ASTRONOMY COURSES

Department of Physics
College of Natural Sciences

AA 100 03(3-0-0). Introduction to Astronomy. (GT-SC2, AUCC 3A). F, S, SS. Prerequisite: None.
Description of the various objects found in the heavens as well as the principles and techniques employed in investigations of these objects.

AA 101 01(0-2-0). Astronomy Laboratory. (GT-SC1, AUCC 3A). F, S, SS. Prerequisite: AA 100 or concurrent registration.
Observations of the various objects found in the heavens with 5-inch reflecting telescopes.

AA 150 03(2-3-0). Observational Astronomy. SS.
Astronomical objects in the night and day sky; observation with 16-inch telescope.

°AA 301 05(4-2-0). Astrophysics I. F. Prerequisite: MATH 124; MATH 126; PH 110 or PH 121 or PH 141.
Celestial mechanics, earth-moon systems, planets and satellites, interplanetary medium, origin of solar system.

°AA 302 05(4-2-0). Astrophysics II. S. Prerequisite: MATH 124; MATH 126; PH 110 or PH 121 or PH 141.
Properties of sun and stars, variable stars, binary and multiple star systems, star clusters, interstellar medium, stellar evolution.

*AA 303 05(4-2-0). Astrophysics III. F. Prerequisite: MATH 124; MATH 126; PH 110 or PH 121 or PH 141.
Properties of the Milky Way, galaxies, quasars and related objects; special and general relativity; cosmology.

AA 495 Var [1-6]. Independent Study in Astrophysics. Prerequisite: Written consent of instructor.

° Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCCsubcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
# ACCOUNTING COURSES

## Department of Accounting

### College of Business

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisite</th>
<th>Subcode</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT 205</td>
<td>Fundamentals of Accounting</td>
<td>For nonbusiness majors. Credit not allowed for both ACT 205 and ACT 210.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 210</td>
<td>Introduction to Financial Accounting</td>
<td>None. Credit not allowed for both ACT 210 and ACT 205.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 220</td>
<td>Introduction to Managerial Accounting</td>
<td>ACT 205 or ACT 210; BUS 150 or concurrent registration or CP 110.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 310</td>
<td>Financial Statement Analysis</td>
<td>ACT 220. For business majors. Credit not allowed for both ACT 310 and ACT 311.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 311</td>
<td>Intermediate Accounting I</td>
<td>ACT 205 with grade of B- or better or ACT 210 with grade of B- or better; ACT 220 with grade of B- or better. Credit not allowed for both ACT 311 and ACT 310.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 312</td>
<td>Intermediate Accounting II</td>
<td>ACT 311 with a C or better. Equity structure of corporations; analysis and interpretation of accounting data.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 321</td>
<td>Cost Management</td>
<td>ACT 220. Utilizing budgetary and cost accounting information for planning, controlling, and decision-making.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 330</td>
<td>Introduction to Taxation</td>
<td>ACT 205 or ACT 210. Introduction to U.S. taxation, with emphasis on federal income tax; impact of taxation on business decisions.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 350</td>
<td>Accounting Information Systems</td>
<td>ACT 220: ACT 321. Design, administration and control of accounting information systems; use of accounting systems software.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 411</td>
<td>Advanced Accounting</td>
<td>ACT 312. Accounting for branches and subsidiaries, partnerships, and business combinations. Accounting for multinational business transactions.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 421</td>
<td>Management Control Systems</td>
<td>ACT 220. Business transaction cycles. Laws and regulations regarding responsibility for internal control. Performance measurement systems and controllership.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 430</td>
<td>Income Tax Accounting</td>
<td>ACT 330. Basic structure of federal income tax law; impact of taxes on decision making; social security taxes.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 431</td>
<td>Corporate Taxation</td>
<td>ACT 220; ACT 330. Federal income tax principles pertaining to formation and operation of corporate entities.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 441</td>
<td>Auditing Practices</td>
<td>ACT 312; ACT 350. Environment, professional standards, and practices involved in auditing financial statements and performance of other assurance services.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 442</td>
<td>International Accounting</td>
<td>ACT 220. International accounting issues facing multi-national enterprises.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 487</td>
<td>Internship</td>
<td>None. Supervised work experience in public, industry, or governmental accounting.</td>
<td>NT</td>
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<tr>
<td>ACT 495</td>
<td>Independent Study</td>
<td>None. Ethical practice of professional accounting. (NT-O)</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 496</td>
<td>Group Study</td>
<td>None. Accounting for business combinations and consolidations in corporate restructuring and alternative organizational forms.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 501</td>
<td>Accounting for Global Sustainable Enterprise</td>
<td>ACT 220; Admission to GSSE program. Basics of U.S. and international financial reporting; accounting issues of not-for-profit enterprises; budgeting; managerial decision making.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 511</td>
<td>Advanced Accounting I</td>
<td>ACT 312. Accounting for business combinations and consolidations in corporate restructuring and alternative organizational forms.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 540</td>
<td>Professional Ethics and Responsibilities</td>
<td>ACT 311. Ethical practice of professional accounting. (NT-O)</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 541</td>
<td>Forensic Accounting and Fraud Auditing</td>
<td>ACT 441; graduate standing. Professional practices for addressing the related areas of forensic accounting and fraud. (NT-O)</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 550</td>
<td>Electronic Commerce Accounting Issues</td>
<td>ACT 350. Best practices for technology use in organizational accounting processes, including advanced skills in spreadsheet and database technologies.</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 561</td>
<td>Legal and Regulatory Issues in Accounting</td>
<td>ACT 205 or BUS 260; graduate standing or written consent of instructor. Contracts, ownership, bankruptcy (debtor/creditor relationship), formation of business entities, regulation of accounting profession. (NT-V)</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 570</td>
<td>Government and Nonprofit Accounting</td>
<td>ACT 441 or concurrent registration; graduate standing or written consent of instructor. Theory and practical application of accounting principles and auditing standards to governmental entities and not-for-profit organizations. (NT-V)</td>
<td>NT</td>
</tr>
<tr>
<td>ACT 575</td>
<td>Oil and Gas Accounting</td>
<td>ACT 311. Specialized financial accounting procedures related to the oil and gas industry.</td>
<td>NT</td>
</tr>
</tbody>
</table>

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ACT 600 03(3-0-0). Accounting for Managers. F. Prerequisite: Admission to a master’s program in business.
Cost management, budgeting, profitability analysis, and decision making.

