 2 cr. RCT May be repeated.
Max 4 cr.
COREQUISITE: MKTG 490. For business majors: Formal admission to the College of Business.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MKTG 498R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
On Demand 1-6 cr. IND May be repeated.
Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

MKTG 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing consent of instructor, approval of Associate Dean and Dean of Graduate Studies.
- Directed research and study on an individual basis.

ML Modern Languages
Department of Modern Languages & Literatures
(406) 994-4448

ML 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ML 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

ML 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.
<table>
<thead>
<tr>
<th>COURSE DESCRIPTIONS: ML 344 - MLF 449</th>
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<tbody>
<tr>
<td><strong>ML 344 INSTRUCTIONAL PERSPECTIVES</strong></td>
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<tr>
<td>F, S, Su On Demand 1 cr. RCT 1 Maximum 5 cr.</td>
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<tr>
<td>PREREQUISITE: MLF 351 or MLF 352; MLG 350 or MLG 351; MLS 350 or MLS 351.</td>
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<td>– Students learn how various pedagogical approaches are realized through class discussion, observation, and practice under the direction of the faculty mentor.</td>
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| **ML 470 INDEPENDENT STUDY** |
| On Demand 1 - 3 cr. IND Maximum 6 cr. |
| PREREQUISITE: Junior standing, consent of instructor and approval of department head. |
| – Directed research and study on an individual basis. |

| **ML 480 SPECIAL TOPICS** |
| On Demand 1 - 3 cr. Maximum 12 cr. |
| PREREQUISITE: Course prerequisites as determined for each offering. |
| – Courses not required in any curriculum for which there is a time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number. |

| **ML 480R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION** |
| F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr. |
| COREQUISITE: ML 490. |
| – Classroom instruction associated with directed undergraduate research/creative activity projects. |

| **ML 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY** |
| F, S, Su 1 - 8 cr. IND May be repeated. Max 12 cr. |
| PREREQUISITE: Course prerequisites as determined for each offering. |
| – Courses not required in any curriculum for which there is a time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number. |

| **ML 570 INDEPENDENT STUDY** |
| On Demand 1 - 5 cr. IND Maximum 6 cr. |
| PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. |
| – Directed research and study on an individual basis. |

| **ML 580 SPECIAL TOPICS** |
| On Demand 1 - 3 cr. Maximum 12 cr. |
| PREREQUISITE: Upper division courses and others as determined for each offering. |
| – Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number. |

| **ML 588 PROFESSIONAL DEVELOPMENT** |
| On Demand 1 - 3 cr. May be repeated; maximum 5 cr. |
| PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. |
| – Courses offered on a one-time basis to fulfill professional development needs of service educators. A specific focus is given to each course which is appropriately subtitled. |

| **MLA Modern Languages, Arabic** |
| Department of Modern Languages & Literatures |
| (406) 994-4448 |

| **MLA 101 ELEMENTARY MODERN STANDARD ARABIC** |
| F 4 cr. RCT 4 |
| – An elementary level course designed to facilitate students' acquisition of basic proficiency in communication within culturally significant contexts. Students learn Modern Standard Arabic language skills in an environment integrating interactive video and classroom instruction. |

| **MLA 102 ELEMENTARY MODERN STANDARD ARABIC II** |
| S 4 cr. RCT 4 |
| PREREQUISITE: MLA 101 or consent of instructor. |
| – This course builds upon the foundation established in 101. Greater emphasis is placed upon oral and written expression. Cultural issues are explored in an environment integrating interactive video and classroom instruction. |

| **MLF Modern Languages, French** |
| Department of Modern Languages & Literatures |
| (406) 994-4448 |

| **MLF 101 ELEMENTARY FRENCH I** |
| F, S, Su alternate years 4 cr. RCT 4 |
| NOTE: Offered on a rotating basis with German and Spanish in Summer. |
| – An elementary level course designed to help students acquire basic proficiency in communicating within culturally significant contexts. An integrated approach to teaching language skills with emphasis on vocabulary acquisition and basic grammatical structures. |

| **MLF 102D ELEMENTARY FRENCH II** |
| F, S, Su alternate years 4 cr. RCT 4 |
| PREREQUISITE: MLF 101 or equivalent, or two years of high school French. Offered on a rotating basis with German and Spanish in Summer. |
| – This course builds upon the foundation established in 101. Greater emphasis is placed upon oral and written expression. Reading and discussions are designed to increase comprehension of more linguistically complex texts and more conceptually complex cultural issues. |

| **MLF 102D ELEMENTARY FRENCH II** |
| F, S, Su alternate years 4 cr. RCT 4 |
| PREREQUISITE: MLF 102 or equivalent, or a minimum three years of high school French or placement interview. |
| – Intensive, methodical review of grammar and syntax combined with the integrated development of proficiency in the four language skills. Expansion of cultural knowledge and functional vocabulary through intermediate-level readings and discussions. Increased emphasis on written communication. |

| **MLF 201D FRENCH LANGUAGE & CULTURE** |
| S/F 3 cr. RCT 3 |
| PREREQUISITE: MLF 219 or equivalent, or placement interview. |
| – Fourth semester French language course designed to provide basis for advanced level study of French language, literature, and culture. Application of language skills in discussions and explications of selected readings in literature and culture. |

| **MLF 301 HISTOIRE CIVILISATION** |
| S alternate years, to be offered even years 3 cr. RCT 3 |
| PREREQUISITE: MLF 220 |
| – Survey of French culture from the middle ages to modern era; focus on historical, artistic, literary, and social developments. Taught in French. |

| **MLF 302 LA FRANCE AUJOURD'HUI** |
| S alternate years, to be offered odd years 3 cr. RCT 3 |
| PREREQUISITE: MLF 220 |
| – The French personality today in social, cultural, and political settings. Taught in French. |

| **MLF 306H FROM REFLECTION TO REVOLUTION** |
| On demand 3 cr. RCT 3 |
| – Reading and discussion of selected major works from the eighteenth century. All reading and discussions are in English. Majors may be required to do some work in French. |

| **MLF 351 ADVANCED GRAMMAR & COMPOSITION** |
| F alternate years, to be offered odd years 5 cr. RCT 5 |
| PREREQUISITE: MLF 220 |
| – Intensive review of French grammar to increase proficiency in various forms of written expression including business correspondence, problems of translation, and short essays. |

| **MLF 352 ADVANCED CONVERSATION & PHONETICS** |
| F alternate years, to be offered even years 5 cr. RCT 5 |
| PREREQUISITE: MLF 220 |
| – Intensive conversation coupled with a practical study of French phonetics and contrasting comparison with English for teaching application. Various levels of the spoken language from slang to formal speech. |

| **MLF 401 FRENCH LITERATURE I** |
| F alternate years, to be offered even years 5 cr. RCT 3 |
| PREREQUISITE: MLF 220 |
| – Survey of French literature from the Middle Ages through the 18th century. Taught in French. |

| **MLF 402 FRENCH LITERATURE II** |
| F alternate years, to be offered odd years 5 cr. RCT 3 |
| PREREQUISITE: MLF 220 |
| – Survey of French literature of the 19th and 20th centuries. Taught in French. |

| **MLF 449 SEMINAR IN FRENCH LITERATURE AND CULTURE** |
| F 3 cr. SEM 3 |
| COREQUISITE: MLF 401 or MLF 402 |
| – Junior/Senior seminar. The study of Francophone literature and culture. Topic varies with instructor. Taught in French. |
MLG 450R CAPSTONE SEMINAR: ADVANCED RESEARCH IN FRENCH LITERATURE/CULTURE
S 3 cr. SEM 3
PREREQUISITE: MLF 401 or MLF 402.
- Senior capstone course. Advanced research in the study of Francophone literature and culture. Research paper required. Taught in French.

MLG 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MLG 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MLG 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

MLG
Modern Languages, German
Department of Modern Languages & Literatures
(406) 994-4448

MLG 101 ELEMENTARY GERMAN I
F, Su 4 cr. RCT 4
NOTE: Offered on a rotating basis with French and Spanish in Summer.
- An elementary level course designed to help students acquire basic proficiency in communication within culturally significant contexts. An integrated approach to teaching language skills with emphasis on vocabulary acquisition and basic grammatical structures.

MLG 102D ELEMENTARY GERMAN II
S alternate years 4 cr. RCT 4
PREREQUISITE: MLG 101 or equivalent, or two years of high school German. Offered on a rotating basis with French and Spanish in Summer.
- This course builds upon the foundation established in 101. Greater emphasis is placed upon oral and written expression. Reading and discussions are designed to increase comprehension of more linguistically complex texts and more conceptually complex cultural issues.

MLG 219D INTERMEDIATE GERMAN
F, 3 cr. RCT 3
PREREQUISITE: MLG 102 or equivalent, or a minimum three years of high school German, or placement interview.
- Intensive methodical review of grammar and syntax combined with the integrated development of proficiency in the four language skills. Expansion of cultural knowledge and functional vocabulary through intermediate-level readings and discussions. Increased emphasis on written communication.

MLG 220D GERMAN LANGUAGE & CULTURE
S 3 cr. RCT 3
PREREQUISITE: MLG 219 or equivalent, or a placement interview.
- Designed to follow the third semester review of grammar and basic skills. Taught through a series of carefully selected readings in German culture, civilization and literature which will provide the basis for writing essays and reports and developing advanced language skills.

MLG 301 GERMAN CULTURE & CIVILIZATION
S alternate years, to be offered odd years
5 cr. LEC 3
PREREQUISITE: MLG 220
- A survey of some of the great figures and periods of German art, literature, music, and public life in German-speaking countries which have made significant cultural contributions to world civilization up to 1871.

MLG 389H ISSUES OF GERMAN CINEMA
S alternate years, to be offered even years
5 cr. SEM 3
PREREQUISITE: Junior standing or consent of instructor.
- Acquaints students with the traditions of German cinema in national, European and global contexts. Theoretical film analysis of silent film, propaganda film, post-war cinema, rubble film, censored films, New German cinema and other genres. All films, readings, and discussions in English. Mandatory weekly evening film screenings.

MLG 315 SURVEY GERMAN LITERATURE
F alternate years, to be offered odd years
5 cr. RCT 3
PREREQUISITE: MLG 220
- A survey of representative works of German literature from selected literary periods before 1900.

MLG 320 CONTEMPORARY GERMAN LITERATURE
S alternate years, to be offered even years
5 cr. LEC 3
PREREQUISITE: MLG 220
- Literary and cultural analysis of German literary production in the twentieth century and to the present.

MLG 350 ADVANCED GRAMMAR CONVERSATION COMPOSITION I
F alternate years, to be offered even years
5 cr. RCT 3
PREREQUISITE: MLG 220
- An in-depth review of grammar, syntax, and idiomatic expression; vocabulary building practice in conversation. Short readings in German as a basis for conversation and composition. Emphasis on accuracy in grammar and expression.

MLG 351 ADVANCED GRAMMAR CONVERSATION COMPOSITION II
F alternate years, to be offered odd years
5 cr. RCT 3
PREREQUISITE: MLG 220
- An in-depth review of grammar, syntax, and idiomatic expression; vocabulary building practice in conversation. Short readings in German as a basis for conversation and composition. Emphasis on accuracy in grammar and expression.

MLG 360 THE FAUST MYTH
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: MLG 315 or consent of instructor.
- An examination of the German Faust figure in pursuit of knowledge. This theme is explored through the texts of Luther, Goethe, Mann, Bulgakov, and others. All readings and discussions in English.

MLG 387

MLG 410 LINGUISTICS-PHONETICS
S alternate years, to be offered odd years
5 cr. RCT 3
PREREQUISITE: MLG 220
- An overview of significant linguistic concepts which contribute to an understanding of Modern German. Also a practical study of German sounds - their pronunciation, combination, and representation by written symbols. Contrastive linguistic study, German-English, for teaching application.

MLG 450R SEMINAR: GERMAN LITERATURE AND CULTURE
S alternate years, to be offered odd years
5 cr. SEM 3
PREREQUISITE: MLG 301, MLG 315, or MLG 320.
- Senior capstone course. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

MLG 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MLG 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MLG 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

MLJ
Modern Languages, Japanese
Department of Modern Languages, Japanese
(406) 994-4448

MLJ 101 ELEMENTARY JAPANESE I
F 4 cr. RCT 4
- Elementary course designed to help students acquire basic language skills in Japanese: reading, writing, listening, speaking. Introduction to Japanese writing systems (hiragana, katakana, kanji). Emphasis on establishing correct pronunciation and grasp of grammar. Cultural perspectives such as greetings, simple dialogues.

MLJ 102D ELEMENTARY JAPANESE II
S 4 cr. RCT 4
PREREQUISITE: MLJ 101 or equivalent, or placement interview with instructor.
- Continuation of MLJ 101. Expansion of cultural knowledge.

MLJ 219D INTERMEDIATE JAPANESE
F 3 cr. RCT 3
PREREQUISITE: MLJ 102 or equivalent, or placement interview with instructor.
- Review of skills acquired in elementary Japanese, followed by additional study of grammatical patterns and vocabulary acquisition. Emphasis on gaining basic conversational skills and improving reading. Expansion of cultural knowledge.

MLJ 220D JAPANESE LANGUAGE & CULTURE
S 3 cr. RCT 3
PREREQUISITE: MLJ 219 or equivalent, or a placement interview.
- Designed to follow the third semester review of grammar and basic skills. Taught through a series of carefully selected readings in Japanese culture, civilization and literature which will provide the basis for writing essays and reports and developing advanced language skills.
MLJ 220D INTERMEDIATE JAPANESE II
3 cr. RCT 4
PREREQUISITE: MLJ 219 or equivalent, or placement interview with instructor.
- Continuation of MLJ 219. Students who successfully complete this course will have "survival" skills for daily life in Japan, and will be ready for more advanced course work using authentic materials. Expansion of cultural knowledge.

MLJ 301 JAPANESE CULTURE & CIVILIZATION
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: ENGL 121W or consent of instructor
- Survey of Japanese society, literature, art, and religion from earliest times to the modern period. All readings and discussions in English. No knowledge of Japanese necessary.

MLJ 306 JAPANESE PORTRAITS OF WORLD WAR II
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: ENGL 121W and Junior Standing or consent of instructor.
- A study of fictional and nonfiction literature and film on the Japanese experience of World War II. Emphasis on the motives, ideologies, and memories involved in the war. All reading and discussion is in English.

MLJ 315 INTRODUCTION TO JAPANESE LITERATURE
F alternate years, to be offered odd years
3 cr. RCT 3
PREREQUISITE: ENGL 121W or consent of instructor
- A study of Japanese literature from earliest times to the mid-nineteenth century. All readings and discussions in English. No knowledge of Japanese necessary.

MLJ 320 CLASSICAL JAPANESE LITERATURE
S alternate years, to be offered odd years
3 cr. RCT 3
PREREQUISITE: ENGL 121W or consent of instructor
- Study of masterpieces of poetry, drama, and narrative from earliest times to the mid-nineteenth century. All readings and discussions in English. No knowledge of Japanese necessary.

MLJ 321 MODERN JAPANESE LITERATURE
F alternate years, to be offered odd years
3 cr. RCT 3
PREREQUISITE: ENGL 121W or consent of instructor
- A study of novels, short stories, and poems written by Japanese authors from the mid-nineteenth century onward. Covers Japan's initial encounter with the West and the establishment of individual identity. All readings and discussions in English. No knowledge of Japanese necessary.

MLJ 341 WOMEN IN JAPANESE LITERATURE AND CULTURE
S alternate years, to be offered odd years
3 cr. RCT 3
PREREQUISITE: ENGL 121W or consent of instructor.
- A study of Japanese women writers and images of women in Japanese culture from earliest times to the present. No knowledge of Japanese necessary.

MLJ 350 ADVANCED READING & GRAMMAR
F 3 cr. RCT 3
PREREQUISITE: MLJ 220 or placement interview with instructor.
- Review and further development of grammar and vocabulary skills necessary for improved reading proficiency in Japanese. Topics for study address Japanese culture and society through manga/cartoons, newspapers, magazines, correspondence, and short essays, with some translation and comparison with English.

MLJ 351 ADVANCED COMMUNICATION & COMPOSITION
S 3 cr. RCT 3
PREREQUISITE: MLJ 220 or placement interview with instructor.
- Review and further development of communication skills with an emphasis on both speaking and writing for various occasions. Cultural and social topics are explored through authentic materials to enhance knowledge of Japan and its people.

MLJ 361 TEXT & CINEMA
F alternate years, to be offered even years
3 cr. RCT 3
PREREQUISITE: ENGL 121W or consent of instructor
- Study of several fine Japanese films and the literary works upon which they were based. Emphasis is on the transformation of written text into image. All readings and discussions in English.

MLJ 371 JAPANESE FILM & ANIME
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: ENGL 121W or consent of instructor
- An introduction to the history and art of Japanese cinema, including its possibilities for exploring Japanese culture, the techniques of major film artists, and theoretical approaches to film. All reading and discussion is in English.

MLJ 450R SEMINAR: JAPANESE LITERATURE AND CULTURE
S 3 cr. SEM
PREREQUISITE: MLJ 315 or MLJ 301
- Senior capstone course. Topics offered at the upper division level which are not covered in regular courses. Students conduct individual research projects while also preparing and presenting discussion materials.

MLJ 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su alternate years 4 cr. RCT 4
PREREQUISITE: MLJ 219 or equivalent, or placement interview.
- Designed to follow the third semester review of grammar and basic skills. Taught through a series of carefully selected readings in Spanish culture, civilization, and literature which will provide the basis for writing essays and reports and developing advanced language skills.

MLS 101 ELEMENTARY SPANISH I
F, Su alternate years 4 cr. RCT 4
NOTE: Offered on a rotating basis with French and German in the summer.
- An elementary level course designed to help students acquire basic proficiency in communicating within culturally significant contexts. An integrated approach to teaching language skills with emphasis on vocabulary acquisition and basic grammatical structures.

MLS 102D ELEMENTARY SPANISH II
F, S 3 cr. RCT 3
PREREQUISITE: MLS 101 or equivalent, or two years of high school Spanish. Offered on a rotating basis with French and German in Summer.
- This course builds upon the foundation established in 101. Greater emphasis is placed upon oral and written expression. Reading and discussions are designed to increase comprehension of more linguistically complex texts and more conceptually complex cultural issues.

MLS 219D INTERMEDIATE SPANISH
F, S 3 cr. RCT 3
PREREQUISITE: MLS 102 or equivalent, or a minimum three years of high school Spanish. Offered on a rotating basis with French and German in Summer.
- Intensive, methodical review of grammar and syntax combined with the integrated development of proficiency in the four language skills. Expansion of cultural knowledge and functional vocabulary through intermediate-level readings and discussions. Increased emphasis on written communication.

MLS 220D SPANISH LANGUAGE & CULTURE
F, S 3 cr. RCT 3
PREREQUISITE: MLS 219 or equivalent, or placement interview.
- Designed to follow the third semester review of grammar and basic skills. Taught through a series of carefully selected readings in Spanish culture, civilization, and literature which will provide the basis for writing essays and reports and developing advanced language skills.

MLS 301 SPANISH CULTURE & CIVILIZATION
F 3 cr. LEC 3
PREREQUISITE: MLS 220
- Readings, lectures, and discussions in Spanish.
This course examines the historical, social, and ideological aspects of Spanish culture from the Middle Ages to the modern period. Taught in Spanish.

MLS 302 LATIN AMERICAN CULTURE & CIVILIZATION
F 3 cr. LEC 3
PREREQUISITE: MLS 220
- Readings, lectures and discussions in Spanish.
This course examines the historical, social, and ideological aspects of modern Latin American culture. Taught in Spanish.
COURSE DESCRIPTIONS: MLS 303 - MSG 270

MLS 303 US LATINO CULTURE & CIVILIZATION
F 3 cr. LEC 3
PREREQUISITE: MLS 220 for majors and minors; junior standing for non-majors
- Examines the history and culture of Latino communities in the US. It centers on the largest Hispanic populations found in the US today: Mexican, Dominican, Puerto Rican, and Cuban. Taught in English. Spanish majors and minors will read and write in Spanish.

MLS 320 SURVEY OF SPANISH LITERATURE
S alternate years, to be offered every 3 cr. LEC 3
PREREQUISITE: MLS 301
- A survey of Spanish literature from the Middle Ages to the modern period through an examination of the masterpieces of each literary period. Taught in Spanish.

MLS 321 CONTEMPORARY LATIN AMERICAN LITERATURE
S 3 cr. LEC 3
PREREQUISITE: MLS 302
- An examination of the major authors, works, and literary movements of the 19th and 20th centuries as Latin American literature has come of age and established its independence from Spanish peninsular influences. Taught in Spanish.

MLS 322 SURVEY OF US LATINO LITERATURE
F 3 cr. LEC 3
PREREQUISITE: MLS 220 for majors & minors; or junior standing for non-majors.
- Examination of the major authors, works, and literary movements of U.S. Latino literature. Taught in English. Spanish majors and minors will read and write in Spanish.

MLS 350H TRAVEL IN LATIN AMERICA LITERATURE & FILM
Su 3 cr. RCT 3
PREREQUISITE: MLS 220 or junior standing.
- The course examines travel in Latin America using texts and films as exploration and search for individual and national identity and as disruptive displacements caused by political and economic forces and the problems of adapting to a new environment. Taught in English.

MLS 350 ADVANCED READING AND GRAMMAR
F 3 cr. LEC 3
PREREQUISITE: MLS 220
- In-depth review of problem areas in grammar, complete review of the verb system and a practical study of Spanish sounds. This class is designed to provide prospective teachers and advanced students with an understanding of the function of Spanish grammar. Taught in Spanish.

MLS 351 ADVANCED COMMUNICATION & COMPOSITION
S 3 cr. RCT 3
PREREQUISITE: MLS 350
- Development and refinement of advanced oral and writing skills, intensive practice in expository and imaginative composition, review of idiomatic expressions, and vocabulary expansion.

MLS 360 HISPANIC TEXTS AND CINEMA
S 3 cr. LEC 3
PREREQUISITE: Junior standing
- This course will focus on different topics of Latin American and/or Spain through the reading and viewing of a variety of Hispanic literature and movies. These themes may include history, race, gender, politics and literary trends in Latin America or Spain. Focus will vary depending on the professor in Spanish.

MLS 363 HISPANIC POETRY
F 3 cr. SEM 3
COREQUISITE: MLS 350
- Examines 20th century poetry from several Latin American countries and Spain including the poets' biographies and their historical, social, and political contexts. Students will watch three movies pertaining to Hispanic poets and also listen to music that uses poetry in Spanish.

MLS 415 LATIN AMERICAN PERSPECTIVES: HISTORY, CULTURE, AND IDENTITIES IN THE TWENTIETH CENTURY
S 3 cr. LEC 3
PREREQUISITE: MLS 220 or equivalent.
- This course approaches historical developments, literature, and constructions of identity in twentieth-century Latin America. Taught in English with Spanish reading/writing option. Focus will vary by professor.

MLS 420 CULTURE AND REVOLUTION
F 3 cr. RCT 3
PREREQUISITE: MLS 220
- An intensive study of the cultural materials produced as a result of dictators and revolutions in Latin America and Spain including movies, documentaries, songs, literature and art. Will encourage the understanding of the mutual influence between historical events and cultural production in Hispanic countries. Focus will vary depending on the professor in Spanish.

MLS 450R SEMINAR: MODERN HISPANIC LITERATURE
F, S 3 cr. SEM 3
PREREQUISITE: MLS 301 or MLS 302 or MLS 320 or MLS 321
- Senior capstone course. An in-depth examination of the most important Hispanic works and authors of the 19th and 20th, and 21st centuries. Taught in Spanish.

MSG 204 LEADERS TRAINING COURSE
Su 5 cr. LAB 1
PREREQUISITE: Consent of Professor of Military Science - Practical application of basic knowledge required of an army officer. Subject matter parallels 100 and 200 level courses. Satisfies prerequisites for advanced course in lieu of the basic course.
MSG 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MSG 301 SMALL UNIT TACTICS AND METHODS OF INSTRUCTION
F 3 cr. LEC 2 LAB 1
PREREQUISITE: MSG 101, MSG 103, MSG 201, MSG 200, or MSG 204.
The study, practice and evaluation of adaptive leadership skills. Small unit tactical operations are used to develop self awareness and critical thinking. Preparation for Leader Development and Assessment Course. A lab component including a field training exercise is required.

MSG 302 PREPARATION FOR LEADER DEVELOPMENT AND ASSESSMENT COURSE
S 3 cr. LEC 2 LAB 1
PREREQUISITE: MSG 301.
A situational leadership challenges are used to build awareness and skills in leading small units. Skills in decision-making, persuading and motivating team members are explored, evaluated and developed. Preparation for Leader Development and Assessment Course. A lab component including a field training exercise is required.

MSG 303 MILITARY SCIENCE LEADER DEVELOPMENT AND COURSE
Su 5 cr. LAB 3
PREREQUISITE: MSG 302. Enrollment restricted to successful completion of MSG 301 and MSG 302 and the Professor of Military Science’s approval.
Practical exercise in tactical, technical, and administrative duties common to all branches of the Army. Development of leadership and the ability to function effectively in small unit operations.

MSG 401 SENIOR SEMINAR I
F 3 cr. LEC 2 LAB 1
PREREQUISITE: MSG 302, approval of instructor.
Study of military justice system and international instructor, and approval of department head.
Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MSG 400 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MSG 409R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MSG 490.
Classroom instruction associated with directed undergraduate research/creative activity projects.

MSG 409R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated, Max 12 cr.
Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

MSSE Master Of Science Education
Division of Graduate Education
(406) 994-5679

MSSE 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MTA Media & Theatre Arts
Department of Media & Theatre Arts
(406) 994-2484

MTA 101A FILM IN AMERICA
F 3 cr. LEC 1 LAB 2
Survey of the development of the motion pictures as an art, a craft and a business in the United States during the 20th century.

MTA 102 AESTHETICS OF FILM PRODUCTION
F, S 3 cr. RCT 3
An understanding of motion pictures, video art and television production. Visual and production styles, including sets, costumes, lighting, and sound, are examined in the context of film history.

MTA 103A UNDERSTANDING PHOTOGRAPHY
F, S, Su 3 cr. LEC 2 LAB 1
An introductory application of basic photographic theory and visual principles, including camera operation, use of B&W darkroom, and photographic assignments. Photography majors must take this class fall semester to fit into the sequential nature of the Photography program.

MTA 104 THEATRE AND MASS MEDIA
S 3 cr. LEC 3
An exploration of major plays from the history of drama via contemporary film and television equivalents.

MTA 106 INTERMEDIATE PHOTOGRAPHY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: B or better in MTA 105 and registration as a Photography major.
Theory and continued application of image control in B&W photography, through the use of a variety of 35mm films and the introduction of basic zone system principles. Advanced traditional B&W printing techniques in preparation for portfolio review.

MTA 218D INTERNATIONAL FILM & TELEVISION
F 3 cr. LEC 1 RCT 1 LAB 1
A close analysis and interpretation of the social function and cultural value of film and television in other countries by comparative approaches, with emphasis on the period since World War II.

MTA 222 LIGHTING TECHNIQUE AND DESIGN
F 3 cr. LEC 1 RCT 2
PREREQUISITE: Sophomore standing or MTA.
An introduction to the aesthetics and technical principles of lighting for film and theatre with attention to familiarity with basic instruments and a lighting board. The opportunity for an exercise in lighting design will be provided.

MTA 232 ACTING I
F 3 cr. LEC 1 RCT 2
PREREQUISITE: Sophomore standing in MTA.
An introduction to the basic skills of acting through acting exercises and individual projects, including a unit for acting for the camera.