ACT 601A-B 03(3-0-0). Professional Practice.
Management of accounting practice; professional ethics and regulation; research techniques. A) Taxation. F. Prerequisite: ACT 330. (NT-O) B) Auditing. S. Prerequisite: ACT 612. (NT-O)

ACT 612 03(3-0-0). Contemporary Financial Accounting Issues. F. Prerequisite: ACT 312.
Historical development of accounting; controversial issues involved in calculations and disclosure of enterprise periodic income. (NT-O)

ACT 614 03(3-0-0). Financial Statement Analysis and Valuation. S. Prerequisite: Admitted to Master of Accountancy (M.Acc.) program.
Tools and techniques of financial statement analysis and application to equity valuation.

ACT 622 03(3-0-0). Advanced Cost and Managerial Accounting. S. Prerequisite: ACT 321.
Contributions of cost accounting to decision making and planning. (NT-O)

ACT 630 03(3-0-0). Tax and Accounting Research. F. Prerequisite: ACT 220.
Research aspects of professional accounting and tax practices; development of oral and written communication skills.

ACT 631 03(3-0-0). Corporate Taxation. F. Prerequisite: ACT 220; ACT 330.
Federal income tax principles pertaining to formation and operation of corporate entities. (NT-V)

ACT 632 03(3-0-0). Flow-Through Entities. S. Prerequisite: ACT 220.
Federal income tax principles and problems pertaining to flow-through entities. (NT-V)

ACT 635 03(3-0-0). State and Local Taxation. F. Prerequisite: ACT 220.
Tax planning and compliance issues for entities doing business in multijurisdictional locales. (NT-O)

ACT 636 03(3-0-0). Taxation of Corporations and Shareholders. SS. Prerequisite: ACT 220.
Federal income tax principles and problems relating to reorganization, consolidation, and termination of corporations. (NT-V)

ACT 639 03(3-0-0). Special Topics in Taxation. S. Prerequisite: ACT 601A; ACT 631.
Taxation of not-for-profit entities; international tax issues; other contemporary topics. (NT-O)

ACT 641 03(3-0-0). Contemporary Auditing. F. Prerequisite: ACT 441.
Seminar exploring various facets of the assurance services environment. (NT-V)

ACT 642 03(3-0-0). International Accounting. SS. Prerequisite: ACT 220. Credit not allowed for both ACT 642 and ACT 442.
Preparation for work with multinational companies in coordinating operations to adhere to global regulations and customs. (NT-O)

ACT 650 03(3-0-0). Advanced Accounting Information Systems. F. Prerequisite: ACT 350.
Research and review of best practices for technology in organizational accounting processes, including advanced skills in spreadsheets and databases.

ACT 679A-B 03(3-0-0). Capstone Seminar. F. S. SS.
Final project integrating material from prior courses. A) Taxation. Prerequisite: ACT 601A; ACT 631. (NT-O) B) Financial accounting. Prerequisite: ACT 601B. (NT-O)

ACT 695 Var. Independent Study.

ACT 696 Var. Group Study.
AGRICULTURAL EDUCATION COURSES
Department of Agricultural and Resource Economics
College of Agricultural Sciences

+AGED 110 03(2-3-0). Agriculture Production Systems. F. Prerequisite: None. Required field trips.
   Broad survey of the diverse aspects of Colorado agriculture. ($)

AGED 220 01(1-0-0). Understanding Agricultural Education. F. Prerequisite: None.
   Understanding different agricultural education systems. Understanding delivery models of agricultural education programs.

AGED 240 02(1-3-0). Technical Tool Applications in Agricultural Education. F. Prerequisite: None.
   Development of safe competencies and applications related to power and technical tools utilized in school based agricultural education programs. ($)

AGED 241 01(1-0-0). Plumbing and Electrical Applications in Agricultural Education. S. Prerequisite: None.
   Development of competencies and theory related to plumbing and electrical applications utilized in school-based Agricultural Education programs. ($)

AGED 244 01(1-0-0). Power Systems in Agricultural Education. S. Prerequisite: None.
   Development of competencies and theory related to agricultural power systems utilized in school-based agricultural education programs. ($)

AGED 320 01(0-3-0). Technology Lab for Agricultural Education. S. Prerequisite: AGED 240 or concurrent registration or AGED 241 or concurrent registration or AGED 244 or concurrent registration. May be taken twice for credit.
   Laboratory applications related to the power, structure, and technical systems pathway utilized in school-based agricultural education programs. ($)

AGED 330 03(3-0-0). Program Design and Evaluation in Agricultural Literacy. F. Prerequisite: AGED 220.
   Design and evaluate programs in agricultural literacy using experiential methods.

AGED 420 03(3-0-0). Developing School-Based Agricultural Education Programs. S. Prerequisite: AGED 220.
   Developing knowledge in the approach and delivery of school-based agricultural education programs. ($)

AGED 430 03(3-0-0). Methods of Agricultural Literacy. S. Prerequisite: AGED 330.
   Prepare and conduct agricultural literacy instructional units to work with a variety of audiences and instructional topics.

AGED 487 Var[1-6]. Internship. F, S, SS. Prerequisite: None.

AGED 495 Var[1-6]. Independent Study. F, S, SS. Prerequisite: None.

AGED 496 Var[1-12]. Group Study. F, S, SS. Prerequisite: None.

AGED 540 02(2-0-0). Agricultural Education Laboratory Management and Safety. F, SS. Prerequisite: EDCT 420.
   Theory, management, and pedagogy of delivering safety instruction and experiential curriculum in secondary agricultural education laboratory settings.

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AGRICULTURE COURSES
Nondepartmental
College of Agricultural Sciences

AGRI 116/IE 116 03(2-0-1). Plants and Civilizations. (GT-S3, AUCC 3E) F, S. Prerequisite: None. Credit not allowed for both AGRI 116 and IE 116.
Plant origins and their relationships with cultures/civilizations as food, spices, perfumes, and medicines and in art, religion, wars, slavery, etc.

AGRI 140 03(0-0-3). Technology in Agriculture. F, S, SS. Prerequisite: None.
Computer concepts and terminology. PC operating systems, Web tools, e-mail, presentation technology, word processing, spreadsheet, and database. (NT-O)

AGRI 192 01(0-0-1). Orientation to Agricultural Systems. F, S. Prerequisite: None.
Freshman inquiry course in agriculture. Information and skills necessary to succeed in majors in the agricultural sciences.

AGRI 270/IE 270 03(3-0-0). World Interdependence – Population and Food. (GT-S3, AUCC 3E) S. Prerequisite: None. Credit not allowed for both AGRI 270 and IE 270.
Survey of world population and food; emphasis on understanding the problems and opportunities in a world context.

AGRI 292 01(1-0-0). Transfer Seminar. F, S. Prerequisite: Transfer student.
The university and its resources, college success skills, careers in the various disciplines of agriculture; current issues in agriculture.

AGRI 330 02(2-0-0). Issues in Agriculture. F. Prerequisite: None. Credit not allowed for both AGRI 300 and AGRI 500.
Scientific, technical, cultural, and social issues facing agriculture, and their interrelationships. (NT-O)

AGRI 320-AF 01(0-2-0). Computer Applications in Agriculture. S. Prerequisite: BUS 150 or CS 110.

AGRI 330/PHIL 330 03(3-0-0). Agricultural and Food System Ethics. S. Prerequisite: CO 150. Credit not allowed for both AGRI 330 and PHIL 330.
Basic concepts in ethics and their application to agriculture and the food system.

AGRI 374 01(0-0-1). Professional Development Seminar. F, S, SS. Prerequisite: Junior or senior standing.
Assess personal workplace skills and strengths, including teamwork and decision-making, for use in career planning.

+AGRI 383/NR 383 02(0-2-1). U.S. Travel-Integrated Resource Management. S. Prerequisite: None. Credit not allowed for both AGRI 383 and NR 383. Required field trips.
Evaluation of integrated ranch management decision alternatives in conjunction with professional resource managers. (S)

AGRI 465 03. Pesticide Management. F, S, SS. Prerequisite: None. Offered as correspondence course only.
Reasons for and safe correct pesticide use. (NT-C)

AGRI 466 01. Management of On-Farm Stored Grain. F, S, SS. Prerequisite: None. Offered as correspondence course only.
Basic principles of grain storage and management strategies for insects and fungi; chemical controls and safe pesticide use. (NT-C)

AGRI 467 02. Management and Control of Wood-Destroying Pests. F, S, SS. Offered as correspondence course only.
Wood-destroying agents; wood preservative chemicals and treatment; industry regulations; labels; safety; environmental concerns. (NT-C)

AGRI 468 03. Management and Control of Turfgrass Pests. F, S, SS. Prerequisite: None. Offered as correspondence course only.
Classification of turfgrass pests; pest management, control; environmental concerns, industry regulations; safety, skill in pesticide applications. (NT-C)

AGRI 487-A-B Var[1-12]. Internship. F, S, SS. Prerequisite: None. No more than a total of 12 credits allowed for AGRI 487.
A) Domestic. (NT-O) B) International. (NT-O)

AGRI 492 Var[1-3]. Seminar. F, S. SS. Prerequisite: None.

AGRI 495 Var[1-12]. Independent Study. F, S, SS. Prerequisite: None.

AGRI 496-A-B Var[1-12]. Group Study. F, S, SS. Prerequisite: None.

AGRI 500 03(2-0-1). Advanced Issues in Agriculture. F. Prerequisite: None. Credit not allowed for both AGRI 500 and AGRI 300.
Scientific, technical, cultural, and social issues facing agriculture, and their interrelationships. (NT-O)

AGRI 521 03(3-0-0). Emerging Issues and Challenges for Global Agr. F, S, SS. Prerequisite: Written consent of instructor. Offered only online.
Interdisciplinary course containing tools and knowledge to discuss the emerging challenges of the global agriculture, water, and food system. (NT-O)

*AGRI 545 02(2-0-0). Plant Tissue Culture. F. Prerequisite: BZ 440.
Theory, technology, and techniques of cell, organ, tissue, and protoplast culture of plants.

AGRI 546 03(3-0-0). Principles of Cooperative Extension. F, S, SS. Prerequisite: None.
Traditional and contemporary delivery systems of Cooperative Extension emphasizing structures of nonformal education. (NT-C/O)

AGRI 547 04(2-0-2). Delivery of Cooperative Extension Programs. S. Prerequisite: Written consent of instructor.
Methods, techniques, and procedures in planning, implementation, and delivery of Cooperative Extension programs. (NT-C/V/O)

AGRI 550 03(3-0-0). Capacity Building for a Changing Workplace. F, S, SS. Prerequisite: Graduate standing in agricultural sciences.
A framework for competence in workplaces applies situation analysis/problem-solving to solve real life agricultural situations shared by experts.

AGRI 562/SOC 562 03(2-0-1). Sociology of Food Systems and Agriculture. F, S. Prerequisite: SOC 100 or SOC 105. Credit not allowed for both AGRI 562 and SOC 562.
How agricultural choices generate intended and unintended consequences for human communities and the natural environment.

*AGRI 570/*VS 570 02(2-0-0). Issues in Animal Agriculture. F. Prerequisite: None. Credit not allowed for both AGRI 570 and VS 570.
Issues that have a major impact on the direction of changes in animal agriculture.

AGRI 587A-B Var[1-12]. Internship. F, S, SS. Prerequisite: None. No more than a total of 12 credits allowed for AGRI 587.
A) Domestic. (NT-O) B) International. (NT-O)

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+AGRI 601/ENGR 601 03(2-2-0). Bioenergy Technology. F.
Prerequisite: None. Required field trips.
Science and engineering aspects of bioenergy production, including plant biology, fermentation, and biofuel properties.

AGRI 602 03(2-2-0). Bioenergy Policy, Economics, and Assessment. S.
Prerequisite: AGRI 601/ENGR 601.
Bioenergy policy; economic principles applied to biofuel production; evaluation of environmental impacts of bioenergy production.