MTA 233 BASIC PRODUCTION OPERATIONS AND TECHNIQUES
S, Su 1 - 3 cr. Maximum 12 cr. Total for both MTA 233 and MTA 335 combined.
PREREQUISITE: MTA 102 or MTA 103.
Practical experience associated with production and research project in motion pictures, television/video, photography, and theatre. May include rehearsal or performance activity. Credit will be offered to students doing basic work on faculty members’ productions or on student productions under direct faculty supervision. Credit will be offered to students giving basic technical support to: a) faculty teaching courses, b) faculty engaged in creative activities, or c) advanced students’ productions (while supervised by an MTA faculty member).

MTA 251 WRITING
S 3 cr. RCT 3
PREREQUISITE: Sophomore standing in MTA.
Experience in techniques and concepts of writing for motion picture and video production.

MTA 252 EDITING
F 3 cr. LEC 1 RCT 2
PREREQUISITE: Sophomore standing in MTA.
History and techniques of motion picture and video editing. The course will combine lectures with hands-on exercises in editing.

MTA 253 DIRECTING
S 3 cr. RCT 2 LAB 1
PREREQUISITE: MTA sophomore standing in MTA.
An examination of the theory and practice of directing and working with actors. Students complete projects for the stage and for filming during the semester.
MTA 254 SOUND
S 3 cr. LEC 1 RCT 2
PREREQUISITE: Sophomore standing MPVT.
- Theoretical and practical approaches to the motion picture soundtrack. Topics and exercises will include field recording, post-production, sound design, and the musical score

MTA 255 CINEMATOGRAPHY/VIDEOGRAPHY
F 3 cr. LEC 1 RCT 1
PREREQUISITE: Sophomore standing in MPVT.
- An examination of the aesthetics and practice of cinematography using 16mm film and digital video cameras.

MTA 260 INTRODUCTION TO COLOR PHOTOGRAPHY
F 4 cr. LEC 2 LAB 1 RCT 1
PREREQUISITE: B or better in MTA 103 and MTA 106 and Sophomore standing in the Photography option.
- Introduction and analysis of color theory, color imagery and color materials. Exploration of image capture via film, scanning and digital cameras. Technical skills are developed in digital systems, applications and printing. Critical exploration of color visual language and aesthetic issues.

MTA 261 PRODUCTION DESIGN
S 3 cr. LEC 2 LAB 1
PREREQUISITE: Sophomore standing in MPVT.
- Introductory course in production design for theatre, film, and video.

MTA 263 STAGE MAKEUP AND COSTUME DESIGN THEORY
On Demand 3 cr. RCT 2
PREREQUISITE: MTA 104.
- Theory and practical experience in various aspects of makeup for stage, screen, and studio, integrated with basic costume design theory.

MTA 264 ADVANCED BLACK AND WHITE PHOTOGRAPHY
S 4 cr. LEC 2 LAB 2
PREREQUISITE: MTA 106 and MTA 260.
- Introduction to large format black and white theory and practice. Basic studio and lighting techniques will be addressed as well as advanced contrast control through application of the zone system and an eye toward future digital technologies.

MTA 290 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MTA 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MTA 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. END may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

MTA 301 INVESTIGATIONS INTO PHOTOGRAPHY
F 3 cr. LEC 3
PREREQUISITE: Junior Standing.
- The critical exploration of photography as cultural phenomenon, personal expression and art form. Emphasis on aesthetic, ethical, and political issues raised through application of the medium and consumption of its products.

MTA 303 EARLY HISTORY OF PHOTOGRAPHY
S alternate years, to be offered every odd year 3 cr. LEC 3
PREREQUISITE: MTA 103, ENGL 121.
- The visual and technical evolution of photography within the cultural context. Personalities, ideas, and style of individual photographers are explored. Prehistory to 1913.

MTA 304 RECENT HISTORY OF PHOTOGRAPHY
S alternate years, to be offered every even year 3 cr. LEC 3
PREREQUISITE: MTA 103, ENGL 121.
- Continued exploration of the visual and technical evolution of photography from 1913 to the present, including study of criticism and the relationship to contemporary culture and art.

MTA 318 WORLD CINEMA
On Demand 3 cr. LEC 1 RCT 2
PREREQUISITE: Junior standing in MPVT Option curriculum (i.e., all freshmen and sophomore MTA requirements are pre-requisites).
- An advanced introduction to the theories which enable an understanding of the national cinemas practiced in light of, outside of, the influence of Hollywood. Focus on particular national cinemas varies by semester, but may include examinations of major European cinemas, Asian cinema, and/or the cinemas of the developing world.

MTA 319 ALTERNATIVE PROCESSES
S 4 cr. RCT 2 STU 2
- Image creation through the use of historical contact printing processes. A variety of alternative processes will be addressed such as gum printing, cyanotype, and platinum/palladium. Extensive aesthetic exploration will be supported through a blend of the old processes and current digital negative making techniques.

MTA 333 ADVANCED PRODUCTION OPERATIONS AND TECHNIQUES
F, S, Su on demand, 2-4 cr. RCT 2-4. May be repeated. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MTA 341 PORTRAITURE
On Demand 4 cr. RCT 2 STU 2
- Advanced portrait techniques, theory, and practice in studio and on location. Emphasis on creative exploration and application of a variety of styles in portraiture, such as informal, editorial, environmental, etc.

MTA 342 ADVANCED LIGHTING PRACTICES
F 4 cr. RCT 2 STU 2
- Advanced photographic theory and practice in studio and on location. Emphasis given to creative aspects of artificial lighting and staged subject matter in all camera formats.

MTA 343 NON-FICTION PHOTOGRAPHY
S 4 cr. LEC 2 RCT 2
- The applied study of photography as a narrative medium, emphasizing the practices and uses of non-fiction, editorial and essays using digital and analog processes.

MTA 344 EXPERIMENTAL PHOTOGRAPHY
F 4 cr. LEC 2 LAB 2
- The applied study of experimental photographic techniques. These techniques will be explored in image capture as well as traditional darkroom working methods.

MTA 347 INTERDISCIPLINARY FILM & MUSIC PROJECTS
On Demand 3 cr. RCT 3
PREREQUISITE: MTA Majors: MTA 254 and consent of instructor. Cross listed with MUS 347.
- For upper-level Film and Music Technology students. Exploration of cross-disciplinary techniques in multimedia art. Individual and collaborative projects with visuals and sound. Overview of the history of audio art, video art and experimental film.

MTA 360 ADVANCED COLOR PHOTOGRAPHY
S 4 cr. LEC 2 LAB 2
- Further applied study of color visual theory and the control of materials for color photographic expression. Emphasis on application of alternative forms, including animation, multimedia, interactivity, and the internet, to individual aesthetic practices.

MTA 361 PHOTOGRAPHY: PROFESSIONAL PRACTICES
F 4 cr. LEC 2 RCT 2
- Introduction to professional practices in photography. Emphasis on the fundamentals of business and marketing to prepare for entering the photographic profession.

MTA 370 PROFESSIONAL PRACTICES
F, S, Su on demand, 3-4 cr. RCT 2-4. May be repeated. Maximum 12 cr.
PREREQUISITE: Junior standing in MPVT.
- Projects pursued under faculty supervision, emphasizing an area of specialization in Theatre, Film or Video relating to professional practices. Details of individual sections and the supervising faculty will be posted by the department prior to pre-registration.
MTA 371 JUNIOR PRODUCTION
PROCESS: NONFICTION
F, S 4 cr. RCT 4
PREREQUISITE: Junior standing in MPVT.
- Projects pursued under faculty supervision, emphasizing fiction production using traditional and non-traditional approaches, from conception and post-production to post-production. Details of individual sections and the supervising faculty will be posted by the department prior to pre-registration.

MTA 372 JUNIOR PRODUCTION
PROCESS: FICTION
F, S 4 cr. RCT 4
PREREQUISITE: Junior standing in MPVT.
- Projects pursued under faculty supervision, emphasizing fiction productions using traditional and non-traditional approaches from pre-production through post-production. Details of individual sections and the supervising faculty will be posted by the department prior to pre-registration.

MTA 374 JUNIOR PRODUCTION: THEATRE
F 4 cr. RCT 4
PREREQUISITE: Junior standing in MPVT.
- Projects pursued under faculty supervision, emphasizing the theatrical production processes. Specific emphasis may include acting, directing, management, technical theatre and/or theatrical design.

MTA 377D WHITENESS AND MASCULINITY IN CINEMA
On Demand 3 cr. LEC 1 RCT 2
PREREQUISITE: MTA 101 or permission of instructor.
- This course uses the methodologies of whiteness and masculinity studies to interrogate how issues of identity are contested within the representational practices of the cinema.

MTA 379 FILM CRITICISM
On Demand 3 cr. LEC 1 RCT 2
- This course models an intelligent encounter with contemporary cinema. By attendance at, and discussion of, films in current release, students will learn to think, talk effectively, and write about the importance of movies in everyday life.

MTA 400 PRODUCTION SEMINAR
F, S Su 1 - 4 cr. SEM Maximum 32 cr.
PREREQUISITE: Junior standing or permission of instructor and as determined for each offering.
- Topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

MTA 401 STUDIES SEMINAR
F, S 1 - 12 cr. SEM May be repeated.
PREREQUISITE: Junior standing or permission of instructor.
COREQUISITE: Sophomore level.
- Studies topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

MTA 444 PROFESSIONAL PRACTICES-L.A. FIELD TRIP
Su 3 cr. SEM
COREQUISITE: Consent of the instructor.
- This course prepares the students for an intensive encounter with accomplished professionals in the motion picture, video, and television industries.

MTA 470 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

MTA 472 MOTION PICTURE/TV/VIDEO/THEATRE SENIOR PRODUCTION
F, S 2 cr. RCT 2 May be repeated Maximum 10 credits
PREREQUISITE: Senior standing in MPVT and faculty supervision in small workshop groups.
COREQUISITE: MTA 474.
- Senior capstone course. A final series of television programming, video production projects, a stage production, or the production of a complete motion picture.

MTA 473 PHOTOGRAPHY SENIOR PRODUCTION
F, S 2 cr. RCT 2 May be repeated Maximum 4 credits
PREREQUISITE: Senior standing in the Photography option.
COREQUISITE: MTA 475.
- Senior capstone course. Independent production of a significant body of work in photography; extensive production combined with group critique and faculty consultation.

MTA 474 INDEPENDENT MOTION PICTURE/TV/VIDEO/THEATRE SENIOR PRODUCTION
F, S 3 cr. IND 3
COREQUISITE: MTA 472.
- Independent production supporting MTA 472.

MTA 475 INDEPENDENT PHOTOGRAPHY SENIOR PRODUCTION
F, S 3 cr. IND 3 May be repeated Maximum 6 credits.
COREQUISITE: MTA 473.
- Independent production work supporting MTA 473.

MTA 476 CAREER INTERNSHIP
F, S, Su 2-12 cr. IND
PREREQUISITE: Consent of instructor.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MTA 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in a curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MTA 489R UNDERGRADUATE RESEARCH/CREATIV ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: MTA 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MTA 490R UNDERGRADUATE RESEARCH/CREATIVITY
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Senior standing in MPVT.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

MTA 504 FILM AND DOCUMENTARY THEORY
F 5 cr. LEC 3
- An advanced introduction to the methods developed for studying the fiction, documentary and experimental film over the past 100 years.

MTA 505 CRITICISM AND THEORY I
F 5 cr. LEC 3
- A close analysis and interpretation of the social function and cultural value of science and natural history films, with a particular emphasis for broadcast nationally and internationally.

MTA 506 CRITICISM AND THEORY II
S 3 cr. LEC 3
- An advanced introduction to the critical methodologies necessary for intelligently interrogating the representations of natural history, science, and technology in print and media.

MTA 510 PRODUCTION TECHNIQUE I
F 2 cr. LEC 2
- Basic field production techniques in film, video, sound, editing for MFA students. Train on digital video, 16 mm cinematography, sound recording and digital nonlinear editing.

MTA 511 PRODUCTION TECHNIQUE II
F 3 cr. LAB 3
- Basic field production techniques in film, video, sound, editing. Train on digital video, 16 mm cinematography, sound recording and digital nonlinear editing.

MTA 512 PRODUCTION METHODS & STUDIES I
F 2 cr. LEC 2
COREQUISITE: MTA 510, 511.
- An introduction to working professionals and faculty that examines successful filmmaking methodologies. May include presentations, forums or seminars designed to explore specific actual production scenarios on a variety of documentary subjects including producing, directing, cinematography, sound, editing, grant writing, distribution and funding.

MTA 515 PRODUCTION TECHNIQUE III
S 2 cr. LEC 2
PREREQUISITE: MTA 510, MTA 511.
- Production Technique III teaches advanced production techniques used by professional science and natural history film makers in high definition digital imaging, 16mm cinematography, location and studio sound recording techniques, and advanced post-production procedures.

MTA 516 PRODUCTION TECHNIQUE IV
S 3 cr. LEC 3
PREREQUISITE: MTA 510, 511.
COREQUISITE: MTA 515.
- Advanced field and studio production exercises in equipment use and applications, including high definition digital imaging, 16mm cinematography, location and studio sound recording and advanced editing and digital effects.
MTA 517 PRODUCTION METHODS & STUDIES II
S 2 cr. LEC 2
PREREQUISITE: MTA 510, 511, 512.
COREQUISITE: MTA 515, 516.
- A master class where working professionals and faculty present and examine successful advanced filmmaking aesthetics and applied methodologies. May include presentations, forums, workshops or seminars designed to explore specific professional film applications on a variety of documentary subjects including producing, directing, cinematography, sound, editing, grant writing, distribution and festivals.

MTA 518 WRITING
S 3 cr. LEC 3
PREREQUISITE: MTA 501 is highly recommended.
- Creative non-fiction introduces central concept of narrative common to the science and history film text. The course examines and questions the models of non-fiction writing and challenges the biases surrounding this genre.

MTA 520 PRINCIPLES OF PRODUCTION MANAGEMENT
S 3 cr. LEC 3
- All phases of the production process for the producer of documentary films examined from practical and creative points of view; includes strategies for producing a proposal that bridges the distance between idea and underwriting with realistic schedules and accurate budgets.

MTA 550 SCIENCE/NATURAL HISTORY ROTATION
F, S, Su 2 cr. IND 2
- On-site learning with scientist(s). This prepares students for area of project proposal.

MTA 551 BUSINESS AND LEGAL PRACTICE: POST-PRODUCTION
F, S, Su 1 cr. LAB 1
PREREQUISITE: MTA 550 and 552.
- A committee directed course in which the students begin the post-production phase and concludes with the completion of their second year project.

MTA 552 ADVANCED CINEMATOGRAPHY
Su, F 1 cr. LAB 1
PREREQUISITES: MTA 515 and MTA 516 and permission of instructor.
- Advanced techniques on the DSR 570 and HD Cameras and Lighting.

MTA 553 ADVANCED PRODUCTION I
F, S, 4 cr. LEC 4
PREREQUISITE: MTA 510, 511, 512, 515, 516, 517.
COREQUISITE: MTA 572.
- Pre-production and production of the second year agenda-based professional project sponsored by a hosting agency that finds significant usage. Proposals and treatments are to be polished and refined so that dialogues with broadcasters and hosting agencies can be effectively initiated and funding fully secured. With approval of advisor and graduate committee, production sequence may begin.

MTA 554 PRODUCTION PRACTICUM: PRE-PRODUCTION
F 2 cr. IND 2
PREREQUISITE: MTA 551.
- The rotation proposal workshop makes students begin the pre-production phase and the presentation of deliverables to the hosting agency and/or broadcast and distribution venues.

MTA 555 ADVANCED PRODUCTION II
S 4 cr. LEC 4
PREREQUISITE: MTA 510, 511, 512, 515, 516, 517.
- Production and post-production of the second year agenda-based professional project that finds significant usage. Production and/or post production work is to be completed and deliverables presented to the hosting agency. Selects and all cuts are to be screened and critiqued by the hosting agency and by the advisor and graduate committee. The post production phase concludes with the completion of the second year project and the presentation of deliverables to the hosting agency and/or broadcast and distribution venues.

MTA 556 POST PRODUCTION MEETS INFORMATION DESIGN
F 3 cr. RCT 3
PREREQUISITE: Completion of MFA First Year curriculum.
- This course will teach advanced post-production and information design skills to Graduate MFA students. The course is tailored specifically to the needs of students training to be science and natural history filmmakers.

MTA 558 PRODUCTION PRACTICUM: POST-PRODUCTION
S 3 cr. IND 3
PREREQUISITE: MTA 550 and 552.
- A committee directed course in which the students begin the post-production phase and concludes with the completion of their second year project.

MTA 570 INDEPENDENT STUDY
On Demand 1 cr. LAB 1
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

MTA 571 FIRST YEAR PROJECT
S 3 cr. IND 3
- Course replaces MTA 591, MTA 592 and MTA 593.

MTA 572 THESIS PREPARATION
S 1 cr. LAB 1
PREREQUISITE: MTA 510, 511, 512, 515, 516, 517.
COREQUISITE: MTA 552 or 553.
- Proposals and treatments are distributed to project advisor and to the graduate committee by the first day of fall semester for workshop review and critique. Pre-production, production and post-production schedule milestones must be determined in conjunction with advisor and graduate committee who provide oversight for the entire second year project production sequence. Due to the widely varying nature and unique demand of each project, those unable to meet the preferred residency requirements for their second year project and this course must adhere to a strict teleconference meeting schedule with their advisor and graduate committee and meet all due date requirements for materials review.

MTA 573 SECOND YEAR PROJECT
F, S, Su 2-15 cr. IND 2-15
PREREQUISITE: MTA 510, 511, 512, 515, 516, 517.
- This course allows the student to spend a semester working in a professional environment under the guidance of a mentor.

MTA 574 ADVANCED STUDIES
S 3 cr. IND 3
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MTA 575 INTERNSHIP
F, S, Su 1-12 cr. IND 1-12
PREREQUISITE: MTA 510, 511, 515, and 516.
- This course provides the student with the skills to record, edit, and create broadcast quality audio for documentary films and videos. Students will learn audio editing and processing using Pro Tools, the film industry standard for post production sound.

MTA 576 INTERNSHIP
F, S, Su 3 cr. IND 3
PREREQUISITE: MTA 510, 511, 512, 515, and 516.
- The rotation proposal workshop makes students begin the pre-production phase and the presentation of deliverables to the hosting agency and/or broadcast and distribution venues.

MTA 577 ADVANCED CINEMATOGRAPHY WORKSHOP
On Demand 3 cr. LEC 3
PREREQUISITE: Restricted to students accepted into the MFA program.
- This course will provide students with the skills to record, edit, and create broadcast quality audio for documentary films and videos. Students will learn audio editing and processing using Pro Tools, the film industry standard for post production sound.

MTA 578 ADVANCED CINEMATOGRAPHY WORKSHOP
S 1 cr. LAB 1
PREREQUISITE: MTA 501, 511, 512, 515, 516, 517.
- An advanced course in which students will master high-definition camera in order to qualify for use in the MFA program in science and natural history filmmaking.

MTA 579 ADVANCED CINEMATOGRAPHY WORKSHOP
F, S 1 cr. LAB 1
PREREQUISITE: MTA 510, 511, 512, 515, 516, 517.
- An advanced course in which students will master high-definition camera in order to qualify for use in the MFA program in science and natural history filmmaking.

MTA 580 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Masters Standing and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a triad basis to determine acceptability and demand before requesting a regular course number.

MTA 589 GRADUATE CONSULTATION
F, S, Su 3 cr. IND 3
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

MTA 590 MASTER'S THESIS
F, S, Su 1-15 cr. IND 1-15
PREREQUISITE: Master's standing/Restricted Entry.
- Course replaces MTA 591, MTA 592 and MTA 593. Maximum of 8 credits per semester. Back to Subject Areas
MUED 500 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

MUED 504 STUDIES
IN HISTORY AND ANALYSIS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: MUS 206, MUS 510, MUS 511.
Review and study of the history of music, with an emphasis on specific works. Review and practice of analytical and theoretical procedures and concepts in a variety of musical genres and styles.

MUED 515 CONTEMPORARY DIRECTIONS IN MUSIC
Su on demand 2 cr. LEC 2
PREREQUISITE: MUS 511.
- In-depth investigation of musical styles prevalent in western music between 1975-present.

MUED 519 WORLD MUSIC
F, Su on demand 2 cr. LEC 2
PREREQUISITE: MUS 511.
- Approaches to and use of music in world cultures. The influence of world musics on Western music.

MUED 520 MONTANA CHAMBER MUSIC WORKSHOP
Su 2 cr. LAB 2
PREREQUISITE: MUS 260, MUS 356 and consent of instructor.
- Students investigate the wealth of chamber music literature that includes their own instrument in various instrumental combinations, through coached playing assignments and in performance forums.

MUED 530 MUSIC, SOCIETY AND EDUCATION
Su alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: EDEL 410, EDSD 410
- Philosophical, historical, psychological and social foundations of music education. Music in public education, music curricula, aesthetics, and music learning theory.

MUED 532 MUSIC EDUCATION: RESEARCH AND PRACTICE
Su alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: EDEL 410, EDS 410
- Examination and close study of research in music education and its implications for practice.

MUED 555 TEACHING MUSIC LITERACY
Su on demand 2 cr. LEC 2
PREREQUISITE: EDEL 357.
- Analysis of the foundations of music literacy, contemporary trends in music reading and writing instruction and research related to these issues.

MUED 540 ADVANCED CONDUCTING
Su on demand 2 cr. RGT 2
PREREQUISITE: MUS 537 or MUS 338.
- Conducting techniques, score study and rehearsal procedures for direction of instrumental and choral groups in the public schools.

MUED 542 GRADUATE VOCAL PEDAGOGY
S alternate years, 2 cr. SEM 2
PREREQUISITE: MUS 442
COREQUISITE: Must be an active music educator.
- Online/Seminar delivery centers around classroom application of vocal methodologies in the studio and classroom. Course content will include the study of vocal physiology and acoustics.

MUED 550 APPLIED MUSIC
F, S, Su 1 cr. STU 1 May be repeated; Maximum 12 cr.
PREREQUISITE: MUS 460 and consent of instructor.
- Advanced studies of techniques of performance and interpretation to develop musical ability, expression, accuracy and stylistic awareness in student's performance area.

MUED 555 GRADUATE RECITAL
F, S, Su 1 cr. IND 1
PREREQUISITE: MUED 560.
- Formal recital to include works from different eras.

MUED 570 INDEPENDENT STUDY
On Demand 1 - 6 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

MUED 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

MUED 576 INTERNSHIP
On Demand 2 - 12 cr. IND Maximum credits unlimited
PREREQUISITE: Graduate standing, consent of instructor and Department Head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

MUED 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MUED 585 PROFESSIONAL DEVELOPMENT
On Demand 1 - 5 cr. May be repeated; maximum 5 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

MUS Music
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MUS 102A FUNDAMENTALS OF MUSICAL CREATION
F, S 3 cr. LEC 1 RCT 1 LAB 1
- Open to all students. Study of the elements of music and their combination in musical creation. Activities include the acquisition of keyboard skills, exploration of traditional harmonic theory and exercises in music reading, analysis, and composition.

MUS 105 AURAL SKILLS I
F 1 cr. LAB 1
PREREQUISITE: Music reading pre-test.
COREQUISITE: MUS 105.
- Studies in ear training and sight-singing to develop aural perception of tonal and temporal relationships. Primarily for students with planned concentration in music. Assumes knowledge of musical notation.
MUS 104 AURAL SKILLS II
S 1 cr. LAB 1
PREREQUISITE: MUS 103.
Continuation of study in ear training and sight-singing to develop aural perception of tonal and temporal relationships. Primarily for students with planned concentration in music.

MUS 105 MUSIC THEORY I
F 3 cr. LEC 3
PREREQUISITE: Music fundamentals pre-test.
COREQUISITE: MUS 103.
Music fundamentals, diatonic harmony and elementary counterpoint. Successful completion of Music Fundamentals Pre-test (administered during the first class meeting and covering scales, rhythm/meter, clefs, and key signatures) required for enrollment in this course.

MUS 106 MUSIC THEORY II
S 3 cr. LEC 3
PREREQUISITE: MUS 105.
Continuation of study of materials used in the previous semester: diatonic harmony and analysis in the common practice style, musical notation and language, function and interaction of the elements of music.

MUS 115 INTRODUCTION TO DIGITAL MUSIC
F, S 5 cr. LEC 3
First course in the Music Technology Sequence. Concepts and terms, creative projects using software and hardware, historical background, an introduction to the music industry, and tools for building self-directed careers within the changing field of music technology.

MUS 120 MARCHING BAND
F 1 cr. LAB 1 May be repeated, Maximum 8 cr.
Non-auditioned ensemble offering experience in marching techniques and outdoor performances.

MUS 125 UNIVERSITY CHORUS
F, S 1 cr. LAB 1 May be repeated, Maximum 8 cr.
PREREQUISITE: Consent of instructor.
Intermediate, mixed-voice choir performing a variety of concert music.

MUS 130 TECHNIQUES: FLUTE & CLARINET
F 1 cr. LAB 1
Teaching techniques, materials and basic playing approaches for flute and clarinet. For music education students.

MUS 131 TECHNIQUES: SAX, OBOE & BASSOON
S 1 cr. LAB 1
Teaching techniques, materials, and basic playing approaches for saxophone, oboe, and bassoon. For music education students.

MUS 132 TECHNIQUES: TRUMPET & FRENCH HORN
S 1 cr. LAB 1
Teaching techniques, materials, and basic playing approaches for trumpet and French horn. For music education students.

MUS 133 TECHNIQUES: TROMBONE, EUPHONIUM & TUBA
S 1 cr. LAB 1
Teaching techniques, materials, and basic playing approaches for trombone, euphonium, and tuba. For music education students.

MUS 134 TECHNIQUES: PERCUSSION
S 1 cr. LAB 1
Teaching techniques, materials, and basic playing approaches for percussion. For music education students.

MUS 135 TECHNIQUES: STRINGS
F 1 cr. LAB 1
Teaching techniques, materials, and basic playing approaches for strings. For music education students.

MUS 141 UNIVERSITY BAND
F, S 1 cr. LAB 1 May be repeated, Maximum 8 cr.
Study and performance of traditional and contemporary repertoire for wind and percussion in a large ensemble format. Open to all students with high school instrumental music experience.

MUS 150 KEYBOARD SKILLS I
F 1 cr. LAB 1
PREREQUISITE: Placement audition and music major.
Study of keyboard theory and technique, creative activities, sight reading, and piano repertoire. For music majors.

MUS 151 KEYBOARD SKILLS II
S 1 cr. LAB 1
PREREQUISITE: MUS 150 or placement audition and music major.
Continued study of keyboard theory and technique, creative activities, sight reading, and piano repertoire. For music majors.

MUS 153 GUITAR IN CLASS I
F, S 1 cr. LAB 1
PREREQUISITE: Placement audition.
Basic instruction in techniques of chord and classical guitar, music reading, and performance.

MUS 154 GUITAR IN CLASS II
S 1 cr. LAB 1
PREREQUISITE: MUS 153 or placement audition.
Continuation of MUS 153.

MUS 155 VOICE IN CLASS
F 1 cr. LAB 1 May be repeated, Maximum 2 cr.
Basic singing technique: tone production, interpretation, introduction to song literature.

MUS 160 APPLIED MUSIC I
S, S 1 cr. STU 1 May be repeated, Maximum 3 cr.
PREREQUISITE: Successful audition.
Techniques of performance and interpretation to develop musical ability, expression, accuracy, and stylistic awareness in student's performance area.

MUS 163 AURAL SKILLS III
F 1 cr. LAB 1
PREREQUISITE: MUS 104.
Continued development of aural and vocal skills that deal with tonal and temporal relationships.

MUS 164 AURAL SKILLS IV
S 1 cr. LAB 1
PREREQUISITE: MUS 203.
Continued development of aural and vocal skills that deal with tonal and temporal relationships.

MUS 170 MUSIC THEORY IV
S 3 cr. LEC 3
PREREQUISITE: MUS 205.
Analysis and use of homophonic forms and 20th Century techniques.

MUS 201A MASTERWORKS IN MUSIC
F, S 3 cr. LEC 3
Presentation of examples of great music literature to develop informed, perceptive listening and musical understanding.

MUS 212A AMERICAN POPULAR MUSIC: REFLECTIONS OF POLITICS & SOCIETY
F, S 3 cr. LEC 3
A study of the way in which American popular music is a product of the social, political, and historical context in which it developed, and in turn how this context was shaped by this music.

MUS 214A JAZZ LITERATURE
S 3 cr. LEC 3
Important literature from American jazz, with an emphasis on a detailed study of styles that have developed new directions in music and shaped America's culture.

MUS 220 INTRODUCTION TO COMPUTER APPLICATIONS AND RECORDING FOR MUSIC EDUCATION MAJORS
F 2 cr. LEC 1 LAB 1
An introduction to computer applications in music, including music notation, marching band and basic music notation, marching band and basic musicianship software programs, as well as audio recording. This course is particularly geared toward music education majors.

MUS 221 RECORDING I
F 3 cr. LEC 2 LAB 1
Introduction to, and exploration of, technologies and concepts used to create, record, edit, format, manufacture, reinforce and reproduce audio. Combination of lecture and hands-on learning.

MUS 222 RECORDING II
S 5 cr. LEC 2 LAB 1
Continuation of the study of the technologies and concepts used to create, record, edit, format, manufacture, reinforce, and reproduce audio. This course builds on the material presented in Recording I, and incorporates both lecture and hands-on learning.

MUS 224 JAZZ ENSEMBLE
F, S 1 cr. LAB 1 May be repeated, Maximum 8 cr.
PREREQUISITE: Successful audition.
Ensemble experience performing musical styles that include swing, jazz, commercial, and popular music. Open to all students with high school instrumental music experience.

MUS 230 MIDI SEQUENCING & NOTATION
S 3 cr. LEC 3
PREREQUISITE: MUS 115 or MUS 221, and permission of instructor.
Continuation of the MIDI component of Introduction to Digital Music. Composition and music notation, synthesizer programming, constructing an integrated music technology studio, and advanced applications for film and theatre.
MUS 235 DICTION: ENGLISH-LATIN
S 2 cr. LEC 2
PREREQUISITE: One of the following: MUS 156 or MUS 160 (voice) is recommended.
- Correct pronunciation of English and Latin for singers using the International Phonetic Alphabet.

MUS 240A MUSIC & SOCIETY
S 3 cr. LEC 3
- An investigation into the relationship between composers, and the cultural, political, and social influences that impacted their creative work. Various composers and significant musical works representing diverse style periods, cultures, and historical backgrounds will be discussed in depth. Students will be required to present a final paper discussing the work of a specific composer of their choice, incorporating the above criteria. Restricted entry. Priority to University Honors students.

MUS 249 ADVANCED KEYBOARD SKILLS: REPERTOIRE
F 1 cr. LAB 1
PREREQUISITE: MUS 151 OR placement audition and music major.
- Continuation of the study of keyboard theory and technique, sight reading, and piano repertoire. For non-keyboard music majors.

MUS 250 ADVANCED KEYBOARD SKILLS: ACCOMPANYING
F 1 cr. LAB 1
PREREQUISITE: MUS 151 or placement audition and music major.
- Continuation of the study of keyboard theory and technique, ensemble playing, sight reading, and piano accompanying. For non-keyboard music majors.

MUS 252 ADVANCED KEYBOARD SKILLS: JAZZ
S 1 cr. LAB 1
PREREQUISITE: MUS 151 or placement audition and music major.
- Continuation of the study of keyboard theory and technique, creative activities, sight reading, improvisation and performance of Jazz. For music majors.

MUS 253 GUITAR IN CLASS III
F 1 cr. LAB 1
PREREQUISITE: MUS 154.
- Continued instruction in techniques of chord and classical guitar, music reading, and performance.

MUS 254 GUITAR IN CLASS IV
S 1 cr. LAB 1
PREREQUISITE: MUS 253.
- Continued instruction in techniques of chord and classical guitar, music reading, and performance.

MUS 260 APPLIED MUSIC II
F, S, Su 1 cr. STU 1 May be repeated, maximum 3 cr.
PREREQUISITE: MUS 160 and successful audition.
- Continued instruction in techniques of performance and interpretation to develop musical ability, expression, accuracy, and stylistic awareness in student's performance area.

MUS 260R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

MUS 290 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

MUS 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

MUS 303 INSTRUMENTATION
S 2 cr. LEC 2 RCT 1
PREREQUISITE: MUS 206.
- Training in scoring principles for instrumental ensembles with emphasis on arranging and adapting music for public school programs.

MUS 310 MUSIC HISTORY: ANTIQUITY THROUGH BAROQUE
F 3 cr. LEC 3
PREREQUISITE: MUS 106.
- Music as it relates to other arts and humanities from an historical and stylistic perspective. From Antiquity through the Baroque era.

MUS 311 MUSIC HISTORY: CLASSICAL THROUGH 20TH CENTURY
S 3 cr. LEC 3
PREREQUISITE: MUS 106.
- Music as it relates to other arts and humanities from an historical and stylistic perspective. From the Classical era through the 20th Century.

MUS 312A WORLD MUSIC
F, S 5 cr. LEC 3
PREREQUISITE: Junior standing.
- Approaches to, and use of, music in world cultures. Impact of world music on the western art music tradition.

MUS 312ZI WORLD MUSIC
F, S 3 cr. LEC 3
PREREQUISITE: MUS 106.
- Music as it relates to other arts and humanities from an historical and stylistic perspective. From the Classical era through the 20th Century.

MUS 322 PERCUSSION ENSEMBLE
F, S 1 cr. LAB 1 May be repeated, maximum 8 cr.
PREREQUISITE: Successful audition.
- Advanced ensemble performance experience focusing primarily on music written for percussion during the 20th Century.

MUS 324 STUDIO JAZZ LAB
F, S 1 cr. LAB 1 May be repeated, maximum 8 cr.
PREREQUISITE: Successful audition.
- Advanced performance training in jazz literature from all style periods, guided improvisational experience.

MUS 325 MSU SYMPHONY ORCHESTRA
F, S 1 cr. LAB 1 May be repeated, maximum 8 cr.
PREREQUISITE: Successful audition.
- Advanced training in the performance repertoire for orchestra.

MUS 330 OPERA WORKSHOP
F, S 3 cr. LAB 1
PREREQUISITE: Successful audition.
- Advanced training in the performance of opera and musical theater repertoire.

MUS 335 DICTION & REPERTOIRE: ITALIAN & GERMAN
F alternate years, to be offered odd years 2 cr. LEC 2
PREREQUISITE: MUS 204, MUS 206.
- Correct pronunciation of Italian and German for singers using the International Phonetic Alphabet. Study of standard art song and operatic repertoire in Italian and German.

MUS 337 INSTRUMENTAL CONDUCTING & REHEARSAL TECHNIQUES
F 2 cr. LEC 1 RCT 1
PREREQUISITE: MUS 204, MUS 206.
- Basic conducting and instrumental rehearsal techniques, instrumental score study, laboratory experiences.

MUS 338 CHORAL CONDUCTING & REHEARSAL TECHNIQUES
S 2 cr. LEC 1 RCT 1
PREREQUISITE: MUS 337.
- Basic conducting and choral rehearsal techniques, choral score study, laboratory experiences.

MUS 340 MARCHING BAND TECHNIQUES
On Demand 2 cr. LEC 2
PREREQUISITE: MUS 206.
COREQUISITE: MUS 120.
- Organization, administration, and creative skills necessary for directing a successful public school marching band.

MUS 341 SOUND DESIGN AND SYNTHESIS
F 3 cr. LEC 3
PREREQUISITE: MTEC Major status and MUS 221.
- Students will explore artistic and scientific applications of recent research in sound, explore artistic and scientific applications of recent research in sound, including software for analysis-re-synthesis, noise reduction, cross-synthesis, physical modeling, and acoustical analysis. Links between music composition, acoustics, computer science, and multimedia post production are emphasized.
MUS 347 INTERDISCIPLINARY
FILM & MUSIC PROJECTS
F 3 cr. RCT 3
PREREQUISITE: MUS Majors: MUS 115 and consent of instructor. Cross listed with MTA 347.
- For upper-level Film and Music Technology students. Exploration of cross-disciplinary techniques in multimedia art. Individual and collaborative projects with visuals and sound. Overview of the history of audio art, video art and experimental film.

MUS 349 FILM SCORING
F 3 cr. LEC 1 LAB 2
PREREQUISITE: MUS 296 and MUS 151 or consent of instructor.
- The course objective is to provide the student with knowledge and guidance through the various stages of the process of creating original music to accompany a visual medium. While no previous film scoring experience is required, a fundamental background in music theory, keyboard skills, and music technology is preferred.

MUS 351 ACCOMPANYING
F alternate years, to be offered even years
2 cr. RCT 2
PREREQUISITE: MUS 260.
- Study of repertoire and principles of accompaniment in all style periods. Laboratory experiences include accompanying instrumentalists and vocalists.

MUS 353 IMPROVISATION I
F alternate years, to be offered odd years
2 cr. LEC 1 LAB 1
PREREQUISITE: MUS 105 and MUS 260 or successful audition.
- Improvisation as a basis for experienced instrumentalists and vocalists, improvement of aural perception, techniques of teaching improvisation and utilizing it at various levels of technical proficiency, enhancing other approaches to music education.

MUS 354 IMPROVISATION II
F alternate years, to be offered even years
2 cr. LEC 1 LAB 1
PREREQUISITE: MUS 353.
- Application of the techniques learned in Improvisation I, continuation of improvisational and creative experiences.

MUS 355 ENSEMBLE
F, S, Su 1 cr. LAB 1 May be repeated; Maximum 8 cr.
PREREQUISITE: Successful audition.
- Selected students perform in small, coached instrumental and vocal ensemble performance.

MUS 356 CHAMBER MUSIC ENSEMBLE
F, S 1 cr. LAB 1 May be repeated; maximum 8 cr.
COREQUISITE: MUS 160; MUS 206, MUS 260, MUS 460, or MUED 560; or successful audition.
- Students perform in small, coached instrumental and vocal chamber music ensembles. Studies in performance and chamber music repertoire composed between 1650 and the present.

MUS 358 PARKENING OBSERVATION
Su 1 cr. IND 1 Maximum 4 cr.
PREREQUISITE: MUS 140.
- Guided observation and critique of Parkening Master Class.

MUS 359 APPLIED MUSIC II
F, S, Su 1 cr. STU 1 May be repeated, Maximum 3 cr.
PREREQUISITE: MUS 260 and successful audition.
- Continued study of techniques of performance and interpretation to develop musical ability, expression, accuracy, and stylistic awareness in student's performance area.

MUS 400 SEMINAR
F, S, Su on Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

MUS 405R SENIOR PROJECT
F 3 cr. LEC 2, SEM 1
PREREQUISITE: MUS 206, MUS 310 AND 311
- Senior capstone course. Synthesis of historical, stylistic, and theoretical concepts and performance. Analysis and study of exemplary compositions. Public performance or other presentation and research paper based on an important work.

MUS 406 COMPOSITION
F, S, Su on demand 1 cr. TUT 1 IND 1-2 May be repeated, Maximum 8 cr.
PREREQUISITE: MUS 106.
- Individual study of compositional practices in any musical idiom, compositional processes and techniques, and aesthetic concepts applicable to the idiom of writing or creation of music.

MUS 407 COUNTERPOINT
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: MUS 206.
- Study and practice of the techniques of writing two- and three-voice counterpoint. 16th, 17th, and 20th-Century styles.

MUS 408 ANALYSIS
F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: MUS 206.
- Advanced analysis and in depth study of selected and representative works from specific categories, such as chamber, orchestral, vocal, or choral music.

MUS 420 WIND ENSEMBLE
F, S 1 cr. LAB 1 Maximum 8 cr.
PREREQUISITE: Successful audition.
- Study and performance of advanced, traditional, and contemporary wind band repertoire.

MUS 425 MONTANANS
F, S 1 cr. LAB 1 Maximum 8 cr.
PREREQUISITE: Successful audition.
- Advanced performance in small vocal ensemble using stylistic variety in programming.

MUS 428 GAMelan
F, S 1 cr. LAB 1
PREREQUISITE: MUS 105 or MUS 312 and consent of instructor.
- Balinese gamelan orchestra rehearsal and performance using authentic instruments. Both traditional music for the angklung gamelan as well as newer directions in music will be addressed. Traditional role learning and musical notation will be used.

MUS 437 INSTRUMENTAL FIELD EXPERIENCE
S 1 cr. LAB 1
COREQUISITE: MUS 446.
- A field experience in secondary (grades 5-12) instrumental music situations prior to student teaching. Observations, interviews, and brief teaching experiences with music ensembles at the secondary level.

MUS 439 CHORAL FIELD EXPERIENCE
F 1 cr. LAB 1
COREQUISITE: MUS 449
- A field experience in secondary (grades 5-12) choral music situations prior to student teaching. Observations, interviews, and brief teaching experiences with music ensembles at the secondary level.

MUS 440 INSTRUMENTAL PEDAGOGY & LITERATURE
F, S and on demand 2 cr. LEC 1 IND 1
PREREQUISITE: Junior standing, MUS 260.
- Studio teaching techniques and relevant studies, solo, and ensemble literature in the student’s major applied area. Evaluation of literature and progression of a young player. Required observation of experienced private lesson teachers.

MUS 442 VOCAL PEDAGOGY & LITERATURE
F, S 1 cr. LEC 1 LAB 1
PREREQUISITE: Junior standing, and one of the following: MUS 156 or MUS 260 and MUS 250.
- Vocal pedagogy, teaching techniques, and literature.

MUS 443 PIANO PEDAGOGY
F alternate years, to be offered odd years
2 cr. LEC 2
PREREQUISITE: MUS 260.
- Study of studio and class piano teaching techniques, beginning piano methods, beginning keyboard literature and materials needed for studio/class piano teaching. Observations and supervised teaching experiences are included.

MUS 444 PIANO LITERATURE
F alternate years, to be offered even years
2 cr. LEC 1 LAB 1
PREREQUISITE: MUS 443.
- Study of historical keyboard instruments and literature from the 1600s to the present.

MUS 445 EXPERIENCE STUDIO TEACHING
F, S 2 cr. IND 2 May be repeated, Maximum 4 cr.
PREREQUISITE: Study of instrumental music for the secondary level:
- Supervised teaching in student’s performance area.

MUS 446 INSTRUMENTAL METHODS & LITERATURE
F, S 3 cr. LEC 3
PREREQUISITE: MUS 357, MUS 206 and MUS 251.
- Rehearsal techniques, materials, literature, strategies for classroom management and the administration of the instrumental program for the middle school band and orchestra teacher.

MUS 449 CHORAL METHODS & LITERATURE
F 5 cr. LEC 3
PREREQUISITE: MUS 388, MUS 206 and MUS 251.
- Rehearsal techniques, materials, literature, strategies for classroom management and the administration of the choral program for the middle school and high school choral instructor.
Nursing

College of Nursing
(406) 994-3783

N 115 NURSING AS A PROFESSION
F, S, Su 2 cr. LEC 2
- The purpose of this course is to initiate and foster the professional socialization process. Content and activities expose students to issues surrounding the profession of nursing, multiple roles of nursing in society and health care, and concepts related to the dimensions of nursing practice: nurse, client, health and environment.

N 200 SEMINAR
F, S 1 - 4 cr. SEM Maximum 12 credits
PREREQUISITE: As determined for each offering.
- Topics offered at the lower division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

N 200 FOUNDATIONS OF ETHICAL NURSING PRACTICE
F, S, Su 2 cr. LEC 1 RCT/DIS 1
- Drawing on contemporary issues in bioethics this foundational course explores influential moral values, philosophical principles and theories as formal grounding for ethical decision making and action in health care. A broad historical, cultural and societal perspective is emphasized to provide the background for understanding the everyday ethical problems that health professionals encounter in their practices. A psychological and social framework of analysis is used to foster sensitivity, skills of analysis and ethical behavior in situations of moral conflict.

N 220 FOUNDATIONS OF CLINICAL NURSING PRACTICE
F, S 4 cr. LEC 2 LAB 2
PREREQUISITES: BIOL 207, BIOL 208, HDCF 150, and MB 201.
COREQUISITE: N 239 or consent of instructor.
- Application of nursing principles, concepts and related skills for care of the individual needing assistance. The clinical decision-making process is utilized in the provision of nursing care in clinical settings.

N 223 FOUNDATIONS FOR PLANNING AND PROVIDING CLINICAL NURSING CARE
F, S 3 cr. LEC 2
PREREQUISITES: BIOL 122, CHEM 121.
- This course provides an introduction to the conceptual frameworks for planning nursing care. Concepts and theories basic to nursing practice and the multidisciplinary framework of analysis is used to foster sensitivity, skills of analysis and ethical behavior in situations and contexts. This emphasis is used to provide care to clients across the lifespan in a variety of settings. Normal pregnancy and childbirth are addressed, as well as the identification and management of high risk childbirth situations. Selected health care of women content is included.

N 229 HEALTH ASSESSMENT AROUND THE LIFE SPAN
F, S 4 cr. LEC 2 LAB 2
PREREQUISITES: BIOL 207 and BIOL 208, BCHM 122 and CHEM 121.
- This course provides an introduction to the abnormal function of human cells, tissues, and organ systems, and the physiological adaptations that occur. Commonly encountered age-related variations are addressed. The influences of environment, genetics, nutrition, and culture are emphasized. Current research that explains the changes that accompany a particular syndrome or disease is considered.

N 290 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects

N 290 UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

N 337 NURSING PHARMACOTHERAPEUTICS
F, S 3 cr. LEC 2 LAB 1
PREREQUISITES: CHEM 121, BCHM 122, HDFN 221, N 224 and N 239.
- The focus of this course is to examine pharmacotherapeutics in nursing practice. Clinical application of pharmacological and pathophysiological principles are integrated. Physical, psychological, social and cultural factors; age related variations; and alternative therapies are highlighted.

N 340 PSYCHOSOCIAL NURSING CONCEPTS
F, S 5 cr. LEC 2 LAB 1
PREREQUISITES: PSY 100, SOC 101, N 115, N 290, N 224 and N 239.
- This course explores selected psychosocial concepts and theories basic to nursing practice with clients in a variety of settings. Topics include family theory, palliative care, crisis theory, anxiety, loss, grief and other human responses; and related psychosocial nursing strategies.

N 349 NURSING CARE OF CHILDREN AND FAMILIES
F, S 5 cr. LEC 2 LAB 3
PREREQUISITES: N 242, N 354 and N 337.
- The focus of this course is health promotion, disease prevention, illness management and nursing care of children within the family context in a variety of settings. This course builds upon and integrates knowledge gained from nursing, sciences and the humanities.

N 354 ACUTE AND CHRONIC ILLNESS
F, S 5 cr. LEC 2 LAB 3
PREREQUISITES: N 223, N 224 and N 239.
- The focus of this course is application of theoretical and empirical knowledge to nursing care for clients across the adult lifespan with acute and chronic illness in a variety of settings. Health promotion, disease prevention, and symptom management are emphasized. This course builds upon and integrates knowledge gained from nursing, sciences and the humanities.
N 377 INTRODUCTION TO COMMUNITY BASED NURSING
F, S 2 cr. LEC 2
- The focus of this course is to introduce the student to community based nursing practice for individuals, families, populations and communities. There is an emphasis on health promotion, disease prevention and health determinants in a variety of settings.

N 387R RESEARCH IN HEALTH CARE
F, S 3 cr. LEC 2 LAB 1
PREREQUISITE: STAT 216 or Consent of Instructor.
- Students are introduced to the research process and evidence-based practice. They develop knowledge, skills, and values necessary to be informed consumers of health related research. Students engage in research processes, examine research reports, and describe practice applications.

N 400 SEMINAR
F, S 1 - 4 cr. SEM 4 Maximum 12 credits
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

N 416 SUMMER INTERNSHIP
Su 5 cr. LAB 3
PREREQUISITE: Satisfactory completion of all 1st semester junior level clinical nursing courses. Placement subject to availability.
- This elective course is designed to increase competence and confidence in previously learned clinical skills. The student works with a registered nurse (RN) in a cooperating clinical agency for a period of intensified clinical experience.

N 444 CARE MANAGEMENT
F, S 3 cr. LEC 2 RCT/DIS 1
PREREQUISITES: N 354 and N 887R.
- This course focuses on case management with application of ethical and legal concepts. The case management process is explored. Case management is examined as a method of managing health care.

N 453 SPIRITUALITY IN HEALTH CARE
F, S 2 cr. RCT/DIS 2
PREREQUISITES: PSY 100 and N 115 or consent of instructor.
- This elective course explores aspects of spirituality and the use of spiritually-based therapies in healthcare from various faith traditions. Spiritual assessment and spiritually-based strategies to promote health and wellness are emphasized. Although a multi-disciplinary approach to spiritual care is presented, a nursing prospective is highlighted.

N 469 CULTURAL APPLICATIONS IN NURSING: THE (SPECIFIC CULTURE) EXPERIENCE
F, S 2 cr. LEC 1 LAB 1
PREREQUISITE: Enrolled in the undergraduate nursing program.
- This elective course is designed as an intense but time-limited immersion into another culture and is focused on health benefits, health care, and nursing applications. The experience is preceded by analysis of cultural principles applicable to nursing and concluded by analysis of actual clinical participation with (specific culture) nurses and clients.

N 470 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of departmental chair. Directed research and study on an individual basis.

N 477 POPULATION BASED NURSING CARE IN THE COMMUNITY
F, S 6 cr. LEC 3 LAB 3
PREREQUISITES: N 437 and N 454.
- The focus of this course is the health and well-being of the community. Global and national health problems are examined from a public health perspective. Community assessment and epidemiologic methods are used to identify populations at risk and potential areas for intervention.

N 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-6 cr. RCT May be repeated. Max 12 cr.
PREREQUISITE: Junior standing.
COREQUISITE: N 490R.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

N 500 SEMINAR
On Demand 1 cr. SEM Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

N 501 TEACHING CONCEPTS FOR NURSING EDUCATORS
F 2 cr. LEC 2
PREREQUISITE: Graduate Standing.
- Designed for students interested in nursing education (academic or practice environment). Emphasizes teaching strategies and delivery of nursing education for diverse learners in a variety of settings. Roles and responsibilities are explored. Includes history and evolution of teaching and learning.

N 502 EFFECTIVE CLINICAL TEACHING
S 2 cr. LEC 2
PREREQUISITE: Graduate Standing.
- Focuses on educator roles and responsibilities in teaching clinical nursing (academic or practice environments). Designed for students interested in developing clinical teaching skills. Major themes: development of learning activities, evaluation of student performance, concepts of student supervision, and agency coordination.

N 503 CURRICULUM DEVELOPMENT
Su, alternate years, to be offered Su even years 3 cr. LEC 3
PREREQUISITE: Graduate Standing.
- Theories and models of curriculum development are explored and designed for nurses teaching in either academic or practice environments. Variables associated with design and planning of educational interventions are explored. Students synthesize appropriate theoretical concepts to develop a model curriculum.

N 504 ASSESSMENT AND EVALUATION OF EDUCATION
Su, alternate years, to be offered Su odd years 3 cr. LEC 3
PREREQUISITE: Graduate Standing.
- Students engage in discussions around design, assessment, and evaluation of instruction by nurses. Topics include writing instructional objectives and constructing activities to assess student learning outcomes. Students complete a project to gain skills in evaluating learning related to a specific unit of study.
<table>
<thead>
<tr>
<th>COURSE DESCRIPTIONS: N 505 - N 570</th>
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<tbody>
<tr>
<td><strong>N 505 EVIDENCE BASED PRACTICE</strong></td>
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<tr>
<td>F 4 cr. LEC 4</td>
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<td><strong>PREREQUISITE:</strong> N 387 (or equivalent) and STAT 216 (or equivalent).</td>
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<td>- This course focuses on the various methods and processes used to translate knowledge into evidence based practice. Students explore processes for acquiring, evaluating and using knowledge for clinical practice in both rural and urban areas.</td>
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| **N 506 MANAGEMENT OF CARE ENVIRONMENTS** |
| S 4 cr. LEC 3 LAB 1                 |
| - Introduces the role of Clinical Nurse Leader, examines internal and external forces which affect care delivery in a variety of settings within healthcare systems and organizations. Opportunity to learn strategies for team coordination, quality management, and risk reduction. Healthcare informatics is included. |

| **N 507 MANAGEMENT OF CLINICAL OUTCOMES** |
| S 4 cr. LEC 3 LAB 1                 |
| **PREREQUISITE:** N 517, N 550, and N 560 or consent of instructor. |
| - This course focuses on the management of clinical outcomes for groups of clients across the wellness-illness continuum. Students learn strategies to use evidence-based practice and knowledge management to ensure optimum care in both rural and urban environments. |

| **N 508 CLINICAL LEADERSHIP PRACTICUM** |
| F, S, Su 7 cr. LAB 7                |
| **PREREQUISITE:** N 505, N 506, and N 507. |
| - This course is an immersion clinical practicum. Students practice Clinical Nurse Leader competencies in their selected health care environment(s) to design, manage, and evaluate care to improve health outcomes for a selected population. |

| **N 517 FOUNDATIONS OF PHARMACOTHERAPEUTICS** |
| F 1 cr. LEC 1                      |
| **PRE or COREQUISITE:** N 560, graduate standing, or consent of instructor. |
| - Introduces the student to the essentials of pharmacology for advanced practice nurses. Provides a basis for understanding the pharmacokinetics and actions of selected classes of drugs commonly used in primary care practice. Legal and ethical considerations of prescriptive practice are addressed. |

| **N 520 PHARMACOTHERAPEUTICS FOR OLDER ADULTS** |
| F 1 cr. LEC 1                      |
| **PREREQUISITE:** N 517 or consent of instructor. |
| - Addresses pharmacological interventions in managing common health problems of elders and their families. Students will apply knowledge of pharmacological management of commonly encountered health problems for the aging population. Regulatory issues regarding prescriptive practice for APRNs are addressed. |

| **N 521 THEORY AND RESEARCH IN NURSING** |
| F 3 cr. LEC 5                      |
| **PREREQUISITE:** N 387 (or equivalent) and STAT 216 (or equivalent). |
| - Provides an overview of the interrelationships among theory, research and practice. Students explore patterns and processes for acquiring knowledge and the utilization of knowledge in clinical practice. |

| **N 522 ADVANCED PRACTICE NURSING: ROLES AND ISSUES** |
| S 2 cr. LEC 2                      |
| **PREREQUISITE:** Graduate standing or consent of instructor. |
| - Introduction to theoretical foundations and competencies of advanced practice nursing and employment settings in which advanced practice nursing may occur. Emphasis on history and development of advanced practice nursing roles, role transition, spheres of influence, core competencies, and target outcomes. |

| **N 531 RURAL HEALTH NURSING** |
| S 3 cr. LEC 2 LAB 1               |
| **PREREQUISITE:** N 521 or consent of instructor. |
| - This course focuses on the health concerns, issues, and trends facing individuals and populations in rural areas. Rural environments will be assessed and data from a variety of sources will be analyzed through systematic approaches. Students will have the opportunity to build and expand upon rural nursing theory. |

| **N 550 ADVANCED HEALTH ASSESSMENT** |
| F 3 cr. LEC 1 LAB 2               |
| - This course consists of study modules and videos based on various components of health assessment with emphasis on rural populations. Students will be required to demonstrate assessment competency to faculty. |

| **N 552 ADMINISTRATION AND ORGANIZATION OF HEALTH CARE SYSTEMS** |
| F 2 cr. LEC 2                     |
| - This course focuses on nursing leadership in community-focused health care systems. Emphasis is on organizational structure, culture, change and behavior. Traditional elements of leadership are blended with emerging nursing theory to strategically energize current and developing health care systems. |

| **N 553 FINANCING AND BUDGETING OF HEALTH CARE SYSTEMS** |
| S 2 cr. LEC 2                     |
| - This course focuses on the application of fiscal management principles of health care systems. Emphasis is on health care economics, fiscal management and budgeting concepts. |

| **N 555 CONCEPTS OF FAMILY CARE** |
| S 2 cr. LEC 2                     |
| **PREREQUISITE:** N 521 or consent of instructor. |
| - Analysis and synthesis of family theories from nursing and other disciplines to form a family-focused foundation for application in advanced practice nursing. Related concepts and theories are analyzed as a basis for understanding the principles of family assessment. Emphasis is placed on family health promotion, nursing of families within a rural context and the influence of culture on family health. |

| **N 560 ADVANCED PHYSIOLOGY AND PATHOPHYSIOLOGY** |
| F 4 cr. LEC 4                      |
| - Focuses on a comprehensive study of the physiological functioning and common pathophysiological alterations in human organs and systems. |

| **N 561 PRIMARY CARE I FOR CHILDREARING AND CHILDCARE FAMILIES** |
| S 6 cr. LEC 3 LAB 3               |
| **PREREQUISITE:** N 517, N 521, N 550 and N 560. |
| **COREQUISITE:** N 551 and N 555. |
| - Focuses on comprehensive assessment, intervention and preventive care for childbearing and childrearing families in primary health care for the advanced practice nurse. Includes content on physiological, pathophysiological, psychological, developmental, sociocultural and spiritual care. |

| **N 562 PRIMARY CARE II FOR MIDLIFE FAMILIES** |
| Su 6 cr. LEC 3 LAB 3               |
| **PREREQUISITE:** N 561. |
| - This course includes content on the physiological, pathophysiological, psychological, development, sociocultural and spiritual primary health care needs of midlife families. Addresses assessment, intervention and preventive care. |

| **N 563 PRIMARY CARE III FOR AGING FAMILIES** |
| F 6 cr. LEC 3 LAB 3               |
| **PREREQUISITE:** N 562. |
| - Assessment, treatment and preventive care for aging families in primary health care settings. Physiological, pathophysiological, psychological, developmental, sociocultural and spiritual responses to acute and chronic conditions will be explored along with the advocacy role of the nurse practitioner. |

| **N 565 PRINCIPLES OF POPULATION-BASED HEALTH** |
| F 3 cr. LEC 2 LAB 1               |
| **PREREQUISITE:** N 477 or equivalent, N 378 or equivalent and STAT 216 or equivalent. |
| - Emphasizes public health concepts and skills essential to community-oriented leadership and practice in rural communities: concepts of risk, epidemiology, biostatistics, health planning, community empowerment and resource development. The values on health promotion and disease prevention are explored. |

| **N 570 INDEPENDENT STUDY** |
| On Demand 1 - 3 cr. IND Maximum 6 cr. |
| **PREREQUISITE:** Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. |
| - Directed research and study on an individual basis. |
N 571 PRIMARY CARE IV: CLINICAL PRECEPTORSHIP
S 5 cr. LAB 5
PREREQUISITE: Final semester of course work.
This practicum allows students to further refine family nurse practitioner skills in practice settings such as family health, pediatrics, women's health or gerontology or a broad based general practice based on availability.