AGRI 630 03(3-0-0). Integrated Decision Making/Management Skills. F.
Prerequisite: None.
Motivation for management, decision making, introduction to systems, information management, introduction to statistics. (NT-O)

AGRI 631 03(3-0-0). Building the Business. F, S.
Prerequisite: None.
Skills required to organize and implement a modern business enterprise with focus on land-based operations. (NT-O)

AGRI 632 03(2-2-0). Managing for Ecosystem Sustainability. F, S.
Prerequisite: None.
Impacts of ecological processes, use of mechanism-based understanding, and tools used to manage the ecosystem for sustainability. (NT-O)

Prerequisite: None.
Evaluating nutritional requirements of a variety of animals, how and why requirements vary according to level of production. (NT-O)

AGRI 634 03(2-2-0). Animal Production Systems. F, S.
Prerequisite: None.
Developing animal management systems for a variety of animal species in a forage-based environment. (NT-O)

+AGRI 635 03(3-0-0). Integrated Forage Management. F, S.
Prerequisite: None. Required field trips.
Development of management plans that integrate diverse forage resources including native rangeland and cultivated forages. (NT-O)

AGRI 636 03(3-0-0). Analyzing and Managing the Business. F, S.
Prerequisite: None.
Assimilating, preparing, and analyzing records; reading financial statements to manage a land-based business. (NT-O)

AGRI 637 03(3-0-0). Understanding Policy and Emerging Issues. F, S.
Prerequisite: None.
Origination, purpose, and policy effects of policy on land-based enterprises; policy effects on management decisions. (NT-O)

+AGRI 638 03(3-0-0). Ecosystem Services on Agricultural Lands. F, S.
Prerequisite: None. Required field trips.
Within an economics framework, explores the unique management challenges involved in a modern, diversified agricultural operation. (NT-O)

AGRI 639 03(3-0-0). Products to Profit. F, S.
Prerequisite: None.
Marketing all aspects of the enterprise, beginning with land and forage resource and tracking all revenue generation. (NT-O)

Prerequisite: None.
Formulation of an optimal land management plan for a specific site based on specific goals and objectives. (NT-O)

AGRI 684 Var[1-2]. Supervised College Teaching. F, S, SS.
Prerequisite: None. Maximum of 4 credits allowed in course.

AGRI 692 01(0-0-1). Seminar. F, S, SS.
Prerequisite: None.

AGRI 695 Var[1-12]. Independent Study. F, S, SS.
Prerequisite: None. (NT-O)

AGRI 698 Var[1-6]. Research. F, S, SS.
Prerequisite: None. (NT-O)

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**APPLIED HUMAN SCIENCES COURSES**

*Nondepartmental*

**College of Health and Human Sciences**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
<th>Prerequisite Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHS 201</td>
<td>03(3-0-0). Perspectives in Gerontology</td>
<td>F, S</td>
<td>Prerequisite: HDFS 101 or PSY 100 or SOC 100. Using multidisciplinary perspectives to explore a variety of issues in human aging; emphasis on applied gerontology. (NT-O)</td>
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<tr>
<td>AHS 484</td>
<td>02(0-0-2). Supervised College Teaching</td>
<td>F, S, SS</td>
<td>Prerequisite: None. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.</td>
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<tr>
<td>AHS 487</td>
<td>Var[1-16]. Internship in Human Services</td>
<td>F</td>
<td>Prerequisite: Written consent of instructor. Application of skills learned in interdisciplinary program or major to a variety of human service settings.</td>
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<tr>
<td>AHS 490</td>
<td>Var[1-5]. Workshop</td>
<td>F, S, SS</td>
<td>Prerequisite: None.</td>
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<tr>
<td>AHS 492</td>
<td>Var[1-5]. Seminar</td>
<td>F, S, SS</td>
<td>Prerequisite: None.</td>
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<tr>
<td>AHS 495</td>
<td>Var[1-5]. Independent Study</td>
<td>F, S, SS</td>
<td>Prerequisite: None.</td>
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<tr>
<td>AHS 590</td>
<td>Var[1-5]. Workshop</td>
<td>F, S, SS</td>
<td>Prerequisite: None.</td>
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<tr>
<td>AHS 692</td>
<td>Var[1-5]. Seminar</td>
<td>F, S, SS</td>
<td>Prerequisite: None.</td>
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<tr>
<td>AHS 695</td>
<td>Var[1-5]. Independent Study</td>
<td>F, S, SS</td>
<td>Prerequisite: None.</td>
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<tr>
<td>AHS 697</td>
<td>Var[1-6]. Group Study</td>
<td>F, S, SS</td>
<td>Prerequisite: None. Offered as an online course only. (NT-O)</td>
</tr>
</tbody>
</table>

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APPAREL AND MERCHANDISING COURSES
Department of Design and Merchandising
College of Health and Human Sciences

AM 101 03(3-0-0). Fashion Industries. F, S, SS. Prerequisite: None.
Development, organization, and trends of domestic and foreign fashion industries. (NT-O)

AM 110 03(2-2-0). Apparel and Merchandising Digital Technology. F, S. Prerequisite: None.
Introduction to computer technologies used in apparel and merchandising industries.

AM 130 03(3-0-0). Design Foundation-Apparel and Merchandising. F, S. Prerequisite: None.
Impact of elements and principles of design on apparel and merchandising within 20th century art. (NT-O)

AM 143 04(2-4-0). Introduction to Apparel Design. S. Prerequisite: Acceptance into the Apparel Design and Production program concentration.
Apparel and garment-pattern development, construction, quality; skill development in technical drawing and rendering. ($)

AM 240 03(0-6-0). Computer-Aided Apparel Design. S. Prerequisite: AM 143; portfolio review.
Apparel design using the computer to generate drawings for fabric, graphic logo, and apparel. ($)

AM 241 03(1-4-0). Apparel Production. F. Prerequisite: AM 143; MATH 124 or concurrent registration; portfolio review.
Production processes of sewn textile products, flat pattern, pattern grading, marker making, and writing specifications. ($)

AM 243 03(3-0-0). Adobe Photoshop for Textile Design. F, S, SS. Prerequisite: None. Offered as online course only.
Textile design using Adobe Photoshop to generate drawings for surface and structural textile design. (NT-O)

AM 244 03(1-4-0). Illustration for Apparel Design. F. Prerequisite: AM 143; portfolio review. Credit not allowed for both AM 244 and AM 343.
Illustration skills using traditional media/CAD applications and analysis of visual communication.

AM 250 03(3-0-0). Clothing, Adornment and Human Behavior. (GT-S3, AUCC 3E). F, S. Prerequisite: None.
Psychological, sociological, and cultural factors influencing clothing and adornment.

AM 270 03(3-0-0). Merchandising Processes. S. Prerequisite: AM 101 with a C- or better; AM 130 with a C- or better; DM 120 with a C- or better; MATH 124.
Forecasting, planning, evaluating, and presenting merchandise lines to meet target market demands. (NT-O)

AM 290 Var. Workshop. F, S, SS. Prerequisite: None.