N 574 TEACHING PRACTICUM
F, S, Su LAB 1 - 4 cr.
PREREQUISITE: N 504 or consent of instructor.
- Teaching/learning principles are integrated into nursing education in academic or practice environments. Students practice, observe, and evaluate teaching/learning processes. The instructor and student negotiate laboratory activities.

N 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S, Su 1 - 4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

N 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or, given on a trial basis to determine acceptability and demand before requesting a regular course number.

N 581 CLINICAL NURSE SPECIALIST PRACTICE I
S alternate years, starting even years
6 cr. LEC 3 LAB 3
PREREQUISITE: N 550, N 560, and N 521 or consent of instructor.
COREQUISITE: N 522 or consent of instructor.
- Focus on clinical management of adults with complex health care problems of selected body systems. Seminars and supervised practice allow students to develop CNS competencies. Emphasis is placed on the patient/client sphere of CNS influence.

N 582 CLINICAL NURSE SPECIALIST PRACTICE II
F alternate years, starting even years
6 cr. LEC 3 LAB 3
PREREQUISITE: N 550, N 560, N 521 or consent of instructor.
COREQUISITE: N 552 or consent of instructor.
- Focus on clinical management of adults with complex health problems of selected body systems. Seminars and supervised practice provide opportunity for students to develop CNS competencies. Emphasis is placed on the nurses/nursing practice sphere of CNS influence.

N 583 CLINICAL NURSE SPECIALIST PRACTICE III
S alternate years, starting odd years
6 cr. SEM 1 LAB 5
PREREQUISITE: N 581, N 582 PRE or COREQUISITE: N 553
- Capstone course. Students implement the CNS role with adults with complex health problems. Emphasis on professional philosophy, scope of practice, collaborating within a multidisciplinary health care team, and working within health care systems to improve client outcomes.

N 589 GRADUATE CONSULTATION
F, S, Su 3 cr. IND
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

N 590 MASTER'S THESIS
F, S, So 1 - 10 cr. IND May be repeated.
PREREQUISITE: Master's standing.

NAS
Native American Studies

Department of Native American Studies
(406) 994-3881

NAS 001 SELECTED ISSUES IN PERSONAL DEVELOPMENT
F 2 cr. RCT 2
- For students making an adjustment to university life. Topics include study skills, goal setting, decision making, time management, and personal issues that face college students.

NAS 100D INTRODUCTION TO NATIVE AMERICAN STUDIES
F, S 3 cr. LEC 3
- A survey of traditional and contemporary American Indian cultures, the historical development of the unique relationship between the federal government and Indian nations, and current issues among Indian peoples.

NAS 201D AMERICAN INDIANS IN MONTANA
S 3 cr. LEC 3
- Movements of Indians into Montana. Social structures including kinship, political affiliations; military, warrior societies, and religion. Establishment of Montana's reservations; treaties and agreements with the federal government; vested rights of Indians; sovereignty and self-government; contemporary tribal governments; contemporary Indian societies; socioeconomic problems.

NAS 220 AMERICAN INDIAN ART
F 3 cr. LEC 3
- The esthetic, cultural, and symbolic meanings of American Indian art and artists.

NAS 240I8 NAS THEORIES & METHODS
F alternate years, to be offered odd years
3 cr. LEC 3
- Analysis of images and representations of Native American religions frames the analysis.

NAS 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 2 cr. RCT
COREQUISITE: NAS 290.
- Classroom instruction associated with directed undergraduate research and creative activity projects.

NAS 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 8 cr. RCT
PREREQUISITE: Consent of department head.
- Directed undergraduate research/creative activity.

NAS 315 NATIVE AMERICAN INDIANS AND THE CINEMA
F alternate years, to be offered odd years
3 cr. LEC 3

NAS 320 AMERICAN INDIAN RELIGIONS
F, S 3 cr. LEC 3
PREREQUISITE: Junior standing.
- An in-depth analysis of specific contemporary and historic, tribal, and pan-Indian beliefs. Basic elements of Native American religions are defined from the perspective of the practitioner's understanding of their contributions to distinct cosmologies. The legal protection of Native American religions frames the analysis.

NAS 325 NATIVE PEOPLES OF THE AMERICAS
S alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: Junior standing.
- Histories and cultures of representative native peoples of North, Central, and South America; impact of European discovery, conquest and colonization: political, social, and economic developments from pre-Colombian to present times including contemporary issues facing the indigenous peoples of the Americas.

NAS 330 AMERICAN INDIAN POLICY AND LAW
S 3 cr. LEC 3
PREREQUISITE: NAS 100, and junior standing.
- Survey of institutions, laws, cultures, and political forces which shaped federal Indian policy from colonial times to the present. Examination of primary documents, treaties, case law, and agencies which are the foundations of federal relationships with Indian Tribes.
NAS 340 AMERICAN INDIAN LITERATURE
F, S 3 cr. LEC 3
PREREQUISITE: Junior standing and ENGL 121.
- Traditional and contemporary Native American literature including oral narratives, folktales, poetry, short stories, essays, and the novel. Methods of literary analysis will be explored to assist students in determining the meaning and function of the various genres.

NAS 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

NAS 405 GENDER ISSUES IN NATIVE AMERICAN STUDIES
F alternate years, to be offered every even year 3 cr. LEC 3
PREREQUISITE: Previous course in NAS and junior standing, or permission of instructor.

NAS 415 NATIVE FOOD SYSTEMS
F alternate years, to be offered 2006 3 cr. LEC 1 SEM 2
PREREQUISITE: NAS 100 or NAS 201 and upper division standing.
- This course engages indigenous practices and beliefs, focusing particularly on the food systems of the Native Americans, and using comparative data from across time and place. Of specific interest are dynamic connections between native foods and the health of people and place, both traditionally and in societies affected by colonization and rapid cultural change.

NAS 425 PAN-INDIANISM IN AMERICAN SOCIETY
S alternate years, will be offered 2006 3 cr. LEC 2 RCT 1
PREREQUISITE: NAS 242.
- The course is a broad study of Pan-Indianism as a cultural mechanism that both empowers and victimizes American Indian identity. Lectures and discussion will cover the sources and scope of the social, economic, spiritual and political aspects of Pan-Indianism, drawing from history, literature, political science and anthropology.

NAS 430 AMERICAN INDIAN EDUCATION
S alternate years, will be offered 2006 3 cr. LEC 3
PREREQUISITE: NAS 242.
- Historical development and contemporary directions in American Indian education, values and assumptions inherent in programs devised at the state and federal levels and their results, the cultural basis of Indian education, and selected materials appropriate to the various educational levels.

NAS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

NAS 476 INTERNSHIP
On Demand 2-12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

NAS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

NAS 489R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: NAS 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

NAS 490R UNDERGRADUATE RESEARCH/CREATIVITY ACTIVITY
F, S Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

NAS 500 SEMINAR
On Demand 1-4 cr. SEM
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

NAS 520 FEMINIST AND GENDER THEORIES IN NATIVE AMERICAN STUDIES
On Demand 3 cr. LEC 3
PREREQUISITE: NAS 100 or equivalent and NAS 858 or equivalent.
- This course is intended to explore gender issues in Native American Studies. It will critically explore the problems and points of conflict between Native American women's gender concerns and Euroamerican feminist theories.

NAS 521 TRIBAL GOVERNMENT: YESTERDAY AND TODAY
On Demand 3 cr. LEC 3
PREREQUISITE: NAS 100 or equivalent and NAS 380 or equivalent.
- The course examines the complexities of the American Indian governments' organization, their histories, and the unique relationship between the Federal government and American Indian tribes. The course highlights several models of both traditional and contemporary tribal governance systems.

NAS 523 AMERICAN INDIANS AND MINORITIES IN HIGHER EDUCATION
On Demand 3 cr. LEC 3
PREREQUISITE: NAS 100 OR NAS 242.
- The course will develop and build the students' understanding of the historical and current situation of American Indians and the relationship of American Indians and other minorities in the U.S. higher education. It will also focus on the unique place of tribal colleges in the U.S. higher education.

NAS 524 CONTEMPORARY ISSUES IN AMERICAN INDIAN STUDIES
S to be offered 2006 3 cr. LEC 3
PREREQUISITE: NAS 320 or NAS 540 or equivalent.
- This course is intended to develop and refine the students' knowledge of the historical background of American Indian issues and how history now affects the contemporary issues facing American Indians.

NAS 525 INDIGENOUS PHILOSOPHIES OF SACRED ECOLOGIES
F alternate years, to be offered odd years 3 cr. LEC 5
PREREQUISITE: NAS 320 or NAS 350.
- This course begins by examining indigenous philosophies of sacred ecologies, contrasting these views with those held by Europeans regarding the natural world. It traces the impact of historical colonialism in the environment up to contemporary conflicts over sacred sites and environmental resources.

NAS 530 FEDERAL LAW AND INDIAN POLICY
S 3 cr. LEC 3
PREREQUISITE: NAS 100 NAS 330 or equivalent.
- Advanced analysis of theories, doctrines, case law, and legislation with a focus on federal policy concerns for contemporary Native American Studies which include treaties, criminal jurisdiction, land, environmental regulation, water rights, fishing and hunting, child welfare, gaming, taxation, repatriation, and religious freedom.

NAS 540 THEORETICAL POSITIONS IN NATIVE AMERICAN STUDIES
F 3 cr. LEC 3
PREREQUISITE: NAS 100 and NAS 350 or equivalent.
- An introduction to the central conceptualizations of the academic discipline of Native American Studies and several of the theoretical paradigms operative within it. Students will gain an understanding of the contributions of Native American Studies to theoretical understandings within, across, and beyond dominant academic disciplines.

NAS 541 A CRITICAL APPROACH TO NAS METHODOLOGIES
S 3 cr. LEC 3
PREREQUISITE: NAS 540 or equivalent.
- A critical survey of the interdisciplinary approaches used in NAS grounded in a sociopolitical context with emphasis on ethical questions raised by research of Native Americans. Students receive individual attention toward formulating an effective methodology for their master's project.

NAS 560 NATIVE AMERICAN LITERARY TRADITIONS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: NAS 340.
- A survey of prose writing, mainly long fiction, by and about contemporary Native Americans.

NAS 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.
NAS 575 PROFESSIONAL PAPER
F, S, Su 1-4 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

NAS 576 INTERNSHIP
F, S, Su 1-6 cr. IND
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

NAS 580 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 6 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

NAS 589 GRADUATE CONSULTATION
F, S, Su 1-10 cr. May be repeated.
PREREQUISITE: Master’s standing.

NAS 590 MASTER’S THESIS
F, S, Su 1-10 cr. May be repeated.
PREREQUISITE: Master’s standing.

PHIL: Philosophy
Department of History & Philosophy
(406) 994-4395

PHIL 105H PROBLEMS OF GOOD & EVIL
F, S, Su 3 cr. LEC 3
- An examination from a multi-cultural perspective of traditional conceptions of good and evil and their implications for relativism.

PHIL 109H REASON AND REALITY
F, S 3 cr. LEC 3
- Exploration of the nature of reality and human knowledge. A critical look at the presuppositions of our common sense world view.

PHIL 206D PHILOSOPHY AND CULTURE
S 3 cr. LEC 3
PREREQUISITE: Sophomore standing or consent of instructor.
- Addresses questions of how philosophy and culture intersect, as well as exploring the differences and commonalities between philosophical traditions. Themes include social justice, identities, society, and culture.

PHIL 215 SOCIAL AND POLITICAL PHILOSOPHY
On Demand 3 cr. LEC 3
- Philosophical problems about the nature of the state and society and their relationship to the individual.

PHIL 220 PHILOSOPHIES OF ASIA
S 3 cr. LEC 3
- A critical examination of some classical school of Asian philosophy such as Confucianism, Hinduism, or Buddhism.

PHIL 225CS SCIENCE, PSEUDO-SCIENCE AND SUBJECTIVITY
On Demand 3 cr. LEC 3
- Introduces both deductive and inductive aspects of scientific as a foundation for addressing broader questions such as, "Is there demarcation between science and non-science?"; "Is science subjective?"; Is scientific knowledge cumulative?"; and many more.

PHIL 226CS OTHER ANIMALS
On Demand 3 cr. LEC 3
- Explores how animals have been understood over time from scientific, philosophical, and cultural perspectives, in the East as well as in the West. More particularly, the understanding of both morphology and behavior will be examined in terms of classical Darwinian and Japanese approaches. The various methodologies employed, their underlying assumptions and possible limits, will be discussed, as well as the larger moral issues that they raise.

PHIL 231 INTRODUCTION TO LOGIC
F, S 3 cr. LEC 3
- Modern forms of valid inference with applications.

PHIL 238RH MORALITY AND SOCIETY
On Demand 3 cr. LEC 3
- The philosophical study of contemporary moral issues such as capital punishment, euthanasia, racism and terrorism. The term will culminate in a substantial piece of original research on a moral issue chosen by the individual student.

PHIL 250RH MORALITY AND SOCIETY
On Demand 3 cr. LEC 3
PREREQUISITE: Consent of instructor.
- The philosophical study of contemporary moral issues such as capital punishment, euthanasia, racism and terrorism. The term will culminate in a substantial piece of original research on a moral issue chosen by the individual student.

PHIL 259RH STATE, COMMUNITY AND INDIVIDUAL
On Demand 3 cr. LEC 3
PREREQUISITE: One course in Philosophy or consent of instructor.
- The philosophical study of the state and society. Topics include the nature and limits of political legitimacy and the nature of just economic systems.

PHIL 262 ETHICS
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of general moral theory with applications to moral problems of current interest such as abortion, the legal enforcement of morality, the death penalty, and nuclear war.

PHIL 264 MORAL THEORY
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of 20th Century moral theory. The focus is on such issues as whether morality is objective or subjective as well as methods of moral reasoning.

PHIL 280 RH HISTORY OF WESTERN PHILOSOPHY: ANCIENT & MEDIEVAL
F 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Great systems of philosophic thought and their origins during ancient and medieval times.

PHIL 290 RH UNDERGRADUATE RESEARCH/CREATIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

PHIL 296 HISTORY OF WESTERN PHILOSOPHY: MODERN
S 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Foundations of contemporary thought, Descartes to Kant.

PHIL 311 AESTHETICS AND THE ARTS
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Philosophical examination of the nature and function of the arts and the aesthetic experience.

PHIL 313 PHILOSOPHY AND FILM
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

PHIL 314 ASIAN PHILOSOPHY
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- A critical examination of some classical school of Asian philosophy such as Confucianism, Hinduism, or Buddhism.

PHIL 315 EXPLORATION OF THE NATURE OF REALITY AND HUMAN SOCIETY AND CULTURE
On Demand 3 cr. LEC 3
- Philosophical problems about the nature of the state and society and their relationship to the individual.

PHIL 320 RH THE STATE
On Demand 3 cr. LEC 3
PREREQUISITE: Consent of instructor.
- The philosophical study of the state and society. Topics include the nature and limits of political legitimacy and the nature of just economic systems.

PHIL 332 ETHICS
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of general moral theory with applications to moral problems of current interest such as abortion, the legal enforcement of morality, the death penalty, and nuclear war.

PHIL 334 RH HISTORY OF WESTERN PHILOSOPHY: MODERN
S 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Foundations of contemporary thought, Descartes to Kant.

PHIL 336 BIO-MEDICAL ETHICS
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of moral problems in medicine such as abortion, euthanasia, human experimentation, and the distribution of scarce medical resources.

NAS 575 - PHIL 338
COURSE DESCRIPTIONS: NAS 575 - PHIL 338

NAS 589 GRADUATE CONSULTATION
F, S, Su 1-10 cr. May be repeated.
PREREQUISITE: Master’s standing.

NAS 590 MASTER’S THESIS
F, S, Su 1-10 cr. May be repeated.
PREREQUISITE: Master’s standing.

PHIL 105H PROBLEMS OF GOOD & EVIL
F, S, Su 3 cr. LEC 3
- An examination from a multi-cultural perspective of traditional conceptions of good and evil and their implications for relativism.

PHIL 109H REASON AND REALITY
F, S 3 cr. LEC 3
- Exploration of the nature of reality and human knowledge. A critical look at the presuppositions of our common sense world view.

PHIL 206D PHILOSOPHY AND CULTURE
S 3 cr. LEC 3
PREREQUISITE: Sophomore standing or consent of instructor.
- Addresses questions of how philosophy and culture intersect, as well as exploring the differences and commonalities between philosophical traditions. Themes include social justice, identities, society, and culture.

PHIL 215 SOCIAL AND POLITICAL PHILOSOPHY
On Demand 3 cr. LEC 3
- Philosophical problems about the nature of the state and society and their relationship to the individual.
PHIL 340 ENVIRONMENTAL ETHICS
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- This course reviews the major readings, both classical and contemporary, on environmental ethics, and isolates the major issues. It provides the appropriate theoretical background. It applies these readings and this background to the investigation and resolution of several environmental policy questions.

PHIL 342 APPROACHES TO EPISTEMOLOGY
S alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- The course gives an introduction to some epistemological problems like the problem of skepticism, the problem concerning the nature of justification, the problem of induction, and the problem associated with the nature and existence of God. It offers three approaches: traditional, naturalized, and Bayesian approaches to some of the problems mentioned above.

PHIL 352 METAPHYSICS
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- The most basic questions human beings raise in reflecting on their world, themselves and their place in the world. Sample questions concern the possibility of freedom, the relation of mind and brain, and the nature of being.

PHIL 360 EXISTENTIALISM AND AFTER
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Existentialism and related developments including phenomenology and post modernism.

PHIL 362 PHILOSOPHY AND RACE
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- Examines the development of the concept of "race" in philosophy since the 17th century. Traces the effects race has had on concepts such as the "person", "self-respect", "rationality", "knowledge", "state of nature", "science", "social justice", and "ordinary life".

PHIL 363 PHILOSOPHY AND FEMINISM
S alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: Philosophical analysis of concepts and assumptions central to feminist theories. Topics may include the nature of gender and oppression, masculinity, the relationship between sexism and other forms of oppression, the ideal society, and feminist challenges to traditional philosophical theories.

PHIL 364 CONTEMPORARY PHILOSOPHY
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- This course introduces students to recent trends in analytical philosophy. Among the topics the course addresses is the nature of consciousness, artificial intelligence, and others.

PHIL 368 LANGUAGE AND THE WORLD
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- A discussion of linguistic meaning, the concept of truth, and the relation between thought and language as viewed by contemporary philosophers.

PHIL 378 PHILOSOPHY OF SCIENCE
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of the concepts of explanation, confirmation, and theory and their application to classic works in the history of the natural and social sciences.

PHIL 388 PHILOSOPHY OF TECHNOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of certain concepts used to describe and explain technology and their application to questions concerning the limitations of a technological way of life.

PHIL 390 REASON AND REVOLUTION
On Demand 3 cr. LEC 3
PREREQUISITE: Previous course in Philosophy or consent of instructor.
- An examination of the scope and limits of reason and their role in revolution as exemplified in Hegel, Marx, and other nineteenth century philosophers.

PHIL 400 SEMINAR
F, S 3 cr. SEM Maximum 9 cr.
PREREQUISITE: Junior standing.
- Senior capstone course. Each semester is given over to the detailed study of a major figure or problem in philosophy. Since the figures and problems studied vary from semester to semester, the course may be repeated for credit. Two semesters of Phil 400 are required for all philosophy majors.

PHIL 470 INDEPENDENT STUDY
On Demand 1 - 6 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and study on an individual basis.

PHIL 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Consent of instructor as determined for each offering.
- Courses are offered only in those special areas or for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHIL 489R UNDERGRADUATE RESEARCH/ CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: PHIL 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

PHIL 490R UNDERGRADUATE RESEARCH/ CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. Ind May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

PHIL 500 SEMINAR
On Demand 3 cr. SEM Maximum 4 cr
PREREQUISITE: Graduate standing or seniors by petition.
- Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

PHIL 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Division of Education.
- Directed research and study on an individual basis.

PHYS Physics
Department of Physics
(406) 994-3614

PHYS 101N MYSTERIES OF THE SKY
F, S, Su 3 cr. LEC 3
- An introduction to contemporary astronomy that explores the nature, methods, and limitations of scientific inquiry within the context of our struggle to understand the structure and evolution of the Universe. Topics include the history of astronomy, motions of the night sky, the solar system, stellar evolution, galaxies, and cosmology.

PHYS 102N MYSTERIES OF THE UNIVERSE
Su 4 cr. LEC 3 RCT 1
- An introduction to contemporary astronomy that explores the nature, methods, and limitations of scientific inquiry within the context of our struggle to understand the structure and evolution of the Universe. Topics include the history of astronomy, motions of the night sky, the solar system, stellar evolution, galaxies, and cosmology. In addition to lectures, students spend one full class each week working in teams on a series of lab-like exercises designed to reinforce the learning of key concepts.
- Students may only count one of PHYS 101 and PHYS 102 toward meeting graduation requirements.

PHYS 103N OUR PHYSICAL WORLD
F 3 cr. LEC 3
PREREQUISITE: High School Algebra.
- A conceptual survey of topics in physics for non-science majors. Topics include motion, force, momentum, energy, waves, and sound, and may include heat, the structure of matter, relativity, optics, electricity and magnetism, or modern physics. Students will not receive credit if they have passed PHYS 205, PHYS 211, or PHYS 221.

PHYS 137 FROM QUARKS TO THE COSMOS
F 1 cr. LEC 1
- An introduction to frontier areas of physics, including the "Standard Model" of elementary particle physics, quantum mechanics, and big-bang cosmology. Students explore these topics using order-of-magnitude estimates, dimensional analysis, and simple observations. Intended for physics majors or those considering a major or minor in physics.
PHYS 200 RESEARCH PROGRAMS IN PHYSICS
F 3 cr. LEC 1
– An introduction to some of the exciting ideas, developments, problems, and experiments of modern day physics.

PHYS 201N PHYSICS BY INQUIRY
F, S 3 cr. LAB 3
– An indepth exploration of basic physics principles. Scientific model building and proportional reasoning skills will be developed in the context of properties of matter, observational astronomy, and DC electric circuits. For pre-service elementary teachers.

PHYS 205 COLLEGE PHYSICS I
F, S, Su 4 cr. LEC 3 LAB 1
PREREQUISITE: High school trigonometry or MATH 160.
– First semester of sequence. Topics include kinematics and dynamics of linear and rotational motion; work and energy; impulse and momentum; and fluids. Students will not receive credit if they have passed PHYS 211 or PHYS 221.

PHYS 206 COLLEGE PHYSICS II
F, S, Su 4 cr. LEC 3 LAB 1
PREREQUISITE: PHYS 205 or PHYS 211.
– Second semester sequence. Topics include simple harmonic motion; electric forces and fields; dc electric circuits; magnetic forces and fields; and magnetic induction and motors. Students will not receive credit if they have passed PHYS 212 or PHYS 222.

PHYS 211 GENERAL AND MODERN PHYSICS I
F, S, Su 4 cr. LEC 3 LAB 1
PREREQUISITE: MATH 181.
– First semester of a three-semester sequence primarily for engineering and physical science students. Covers topics in mechanics (such as motion, Newton's laws, conservation laws, work, energy, systems of particles, and rotational motion) and in mechanical waves (such as oscillations, wave motion, sound, and superposition).

PHYS 212 GENERAL AND MODERN PHYSICS II
F, S 4 cr. LEC 3 LAB 1
PREREQUISITE: PHYS 211 or PHYS 221.
– Covers topics in electricity and magnetism (such as Coulomb's law, Gauss' law, electric fields, electric potential, dc circuits, magnetic fields, Faraday's law, ac circuits, and Maxwell's equations) and optics (such as light, geometrical optics, and physical optics).

PHYS 215 GENERAL AND MODERN PHYSICS III
S 4 cr. LEC 3 LAB 1
PREREQUISITE: PHYS 212 or PHYS 222.
– Covers topics in thermodynamics (such as temperature, heat, laws of thermodynamics, and the kinetic theory of gases) and modern physics (such as relativity; models of the atom; quantum mechanics; and atomic, molecular, solid state, nuclear, and particle physics).

PHYS 221 HONORS
GENERAL AND MODERN PHYSICS I
S 4 cr. LEC 3 LAB 1
PREREQUISITE: MATH 181.
– The honors section of PHYS 211. The concepts are discussed in more depth and the range of applications is greater.

PHYS 222 HONORS
GENERAL AND MODERN PHYSICS II
F 4 cr. LEC 3 LAB 1
PREREQUISITE: PHYS 211 or PHYS 221, MATH 182.
– The honors section of PHYS 212. The concepts are discussed in more depth and the range of applications is greater.

PHYS 251 INTRODUCTION TO THEORETICAL PHYSICS
S 3 cr. LEC 3
– PREREQUISITE: PHYS 224.
– COREQUISITE: MATH 225, PHYS 213.
– Mathematical methods essential to the practice of theoretical physics, such as matrices, vector calculus, differential equations, and Fourier series, with applications to examples from mechanics and electromagnetism.

PHYS 253 PHYSICS OF PHOTOGRAPHY
F 2 cr. LEC 2
– PREREQUISITE: High school algebra.
– Improvement of photographic skills through an understanding of the basic principles of photography. The nature of light and color and the physical principles involved in the operation of a camera will be presented. Unusual effects and recent developments will be discussed. Numerous demonstrations, photographs, and slides will be used to illustrate the principles.

PHYS 256 LABORATORY ELECTRONICS I
F 2 cr. LEC 1 LAB 1
– COREQUISITE: PHYS 212 or PHYS 222.
– Laboratory electronic measurements and analysis, and design of basic linear circuits.

PHYS 270 INDEPENDENT STUDY
On Demand 1-3 cr. IND Maximum 6 cr.
– PREREQUISITE: Consent of instructor and approval of department head.
– Directed study on an individual basis.

PHYS 280 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
– PREREQUISITE: None required but some may be determined necessary by each offering department.
– Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHYS 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 2 cr. RCT MAY BE REPEATED. MAX 4 CR.
– Classroom instruction associated with directed undergraduate research/creative activity projects.

PHYS 301 CLASICAL MECHANICS
F 4 cr. LEC 4
– PREREQUISITE: PHYSICS 215, PHYS 231.
– Principles of Newtonian, Lagrangian, and Hamiltonian mechanics including single particle motion, systems of particles, rigid body motion, moving coordinate systems, and small oscillations.

PHYS 311 SOLAR SYSTEM ASTRONOMY
F, Su on demand 4 cr. LEC 3 LAB 1
– PREREQUISITE: PHYS 205, PHYS 211, or PHYS 221.
– COREQUISITE: PHYS 206, PHYS 212, or PHYS 222.
– Covers the origin and evolution of our solar system, including detailed examinations of the sun, earth, moon, other planets, and satellites. Exciting new discoveries and emerging research results will be integrated into the course. The laboratory operates in a "project mode" and includes experiments with models that can be done indoors as well as with the use of telescopes.

PHYS 312 INTRODUCTION TO ASTRONOMY
S alternate years, to be offered odd years 4 cr. LEC 3 LAB 1
– PREREQUISITE: PHYS 205, PHYS 211, or PHYS 221, or the equivalent.
– COREQUISITE: PHYS 206, PHYS 212, or PHYS 222, or the equivalent.
– After reviewing basic classical astronomy on the properties, structure and evolution of stars and galaxies, the course will introduce some hot topics in frontiers of astronomy, such as pulsars, quasars, black holes, and fate of the universe.

PHYS 317 ELECTRICITY AND MAGNETISM I
F 5 cr. LEC 3
– PREREQUISITE: PHYS 253 or MATH 348.
– Electrostatic fields, dielectric materials, magnetic fields, magnetic materials, and Maxwell's equations.

PHYS 318 ELECTRICITY AND MAGNETISM II
S 5 cr. LEC 3
– PREREQUISITE: PHYS 317.
– Propagation of electromagnetic waves, radiation, and general wave phenomena.

PHYS 321 COMPUTATIONAL PHYSICS
F 1 cr. LEC 1
– PREREQUISITE: PHYS 251.
– Introduction to the use of computational methods in physics. Emphasis will be placed on common methods of casting problems into forms amenable to numerical solution and for displaying numerical results.

PHYS 341 SPECIAL RELATIVITY
S alternate years, to be offered odd years 1 cr. LEC 1
– PREREQUISITE: PHYS 211 or PHYS 221.
– Einstein's theory of special relativity is presented from the modern viewpoint, with emphasis on the geometry of space time.

PHYS 353R THE ART AND SCIENCE OF HOLOGRAPHY
S 3 cr. LEC 2 LAB 1
– PREREQUISITE: Junior standing and one core science course. Math 160 or equivalent Math Placement Test.
– Beginner's course on creating holograms. Pictorial and geometric interpretations of lasers, interference, coherence, film, and holography enable students with limited science and math backgrounds to create their own holographic masterpieces. Lab techniques and documenting the creative process are emphasized.

PHYS 361 LABORATORY ELECTRONICS II
S 2 cr. LEC 1 LAB 1
– PREREQUISITE: PHYS 261.
– Analysis and design of basic digital circuits and advanced laboratory electronic measurements.

COURSE DESCRIPTIONS: PHYS 200 - PHYS 361
COURSE DESCRIPTIONS: PHYS 400 - PHYS 507

PHYS 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr
PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

PHYS 401 PHYSICS BY INQUIRY I
Su 3 cr. LAB 3.
PREREQUISITE: Teacher Certification.
- An in-depth and hands-on exploration of basic physics principles. Scientific model building and proportional reasoning skills will be developed in the context of dc electrics, one and two-dimensional kinematics, and dynamics. For middle school and high school science teachers.

PHYS 402 PHYSICS BY INQUIRY II
Su 3 cr. LAB 3.
PREREQUISITE: PHYS 401.
- An in-depth and hands-on exploration of basic physics principles. Scientific model building and proportional reasoning skills will be developed in the context of light, color, geometrical optics, heat, and temperature. For middle school and high school teachers.

PHYS 403 SPECIAL RELATIVITY ONLINE
S alternate years, to be offered odd years 3 cr. RCT 3.
PREREQUISITE: PHYS 212, MATH 182, Bachelor's degree, and one year teaching experience.
- This online course addresses the question: In what ways does nature behave differently at high relative speeds than at low speeds? Designed for practicing high school physics teachers. Assignments and discussions use electronic computer conferencing and interactive visual software.

PHYS 404 PHYSICS BY INQUIRY III
Su 3 cr. LAB 3
PREREQUISITE: Science Teacher Certification.
COREQUISITE: PHYS 401.
- PHYS 404 is a continuation of the PHYS 401 experience, but it may also be taken concurrently with PHYS 401. The course will begin with a careful investigation of geometrical optics, leading to an understanding of pinhole cameras, lenses, and prisms. This will be followed by an exploration of magnetic interactions and magnetic materials.

PHYS 406 CAPSTONE PRESENTATIONS
S 1 cr SEM 1
PREREQUISITE: Senior standing; 2 credits of PHYS 470, 489, or 490, and completion of a senior project.
- Senior capstone course. Participation in this course requires the completion of a senior capstone project that integrates the student's knowledge and skills acquired during the undergraduate curriculum. Results of the senior project will be presented orally and in writing.

PHYS 411 INTRODUCTORY QUANTUM MECHANICS I
S 4 cr. LEC 4
PREREQUISITE: PHYS 301.
- Historical review, operators, eigenvalue problem, Schrödinger equation, one-dimensional problems, bound and unbound states, harmonic oscillator, and angular momentum.

PHYS 412 INTRODUCTORY QUANTUM MECHANICS II
F 3 cr. LEC 3
PREREQUISITE: PHYS 411.
- Three-dimensional problems, hydrogen atom, matrix mechanics, spin, perturbation theory, and applications to atomic, molecular, nuclear, and particle physics.

PHYS 425 THERMODYNAMICS
SU alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PHYS 231.
- Statistical physics and thermodynamics and their applications to physical phenomena. This course is strongly recommended for students intending to study physics in graduate school.

PHYS 426 MODERN OPTICS
SU alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PHYS 213 and MATH 225.
- Emphasis is on new developments in optics trig- gered by the laser. Provides a good foundation in wave optics, nonlinear optics, integrated optics, and spectroscopy.

PHYS 427 LASER APPLICATIONS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PHYS 212.
- A survey of laser types and properties and applications for scientists and engineers who wish to use lasers in research or technology. Many demonstrations will be used to illustrate the principles.

PHYS 435 ASTROPHYSICS
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PHYS 301 and PHYS 317.
- A survey covering basic problems in modern astrophysics such as stellar structure and evolution, solar physics, compact objects, quasars, and cosmology.

PHYS 441 SOLID STATE PHYSICS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: PHYS 215.
- A treatment of the classification and electronic structure of solids. Properties of conductors, superconductors, insulators, and semiconductors will be discussed. This course is strongly recommended for students intending to study physics in graduate school.

PHYS 442 NOVEL MATERIALS FOR PHYSICS AND ENGINEERING
S alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: Knowledge of introductory solid state physics; PHYS 441 or consent of instructor.
- Provides basic physical knowledge of advanced natural/artificial materials; ferroelectrics, superconductors, nanotubes, superlattices, photonics materials, materials with giant magnetoresistance and negative susceptibilities, molecular magnets, and biomaterials.

PHYS 451 ELEMENTARY PARTICLE PHYSICS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PHYS 231.
- A survey of elementary particle physics, beginning with an historical viewpoint and leading up to today's remarkably successful "Standard Model" of quarks, leptons, and gauge bosons.

PHYS 461 SENIOR LAB
F, S 4 cr. LAB 4 Maximum 8 cr
PREREQUISITE: PHYS 361.
COREQUISITE: PHYS 411.
- Introduction to methods, instrumentation, and data acquisition techniques used in modern physics research. Experiments chosen from laser optics, atomic physics, solid-state physics, superconductivity, and nuclear physics.

PHYS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- Directed study on an individual basis.

PHYS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHYS 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: PHYS 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

PHYS 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 3 cr. IND May be repeated. Max 6 cr.
PREREQUISITE: Junior standing and signed consent of instructor/research advisor and academic advisor.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

PHYS 500 SEMINAR
On Demand 1 cr. SEM Maximum 8 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

PHYS 501 ADVANCED CLASSICAL MECHANICS
F 5 cr. LEC 3
PREREQUISITE: PHYS 301.

PHYS 506 QUANTUM MECHANICS I
S 3 cr. LEC 3
PREREQUISITE: PHYS 412.

PHYS 507 QUANTUM MECHANICS II
F 3 cr. LEC 3
PREREQUISITE: PHYS 506.
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PHYS 582 ASTROBIOLOGY FOR TEACHERS
F, S 3 cr. Online Lec 3
PREREQUISITE: PHYS 311, PHYS 511, or equivalent; PHYS 205, PHYS 311, or equivalent; BIOG 301 or equivalent; EDSD 366 or equivalent; and Bachelor's degree and minimum of one year of full-time teaching experience at the secondary level or above.

- Astrobiology is the study of the origin, evolution, distribution, and destiny of life in the universe. It defines itself as an interdisciplinary science at the intersection of physics, astronomy, biology, geology, and mathematics, to discover where and under what conditions life can arise and exist in the Universe. The course topics will cover the discovery of planetary systems around other stars, the nature of habitable zones around distant stars, the existence of life in extreme environments. This course will serve as a foundation to study possible extraterrestrial ecosystems on planets and moons like Mars and Europa.

PHYS 583 THE INVISIBLE UNIVERSE ONLINE: THE SEARCH FOR ASTRONOMICAL ORIGINS
F, S 3 cr. Online Lec 3
PREREQUISITE: PHYS 311, PHYS 511, or equivalent; PHYS 205, PHYS 511, or equivalent; EDSD 366 or equivalent; Bachelor's degree and minimum of one year of full-time teaching experience at the secondary level or above.

- This course covers the long chain of events from the birth of the universe in the Big Bang, through the formation of galaxies, stars, and planets by focusing on the scientific questions, technological challenges, and space missions pursuing the search for origins in alignment with the goals and emphasis of the National Science Education Standards.

PHYS 589 GRADUATE CONSULTATION
F, S 3 cr. Online Lec 3
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.

- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

PHYS 590 MASTER'S THESIS
F, S 1 - 3 cr. IND Maximum credits unlimited.
PREREQUISITE: Master's standing.

PHYS 598 DOCTORAL READING & RESEARCH
On Demand 3 - 6 cr. IND Maximum 15 cr.
PREREQUISITE: Doctoral standing.

- This course may be used by doctoral students who are reading research publications in the field in preparation for beginning doctoral thesis research.

PHYS 690 DOCTORAL THESIS
F, S 1 - 6 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

POL 206 IS THE GOVERNMENT OF THE UNITED STATES
F, S 3 cr. LEC 3
- Examines the major institutions of national government and politics. Special emphasis on the constitution and other political rules of the game as shapers of public consciousness and government policy.

POL 208 STATE AND LOCAL GOVERNMENT AND POLITICS
S 3 cr. LEC 3
- Examines the changing role of state and local government in American society. Emphasis on the constitutional basis of the distribution of governing powers and upon the problems confronting state and local government in Montana.

POL 214 IS PRINCIPLES OF POLITICAL SCIENCE
F 3 cr. LEC 3
- Major concepts and values of democracy in the United States including the founding, power, behavioral concepts, and sense of community.

POL 214D INTRODUCTION TO INTERNATIONAL RELATIONS
F 3 cr. LEC 3
- A survey of the major global issues and the means to their resolution. Special emphasis on the global trends of regionalism and internationalism.

POL 251 CONDUCTING POLITICAL INQUIRY
S 3 cr. LEC 3
PREREQUISITE: POLS 206.
- Research design and measurement of political behavior at the level of the individual and the political unit. Techniques of gathering and analyzing attitudinal data, voting records, policy outputs, and other political variables. Use of nonparametric statistics.

POL 255 PRINCIPLES OF PUBLIC ADMINISTRATION
S 3 cr. LEC 3
PREREQUISITE: POLS 206.
- Implementation of public policy in American government. Topics include but are not limited to: bureaucratic politics, decision making, budgeting, personnel management, ethics, organization theory, and organization behavior.

POL 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand for requesting a regular course number.

POL 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

POL 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

POL 301 PARTIES AND ELECTIONS
F alternate years, to be offered 2006 3 cr. LEC 3
PREREQUISITE: POLS 206, POLS 214, POLS 251.
- Examines the structure and function of political parties, interest groups, and the mass media in the electoral process. Special emphasis on electoral rules and citizen participation from a comparative democratic perspective.

POL 302 MEDIA & POLITICS
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: POLS 206, POLS 214, POLS 251.
- Examines the role of the media in the political process with special emphasis on various print media, television, film, and cyberspace.

POL 304 THE U.S. PRESIDENCY
F alternate years, to be offered 2006 3 cr. LEC 3
PREREQUISITE: POLS 206, POLS 214, POLS 251.
- The American presidency as a government institution. Examination of the legal, political, administrative, and policy making roles of the president. Emphasis on recent issues of responsiveness to national needs and public accountability.

POL 306 THE LEGISLATIVE PROCESS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: POLS 206, POLS 208, POLS 214, POLS 251.
- Examines legislative decision-making in a constitutional, political, and comparative context. Special emphasis on how institutional rules and relationships shape the making of public policy at both the Congressional and state legislative levels.

POL 310 STATISTICAL TECHNIQUES IN POLITICAL SCIENCE
F 3 cr. LEC 3
PREREQUISITE: POLS 206,251. Quantitative Core Course.
- Provides an introduction to methods and techniques in quantitative political statistics. Topics covered range from levels of measurement and descriptive statistics to logistic regression, using political science data sets and examples.

POL 321 CLASSICAL POLITICAL THOUGHT
F 3 cr. LEC 3
PREREQUISITE: POLS 206, POLS 214, POLS 251.
- Themes and issues in political discourse from Plato through Rousseau with emphasis on contemporary relevance.

POL 322 MODERN POLITICAL THOUGHT
S 3 cr. LEC 3
PREREQUISITE: POLS 206, POLS 214, POLS 251.
- Significant modern and post-modern thinkers, ideologies, utopias, movements, and discourses. May include variants of liberalism, Marxism, anarchism, feminism, political ecology, Freud, and political dimensions of popular culture and cultural theory.

POL 324 CONTEMPORARY POLITICAL THEORY
F, S 3 cr. LEC 3
PREREQUISITE: POLS 206, POLS 214, POLS 251.
- Ideas of major thinkers from 2000 on.
POLS 354 THEORIES OF POLITICAL SCIENCE
F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: POLS 241.
- Theoretical and empirical social science approaches to political movements, resistance cultures, and protest and change in selected contexts, both historical and contemporary. Behavior of individuals in mass and revolutionary movements, in civil society, and through acts of terrorism is examined.

POLS 400 SEMINAR: JUNIOR-SENIOR
F, S, Su 3 cr. SEM 3
PREREQUISITE: Junior standing.
- Topics offered at the upper division level which are not covered by catalogued courses. Students are expected to do individual research projects leading to an oral and written report of each student's findings.

POLS 409 CONSTITUTIONAL LAW AND PUBLIC POLICY
S alternate years, to be offered odd years
5 cr. LEC 3
PREREQUISITE: Junior standing and POLS 206.
- Explores the relationship between law, individual rights, and public policy. Legal research and case law approach are stressed. Topics will include, but are not limited to the aspects of the Bill of Rights and the 14th and 15th Amendments.

POLS 415 MONTANA LOCAL POLITICS & POLICY
F alternate years, to be offered 2006 3 cr. LEC 3
PREREQUISITE: Junior standing, POLS 208.
- The development of Montana politics with an emphasis on the historical context underlying the political issues of the state of Montana, the structure of Montana's local governments and the critical issues they confront. Examination of the Montana local governing process as determined by the interaction of federal, state, and local government, and contemporary political and policy issues of governance.

POLS 421 POLITICS OF FOOD & HUNGER
S 3 cr. LEC 3
PREREQUISITE: POLS 241 and Junior standing.
- The role of civil society, government and multilateral organizations are examined in a comprehensive analysis of food and hunger, including the issues presented by agricultural policy, famine, biotechnology and food safety, domestic and international food aid, and the right to food.

POLS 433 THEORIES OF POLITICAL SCIENCE
F 3 cr. LEC 3
PREREQUISITE: POLS 241, Junior or Senior standing required.
- The nature and origin of modern public international law and its role in contemporary world politics. Topics include the rights and duties of states, human rights, law pertaining to armed conflict, aggression and international crimes, and the role of international law in conflict management.

POLS 444 GLOBALIZATION AND POLITICS
S 3 cr. SEM 3
PREREQUISITE: POLS 443, junior standing or consent of instructor.
- Issues in globalization are critiqued using in-depth case studies on trade and trade disputes, programs imposed by the World Bank/IMF, global income inequality, the role of civil society, labor standards and personal criteria for globalization.

POLS 450 NATURAL RESOURCE POLICY
S 3 cr. LEC 3
PREREQUISITE: POLS 206, POLS 208, POLS 251.
- Explores the relationship between public policies and economic and political issues that emerge. Special emphasis is placed on the National Parks and Federal public lands of the Greater Yellowstone Ecosystem.

POLS 452 AMERICAN PUBLIC POLICY
S 3 cr. LEC 3
PREREQUISITE: POLS 206, 208, 241, 251 and 214 or 255.
- Explores the relationship between public policies and economic and political issues that emerge. Special emphasis is placed on political narratives, decision making and implementation strategies.

POLS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, cumulative g.p.a. of 2.5 or better, consent of the instructor, and approval of the department head.
- Directed research and study on an individual basis.

POLS 476 INTERNSHIP
F, S, Su 6 - 12 cr. IND 5-11 RCT 1-2
PREREQUISITE: Junior standing, cumulative g.p.a. of 2.5 or better, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.
COURSE DESCRIPTIONS: POLS 480 - PSPP 105

POLS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

POLS 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: POLS 490, junior standing.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

POLS 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. LEC May be repeated. Max 12 cr.
- An individualized preprofessional assignment under the direction of a faculty mentor. Written and oral presentation of results are expected.

POLS 520 GOVERNMENT LEADERSHIP & ADMINISTRATION
F alternate years, 3 cr. LEC 3
- This course exposes students, using the most current theoretical and empirical literature, to the essential competencies need for management and leadership roles in public organizations.

POLS 551 RESEARCH METHODS
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- The research process as a means of acquiring knowledge that is relevant and reliable to making of public management decisions. Students will prepare and submit a research design that meets social scientific standards.

POLS 552 PUBLIC POLICY PROCESSES
S, alternate years, to be offered odd years 3 cr. LEC 3
- This course exposes students, using the most current theoretical and empirical literature, to the essential competencies needed to understand the development and implementation of public policy.

POLS 554 FOUNDATIONS OF PUBLIC ADMINISTRATION
F 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- Theoretical, historical, intellectual foundations of public administration. Examines the relationship between public administration theory and practice, the political context and the intellectual heritage of the field. Examines basic functions and processes of public administration. Examines the relationship between public administration and contemporary issues of governance facing the public sector.

POLS 555 HUMAN RESOURCES MANAGEMENT
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: POLS 554, graduate standing.
- The development of the concept of "public service" in the United States. Topics include historical development of public personnel, position classification, recruitment, selection, equal opportunity, affirmative action, collective bargaining and flexible employment relationships under more limited and decentralized government.

POLS 557 PUBLIC BUDGETING & FINANCE
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: POLS 554, graduate standing.
- Public sector budgeting as a tool for financial management and the implementation of fiscal and programmatic policy. Emphasis on the political context.

POLS 558 PUBLIC ORGANIZATION DYNAMICS
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: POLS 554, graduate standing.
- Examines alternative organization structures for public management and the influence of those structures upon organization behavior and performances. Influence of management styles and individual differences are examined as well as issues relating to personal development and organizational mission. Public and non-profit organizations are contrasted.

POLS 559 PROGRAM EVALUATION AND POLICY ANALYSIS
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: POLS 554, graduate standing.
- Methods of program evaluation and policy analysis for public programs. Quantitative and qualitative methods of analysis are contrasted. Implementation, utilization, and political context of the analysis and evaluation process are examined. Philosophical and ethical issues underlying alternative methods are examined.

POLS 560 ETHICS AND PUBLIC SERVICE
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: POLS 554.
- Explores ethics and selected issues in public service and policy making through theoretical and case study approaches. Emphasis on the relation of continuing issues and problem areas to individual careers in policy making and administrative decision making.

POLS 562 LOCAL GOVERNMENT ADMINISTRATION
F alternate years, to be offered 2006 3 cr. LEC 3
PREREQUISITE: POLS 554, graduate standing.
- Training in the administration of municipal and county governments for graduate students who intend a career in agencies of these governments, or instate and federal agencies whose programs focus on local governments.

POLS 570 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

POLS 574 DIRECTED PROFESSIONAL RESEARCH PROJECT
F, S 3 cr. RCT 3
PREREQUISITE: Graduate standing.
- Write, complete and present a graduate professional paper under the supervision of a faculty mentor.

POLS 576 INTERNSHIP
F, S, Su 3-12 cr. IND 10-11 RCT 1-2 Maximum 12 cr.
- An individualized preprofessional assignment arranged with an agency, business, or other organization.

POLS 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering, consent of instructor.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

POLS 588 PROFESSIONAL DEVELOPMENT
On Demand 1 - 5 cr. May be repeated; maximum 3 cr.
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies.
- Course offered on a one time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subtitled.

PSPP 101CS INTRODUCTION TO BIOTECHNOLOGY
F 5 cr. LEC 2 SEM 1
- Introduction to an ever-growing industry. Course is designed to demonstrate the significance of biotechnology in today's world. Lecture series presented by research professors, social scientists, and industrial experts. Cross-listed with VITM 101 and MB 110.

PSPP 105CS PLANT SCIENCE, RESOURCES AND THE ENVIRONMENT
S 3 cr. LEC 3
- Provides an understanding of basic plant science principles and environmental components that impact humankind and develop solutions to problems. Real-life case histories will be emphasized with a career goal emphasis on science, resources, the environment, and the transfer of technologies.

PSPP 105C MIRACLE GROWING: INTRODUCTION TO HORTICULTURE
S 3 cr. LEC 3
- Science in the context of horticulture. Learn environmental factors affecting horticulture and current measurement technology. Projects explore global and regional issues, careers, and tools necessary to be a successful horticulturist. Culminates in a presentation at the Horticulture Open House.
COURSE DESCRIPTIONS: PSPP 131 - PSPP 342

PSPP 131 LANDSCAPE DESIGN
HISTORY/THEORY
S 3 cr. LEC 3
- Introduction to the history of landscape design from ancient civilizations to the present. The evolution of design theory as it relates to visual arts, material palettes, climate, ecology, cultural, and social issues. Current trends in landscape industry and the work of major designers will be studied.

PSPP 212 METHODS IN BIOTECHNOLOGY
F, S cr. LAB 4
- This course will challenge students in the biotech major to learn a series of essential molecular techniques focusing on research and faculty interaction. The techniques learned will be highly applicable to the biotech industry, giving students a post-graduation competitive edge.

PSPP 225 LANDSCAPE GRAPHICS
F, S cr. LEC 1 LAB 2
PREREQUISITE: ME 116 or TE 230 or AutoCAD experience.
- Landscape graphic communication including review of graphic enhancing techniques, rendering and computer presentation drawing applications of site analysis, site planning, landscape and planting design.

PSPP 226 COMPUTER GRAPHICS
S 3 cr. LEC 3
PREREQUISITE: ME 116 or TE 230 and PSPP 225.
- Understanding of the opportunities offered by computer-based modeling technologies; exploring software common to the profession of landscape architecture including desktop publishing, image manipulation, modeling and drafting; utilizing computer-aided methods at different phases of a design project.

PSPP 231 WOODY ORNAMENTALS
F 3 cr. LEC 1 LAB 1
PREREQUISITE: BIOL 101 (may be used as a corequisite).
- Identification characteristics, adaptations and uses of coniferous trees, deciduous trees, coniferous shrubs, deciduous shrubs, and woody vines commonly used as ornamentals in Montana and some species utilized outside of Montana. Lab includes extensive plant walks.

PSPP 232 HERBACEOUS ORNAMENTALS
S 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 101.
COREQUISITE: BIOL 101.
- Identification, characteristics, cultural requirements and ornamental uses of indoor tropical foliage and flowering plants, herbaceous landscape annuals and perennials, flowering bulbs, and water gardening plants.

PSPP 242 CROP IDENTIFICATION
F 1 cr. LAB 1
- Meets first third of semester. Recognition and identification of seed, vegetative parts, and floral structure of the major species of cereals, forage legumes, and grasses.

PSPP 245 PLANT PROPAGATION
S 3 cr. LEC 2 LAB 1
PREREQUISITE: CHEM 121 or 131 and BIOL 101.
- Traditional sexual and asexual reproduction of plants including seed germination, stem and leaf cuttings, grafting, and layering. Includes discussion of the biology and physiology of propagation methods. Lab includes experimentation with the various propagation methods using native plants as model systems.

PSPP 250 IDENTIFICATION OF SEED PLANTS
S 4 cr. LEC 2 LAB 2
PREREQUISITE: BIOL 101.
- Identification of conifers, trees and shrubs, and herbaceous seed plants; determination by use of manuals; vocabulary, classification and nomenclature; preparation and collection of seed plant specimens. Cross-listed with BIOL 230.

PSPP 250 SPECIAL TOPICS
On demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required, but some may be necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PSPP 290 UNDERGRADUATE RESEARCH/Creative Activity Instruction
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: PSPP 290.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

PSPP 305 PRACTICAL GENETICS
(Change, effective Fall 05) S 3 cr.
PREREQUISITE: BIOL 102 214.
- Examination of the modes of inheritance, gene expression and genetic manipulation of eukaryotic organisms, particularly those of flowering plants and mammal. Population genetics, genetic diversity and quantitative genetics are also discussed.