AM 321 03(3-0-0). Advanced Textiles. S. Prerequisite: DM 120.
Textile product serviceability; effect of fiber structure on properties and performance; new developments.

AM 330 03(3-0-0). Textile and Apparel Economics. F. Prerequisite: AM 270 with a C- or better; DM 120 with a C- or better; DM 272 with a C- or better; AREC 202 with a C- or better or ECON 202 with a C- or better.
Manufacture of textile and apparel products; structure of the industries; international trade and consumption.

AM 341 03(1-4-0). Computer-Aided Apparel Production. S. Prerequisite: AM 241.
Computer-aided design technology used in apparel sketching, pattern drafting, grading, and marker making. ($)

AM 342 03(0-6-0). Computer-Aided Textile Design. F. Prerequisite:AM 110.
Computer-aided technology and multicultural research used to create repeat fabric designs; fabric printing using silkscreen.

AM 344 03(3-0-0). Adobe Illustrator for Apparel Designers F, S, SS. Prerequisite: AM 243 or concurrent registration. Offered only through the Division of Continuing Education.
Apparel design using Adobe Illustrator to generate drawings for garment technical sketching, fashion illustration, and graphic logos. (NT-O)

AM 345 03(0-6-0). Draping Design. S. Prerequisite: AM 241.
Apparel designing through basic draping techniques. ($)

AM 363 03(3-0-0). Historic Costume. S. Prerequisite: None.
Influence of social, political, and economic conditions on costume of predynastic Egypt to present time.

AM 364 03(3-0-0). History of Fashion Designers/Manufacturers. F, S, SS. Prerequisite: None. Offered as online course only.
Fashion designers and manufacturers who established the field and their contemporaries. (NT-O)

AM 366 03(3-0-0). Merchandising Promotion. F. Prerequisite: AM 270 or MKT 300 or MKT 305.
Activities used to influence sale of merchandise and services; to promote trends and ideas.

AM 370 03(3-0-0). Fashion Trend Analysis and Forecasting. F, S. Prerequisite: AM 270.
Fashion trend analysis and forecasting between markets and products; the direction of fashion.

AM 371 04(3-2-0). Merchandising Systems. F. S. Prerequisite: ACT 205 or ACT 210; AM 270 with a C- or better.
Business mathematics and current practices related to acquisition, negotiation, distribution, and sale of merchandise.

+AM 375 03(2-2-0). Product Design and Development. F, S. Prerequisite: DM 272; AM 270. Required field trips.
Product design and development for apparel and other soft goods through industry-driven projects.

AM 384 Var[1-3]. Supervised College Teaching. F, S, SS. Prerequisite: None. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.

AM 421 03(1-4-0). Textile Analysis. F. Prerequisite: DM 120.
Performance evaluation of selected fabrics through standard testing procedures; individual projects. ($)

*AM 430 03(3-0-0). International Retailing. S. Prerequisite: AM 330; DM 360/MKT 360.
Application of retail principles to analyze the internationalization process of retailing.

AM 446 03(1-4-0). Apparel Design and Production. F. Prerequisite: AM 341; AM 342.
Computer-aided design technology used in apparel sketching, pattern drafting, grading and marker making; final portfolio preparation and review. ($)

*AM 450 03(3-0-0). Social-Psychological Aspects of Clothing. S. Prerequisite: AM 250; PST 100 or SOC 100.
Psychological and social factors influencing clothing and its effect on others.

° Alternate year offering (odd); * Alternate year offering (even); + Field trips; S Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCC-subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
AM 460 03(3-0-0). Historic Textiles. F. Prerequisite: None.
  Historic development of textiles from a global perspective, focusing on textiles produced by diverse cultures.

*AM 466 03(2-2-0). Retail Environment Design and Planning. S. Prerequisite: AM 130; AM 270.
  Application of design/merchandising principles to retail selling environments, including traditional store design/layout, direct mail, and websites.

AM 479 03(3-0-0). Merchandising Policies and Strategies. F. S.
  Prerequisite: AM 270; AM 330; AM 366; AM 371; DM 360/MKT 360.
  Examination of merchandising environment as influenced by its structure, and economic, legal, demographic, and psychographic trends.

AM 495A-D Var[1-3]. Independent Study. F, S, SS. Prerequisite: None.

AM 496A-D Var. Group Study. F, S, SS. Prerequisite: None.

AM 500 01(1-0-0). Apparel Supply Chains/Social Responsibility. F.
  Prerequisite: None. Offered as online course only.
  Challenges for social responsibility in the context of the structure, relationships, and long-standing practice of the apparel industry. (NT-O)

*AM 525 03(1-2-1). Application of Textile Technology to Design. F.
  Prerequisites: AM 321 or AM 421.
  Advanced study of textile technology in apparel, merchandising and interior design; recent advances in the field.

*AM 546 03(1-2-1). Theoretical Apparel Design Solutions. F.
  Prerequisite: None.
  Applications of theoretical frameworks and computer-aided design techniques for the development of wearable and fiber art. ($)

*AM 550 03(0-0-3). Appearance, Self, and Society. S.
  Prerequisite: AM 450 or six credits in psychology and/or sociology.
  Analysis of social science theories and concepts as they apply to appearance and dress research.

*AM 572 03(0-0-3). Merchandising Theories and Strategies. S.
  Prerequisite: Graduate student standing.
  Theoretical perspective on the design and development of merchandising strategies for U.S. and global production, distribution, and consumption.

AM 590B Var. Workshop-Apparel. F, S, SS. Prerequisite: None.

° Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCC-subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
AMERICAN STUDIES COURSES  
Department of English  
College of Liberal Arts

AMST 100 03(3-0-0). Self/Community in American Culture, 1600-1877. (GT-AH2, AUCC 3D). F. Prerequisite: None.  
Meaning and development of American culture, 1600-1877, through themes of self and community, in art, politics, society, and religion.

AMST 101 03(3-0-0). Self/Community in American Culture Since 1877. (GT-AH2, AUCC 3D). S. Prerequisite: None.  
Meaning and development of American culture since 1877, through themes of self and community, in art, politics, society, and religion.