PSPP 310 TURFGRASS MANAGEMENT
F 3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 101, Quantitative Reasoning Core, and PSPP 254.
- Turfgrass propagation, fertilization, establishment, and maintenance. Recognition and adaptabilities of Northern and Southern turfgrasses used for landscape and sports use. Includes irrigation principles and basic hydraulics, establishment and fertilizer calculations, and pest management. Lab includes experimentation with establishment techniques, equipment calibration, soil testing, and turfgrass maintenance.

PSPP 318 BIOMETRY
F 3 cr. LEC 3
PREREQUISITE: MATH 150 and computer literacy.
- Analysis and interpretation of biological data. Topics include: analysis of frequency data, probability distributions, hypothesis testing, one-way analysis of variance, linear regression, and correlation. Use of computer software in solving problems.

PSPP 331 PLANTING DESIGN
F 5 cr. LEC 1 STU 2
PREREQUISITE: PSPP 231 (may be taken as a corequisite).
- Graphic communication skills; landscape trends and styles; landscape design principles; and planting design for engineering, architectural, climate control, and aesthetic uses. Emphasis on residential landscape planning. Specification writing and cost estimating for landscape installation.

PSPP 335 SITE DEVELOPMENT
S 4 cr. LEC 3 LAB 1
PREREQUISITE: MATH 150, PSPP 331.
- Site analysis, site survey, structure siting, roadway and parking lot planning, grading and earthwork modifications, site drainage, pedestrian circulation and circulation design. Lab includes experimentation with problem-solving and field measurement for: site analysis, boundary survey, leveling and topographic survey.

PSPP 336 LANDSCAPE CONSTRUCTION
S 4 cr. LEC 2 LAB 2
PREREQUISITE: PSPP 331, PSPP 335 (may be taken as a corequisite).
- Understanding of construction materials used to create the built landscape. Design and production of working drawings for walks, patios, steps, ramps, retaining walls, decks, fences, irrigation systems, and other landscape features. Production of landscape construction portfolio which details a complete site development project including cost estimating and bidding for construction.

PSPP 337 VEGETABLE PRODUCTION
F alternate years, to be offered odd years S 3 cr. LEC 3
PREREQUISITE: PSPP 102 or PSPP 251.
- Modern production practices for all major temperate-zone vegetable crops, including crop management principles, crop growth and development, storage, and post-harvest physiology. The class will include production of transplants and detailed discussion of several major vegetable crop families, including Solanaceae, Cucurbitaceae, Brassicaceae, Liliaceae, and the Fabaceae.

PSPP 338 FRUIT PRODUCTION
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSPP 102 or PSPP 251.
- Modern production practices for all major temperate-zone tree and small fruit, including crop management, fruit crop growth and development, storage, and post-harvest physiology. The class will include a discussion of rootstocks, grafted, pruning, trellising, and quality control as they impact today's fruit production system.

PSPP 341 FIELD CROP PRODUCTION
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: PSPP 102.
- Production of field crops using practical and applied crop management principles. Emphasis includes understanding of crop management principles and application of problem solving capabilities to field crop management situations.

PSPP 342 FORAGES
F 3 cr. LEC 3
PREREQUISITE: PSPP 102.
- Principles of applied forage crop management including establishment, irrigation, fertilization, pests, harvesting, and forage integration of many legume and grass species.
COURSE DESCRIPTIONS: PSPP 343 - PSPP 456

PSPP 343 COMMERCIAL PLANT PRODUCTION
S 3 cr. LEC 3
PREREQUISITE: PSPP 245.
- Greenhouse and nursery design and operation, including environmental control, growing media, irrigation, and fertilization of field and container grown ornamental crops. Retail and wholesale marketing strategies will be explored. Sustainable practices will be emphasized.

PSPP 345 ORGANIC MARKET GARDENING
Su 3 cr. LEC 1 LAB 2
PREREQUISITE: PSPP 102, LRES 201 and Junior standing.
- Focus is on the production of quality vegetable, herb and flower products for sale through local, regional or non-traditional marketing avenues. Special attention is made to present and analyze sustainable food crop production systems.

PSPP 421 CONCEPTS OF PLANT PATHOLOGY
S 3 cr. LEC 1 LAB 1
PREREQUISITE: BIOL 101.
- An introductory course in the study of plant diseases. Includes plant pathogens, etiology of disease, and various control strategies.

PSPP 422 PLANT DISEASE CONTROL
S alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: PSPP 421 or consent of instructor.
- This course will provide comprehensive coverage of the concepts of integrated management of plant diseases. Concepts covered include regulatory, cultural, chemical, host plant resistance, and biological controls. Students will be introduced to epidemiology and weather-based predictive computer models for use in disease management programs.

PSPP 423 MYCOLOGY
F alternate years, to be offered even years
3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 101.
- This course surveys the immense diversity of fungi, including all major groupPSPP with emphasis on structures, life cycles, identification, and ecology. It provides a basic knowledge of the rapidly expanding relevance of fungi in research, medicine, agriculture, biotechnology, and industry.

PSPP 424 ECOLOGY OF FUNGI
F alternate years, to be offered odd years
3 cr. LEC 2 LAB 1
PREREQUISITE: BIOL 101, BIOL 215, a comparable course in introductory biology, or consent of instructor.
COREQUISITE: None, but an upper division biology course is recommended.
- This course emphasizes the important and varied roles of the higher fleshly fungi in natural and managed systems, focusing on forest habitats. Fungi are the ecological backbone of many terrestrial systems, yet their ecological roles as saprophages, symbionts, and mycorrhizal mutualists are often minimized. Fungi are major players in carbon sequestration, nutrient recycling, and succession. They are symbionts of algae, cyanobacteria, trees, shrubs, forbs, orchids, ants, termites, beetles and small mammals. Fungi are unique organisms that require special methods of study. Both traditional techniques and more recent molecular methods will be presented at the individual, population, community, landscape, and biome levels, along with topics on fungal conservation and global change. This course consists of twice weekly sessions of two hours each for lecture, discussions, and demonstrations. One or two afternoon or morning field trips to nearby forests are required to initiate a final project.

PSPP 425 SENIOR CAPSTONE I
F 1 cr. IND 1
PREREQUISITE: Senior standing, for majors only.
- First semester of a two-semester project for seniors majoring in Horticulture Science. This capstone course allows students to pursue an area of interest in a largely self-chosen research or community service project.

PSPP 426 PLANT BIOTECHNOLOGY
S 3 cr. LEC 2 LAB 1
PREREQUISITE: BCHM 340 or BIOL 201 or PSPP 305.
- Humans have historically altered plants to meet food and fiber needs. Our ability to transfer genes from organism to organism is accelerating this process. The principles of plant genetic engineering will be discussed along with hands-on laboratory.

PSPP 429 BIOTECHNOLOGY
S alternate years, to be offered even years
F 2 SEM 2
PREREQUISITE: Junior or Senior standing.
- Senior capstone course. Participants in this seminar section will bring closure to the student's required internship. Students will have the opportunity to refine their public speaking and writing skills through synthesis of the goals, progress, and outcome of their industrial or research laboratory experience. Exposure to many different types of internship outcomes will broaden the student's perception of the disciplines which contribute to the field of Biotechnology.

PSPP 431 TOUGH PLANTS IN TOUGH PLACES
F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: BIOL 101, PSPP 102, (PSPP 231 and PSPP 232) or PSPP 250.
- Delve into the physiological adaptation for both native and non-native plants to survive in urban and highly disturbed landscapes if the intermountain west. Explore the roles and interactions of turfgrass, trees, shrubs, perennials and annuals in the ecology of the developed landscape. Learn about the interaction of the built landscape with natural systems.

PSPP 432 ADVANCED LANDSCAPE DESIGN
F alternate years, to be offered even years
4 cr. LEC 1 STU 1
PREREQUISITE: PSPP 331, PSPP 335, PSPP 356.
- Advanced graphic communication skills, environmental land use planning, master plan design, site specific design, and construction detailing. Individual and group problem-solving skills are stressed through graphic, verbal, and written landscape design solutions. •

PSPP 434 GREENHOUSE MANAGEMENT
S 3 cr. LEC 2 LAB 1
PREREQUISITE: CHEM 121 or 131, PSPP 254.
- Focus is on greenhouse design and operation, including environmental control systems, growing media, irrigation, and fertilization systems. Emphasis on retail and wholesale management strategies and the marketing of greenhouse crops. Insect and disease identification and integrated pest management strategies explored. Lab will investigate herbaceous ornamentals and vegetable production techniques.

PSPP 435 NURSERY MANAGEMENT
Fall alternate years, to be offered even years
3 cr. LEC 2 LAB 1
PREREQUISITE: Junior standing and CHEM 121 or 131, PSPP 254.
- Addresses all aspects of production of field and container grown ornamental crops including nursery design, environmental concerns, marketing and current issues. A 3-day field trip is mandatory.

PSPP 438 MARKET GARDENING
Su, 3 cr. LEC 1 LAB 2
PREREQUISITE: PSPP 102, LRES 201, and Junior standing.
- Focus is on the production of quality vegetable, herb, and flower products for sale through local, regional, or non-traditional marketing avenues. Special attention is made to present and analyze sustainable food crop production systems.

PSPP 441 CROP BREEDING
S alternate years, to be offered odd years
5 cr. LEC 3
PREREQUISITE: BIOL 501 or PSPP 305.
- Application of genetic principles in improving important agronomic and horticultural plant species. Traditional methods of hybridization as well as methods of non-sexual gene transfer are included.

PSPP 447 ADVANCED PLANT PROPAGATION
S 3 cr. LEC 1 LAB 2
PREREQUISITE: PSPP 245.
- Students will learn specialized sexual and asexual propagation techniques, with an emphasis on the physiological and environmental manipulation of plants associated with in vitro, seed and grafting production. Students will receive extensive tissue culture experience.

PSPP 450 PLANT PHYSIOLOGY
S 3 cr. LEC 3
PREREQUISITE: Junior standing, BIOL 101, and one of the following: CHEM 215, CHEM 311, or BCHM 122.
- Physiological process of higher plants, including photosynthesis, water relations, mineral nutrition, development, stress physiology, and biotechnology. Cross-listed with BIOL 430.

PSPP 454 AGROSOLOGY
F alternate years, to be offered odd years
3 cr. LEC 1 LAB 2
PREREQUISITE: BIOL 230.
- Determination, classification, evolution, and nomenclature of grasses and grass-like plants; morphological and ecological features; preparation of reference specimens. Cross-listed with BIOL 434.

PSPP 455 PLANT SYSTEMATICS
F alternate years, to be offered even years
3 cr. LEC 1 LAB 2
PREREQUISITE: BIOL 101, BIOL 230.
- Introduction to the local vascular plant flora emphasizing characteristics of the common families and genera. Lab concentrates on plant identification of common angiosperm plant families in Montana; preparation of about 120 reference specimens taken from the local flora. Cross-listed with BIOL 450.
COURSE DESCRIPTIONS: PSPP 457 - PSPP 570

PSPP 457 PLANT DEVELOPMENT
F alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: BIOL 301.
- Cellular and molecular mechanisms of the development of plants. Topics include developmental differences between plants and animals, regulation of gene expression, environmental effects on plant development, and computer modeling of development. Cross-listed with BIOL 457.

PSPP 458 PLANT CELL PHYSIOLOGY
F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: BIOL 301, BCHM 540.
- The features of plant cells that differentiate them from animal cells are the chief topics covered. These include cell walls, plastids and vacuoles. Other cellular organelles will also be briefly covered, including intra- and inter-cellular communication mechanisms.

PSPP 460 PLANT METABOLISM
S alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: PSPP 251, BCHM 540.
- In-depth overview of plant metabolism: photosynthesis including C4 and CAM metabolism; intermediary carbon metabolism; lipids; nitrogen and sulfur assimilation and metabolism; amino acid biosynthesis; secondary metabolism (terpenoids, alkaloids, phenylpropanoids, flavonoids); metabolic changes during plant development.

PSPP 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- Directed research and study on an individual basis.

PSPP 476 INTERNSHIP
On Demand 1 - 4 cr. IND Maximum 12 cr.
PREREQUISITE: Junior standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

PSPP 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or even on a trial basis to determine acceptability and demand.

PSPP 480R UNDERGRADUATE RESEARCH/CREATIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Maximum 4 cr.
COREQUISITE: PSPP 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

PSPP 490R UNDERGRADUATE RESEARCH/CREATIVITY INSTRUCTION
F, S 1 - 4 cr. IND
PREREQUISITE: Junior or Senior standing and approval of instructor.
- Undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis.

PSPP 500 SEMINAR
F, S 1 cr. SEM Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Students prepare, present, and critique scientific presentations.

PSPP 516 RESEARCH DESIGN AND ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: STAT 401.
- Data analysis and interpretation of problems unique to agricultural and biological research. Topics include: sample size determination, transformation of data scale, randomized block and Latin square designs, comparisons among means, factorial experiments with restricted randomization and analysis of covariance.

PSPP 518 PLANT VIRUS DISEASES
F alternate years, to be offered 2006 3 cr. LEC 3
- An in-depth study of viruses with emphasis on plant viruses.

PSPP 519 PLANT VIRUS DISEASES LAB
F alternate years, to be offered 2006 1 cr. LAB 1
COREQUISITE: PSPP 518.
- Laboratory exercises related to plant virology.

PSPP 524 ADVANCED PLANT PATHOLOGY
F alternate years, to be offered odd years
3 cr. LEC 3
- This course is designed to give graduate students in the Department of Plant Sciences & Plant Pathology or other departments a broad survey of plant pathology subject matter at the graduate level and to give all graduate students in PSPP a common experience and introduction to PSPP graduate faculty. This course will serve as a companion to 'Genetic Plant Improvement (PS 542)' taught in spring even years and alternate years by our plant breeding faculty.

PSPP 526 PLANT BACTERIAL DISEASES
F alternate years, to be offered odd years
3 cr. LEC 3
PREREQUISITE: PS 421.
- An in-depth study of bacteria and their etiology in causing plant disease.

PSPP 527 PLANT BACTERIAL DISEASES LAB
F alternate years, to be offered odd years
1 cr. LAB 1
PREREQUISITE: PS 421.
COREQUISITE: PSPP 526.
- Laboratory exercises related to the study of plant bacterial diseases.

PSPP 531 PHYSIOLOGY OF HOST-PARASITE INTERACTIONS
S alternate years, to be offered even years
1 cr. LAB 1
PREREQUISITE: PS 421.
- Advanced study of the physiological and biochemical aspects of host-parasite interactions.

PSPP 541 ADVANCED PLANT GENETICS
F alternate years, to be offered odd years
4 cr. LEC 3 LAB 1
PREREQUISITE: PSPP 441.
- Theory and practice of genetic analysis and genome modification in higher plants. Development of familiarity with current and classical literature is stressed as is sound hypothesis formulation and research project planning.

PSPP 542 GENETIC PLANT IMPROVEMENT
S alternate years, to be offered even years
3 cr. LEC 3
PREREQUISITE: PSPP 441, STAT 401.
- The past, present and future of plant improvement. Emphasis on genetical principles underlying classical plant breeding, and on molecular biological principles underlying plant genetic engineering.

PSPP 546 HERBICIDE PHYSIOLOGY
F 3 cr. LEC 3
PREREQUISITE: BCHM 540 and PSPP 450 or equivalents.
- A team-taught, distance delivery course on the biochemistry and physiology of herbicide action in plants. Herbicide discovery, classification, and mechanisms of action and resistance are explored.

PSPP 548 FLOWERING PLANTS OF THE NORTHERN ROCKY MOUNTAINS
Su alternate years, to be offered even years
2 cr. LEC 2
- A field oriented study of the flowering plants of Montana with a emphasis on plant keying skills. Objectives are: 1) to identify the plants of flowering plants and become familiar with botanical terms; 2) to learn morphological characteristics of common plant families; 3) to learn how to use a plant key to successfully identify flowering plants; application of these skills and botanical texts to the classroom. Mon - Tues are class/lecture days; Wed - Fri are day field trips to local trailheads.

PSPP 552 ADVANCED SOIL AND ENVIRONMENTAL MICROBIOLOGY
S alternate years, to be offered 2006, even years
3 cr. LAB 3
PREREQUISITE: Graduate standing and instructor's permission.
- Advanced laboratory course. Microorganisms are targeted for isolation and characterization, emphasizing those not normally encountered in general microbiology laboratory. Biogeochemical cycling, contaminant biodegradation, extremophiles, and plant-microbe interactions are typical topics investigated. Students employ classic and novel cultivation approaches, identifying microbes based morphologically, physiologically, and phylogenetically. Cross-listed with LRES 552.

PSPP 553 PLANT FUNGAL DISEASE
S alternate years, to be offered even years
5 cr. LEC 3
PREREQUISITE: PSPP 421.
- An in-depth study of fungi and their etiology in causing plant diseases.

PSPP 554 PLANT FUNGAL DISEASE LAB
S alternate years, to be offered even years
1 cr. LAB 1
PREREQUISITE: PSPP 421.
COREQUISITE: PSPP 553.
- Laboratory exercises related to the study of plant fungal diseases.

PSPP 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies.
- Directed research and study on an individual basis.
PSY 221 RESEARCH DESIGN AND ANALYSIS I
F, S 4 cr. LEC 3 LAB 1
PREREQUISITE: PSY 100 and either MATH 150 (or higher) or STAT 216.  
Introduction to the design and analysis of psychological research. Topics include logic and  
philosophy of psychological research, conceptualizing research questions, hypothesis testing, data  
collection and analysis strategies used by researchers in psychology, and introduction to using  
statistical software for data analysis.

PSY 231 RESEARCH DESIGN AND ANALYSIS II
F, S 3 cr. LEC 3
PREREQUISITE: PSY 221.  
Continuation of PSY 221. Topics include experimental, quasi-experimental, and non-
experimental designs and methodological issues; assessing research questions; reliability and  
validity of psychological measures; ethics of psychological research; writing research reports; using  
statistical software for data analysis.

PSY 241 PSYCHOLOGICAL MEASUREMENT
On Demand 3 cr. LEC 3
PREREQUISITE: PSY 221.  
Principles of psychological testing and measurement as related to intelligence, aptitudes, attitudes,  
occupations, and personality. Topics include nature and types of psychological tests, test construction,  
test administration, basic psychometric theory, methods for estimating the reliability and validity  
of psychological tests, and ethical issues regarding psychological testing and measurement.

PSY 252 DEVELOPMENTAL PSYCHOLOGY
F 3 cr. LEC 3
PREREQUISITE: PSY 100.  
Human development across the lifespan using major theories of development including psycho-
analytic, psychosocial, learning, and cognitive. Physical, cognitive, social, emotional, and personal-
ity development are explored from conception to death.

PSY 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor.  
Directed research and study on an individual basis.

PSY 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering  
department.  
Courses not required in any curriculum for which there is a particular one-time need, or given on a  
trial basis to determine acceptability and demand before requesting a regular course number.

PSY 282 INTRODUCTION TO LEARNING
On Demand 3 cr. LEC 3
PREREQUISITE: PSY 100.  
Introduction to scientific principles, theories, and applications of learning, including respondent  
and operant conditioning, social learning, verbal learning. Other types and approaches to learning  
will also be discussed.

PSY 290R UNDERGRADUATE RESEARCH/  
CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated  
Classroom instruction associated with directed undergraduate research/creative activity projects.

PSY 301 PHYSIOLOGICAL PSYCHOLOGY
F 3 cr. LEC 3
PREREQUISITE: PSY 100 and BIOL 100,  
BIOL 102, or BCHM 104.  
Introduction to the biological bases of behavior; brief review of functional neuroanatomy and  
physiology in relation to such topics as sensation, movement, motivation, emotion, sleep, learning  
and memory, consciousness, and abnormal behavior.

PSY 305 APPLIED CRITICAL THINKING
On Demand 3 cr. LEC 2 RCT 1
PREREQUISITE: PSY 100, and any Quantitative core course.  
Study of critical thinking skills through an understanding of psychological factors involved. Practical  
strategies are explored in relation to hypothesis formation and evaluation, decision making, problem  
solving and creativity, reasoning, and memory. Applications are emphasized.

PSY 311 SENSATION & PERCEPTION
F 3 cr. LEC 3
PREREQUISITE: PSY 301.  
Basic principles of sensory systems (with emphasis on the visual system), contemporary psychophysical  
procedures, and principles of perception.

PSY 332 BEHAVIOR MODIFICATION
F 3 cr. LEC 3
PREREQUISITE: PSY 231 and PSY 282 or PSY 341.  
Human behavior change with emphasis on practical techniques for changing individual and group  
behavior in real-life situations.

PSY 341 LEARNING AND MOTIVATION
S 3 cr. LEC 3
PREREQUISITE: PSY 231.  
Examines basic principles and theories of learning and motivation. Classical and operant  
conditioning, discrimination learning, incentive motivation, reward and punishment, and concept  
learning.

PSY 361 MEMORY AND COGNITION
F, S 3 cr. LEC 3
PREREQUISITE: PSY 100, Junior standing or consent of instructor.  
Theories and evidence concerning human information processing, focusing especially on attention  
and memory, problem solving, decision making, reasoning, and related topics.

PSY 382 ABNORMAL PSYCHOLOGY
F 3 cr. LEC 3
PREREQUISITE: PSY 100.  
Historical and current perspectives on psychopathology, including neuroscience, behavioral  
cognitive, psychodynamic, and humanistic/existential approaches. Traditional approaches and  
recent innovations in therapy and diagnosis are considered along with current diagnostic catego-
ries, especially DSM.

PSY 576 INTERNSHIP
On Demand 2 - 4 cr. IND Maximum 12 cr.
PREREQUISITE: Graduate standing, consent of instructor and approval of Department Head, and  
Dean of Graduate Studies.  
An individualized assignment arranged with an agency, business or other organization to provide  
guided experience in the field.

PSY 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and  
others as determined for each offering.  
Courses not required in any curriculum for which there is a particular one-time need, or given on a  
trial basis to determine acceptability and demand.

PSY 589 GRADUATE CONSULTATION
F, S, Su 3 cr. IND
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.  
This course may be used only by students who have completed all of their coursework (and thesis,  
if on a thesis plan), but who needs additional faculty or staff time help.

PSY 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.  
PREREQUISITE: Master's standing.

PSY 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.  
PREREQUISITE: Doctoral standing.

PSY 695 DOCTORAL INTERNSHIP
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.  
PREREQUISITE: Doctoral standing.

PSP 575 PROFESSIONAL PAPER
F, S, Su 1-10 cr. IND 1-10 cr.
PREREQUISITE: Graduate standing.  
A research or professional paper or project dealing with a topic in the field. The topic must  
have been mutually agreed upon by the student and his or her major adviser and graduate com-
mittee.

PSPP 575 DOCTORAL THESIS
F, S, Su 1-10 cr. IND 1-10 cr.
PREREQUISITE: Doctoral standing.  
Courses not required in any curriculum for which there is a particular one time need, or given on a  
trial basis to determine acceptability and demand.

PSPP 575 DOCTORAL SEMINAR
On Demand 1 - 10 cr. Maximum 12 cr.
PREREQUISITE: None required but some  
courses not required in any curriculum for which there is a particular one-time need, or given on a  
trial basis to determine acceptability and demand.

PSPP 575 PROFESSIONAL PAPER
F, S, Su 1-10 cr. IND 1-10 cr.
PREREQUISITE: Master's standing and approval  
of the Dean of Graduate Studies.  
This course may be used only by students who have completed all of their coursework (and thesis,  
if on a thesis plan), but who needs additional faculty or staff time help.
PSY 392 PSYCHOLOGY OF WOMEN
F 3 cr. LEC 3
PREREQUISITE: PSY 100
- Traditional and feminist perspectives on psychological needs and concerns specific to women, including gender stereotyping and beliefs, cognitive differences between the sexes, psychological disorders common to women, women's sexuality, and cultural and biological roles and norms.

PSY 394 PSYCHOLOGY AND AGING
S 3 cr. LEC 3
PREREQUISITE: PSY 100 and Junior standing or consent of instructor
- Surveys different domains in which human behavior is influenced by aging. Topics include the influence of age on cognitive processes (e.g., attention and memory), social processes (e.g., personality and well being), and biological processes (e.g., brain-related changes).

PSY 400 SEMINAR
On Demand 1 cr. SEM Maximum 4 cr
PREREQUISITE: PSY 231, Junior standing and as determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students help prepare and present discussion material, and attend presentations by guest speakers.

PSY 411 HISTORY & SYSTEMS OF PSYCHOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: PSY 231
- Examination of the historical development of major concepts, theoretical ideas, and approaches to psychology, with emphasis on perspectives of broad current interest such as behavioral science, cognitive science, and neuroscience.

PSY 415 PSYCHOLOGY OF PREJUDICE
S 3 cr. LEC 3
PREREQUISITE: PSY 100 or consent of instructor
- Reviews theory and research on prejudice. Topics include stereotyping and discrimination, cognitive and affective dynamics of prejudice, causes of prejudice, eliminating prejudice, affirmative action, and diversity programs, and psychological effects of prejudice.

PSY 418 PERSONALITY
S 3 cr. LEC 3
PREREQUISITE: PSY 231
- Theories and evidence on processes that underlie consistent and enduring differences in behavior, cognition, and affect. Topics include emotion, motivation, temperament, inner experience, identity and the self, personality change, the influence of sociocultural context, and related topics.

PSY 422 CONSCIOUSNESS
On Demand 3 cr. LEC 3
PREREQUISITE: PSY 231 and PSY 301
- Theories and evidence concerning consciousness and altered states of consciousness, including dreaming, meditation, hypnosis, sensory deprivation, psychoactive drug effects, temporal experience, psychic phenomena, and related topics.

PSY 453 SOCIAL PSYCHOLOGY
F 3 cr. LEC 3
PREREQUISITE: PSY 100.
- Experimental research and theoretical viewpoints in social psychology, including such topics as: interpersonal attraction, perception, aggression, attitudes and attitude change, altruism, group behavior, social influence, stereotypes and prejudice, and the self.

PSY 455 INDUSTRIAL & ORGANIZATIONAL PSYCHOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: PSY 231.
- Basic concepts and theoretical frameworks for the fundamental areas of industrial and organizational psychology. Topics include history of I/O psychology, personnel selection, psychological testing, personnel training, performance appraisal, managerial decision making, job satisfaction, work motivation, leadership, job stress, organizational conflict, job design, and organizational development.

PSY 454 SOCIAL COGNITION
F 3 cr. LEC 3
PREREQUISITE: PSY 100.
- Addresses how fundamental cognitive processes (e.g., concept activation, attention, memory) influence social behavior and thought. Topics include impression formation, mental simulations of alternative realities, nonconscious mental processes, subliminal stimuli, mental representations, stereotypes, and heuristics and biases.

PSY 461 JUDGMENT & DECISION MAKING
On Demand 3 cr. LEC 3
PREREQUISITE: PSY 100, Quantitative core and Junior standing.
- Theories and evidence on the psychology of judgment and decision making, including rationality, normative rules for choice, irrationality of some human judgments, and group decision making. Applications of decision theory at the personal, organizational, and societal levels are reviewed.

PSY 462 PSYCHOLINGUISTICS
F 3 cr. LEC 3
PREREQUISITE: PSY 100 and either PSY 361 or ENGL 236.
- Examines the psychological processes that make it possible for humans to learn and acquire language. Emphasizes on how spoken and written language is understood, how speech is produced, and how language is acquired.

PSY 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor.
- Directed research and study on an individual basis.

PSY 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PSY 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Junior or Senior standing, PSY 231 and consent of instructor.
COREQUISITE: PSY 490.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

PSY 491 FIELD PRACTICUM IN APPLIED PSYCHOLOGY
F, S, Su 3 - 12 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Junior or Senior standing, PSY 231 and consent of instructor.
- Exposure to the various roles and demands of a field setting, including specialization in one of the following areas: applied research, behavior modification, psychological assessment, industrial/organizational behavior, or others (to be arranged).

PSY 493R SENIOR THESIS CAPSTONE
F, S 3 cr. SEM 3
PREREQUISITE: PSY 489 and 490 (minimum 3 cr.) or PSY 491.
- Senior capstone course. Written and oral presentation of senior thesis work.

PSY 500 SEMINAR
On Demand 1 cr. SEM Maximum 4 cr.
PREREQUISITE: Graduate standing or consent of instructor.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

PSY 501 ADVANCED RESEARCH DESIGN AND ANALYSIS
F 3 cr. LEC 3
PREREQUISITE: Graduate standing or PSY 231.
- Advanced topics in the design and analysis of psychological research.

PSY 539 PHYSIOLOGICAL PROCESSES
S 3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Overview of research methods and relevant aspects of neurophysiology, neuroanatomy, and neuropharmacology. Applications of prior work to the problem of discovery in biopsychology.

PSY 541 COGNITIVE PROCESSES
S 3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Theories, methods, findings, and applications concerning memory and cognitive processes.

PSY 542 LEARNING
S 3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Principles and theories of learning and motivation. Topics include conditioning, learning, incentive motivation, reward and punishment. Application to organizational and human resource management problems.
PSY 543 MEMORY
F 3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Theories and applications of human memory from cognitive psychological perspective. Topics include memory in social, legal, and educational contexts; memory conformity; memory across the lifespan, memory and expertise; autobiographical memory; metamemory; and forgetting.

PSY 544 SOCIAL PSYCHOLOGY
F 3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Advanced experimental and applied research and theoretical viewpoints in social psychology. Topics include social cognition, interpersonal attraction, aggression, attitudes and attitude change, the self, group dynamics, stereotypes and prejudice, and social influence.

PSY 545 ORGANIZATIONAL PSYCHOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: Graduate standing or consent of instructor.
- Introduction to major concepts and theories in organizational psychology through examination of research, theory and application in organizational psychology topics such as: organizational entry and socialization, leadership, motivation, group processes, conflict, job design, and personality.

PSY 546 SOCIAL COGNITION
S 3 cr. LEC 3
PREREQUISITE: Graduate standing.
- This course examines decision making, judgment, cognition, and affect from a social-cognitive perspective. Topics may include: theory development, stereotypes, prejudice and discrimination, group behavior, attitudes and attitude change, mood and affect, heuristics and biases, memory, the self, and decision making. The primary goal is to understand theory and research in social cognition.

PSY 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor.
- Directed research and study on an individual basis.

PSY 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
F, S 1-6 cr. IND. Maximum 6 cr.
PREREQUISITE: Graduate standing.
- A research or professional paper dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

PSY 580 SPECIAL TOPICS
On Demand 1 - 4 cr.
PREREQUISITE: Graduate standing and consent of instructor.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PSY 589 GRADUATE CONSULTATION
F, S 3 cr. TUT.
PREREQUISITE: Graduate standing and approval of Division of Graduate Education.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis option) for a master's degree but who need additional faculty help or time.

PSY 590 MASTER'S THESIS
F, S 1-10 cr. IND. Maximum 15 cr.
PREREQUISITE: Graduate standing.

RELS Religious Studies
Department of History & Philosophy
(460) 994-4395

RELS 105D INTRODUCTION TO THE STUDY OF RELIGION
On Demand 3 cr. LEC 3
- The great themes of the world's religions and the methodological approaches to the academic study of religion and culture.

RELS 110D RELIGION, CONFLICT AND POLITICS
F 4 cr. LEC 3 RCT 1
- This course will focus on issues in which political events and conflict have had their roots in religion or in specific interpretations of different aspects of religion.

RELS 201D RELIGION IN LATIN AMERICA
S alternate years, to be offered odd years 3 cr. SEM 3
- This course examines the history of religion in Latin America from pre-conquest times to the present and traces the mutual influences of indigenous, African, and Iberian traditions. It will emphasize "popular" beliefs, symbols, and rituals and their relationship with elite religion and state power.

RELS 202D ASIAN RELIGIONS: HINDUISM AND BUDDHISM
On Demand 3 cr. LEC 3
- The sacred texts and the historical forms of religious thought and practice in the traditions of India.

RELS 203D ASIAN RELIGIONS: FROM TAOSIM TO ZEN
On Demand 3 cr. LEC 3
- The sacred texts and images of the religious thought and practices in the traditions of China, Korea, and Japan.

RELS 204H INTRODUCTION TO HEBREW BIBLE
On Demand 3 cr. LEC 3
- The Hebrew Bible (Old Testament) and its interpreters will be studied from literary, historical, archaeological, anthropological, and cultural perspectives.

RELS 205H INTRODUCTION TO THE NEW TESTAMENT
On Demand 3 cr. LEC 1 RCT 2
- The New Testament and its interpreters will be studied from literary, historical, archaeological, anthropological, and cultural perspectives.

RELS 206H ORIGINS OF GOD
On Demand 3 cr. LEC 3
- The history and roots of and of varieties of concepts of the divine in Judaism, Christianity, and Islam.

RELS 227H MYTH, METAPHOR, AND METAMORPHOSES
F alternate years, 3 cr. LEC 3 to be offered even years
- Images of key figures from sacred texts of the world, such as Moses, Krishna, the Buddha, Confucius, Jesus, or Muhammad, will be explored through themes such as the avatar, iconoclasm, sacrifice, or textuality, and examined in their cultural contexts.

RELS 271H RELIGION AND SCIENCE
On Demand 3 cr. LEC 3
- The histories of religious world-views and their responses to scientific thought.

RELS 290H INTERPRETATION OF AMERICAN RELIGION
On Demand 3 cr. LEC 3
- Religion in America and America as religion: an examination of figures, texts, and material culture in religious traditions that create twenty-first century America. This includes issues in the history of American religions, myth, cultural imagery, thought, trends, and practices.

RELS 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

RELS 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-4 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

RELS 350H PHILOSOPHY OF RELIGION
On Demand 3 cr. LEC 3
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

RELS 389R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

RELS 399R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-4 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

RELS 500H ORIGINS OF GOD
On Demand 3 cr. LEC 3
- The history and roots of and of varieties of concepts of the divine in Judaism, Christianity, and Islam.

RELS 527H MYTH, METAPHOR, AND METAMORPHOSES
F alternate years, 3 cr. LEC 3 to be offered even years
- Images of key figures from sacred texts of the world, such as Moses, Krishna, the Buddha, Confucius, Jesus, or Muhammad, will be explored through themes such as the avatar, iconoclasm, sacrifice, or textuality, and examined in their cultural contexts.

RELS 521H RELIGION AND SCIENCE
On Demand 3 cr. LEC 3
- The histories of religious world-views and their responses to scientific thought.

RELS 530H INTERPRETATION OF AMERICAN RELIGION
On Demand 3 cr. LEC 3
- Religion in America and America as religion: an examination of figures, texts, and material culture in religious traditions that create twenty-first century America. This includes issues in the history of American religions, myth, cultural imagery, thought, trends, and practices.

RELS 522N RELIGION AND SCIENCE
S alternate years, to be offered even years 3 cr. LEC 3 RCT 1
- The roots of the western world views of nature; the development of western scientific theories and technologies; gender, ethnicity, and class influences on descriptions of nature; and a survey of non-western views of nature and society.

RELS 529 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
RELS 321 GENDER AND RELIGION
On Demand 3 cr. LEC 2 RCT 1
PREREQUISITE: One of the following: HUM 204, HUM 205, RELS 105, RELS 110, RELS 202, RELS 203, RELS 204, RELS 205 or RELS 220.
- Investigation of metaphors and myths of gender and world cultures.

RELS 325 LITERATURE AND RELIGION
On Demand 3 cr. SEM 3
PREREQUISITE: At least two 200 level courses in any one or combination of Religious Studies, English, Humanities, Modern Languages; or permission of the instructor.
- Exploration of the relationship between the sacred and the aesthetic in a variety of ancient, modern, and postmodern texts.

RELS 326 MYSTICS, FOUNDERs, REFORMERS
On Demand 3 cr. SEM 3
PREREQUISITE: One of the following: RELS 105, RELS 202, RELS 203, RELS 204, RELS 205, RELS 206, RELS 207, or permission of the instructor.
- The varieties of religious experience and the varieties of theories describing and analyzing those texts considered mystical. Questions of foundation and reformation periods considered in light of mystical experience.

RELS 350 RELIGION AND SOCIETY IN ANCIENT EGYPT
On Demand 3 cr. LEC 3
PREREQUISITE: RELS 105, RELS 110, RELS 204, RELS 205, or RELS 206.
- Survey Egyptian culture, religion, and society from the beginning of the history of a unified Kingdom of Ancient Egypt in the middle of the third millennium BCE through the Hellenistic conquest of Egypt by Alexander the Great in 323 BCE.

RELS 352 BIBLICAL ARCHAEOLOGY
3 alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: RELS 105 or RELS 110, and RELS 204 or RELS 206.
- This course will examine the archaeology of the biblical world. Major topics to be covered will be the interaction of archaeological and biblical scholarship, and the history and background of those peoples and cultures that made up the "biblical world."

RELS 402 THE NATURAL, THE UNNATURAL, AND THE SUPERNATURAL
On Demand 4 cr. SEM 4
PREREQUISITE: One of the following: HUM 205, RELS 202, RELS 203, RELS 204, RELS 205, RELS 206, RELS 220 or permission of the instructor.
- Investigating biblical, medieval, American, Taoist, and Buddhist views of nature, ways of categorizing nature and the sacred, and implications of traditional images for contemporary thought.

RELS 405 TEXT AND IMAGE
On Demand 4 cr. LEC 5 RCT 1
PREREQUISITE: One of the following: RELS 105, RELS 110, RELS 204, RELS 205, RELS 206, HUM 201 or HUM 205.
- If western religions are grounded in an iconoclastic imagination, what are the theories of reading and of seeing? This course examines the histories of literacy and of visual representation as keys to the foundations of western culture and religion.

RELS 407 INMS-THE RELIGIOUS BACKGROUND OF SOCIAL & POLITICAL CATEGORIES
F, S alternate years, to be offered Fall even years 3 cr. SEM 3
PREREQUISITE: RELS 110.
- This course will examine the religious roots of various social and political categories in today's world which might include, among other, nationalisms, fundamentalisms, or sexism, and examine the means by which these religiously-influenced categories have affected contemporary society and events.

RELS 410 PSYCHE AND THE SACRED
On Demand 3 cr. LEC 3
PREREQUISITE: One of the following: RELS 105, RELS 202, RELS 203, RELS 204, RELS 205, HUM 201, or permission of the instructor.
- This course is a cross cultural investigation of the ideas of personhood, including theories of the individual, the social, the body, and the transpersonal and transtemporal.

RELS 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

RELS 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

RELS 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: RELS 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

RELS 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1 - 6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Junior standing and consent of department head.
- Directed undergraduate research.

RELS 570 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of Associate Dean and Dean of Graduate Studies.
- Directed research and study on an individual basis.

SOCIology
Sociology
Department of Sociology and Anthropology
(406) 994-4201
SOCI 101S SOCIOLOGICAL INQUIRY
F, S 3 cr. LEC 3
- Theoretical and methodological underpinnings of sociology. How theory guides investigation of social life and results in creation of factual knowledge. How sociological questions are studied and results are interpreted.

SOCI 110S HONORS SOCIOLOGICAL INQUIRY
On Demand 5 cr. LEC 3
- In-depth study of the sociological enterprise: the broad range of theories and research used by sociologists to think about and examine the social world. All major areas of sociology are covered with an emphasis on institutions and systems of stratification.

SOCI 150D SOCIAL DIFFERENCE
S 3 cr. LEC 3
- Examination of social differences by focusing on the construction and consequences of a limited set of ascribed social characteristics: race, ethnicity, gender, sexual orientation and class. Focus on how these ascribed statuses are central to the sociological study of inequality.

SOCI 202 INTRODUCTION TO THEORY AND ANALYSIS
On Demand 3 cr. LEC 3
PREREQUISITE: SOCI 101.
- How sociologists look at social phenomena from different theoretical and methodological perspectives. Selected social issues relevant to contemporary society are analyzed.

SOCI 212 SOCIAL PROBLEMS
On Demand 3 cr. LEC 3
- Major social problems such as human deviance, discrimination, crime, mental illness, and economic inequality. These problems will be considered primarily as consequences of cultural premises and values in American society. Competing theoretical explanations.

SOCI 218 QUANTITATIVE TECHNIQUES
F, S 3 cr. LEC 3
PREREQUISITE: SOCI 101 or equivalent course; Quantitative Core course.
- Topics covered include: Levels of measurement; measures of central tendency; dispersion and association; normal curve, statistical inference; logic of quantitative comparison and decision making utilized by social scientists; introduction to data collection techniques.

SOCI 290 SPECIAL TOPICS
On Demand 1 - 6 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

SOCI 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1 - 3 cr. RCT May be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

SOCI 299R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1 - 6 cr. IND may be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.
SOC 301 INTRODUCTION TO SOCIAL THEORY
F S 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Introduction to major sociological theories with focus on the implication for the development of empirical research. Theory as a set of tools to guide research. The explanations provided by theorists are compared and their contributions to the study of selected social phenomena are discussed.

SOC 303 SOCIAL PSYCHOLOGY
S 5 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Social behavior of the individual in the group, linguistic behavior, social perception, motivation and learning, and self-focus on symbolic interaction.

SOC 304 SOCIAL STRATIFICATION
S 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.

SOC 305 SOCIOLOGY OF SPORT
On Demand 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Designed to mesh personal experience and knowledge of sport phenomena with empirical evidence and sociological theory related to competitive physical activity or sport. Sociological concepts such as race, class, gender, political economy and socialization will be applied and illustrated.

SOC 307 SOCIOLOGY OF CHILDHOOD AND ADOLESCENCE
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Examines the role of culture and societal forces influencing development among children and adolescents from a sociological perspective.

SOC 308 POPULATION AND SOCIETY
F 5 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Distribution, growth trends, and future prospects of human population numbers in local, national, and world communities including analysis of birth, death, and migration changes. Elementary methods and theories of demographic analysis.

SOC 309 SOCIOLOGY OF DEVIANC
On Demand 5 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Varieties of social deviance including legal, mental, sexual, and religious. Theories of general deviance, the social setting in which types of deviance take place, and the relationship between forms of deviance and social organization.

SOC 310 GROUP PROCESSES
On Demand 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- This course examines research on social perception, social communication and social interaction; how group dynamics are affected by race, class and gender; effects of social structure and group interaction on individuals' values, attitudes and behaviors.

SOC 311 CRIMINOLOGY
Varies, to be offered F even years, S odd years and S even years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Discussion of major theories of crime and delinquency with special attention to systems of adult and juvenile deterrence.

SOC 312 PRINCIPLES OF LAW AND PROCEDURES
F S 5 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- This course introduces the student to fundamental American legal principles developed in both the civil and criminal law. In addition, the student will gain a basic understanding of key issues in the application and development of contemporary legal procedures.

SOC 314 FAMILY AND SOCIETY
Alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- The family as a structural and functional unit in social life and organization, as a unit of social control; its status, change, and associated problems.

SOC 318R RESEARCH METHODS
F S 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Introduction to research methods in sociology with emphasis given to defining variables, hypothesis formation, and development of strategies used to test hypotheses. Student research project.

SOC 325 SOCIOLOGY OF RACE AND ETHNICITY
F S 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Historical, comparative, and social psychological study of race and ethnic relations in the U.S. and elsewhere. Power, prejudice, and discrimination relating to minority status are emphasized.

SOC 326 SOCIOLOGY OF GENDER
S 5 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Examines the social and biological bases of gender; how gender is constructed through socialization, social interaction and institutional processes, and the social, cultural and economic consequences of gender differences for men and women.

SOC 328 ENVIRONMENTAL SOCIOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.

SOC 330 SOCIOLOGY OF EDUCATION
F alternate years, offered even years 5 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core.
- This course will focus on the relationship between education and society including the role of education in structuring socialization; racial, ethnic, gender and class stratification; human capital development; economic, political and labor market opportunities; and the political system.

SOC 332 JUVENILE DELINQUENCY
On Demand 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core.

SOC 335 LAW & SOCIETY
S 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Analysis of law, legal processes, and legal and quasi-legal institutions from sociological and philosophical perspectives. Some issues that are addressed include the functions of the law in modern society, the issue of the law's power (or impotence) in the everyday, and the law's violence.

SOC 336 LAW & INEQUALITY
F alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- This course addresses the problem of social inequality by examining the contradictory ways in which the law may be used as both an instrument of social change and as a medium to formalize and solidify social inequality.

SOC 337 OCCUPATIONAL AND CORPORATE CRIME
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- A sociological analysis of crimes committed by individuals within the work place and by corporations. Addressed are the extent of the problems, social costs, legal responses, and theoretical perspectives assessing the etiology of such crimes.

SOC 339 CRIME & INEQUALITY
F 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- This course examines how crime amid justice play out in the context of a stratified society. Students explore how social organization, inequality and conflict influence and shape the nature and distribution of crime and social control.

SOC 340 SOCIAL MOVEMENTS
On Demand 3 cr. SLCE 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Of all the means of achieving social change, movements are among the most controversial. This course looks at movements through the theories used to interpret their activities in order to improve our understanding of their dynamics.
SOC 345 COMPLEX ORGANIZATIONS
F 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Rational, natural, and open systems theories of complex organizations. Introduction to organizational structure. Irrational aspects of organizations. Organizational environments and their effects on structure and activity.

SOC 350 CRIME, JUSTICE, AND THE MEDIA
F 3 cr. LEC 3
PREREQUISITE: SOC 101 and Quantitative core.
- Examines interrelationships between mass media, criminal justice system and crime in the US; public policy implications of media portrayals of crime, criminals, police and court system; relationship between media consumption and crime.

SOC 351 SOCIOLOGY OF SCIENCE AND TECHNOLOGY
On Demand 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- It has been said that the "fresh power" in society comes from science. This course explores that statement as well as the social forces that shape science and technology and the roles of technologies in our daily lives.

SOC 352 SOCIETY AND CONSUMPTION
On Demand, 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- This course analyzes long-standing questions within consumer society through the lens of race-class-gender. The focus is on: the historical evolution of consumer society; the relationship between consumption and identity; the impacts of consumption on the environment; and consumption's global dimensions.

SOC 359 SOCIOLOGY OF WORK AND OCCUPATIONS
On Demand 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Power. Who has it, who doesn't, and why. Political Sociology explores the omnipresence of power in society from political power in government to power relationships in our day-to-day lives. Political economy will also be examined.

SOC 363 SOCIOLOGY OF GLOBALIZATION
S 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- Examines the global interconnectedness of economic, political and cultural processes. Topics covered include theories and historical analysis of globalization, global culture and consumerism. The human struggles that accompany these changes including gender, family, and immigration.

SOC 368 IMMIGRATION & INEQUALITY: LATINOS IN THE U.S.
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core.
- In this course we explore the forces behind labor flows between Latin America and the U.S. and the parallel reality of immigrant life. Although rooted in immigration theory, we use Latino daily life experience as our primary analytical lens.

SOC 400 SEMINAR
On Demand 3 cr. SEM 1 Maximum 6 cr.
PREREQUISITE: As determined for each offering.
- Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

SOC 403 POLICE AND SOCIETY
On Demand 3 cr. LEC 3
PREREQUISITE: SOC 101 or equivalent course, Quantitative core; or consent of instructor.
- An in-depth analysis of policing and its role in society. The historical development of law enforcement practices, contemporary police issues and the role of police in democratic society.

SOC 410 CORRECTIONAL INSTITUTIONS
On Demand 3 cr. LEC 3
PREREQUISITE: SOC 101, or equivalent course, Quantitative core; or consent of instructor.
- Examination of philosophical and sociological theories of punishment. Critical analysis of the distribution of punishment across different socioeconomic groups in the U.S., historical and contemporary prison issues are explored.

SOC 414 FAMILY VIOLENCE
F alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: SOC 101, or equivalent course, Quantitative core; or consent of instructor.

SOC 427 SOCIOLOGICAL ANALYSIS
On Demand 3 cr. LEC 3
PREREQUISITE: SOC 101, or equivalent course, Quantitative core; or consent of instructor.
- Application of analytical tools to the analysis of sociological data.

SOC 440 RESEARCH PRACTICUM
F, S, Su 1-12 cr. RCT May be repeated. Max 4 cr.
PREREQUISITE: SOC 318
- Directed undergraduate research/creative activity projects.

SOC 451 SENIOR CAPSTONE SEMINAR
F, S 3 cr. SEM 3
PREREQUISITE: Senior standing, SOC 301, and SOC 310 and at least one additional upper division sociology course.
- Senior capstone course. The application of theory and methods in the development of an integrated framework for understanding and explaining issues of current concern. Verbal and written presentation of research paper.

SOC 470 INDEPENDENT STUDY
On Demand 3 cr. Maximum 12 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- Directed research and study on an individual basis.

SOC 476 INTERNSHIP
On Demand 2-12 cr. IND
PREREQUISITE: Junior standing, SOC 318, consent of instructor, approval of department head, and at least one additional upper division sociology course.
- An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. See departmental qualification standards for internships.

SOC 480 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

SOC 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1-2 cr. RCT May be repeated. Max 4 cr.
PREREQUISITE: SOC 318
- Classroom instruction associated with directed undergraduate research/creative activity projects.

SOC 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1-6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

SOC 500 SEMINAR
On Demand 3 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

SOC 579 INDEPENDENT STUDY
On Demand 1-3 cr. IND
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

SOC 580 SPECIAL TOPICS
On Demand 1-4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular need, or given on a trial basis to determine acceptability and demand.
COURSE DESCRIPTIONS: STAT 216Q - STAT 476

STAT

Statistics

Department of Mathematical Sciences

(406) 994-3601

The Department of Mathematical Sciences enforces prerequisites. By University policy, in order for any course to serve as the prerequisite you must earn a "C-" or better. In addition to the specific prerequisite courses listed, students in 100 level math courses and STAT 216 may also meet the prerequisite with the appropriate Math ACT, Math SAT, or Math Placement Exam score. Specific levels and scores for these courses can be found at: www.math.montana.edu/undergrad/Math_Hierarchy.pdf.

STAT 216Q ELEMENTARY STATISTICS

F, S, Su 3 cr. LEC 3
PREREQUISITE: C- or better in any 100 level or above MATH course, or Math Placement Test within the past 12 months.

- Traditional and robust estimates of location and variability, fundamentals of probability theory, confidence intervals, and tests of hypothesis for normal distributions.

STAT 217Q INTERMEDIATE STATISTICAL CONCEPTS

F, S, Su 3 cr. LEC 3
PREREQUISITE: STAT 216.

- One- and two-sample tests and associated confidence intervals for means and proportions; analysis of variance; F-tests, correlation, regression, contingency tables. Statistical analysis using the computer.

STAT 218Q HONORS ELEMENTARY STATISTICS

S 3 cr. LEC 3
PREREQUISITE: Enrollment in the MSU Honors Program or consent of instructor.

- Honors section of STAT 216. Topic coverage parallels STAT 216 but with greater emphasis on applications, data analysis and interpretation, statistical computing, and statistics in the media.

STAT 280 SPECIAL TOPICS

On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary.

- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

STAT 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION

F, S, Su 1 - 2 cr. RCT may be repeated. Maximum 4 cr.
COREQUISITE: STAT 290.

- Classroom instruction associated with directed undergraduate research and creative activity projects.

STAT 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY

F, S, Su 1 - 8 cr. IND
PREREQUISITE: Consent of department head.

- Directed undergraduate research.

STAT 332 STATISTICS FOR SCIENTISTS & ENGINEERS

F, S 3 cr. LEC 3
PREREQUISITE: MATH 182.

- Methods of estimation, collection, analysis, and display of quantitative information, continuous and discrete random variables, families of probability distributions, hypothesis testing, regression, ANOVA.

STAT 338 STATISTICAL COMPUTING AND GRAPHICAL ANALYSIS

S 3 cr. LEC 3
PREREQUISITE: One of the following: STAT 217, STAT 332, or STAT 401.

- Introduction to statistical packages SAS and S, including data importation, graphing, and basic analysis. Emphasis on use of graphical displays to explore, understand and present data.

STAT 400 SEMINAR

On Demand 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Consent of instructor, and approval of department head.

- An introduction to time series analysis considering time series regression, autoregressive, moving average, and ARIMA models, time series model building, estimation, and forecasting, and basic frequency domain methods.

STAT 401 APPLIED METHODS IN STATISTICS

F, S 3 cr. LEC 3
PREREQUISITE: STAT 401.

- Classic multivariate methods, including but not limited to principal components analysis, canonical correlation analysis, factor analysis, discrimination and classification methods, and cluster analysis.

STAT 409 INTRODUCTION TO CATEGORICAL DATA ANALYSIS

S alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: STAT 401.

- Contingency table analysis, Poisson regression, logistic regression, log-linear models, multicategory logit models.

STAT 410 METHODS FOR DATA ANALYSIS I

F 3 cr. LEC 3
PREREQUISITE: One of the following: STAT 217, STAT 332, or STAT 401.

- Two-way ANOVA, studies with no replication, confounding, interaction, multiple comparisons, simple linear regression.

STAT 412 METHODS FOR DATA ANALYSIS II

S 3 cr. LEC 3
PREREQUISITE: STAT 410.

- Two-way ANOVA, studies with no replication, correlation, repeated measures, factorial and blocked designs, comparisons of proportions or odds, logistic regression, Poisson regression.

STAT 420 PROBABILITY

F 3 cr. LEC 3
PREREQUISITE: MATH 224.

- Fundamentals of probability; discrete and continuous random variables; expected value; variance; joint, marginal, and conditional distributions; conditional expectations; applications; simulation; central limit theorem, order statistics. Also listed as MATH 450.

STAT 424 MATHEMATICAL STATISTICS

S 3 cr. LEC 3
PREREQUISITE: STAT 420 or MATH 450.

- Senior capstone course. Introduction to the theory of point estimation, interval estimation, and hypothesis testing. Also listed as MATH 434.

STAT 431 NONPARAMETRIC STATISTICS

F alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: One of the following: STAT 217, STAT 332, or STAT 401.

- Sign test, permutation tests, Wilcoxon and Mann-Whitney tests, the Kruskal Wallis test, Spearman and Kendall’s measures of association, bootstrap techniques, and smoothing methods for model fitting. Emphasis on methods and interpretation rather than theory.

STAT 435 INTRODUCTION TO TIME SERIES ANALYSIS

F alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: STAT 410.

- An introduction to time series analysis considering time series regression, autoregressive, moving average, and ARIMA models, time series model building, estimation, and forecasting, and basic frequency domain methods.

STAT 437 INTRODUCTION TO APPLIED MULTIVARIATE ANALYSIS

S alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: STAT 401.

- Contingency table and analysis, comparison of proportions and means, canonical correlation analysis, factor analysis, and discriminant analysis.

STAT 439 MIXED EFFECTS MODELS

F alternate years, offered in odd years 3 cr. LEC 3
PREREQUISITE: STAT 410.

- Mixed effects models, including the use of statistical software for analysis, and interpretation of results. Emphasis on observations correlated in time (repeated measures) and space, and on random coefficients models (growth curves).

STAT 470 INDEPENDENT STUDY

F, S, Su 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.

- Directed research and study on an individual basis.

STAT 476 INTERNSHIP

F, S, Su 1-12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head.