AMST 300/E 300 03(3-0-0). American Lives—Methods in American Studies. F, S. Prerequisite: AMST 100; AMST 101. Credit not allowed for both AMST 300 and E 300.  
Methods and changing approaches of American studies since 1950s using autobiography as organizing theme.

AMST 492 03(3-0-0). Seminar in American Studies. Prerequisite: AMST 300/E 300.

AMST 495 Var[1-3]. Independent Study in American Studies. Prerequisite: Written consent of instructor.  
Individually guided studies in interdisciplinary work in American culture.

AMST 499 03. Thesis in American Studies. Prerequisite: AMST 492.
ANIMAL SCIENCE COURSES
Department of Animal Sciences
College of Agricultural Sciences

+ANEQ 101 03(3-0-0). Food Animal Science. F, S. Prerequisite: None. Required field trips. Development, organization, trends, and management of the livestock industry; emphasis on applying science to the production of food and fiber.

+ANEQ 102 04(3-2-0). Introduction to Equine Science. F. Prerequisite: None. Required field trips. Equine physiology, production systems and management systems as it pertains to the equine industry and management. ($)

ANEQ 104/PHIL 104 03(3-0-0). Values, Culture, and Food Animal Agriculture. S. Prerequisite: Non-Animal Science majors with a freshman or sophomore standing. Credit not allowed for both ANEQ 104 and PHIL 104. Evolution of the social values and cultural understandings shaping modern animal agriculture; current problems in animal agriculture.

ANEQ 201A-B 02(0-4-0). Preparation of Horses for Competition. F, S. Prerequisite: Written consent of instructor. Development of skills to prepare and present horses in competitions aimed at enhancing their value. A) Western. (S) B) English. ($)

ANEQ 202 01(1-0-0). Safety in Horse Handling. F. Prerequisite: None. Horse handling safety skills. ($)

ANEQ 203 02(1-2-0). Equine Management. S. Prerequisite: ANEQ 102. Equine management and care techniques with hands-on experience. ($)

+ANEQ 204 03(2-2-0). Equine Facilities Management. S. Prerequisite: ANEQ 102. Required field trips. Understanding of all aspects required to manage an equine facility coupled with hands-on experience. ($)

ANEQ 220 02(2-0-0). Feeds and Feeding. F, S. Prerequisite: ANEQ 101 or ANEQ 102. Advantages and limitations of feedstuffs; nutrients and their functions; and feed practices for all physiological stages of livestock.

ANEQ 230 03(3-0-0). Farm Animal Anatomy and Physiology. F, S. Prerequisite: Three credits of 100-level LIFE. Credit not allowed for both ANEQ 230 and ANEQ 305. Basic concepts of farm animal anatomy and physiology; emphasis on growth, digestion, and reproduction.

ANEQ 249 01(0-2-0). Introduction to the Trail Riding Industry. F, S. Prerequisite: Written consent of instructor. Emphasis on horse care, regulations, first aid, health, training, and hosting a trail ride. ($)

ANEQ 250 03(1-4-0). Live Animal and Carcass Evaluation. F, S. Prerequisite: ANEQ 101 or ANEQ 102. Growth, development, and value-determining characteristics of market animals. ($)

ANEQ 286 02(1-2-0). Livestock Practicum. F, S. Prerequisite: ANEQ 101 or ANEQ 102. Livestock breed and terminology; classification of feedstuffs; livestock handling and care; basic animal management techniques, hands-on experience. ($)

ANEQ 292 01(1-0-0). Equine Industry Seminar. S. Prerequisite: ANEQ 102. May be offered as a partial semester course. Overview of the equine industry and industry careers. (NT-B)

ANEQ 300A-W. Topics in Animal Sciences. F, S. A) Livestock handling 01(1-0-0). B) /BSPM 300. Livestock entomology 01(1-0-0). Prerequisite: 3 credits of BZ or LIFE at the 100-level. Credit not allowed for both ANEQ 300B and BSPM 300. E) Family ranching 01(1-0-0). S (odd years). Prerequisite: ANEQ 101 or ANEQ 102. L) Quality Assurance 02(2-0-0). Prerequisite: ANEQ 101 or ANEQ 102. N) Seed-stock merchandising 02(2-0-0). F. Prerequisite: Junior or senior standing. Overview of beef seedstock industry, including hands-on selection, management, and marketing of cattle. Course required to apply for seedstock team. +R) Calves and Calf Care 02(1-2-0). Prerequisite: ANEQ 310; ANEQ 478. Required field trips. (S) T) Event, fair, and show management 01(1-0-0). Prerequisite: ANEQ 101 or ANEQ 102. Credit not allowed for both ANEQ 300T and ANEQ 358. U) Seedstock sale management 02(2-0-0). Prerequisite: ANEQ 300N. S, W) Equine manure management 01(1-0-0). S. Prerequisite: ANEQ 101 or ANEQ 102.

ANEQ 305 03(3-0-0). Functional Large Animal Anatomy/Physiology. F, S, SS. Prerequisite: CHEM 107 or CHEM 111; 3 credits of 100-level LIFE. Credit not allowed for both ANEQ 305 and ANEQ 230. Concepts of large animal anatomy and physiology; emphasis on growth, digestion, and reproduction.

ANEQ 310 03(3-0-0). Animal Reproduction. F, S, SS. Prerequisite: ANEQ 230 or ANEQ 305 or BMS 300. Anatomy and physiology of the reproductive system; causes of reproductive failure in farm animals; methods of improving reproductive performance. (NT-O)

ANEQ 312 02(1-2-0). Animal Ultrasonography. F. Prerequisite: ANEQ 230 or ANEQ 305; ANEQ 310. Fundamentals and application of using ultrasound in farm animals; basic reproductive technologies; utilizing ultrasound as a management tool. ($)

ANEQ 313/VS 313 03(3-0-0). Prevention and Control of Livestock Diseases. F. Prerequisite: ANEQ 230 or ANEQ 305 or BMS 300; ANEQ 310 or concurrent registration; ANEQ 320 or concurrent registration; junior or senior standing. Credit not allowed for both ANEQ 313 and VS 313. Common ailments of livestock; sanitation and disease prevention and control.

ANEQ 315 02(1-2-0). Equine Behavior. S. Prerequisite: ANEQ 102; sophomore or higher standing. Equine behaviors related to training and learning.

+ANEQ 320 04(3-3-0). Principles of Animal Nutrition. F. S. Prerequisite: ANEQ 230 or ANEQ 305 or BMS 300; 3 credits 100-level chemistry. Required field trips. Understanding of nutrients and nutrient function required to support animal life through all physiological states. ($)

ANEQ 322 02(2-0-0). Pet Nutrition. F, S, SS. Prerequisite: ANEQ 320; ANEQ 345; FSHN 350. Offered as correspondence course or online course only. Nutrients, nutrient requirements, feeding practices, food sources and management for companion animals (dogs, cats, birds, fish, reptiles, etc.). (NT-C/O)

ANEQ 323 02(2-0-0). Zoo Nutrition. F, S. SS. Prerequisite: ANEQ 320; ANEQ 345; FSHN 350. Offered as correspondence course or online course only. Unique nutritional requirements of mammalian, avian, and reptile captive wild animals; management protocols needed. (NT-C/O)

ANEQ 325 02(2-0-0). Equine Exercise Physiology. S. Prerequisite: ANEQ 230 or ANEQ 305 or BMS 300. Overview of the main aspects of equine exercise physiology. ($)

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ANEQ 328 03(3-0-0). Foundations in Animal Genetics. S. Prerequisite: ANEQ 101 or ANEQ 102; LIFE 102.
Foundational information of the influence of the genome and its genes on qualitative and quantitative traits in animal populations.

ANEQ 330 03(3-0-0). Principles of Animal Breeding. F, S. Prerequisite: ANEQ 328 or BZ 350 or SOCR 330; 3 credits of STAT 200-279 or 300-379.
Genetic principles underlying animal improvement; elementary population genetics; heritability; selection response; mating systems; DNA markers. (NT-O)

ANEQ 334 03(3-0-0). Principles of Equine Genetics. S. Prerequisite: ANEQ 102; ANEQ 328 or SOCR 330 or BZ 350; STAT 301 or STAT 307.
Principles of selection and genetic improvement of horses, including economically relevant qualitative and quantitative traits.

ANEQ 340 03(0-6-0). Horse Training and Sale Preparation I. F. Prerequisite: Written consent of instructor.
Practical training skills using a yearling or two year old: in-hand, restraint, ground driving, longeing, first rides, stable management. ($)

ANEQ 341 03(0-6-0). Horse Training and Sale Preparation II. S. Prerequisite: ANEQ 340.
Skills in training for specific riding maneuvers, conditioning, fitting for sale. Additional time outside of class required on weekends.($)

ANEQ 344 04(3-2-0). Principles of Equine Reproduction. F. Prerequisite: ANEQ 102; ANEQ 230 or ANEQ 305 or BMS 300.
Principles of reproduction and reproductive management of the mare and stallion. ($)

ANEQ 345 03(3-0-0). Principles of Nutrition: Equine Applications. S. Prerequisite: ANEQ 102; ANEQ 230 or ANEQ 305 or BMS 300; three credits 100-level chemistry; three credits of mathematics.
Principles of nutrition; application in feeding horses in different physiological states to promote health and well-being. (NT-O)

ANEQ 346 04(3-2-0). Equine Disease Management. F. Prerequisite: ANEQ 230 or ANEQ 305 or BMS 300.
Normal and abnormal body structures and functions of major systems of the horse. Recognition of main diseases, causes, prevention and treatments. ($)

ANEQ 348 02(1-2-0). Equine Training Techniques. S. Prerequisite: ANEQ 315.
Training techniques in multiple riding disciplines.

ANEQ 349 02(1-2-0). Packing and Outfitting. F. S. Prerequisite: ANEQ 102; written consent of instructor.
Business aspects of outfitting/packing the horse; hitches, knots, horse care; planning pack trips, setting up camp. Overnight pack trip. ($)

ANEQ 351 02(1-2-0). Techniques in Therapeutic Riding. F, S. Prerequisite: ANEQ 102.
Equine assisted activities: therapeutic horseback riding, hippotherapy, driving/vaulting, mental health treatments, programs for youth at risk. ($)

ANEQ 352 02(0-4-0). Introduction to Horse Evaluation. S. Prerequisite: ANEQ 102.
Criteria and techniques for evaluation of horses; development of logical decision processes for establishing comparative value. ($)

ANEQ 353 03(0-6-0). Advanced Horse Evaluation. F. Prerequisite: ANEQ 352.
Advanced criteria/techniques for horse evaluation; logical decision process development to establish comparative value; intercollegiate competition.

ANEQ 354 03(0-6-0). Introduction to Livestock Evaluation. F. Prerequisite: ANEQ 101.
Criteria and techniques for evaluation of livestock; development of logical decision processes for establishing comparative value.

ANEQ 355 01(0-9-0). Advanced Livestock Evaluation. F, S. Prerequisite: ANEQ 354. Course may be taken twice for a maximum of 2 credits.
Advanced criteria and techniques for evaluation of livestock; establishing comparative value; participating in intercollegiate competition.

ANEQ 356 03(0-6-0). Introduction to Dairy Evaluation. S. Prerequisite: None.
Criteria and techniques for evaluation of dairy cattle; development of logical decision processes for establishing comparative value.

ANEQ 357 02(0-4-0). Advanced Dairy Evaluation. F. Prerequisite: ANEQ 356.
Advanced criteria and techniques for evaluation of dairy cattle; establishing comparative value; participating in intercollegiate competition.

ANEQ 358 02(2-0-0). Equine Event and Sales Management. F. Prerequisite: ANEQ 102. Credit not allowed for both ANEQ 358 and ANEQ 300T.
Skills necessary to produce, organize, and promote equine related events. ($)

ANEQ 359 02(0-4-0). Equine Sales Production. S. Prerequisite: ANEQ 358; written consent of instructor.
Emphasizes skills necessary to host and evaluate an equine sale.

ANEQ 360 03(3-0-0). Principles of Meat Science. F. Prerequisite: Three credits 100-level chemistry.
Structure, composition, and biology of muscle and associated tissues; wholesomeness, nutritive value, and palatability of beef, pork, and lamb.

ANEQ 361 03(0-6-0). Introduction to Meat Product Evaluation. F. Prerequisite: None.
Criteria and techniques for evaluation of meat products; development of logical decision processes for establishing comparative value.

ANEQ 362 01(0-4-0). Advanced Meat Product Evaluation. F, S. Prerequisite: ANEQ 361. Course may be taken twice for a maximum of 2 credits.
Criteria and techniques for evaluation of meat products; establishing comparative value; participating in intercollegiate competition.