- An individualized assignment arranged with an agency business, or other organization to provide guided experience in the field.
COURSE DESCRIPTIONS: STAT 480 - STAT 578

STAT 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

STAT 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: STAT 490.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

STAT 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Junior standing in statistics and consent of department head.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

STAT 500 SEMINAR
F, S, Su 1 cr. SEM 1 Maximum 6 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered as the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

STAT 501 INTERMEDIATE PROBABILITY & STATISTICS
F 3 cr. LEC 3
PREREQUISITE: STAT 424 or MATH 502.
- Families of probability distributions, distributions of functions of random variables, limiting distributions, order statistics.

STAT 502 INTERMEDIATE MATHEMATICAL STATISTICS
S 3 cr LEC 3
PREREQUISITE: STAT 501.
- Estimation, likelihood inference, statistical hypothesis tests, sufficient statistics, exponential families, Bayesian statistics.

STAT 503 LINEAR MODELS
F 3 cr. LEC 3
PREREQUISITE: STAT 502.
- Special matrix theory for statistics, multivariate normal distribution, distributions of quadratic forms, estimation and testing for the general linear model, one-way and two-way classification models, contrasts (main effect, simple effect and interaction), multiple comparison techniques.

STAT 506 ADVANCED REGRESSION ANALYSIS
S 3 cr. LEC 3
PREREQUISITE: STAT 505.
- Applications of linear models using statistical packages; detecting and dealing with violations of assumptions including nonconstant variance, non-normality, and collinearity; mixed effects models.

STAT 510 STATISTICAL CONSULTING SEMINAR
F, S 1 cr. SEM 1 Maximum 6 cr.
PREREQUISITE: Graduate standing in statistics.
- Seminar discussions of issues and cases in statistical consulting. Supervised practice in consulting with researchers from various disciplines.

STAT 520 TOPICS IN APPLIED STATISTICS
F alternate years, offered in even years 5 cr. LEC 3
PREREQUISITE: STAT 424 and consent of instructor.
- Current topics selected from computational statistics, time series and spatial statistics, decision theory, sampling, linear and mixed models, and multivariate statistics.

STAT 522 STOCHASTIC PROCESSES
5 alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: STAT 420.
- Conditional probability theory, discrete and continuous time markov chains including birth and death processes and long run behavior; Poisson processes; queueing systems; system reliability.

STAT 524 BIOSTATISTICS
F alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: STAT 410.
- Statistical methodology applicable to vital statistics, life tables and survival curves, clinical trials, epidemiologic investigations, and cause-effect studies.

STAT 525 EXPERIMENTAL DESIGN
F alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: STAT 410.
- Randomization, multiple comparisons and contrasts, balanced complete and incomplete blocking designs, Latin square designs, factorial designs, nested designs, split-plot designs, random and fixed effects.

STAT 528 STATISTICAL QUALITY CONTROL
F alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: STAT 420 or an equivalent transfer course in probability theory.
- Modeling process quality, traditional SQC tools, control charts for variable and attribute data, CUSUM and WMA charts, process capability analysis, reliability statistics, accelerated testing.

STAT 532 BAYESIAN DATA ANALYSIS
F alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: STAT 502 or STAT 504.
- Decision theory including loss functions, minimax criteria, shrinkage estimators, Bayesian data analysis and applications including posterior simulation via markov chain monte carlo.

STAT 534 SPATIAL DATA ANALYSIS
5 alternate years, to be offered odd years 5 cr. LEC 3
PREREQUISITE: STAT 410 and STAT 424, or equivalent, or consent of the instructor.
- Statistical methods of spatial data analysis, stationarity and nonstationary random fields, covariance structures, geostatistical models and analysis, spatial point process models and analysis, spatial lattice models and analysis.

STAT 536 INTRODUCTION TO TIME SERIES ANALYSIS
F alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: STAT 410 and consent of the instructor.
- An introduction to time series analysis considering time series regression, autoregressive, moving average, and ARIMA models, time series model building, estimation, and forecasting, and basic frequency domain methods.

STAT 537 MULTIVARIATE ANALYSIS I
5 alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: STAT 505.
- Multivariate graphical methods, Wishart distribution, Hotelling's T-squared, multivariate regression, multivariate analysis of variance, and covariance; analysis of repeated measures, principal component analysis, factor analysis, canonical correlation, multivariate graphical displays, robust estimation discriminant and classification analysis, cluster analysis.

STAT 538 MULTIVARIATE ANALYSIS II
F alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: STAT 537.
- Special topics in multivariate analysis including general latent variable methods, analysis of covariance structures, common principle components, robust and distribution free multivariate analysis.

STAT 539 GENERALIZED LINEAR MODELS
5 alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: STAT 424 and STAT 410.
- Analysis of categorical data including logistic regression, log-linear models, analysis of deviance, extra-binomial variation, quasi-likelihood.

STAT 550 ADVANCED MATHEMATICAL STATISTICS
5 alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: STAT 502 and either MATH 362, MATH 565, or STAT 547.
- Sufficiency, completeness, ancillary statistics, invariance, likelihood-based inference, large sample theory, Edgeworth and saddlepoint approximations.

STAT 570 INDEPENDENT STUDY
F, S, Su 1-3 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

STAT 575 RESEARCH OR PROFESSIONAL PAPER/PROJECT
S alternate years, to be offered even years 5 cr. LEC 3
PREREQUISITE: Graduate standing.
- A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

STAT 576 INTERNSHIP
F, S, Su 1-6 cr. IND Maximum credits unlimited.
PREREQUISITE: Graduate standing, consent of instructor and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

STAT 578 RESPONSE SURFACE METHODOLOGY
5 alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: STAT 526.
- Diagnostics; fractional-factorial designs; method of steepest ascent; canonical analysis; response optimization; ridge analysis; response surface design including central composite designs, orthogonal designs, rotatable designs, and optimal designs; mixture designs.
COURSE DESCRIPTIONS: STAT 580 - TE 480

STAT 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
- PREREQUISITE: Upper division courses and others as determined for each offering.

STAT 589 GRADUATE CONSULTATION
F, S 3 cr. IND
- Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time.

STAT 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
- PREREQUISITE: Master's standing.

STAT 689 DOCTORAL READING & RESEARCH
F, S 3 - 5 cr. IND Maximum 15 cr.
- PREREQUISITE: Doctoral standing.
- This course may be used by doctoral students who are reading research publications in the field in preparation for doctoral thesis research.

STAT 690 DOCTORAL THESIS
F, S 1-10 cr. IND Maximum credits unlimited.
- PREREQUISITE: Doctoral standing.

TE Technology Education
Department of Education
(406) 994-3120

TE 101 INTRODUCTION TO TECHNOLOGY EDUCATION
F 1 cr. LEC 1
- Introduction to the rationale, principles, concepts, and philosophy of technology education. An overview of the Technology Education paradigm is provided through a variety of class activities.

TE 113 BASIC ELECTRONICS/COMPUTER NETWORKS
F 2 cr. LEC 1 LAB 1
- Provides basic understanding of electricity/computers. Basic principles and theory behind computer operation and networking are also reviewed.

TE 200 SEMINAR
F, S 1 cr. SEM 1 Maximum 4 cr.
- Topics offered at the lower division level which are not covered in regular courses.

TE 207 MATERIALS AND PROCESSES
F, S alternate years, to be offered 2010
4 cr. LEC 3 LAB 2
- Exploration of technical competencies using tools and equipment common to wood, metal and composite materials related to industrial usage.

TE 214 MATERIALS MACHINING AND SAFETY
S alternate years, to be offered 2010
3 cr. LEC 1 LAB 2
- PREREQUISITE: TE 207
- Materials processing information and laboratory practice with emphasis on laboratory/machine facility safety. Machine tool technology practices emphasized.

TE 230 2-D COMPUTER-AIDED DRIFTING
F, Su 3 cr. LEC 1 LAB 2
- Provides the learner with an understanding of two-dimensional computer-aided drafting. Includes instruction on the use of a complete computer-aided drafting system.

TE 254CS TECHNOLOGY & SOCIETY
F, S 3 cr. LEC 3
- The major technological periods, inventions, and innovations that have altered the course of humanity and their impact on the civilization process, leading to a perspective on technological literacy.

TE 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
- PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

TE 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

TE 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

TE 330 TRANSPORTATION TECHNOLOGY
S alternate years, to be offered 2009
3 cr. LEC 1 LAB 2
- PREREQUISITE: TE 101 and TE 207
- Systems analysis of transportation technologies. Study of transportation systems of land, sea, and air, and the dependence on energy forms to operate transportation systems. Development of technological literacy pertinent to transportation and energy systems through problem solving activities.

TE 331 ELECTRONIC COMMUNICATION TECHNOLOGY
S 4 cr. LEC 2 LAB 2
- Students explore the technical and technological concepts of communication systems and sub-systems.

TE 355 TEACHING PRACTICES
F 1 cr. LEC 1
- COREQUISITE: EDSD 452
- Provides additional experiences in planning, teaching and evaluating lessons in Technology Education.

TE 360 TECHNOLOGY PRACTICUM
F, S 3 cr. LAB 3
- PREREQUISITE: Consent of Instructor.
- Self-selected, self-directed interdisciplinary field experience arranged with and supervised by an academic advisor. This practicum will pertain to the transfer of technological literacy in a variety of settings.

TE 400 SEMINAR
On Demand 1 cr. SEM 1 Maximum 4 cr.
- PREREQUISITE: Junior standing and as determined for each offering.
- Topics offered at the upper division level not covered in regular courses. Students participate in preparing and presenting discussion material.

TE 406 CURRICULUM AND FACILITIES PLANNING
F 3 cr. LEC 3
- PREREQUISITE: Acceptance in Teacher Education program; junior standing.
- COREQUISITE: EDSD 352
- Determining appropriate development of Technology Education and Agricultural Education programs based on an analysis of student and community needs. Organizing subject matter materials and laboratory resources to promote the development of standard based curricula.

TE 410 COMPUTER-AIDED MACHINING & MANUFACTURING
On demand 3 cr. LEC 1 LAB 2
- Understanding of computer aided machining and manufacturing. Includes instruction in the use and operation of a complete CAM system including applications on a CNC milling machine.

TE 417C MANUFACTURING TECHNOLOGY
F 3 cr. LEC 1 LAB 2
- PREREQUISITE: TE 207 and TE 230 and junior or senior standing
- Capstone course. Study and application of manufacturing concepts common to industry, including the stages of initial planning, prototype construction through the use of modern manufacturing techniques, market research, and analysis.

TE 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. Maximum 4 cr.
- Directed research and study on an individual basis.

TE 476 INTERNSHIP
F, S 12 cr. IND (Maximum 12 cr.)
- PREREQUISITE: Junior standing, consent of instructor, and approval of department head.
- An individualized assignment arranged with an agency, business or other organization to provide guided experience in a technology field.

TE 480 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
- PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
TE 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
- Classroom instruction associated with directed undergraduate research/creative activity projects.

TE 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

TE 500 SEMINAR
- On Demand 1 cr. SEM 1 Maximum 4 cr.
- PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

TE 530 3D MODELING & ANIMATION
- 5 cr. LEC 1 LAB 2
- PREREQUISITE: TE 230 or ME 115, 116, 117 or have consent of instructor
- This course is designed to provide the learner with experiences that build on previous AutoCAD use and focuses primarily on the creations of 3D solid models. Viz will be used to create animations from the 3D solid models that were created in AutoCAD.

UH University Honors
University Honors Program (406) 994-4110

UH 150IS THE ECONOMICS OF LIFE
- F 3 cr. LEC 3
- PREREQUISITE: Member of University Honors Program.
- This class applies the concepts and methods of economics to the choices people make during their life cycles. Students will explore economic analysis of issues such as marital choices, child bearing, voting, explanations for the rise in obesity, the effect of legalized abortion, and the advantages and disadvantages of estate taxes. The course encourages students to apply economic concepts to diverse topics, to assess the difficulty of empirically testing the predictions of an economic model, and to debate the current research in economics.

UH 201US TEXTS AND CRITICS: KNOWLEDGE
- F 4 cr. SEM 4
- PREREQUISITE: Restricted entrance; admission to the University Honors Program.
- University Seminar in critical reading/analysis of fundamental texts in the humanities, arts, communication, social studies, science, and history of ideas. Socratic teaching methodology. Particular emphasis on development of analytic thinking and criticism through argument, writing, and oral communication. Academic writing and oral argumentation presentations.

UH 202 TEXTS AND CRITICS: IMAGINATION
- S 4 cr. SEM 4
- PREREQUISITE: Restricted entrance; admission to the University Honors Program.
- Critical reading/analysis of fundamental texts in the humanities, arts, communication, social studies, science, and history of ideas. Socratic teaching methodology. Particular emphasis on development of analytic thinking and criticism through argument, writing, and oral communication. Academic writing and oral argumentation presentations. Honors students completing this course are exempt from the IH requirements in the core.

UH 204 GREAT EXPEDITIONS
- On Demand 3 cr. SEM 3 Maximum credits unlimited.
- PREREQUISITE: Consent of instructor.
- Preparation and execution of an expedition paralleling a portion of a historically and/or culturally significant expedition. Students study the original expedition journals, history, social, scientific, artistic, and environmental context as well as plan their own expedition. The expedition occurs over a vacation break and students are required to make a public presentation on the expedition and their specific research project during the subsequent semester.

UH 210 MENTORING GIFTED CHILDREN
- F, S 2 cr. SEM 2 Maximum 4 cr.
- PREREQUISITE: Admission to the University Honors Program.
- University Honors Program students mentor gifted children from the Bozeman Public Schools. Students meet together in seminar discussion, plan and implement projects, and evaluate their projects.

UH 270 INDEPENDENT STUDY
- On Demand 1 - 3 cr. IND Maximum 6 cr.
- PREREQUISITE: Consent of instructor and approval of Director.
- Directed research and study on an individual basis.

UH 280 SPECIAL TOPICS
- On Demand 1 - 4 cr. Maximum 12 cr.
- PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

UH 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
- F, S 1-3 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

UH 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
- F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

UH 400 HONORS SEMINAR
- On Demand 2 - 4 cr. SEM Maximum credits unlimited.
- PREREQUISITE: UH 201 and UH 202.
- Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 401RA HONORS RESEARCH SEMINAR IN THE ARTS
- On Demand 2 - 4 cr. SEM Maximum credits unlimited.
- PREREQUISITE: UH 201 and UH 202.
- Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 402RH HONORS RESEARCH SEMINAR IN THE HUMANITIES
- On Demand 2 - 4 cr. SEM Maximum credits unlimited.
- PREREQUISITE: UH 201 and UH 202.
- Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 403RS HONORS RESEARCH SEMINAR IN THE SOCIAL SCIENCES
- On Demand 2 - 4 cr. SEM Maximum credits unlimited.
- PREREQUISITE: UH 201 and UH 202.
- Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 404RN HONORS RESEARCH SEMINAR IN THE NATURAL SCIENCES
- On Demand 2 - 4 cr. SEM Maximum credits unlimited.
- PREREQUISITE: UH 201 and UH 202.
- Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 450 ADVANCED HONORS TUTORIAL
- F, S 4-6 cr. RCT 4 TUT 2 May be repeated; maximum 12 cr.
- PREREQUISITE: UH 201 and UH 202.
- Weekly seminar and tutorial supervision with extensive interdisciplinary reading, analytic writing, and oral argument, leading to comprehensive examinations.

UH 451 ADVANCED HONORS TUTORIAL
- F, S 4-6 cr. RCT 1 TUT 2 May be repeated; maximum 12 cr.
- PREREQUISITE: UH 450, admission to the University Honors Program, and approval of Director.
- Weekly seminar and tutorial supervision with extensive interdisciplinary reading, analytic writing, and oral argument, leading to comprehensive examinations.

UH 470 INDEPENDENT STUDY
- On Demand 1 - 3 cr. IND Maximum 12 cr.
- PREREQUISITE: UH 201 and UH 202.
- Directed research and study on an individual basis.

UH 480 SPECIAL TOPICS
- On Demand 1 - 4 cr. Maximum 12 cr.
- PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
UH 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

UNIV
University Courses
University College
(406) 994-3120

UNIV 125CS MICROBES IN THE ENVIRONMENT
F 3 cr. LEC 3
- Directed undergraduate research/creative activity instruction associated with directed research and/or study on an individual basis. May be repeated.

US
University Studies
(406) 994-3532

US 101US FIRST YEAR SEMINAR
F, S 3 cr. SEM
PREREQUISITE: First year students (less than 30 credits) only.
- This multi-disciplinary course, presented in seminar format, draws from the disciplines of psychology, sociology, history, and philosophy, and encourages students to explore issues critical to their academic goals and objectives. The course emphasizes verbal communication, critical thinking, intellectual development, and academic choices. Fulfills university seminar requirement of the core curriculum. This course may not be repeated.

US 102 CAREER CONNECTIONS
S 1 cr. SEM 1
- Course is designed to assist students in the selection of a major in accordance with their interests and abilities.

US 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of the Director of University Studies.
- Directed study on an individual basis.

US 280 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: None required but some may be determined necessary by each offering department.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

US 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-3 cr. RCT May be repeated.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

US 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY THESIS
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
PREREQUISITE: Admission to the University Honors Program, and approval of Director.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

US 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated.
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

US 400 ADVOCAT SEMINAR
F 1 cr. SEM 1
PREREQUISITE: Sophomore standing and consent of instructor.
- As student ambassadors on campus, Advocats are trained to market the programs and activities at MSU to prospective students and their families.

US 460 PEER LEADERSHIP
F, S 3 cr. LEC 1 RCT 2 Maximum 6 cr.
PREREQUISITE: Accepted Peer Leader Status, Restricted Entry.
- Provides selected upper division students an opportunity to develop leadership and mentoring skills through the involvement with the US 101US First Year Seminar course. Includes training in group leadership and includes topics such as counseling and communication skills, student development, problem solving, and conflict resolution. Peer leaders work closely with faculty to enhance the academic, cultural, and social experiences of students in the seminar course.

US 470 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Junior standing, consent of instructor, and approval of the Director of University Studies.
- Directed study on an individual basis.

US 476 INTERNSHIP
On Demand 1 - 12 cr. IND
PREREQUISITE: Junior standing, consent of instructor, and approval of the Director of University Studies.
- An individual assignment arranged with an agency, business or other organization to provide guided experience in the field.

US 480 SPECIAL TOPICS
On Demand 1 - 5 cr.
PREREQUISITE: Course prerequisites as determined for each offering.
- Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

US 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
COREQUISITE: US 489.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

US 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

USP
Undergraduate Scholars Program
(406) 994-3561

USP 290R UNDERGRADUATE SCHOLARS PROGRAM
On Demand 1 - 4 cr. IND
PREREQUISITE: 1st or 2nd year student and consent of collaborating faculty member.
- First and second year students in this course will conduct research in collaboration with a faculty member which may culminate in a research paper, a journal article, or an oral presentation.

USP 489R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT May be repeated. Max 4 cr.
- Classroom instruction associated with directed undergraduate research/creative activity projects.

USP 490R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 6 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

VETMB
Veterinary Molecular Biology
Department of Veterinary Molecular Biology
(406) 994-4705

VMB 101CS INTRODUCTION TO BIOTECHNOLOGY
F 3 cr. LEC 2 SEM 1
- Introduction to an ever-growing industry. Course is designed to demonstrate the significance of biotechnology in today's world. Lecture series presented by research scientists, covering four areas (scientific basis of biotechnology, experimental techniques, applications and societal issues). History of 20th century biotechnology will be followed in a student seminar. Cross-listed with PS 101 and MB 110.

VMB 270 INDEPENDENT STUDY
On Demand 1 - 3 cr. IND Maximum 6 cr.
PREREQUISITE: Consent of instructor and approval of department head.
- Directed research and/or study on an individual basis.

VMB 271 FUNCTIONAL ANATOMY OF DOMESTIC ANIMALS
F 4 cr. LEC 3 LAB 1
PREREQUISITE: BIOL 102, Sophomore standing.
- Location, structure and function of various tissues, organs, and systems of domestic animals. Lab utilizes ruminants and monogastric species.
VTMB 280 SPECIAL TOPICS
On Demand 1 - 3 cr. Maximum 12 cr.
PREREQUISITE: Course prerequisites as determined by each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

VTMB 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT may be repeated. Max 4 cr.
COREQUISITE: VTMB 290.
- Classroom instruction associated with directed undergraduate research projects.

VTMB 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
On Demand 1 - 4 cr. IND
PREREQUISITE: Sophomore standing.
- Directed undergraduate research.

VTMB 406 INFECTIOUS DISEASES
S 3 cr. LEC 2 RCT 1
PREREQUISITE: MB 301; Recommended MB 401.
- Selected viral, bacterial and protozoan infections of man and domestic animals will be covered with an emphasis on disease process and immune responses.

VTMB 411 HYBRIDOMAS
F 2 cr. LEC 1 LAB 1
PREREQUISITE: MB 301 or consent of instructor.
- This course will provide students with a thorough theoretical and practical appreciation and understanding of the uses and methods involved in the production of monoclonal antibodies.

VTMB 412 ADVANCED IMMUNOLOGY
F 1 cr. LAB 1
PREREQUISITE: MB 301, BIOL 301, or consent of instructor.
- This course provides hands-on experience on assays commonly used in immunology for the detection of an immune response.

VTMB 413 FLOW CYTOMETRY
F 1 cr. LAB 1
PREREQUISITE: MB 301, BIOL 301, or consent of instructor.
- Theory and practice of flow cytometry with an emphasis on the analysis of mammalian cells.

VTMB 414 ADVANCED MICROSCOPY
F 1 cr. LAB 1
PREREQUISITE: MB 301, BIOL 301, or consent of instructor.
- Introduction to instrument design, operation and applications, and to modern techniques in preparing specimens for microscopic analyses, including computer-assisted microscopic imaging technology and microinjection.

VTMB 421 GENOME SCIENCE
S, 3 cr., LEC 1 LAB 2
PREREQUISITE: BCHM 340 or consent of instructor.
- Course will train students in modern practice of genomics and functional gene expression using DNA cloning, automated DNA sequencing, and comprehensive sequence analysis.

VTMB 422 FUNCTIONAL GENE EXPRESSION
S, 2 cr. LEC 1 LAB 1
PREREQUISITE: BCHM 340 or consent of instructor.

VTMB 425 PROTEIN BIOCHEMISTRY
On Demand 1 cr.
PREREQUISITE: VTMB 412 series or consent of instructor.
- Principles and techniques involved in biochemical analysis of proteins.

VTMB 452 ETHICAL PRACTICE OF SCIENCE
F 1 cr. LAB 1
PREREQUISITE: VTMB 412 series or consent of instructor.
- Theory of eukaryotic gene expression and this process with specific focus on the ethical responsibilities of scientists and to examine policies and procedures developed by the scientific community to ensure integrity in the research process.

VTMB 455 ADVANCED GENETIC ENGINEERING
F 2 cr. LAB 2
PREREQUISITE: MB 401.
- Senior capstone course. Participants in this seminar section will bring closure to the student's required internship. Students will have the opportunity to refine their public speaking and writing skills through synthesis of the goals, progress, and outcome of their industrial or research laboratory experience. Exposure to many different types of internship outcomes will broaden the student's perception of the disciplines which contribute to the field of biotechnology.

VTMB 460R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S, Su 1 - 2 cr. RCT may be repeated. Max 4 cr.
COREQUISITE: VTMB 460.
- Classroom instruction associated with directed undergraduate research/creative activity.

VTMB 465R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S, Su 1 - 2 cr. IND May be repeated. Max 12 cr.
- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis.

VTMB 500 SEMINAR
F, S 1 cr. SEM 1 Maximum 4 cr.
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering.
- Topics offered at the graduate level which are not covered in regular courses.

VTMB 501 EXPERIMENTAL IMMUNOLOGY/PATHOLOGY
S alternate years, to be offered even years 3 cr. LEC 3
PREREQUISITE: MB 401.
- Recent advances in and history of immunobiology, immunogenetics, immunopathology, molecular and cellular immunology. Cross-listed with Microbiology 525.

VTMB 503 ADVANCED VIROLOGY
F alternate years, to be offered 2006 3 cr. LEC 3
PREREQUISITE: Graduate Standing or permission of instructor.
- Considers the primary literature on viruses of animals, plants, and bacteria with the goals of understanding (1) the ubiquity of viruses in nature and (2) the solutions that viruses have evolved to maintain themselves in a host species.

VTMB 505 EUKARYOTIC GENE REGULATION
S alternate years, to be offered odd years 3 cr. LEC 3
PREREQUISITE: CHEM 442 and graduate standing.
- Students in this course study the fundamental mechanisms of eukaryotic gene expression and this knowledge is placed within the context of modern genomics approaches. The course is divided between traditional lectures and a review of current literature in genome science, functional genomics (mRNA expression), and proteomics. Students learn basic informatics skills through a hands-on analysis of genome data with an emphasis on what can, and cannot, be learned from genome data.

VTMB 521 LABORATORY RESTORATION I
F 2 cr. LAB 2
PREREQUISITE: Must be a first year VMB Graduate Student.
- An independent scientific project within a VMB research laboratory. Student should identify a question, master the necessary methods, collect and analyze data, and interpret how the data addresses the question. Final results are presented in a 15-minute departmental seminar.
COURSE DESCRIPTIONS: VTMB 522 - WS 301RH

VTMB 522 LABORATORY RESTORATION II
S 2 cr. LAB 2
PREREQUISITE: Must be a first year VMB Graduate Student. The VMB laboratory in which VTMB 522 is performed must be different from the laboratories in which VTMB 521 was performed.
- An independent scientific project within a VMB research laboratory. Student should identify a question, master the necessary methods, collect and analyze data, and interpret how the data addresses the question. Final results are presented in a 15-minute departmental seminar.

VTMB 523 LABORATORY RESTORATION III
S 2 cr. LAB 2
PREREQUISITE: Must be a first year VMB Graduate Student. The VMB laboratory in which VTMB 523 is performed must be different from the laboratories in which VTMB 521 and VTMB 522 were performed.
- An independent scientific project within a VMB research laboratory. Student should identify a question, master the necessary methods, collect and analyze data, and interpret how the data addresses the question. Final results are presented in a 15-minute departmental seminar. An independent scientific project with a VMB research laboratory.

VTMB 570 INDEPENDENT STUDY
On Demand 1 - 5 cr. IND Maximum 6 cr.
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies.
- Directed research and study on an individual basis.

VTMB 580 SPECIAL TOPICS
On Demand 1 - 4 cr. Maximum 12 cr.
PREREQUISITE: Upper division courses and others as determined for each offering.
- Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

VTMB 589 GRADUATE CONSULTATION
F, S, Su 3 cr. TUT 3 Maximum credits unlimited.
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies.
- This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

VTMB 590 MASTER'S THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Master’s standing.

VTMB 690 DOCTORAL THESIS
F, S, Su 1 - 10 cr. IND Maximum credits unlimited.
PREREQUISITE: Doctoral standing.

WS Women's Studies
College of Letters and Science
(406) 994-4288

WS 201H INTRODUCTION TO FEMINIST THEORIES AND METHODOLOGIES
F 3 cr. LEC 3
- Major directions in feminist scholarship. Examination of the various schools of thought which have addressed gender inequities, and review of the strategies of cultural criticism which incorporate gender.

WS 289R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY INSTRUCTION
F, S 1-5 cr. RCT may be repeated
- Classroom instruction associated with directed undergraduate research/creative activity projects.

WS 290R UNDERGRADUATE RESEARCH/CREATIVE ACTIVITY
F, S 1-6 cr. IND may be repeated
- Directed undergraduate research/creative activity which may culminate in a written work or other creative project.

WS 301RH INTEGRATIVE SEMINAR IN WOMEN'S STUDIES
S 3 cr. SEM 3 Maximum 9 cr.
- The seminar builds on the theoretical issues in women's studies and addresses special topics each year from a variety of disciplines.