ANEQ 363 01(0-2-0). Introduction to Wool and Fiber Evaluation. F. Prerequisite: None.
Criteria and techniques for evaluation of wool; development of logical decision processes for establishing comparative value.

ANEQ 364 01(0-2-0). Advanced Wool and Fiber Evaluation. S. Prerequisite: ANEQ 363.
Criteria and techniques for evaluation of wool; establishing comparative value; participating in intercollegiate competition.

ANEQ 365 03(2-0-0). Principles of Teaching Therapeutic Riding. S. Prerequisite: ANEC 351 and sophomore standing or above.
Required field trips.
Practical experiences and knowledge of the techniques to be a professional certified therapeutic riding instructor. ($)

1For Animal Science and Equine Science majors, a maximum of five credits is allowed for ANEQ 350A-E, ANEQ 352, ANEQ 353, ANEQ 354, ANEQ 355, ANEQ 356, ANEQ 357, ANEQ 361, ANEQ 362, ANEQ 363, and ANEQ 364. A maximum of 12 credits is allowed for any combination of the following: ANEQ 350A-E, ANEQ 352, ANEQ 353, ANEQ 354, ANEQ 355, ANEQ 356, ANEQ 357, ANEQ 361, ANEQ 362, ANEQ 363, ANEQ 364, ANEQ 384, ANEQ 487, ANEQ 495, and ANEQ 496.

Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCC-subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
ANEQ 384 Var [1-5]. Supervised College Teaching. F, S, SS. Prerequisite: Written consent of instructor. Maximum of 6 credits allowed in course. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.

ANEQ 386A-C. Equine Practicum.
A) Equine training and management 02(1-2-0). Prerequisite: ANEQ 102. B) Equine reproductive management 02(2-2-0). Prerequisite: ANEQ 344. (S) C) Equine farrier management 01(0-2-0). Prerequisite: ANEQ 102. ($)

ANEQ 440 03(3-0-0). Equine Industry and Issues. F, S. Prerequisite: Any two of the following: ANEQ 334, ANEQ 344, ANEQ 345, ANEQ 347.
For students planning a career in the horse industry; management of facilities, production systems, personnel, marketing, and biological systems.

ANEQ 441 02(2-0-0). Integrated Equine Science. F, S, SS. Prerequisite: ANEQ 344; ANEQ 344; ANEQ 345; ANEQ 346.
Describe, understand, and integrate the newest scientific principles in equine sciences with equine management.

ANEQ 442 02(0-4-0). Riding Instructor Training. F, S. Prerequisite: ANEQ 102; written consent of instructor.
Teaching techniques; theory; handling of large mounted groups, beginner through advanced levels. ($)

+ANEQ 443 02(1-2-0). Applied Equine Nutrition. S. Prerequisite: ANEQ 345. Required field trips.
Applying principles of nutrition to feeding horses in different physiological states in an effort to promote their health and well-being.

+ANEQ 444 02(2-0-0). Equine Business Management. F, S. Prerequisite: ANEQ 440. Required field trips.
“Real life” equine industry experience and the ins and outs of managing an equine facility/business. ($)

ANEQ 445 02(1-3-0). Foaling Management. S. Prerequisite: ANEQ 344 or PVM sophomore standing.
Management of the foaling mare and newborn foal; monitoring techniques, preventative and emergency care procedures. ($)

**+ANEQ 448 03(2-2-0). Livestock Manure Management and Environment. F. Prerequisite: Three credits 100-level chemistry. Credit allowed for only one of the following courses: ANEQ 448, ANEQ 548, SOCR 448, SOCR 548. Required field trips.
Manure management; maximizing benefits to soils and crops; minimizing air and water quality hazards; complying with regulations.

ANEQ 460 02(2-0-0). Meat Safety. F. Prerequisite: Three credits 100-level chemistry.
Meat safety; food born pathogens; hazard analysis critical control points (HACCP) and total quality management (TQM) practices.

ANEQ 470 04(3-2-0). Meat Processing Systems. F. Prerequisite: ANEQ 360; senior standing.
Advanced understanding of the manufacturing, packaging, distribution, storage, and cooking of meat products. ($)

ANEQ 472 03(2-2-0). Sheep Systems. S. Prerequisite: Senior standing.
Sheep production under farm and ranch conditions; products, breeds, breeding, nutrition, reproduction, and management systems.

ANEQ 473 03(2-3-0). Dairy Systems. F. Prerequisite: ANEQ 230 or ANEQ 305 or BMS 300; ANEQ 310; ANEQ 320; senior standing.
Integration of nutrition, genetics, physiology, and economics for management decisions of dairy farm operations and production and marketing of milk.

ANEQ 474 03(2-2-0). Swine Systems. S. Prerequisite: Senior standing.
Production of purebred and commercial swine; breeds, breeding, feeding, marketing, and management. ($)

ANEQ 475 02(2-0-0). Travel Abroad—Animal Agriculture. F, S, SS. Prerequisite: Written consent of instructor.
Onsite evaluation of international animal agriculture systems with emphasis on production, marketing, and management.

ANEQ 476 03(3-0-0). Feedlot Systems. S. Prerequisite: ANEQ 320; senior standing.
Feedlot facilities; nutrition; procurement, merchandising, handling, processing cattle; health care; custom feeding; managerial duties. ($)

ANEQ 478 03(2-2-0). Beef Systems. F. Prerequisite: Senior standing.
Beef production as related to consumer through seedstock segments. Major emphasis on cow-calf management. ($)

ANEQ 486 01(0-3-0). Therapeutic Riding Instructor Practicum. F. Prerequisite: ANEQ 365.
Mentor-guided teaching hours to students preparing for the PATH International Instructor examination.

ANEQ 486 01(0-3-0). Therapeutic Riding Instructor Practicum. F. Prerequisite: ANEQ 365.
Mentor-guided teaching hours to students preparing for the PATH International Instructor examination.

ANEQ 487A-B Var [1-6]. Internship. F, S, SS. Prerequisite: Written consent of instructor. Maximum of 6 credits allowed in course.

ANEQ 495 Var. Independent Study. F, S, SS. Prerequisite: Written consent of instructor. Maximum of 6 credits allowed in course.

ANEQ 496 Var [1-6]. Group Study. F, S, SS. Prerequisite: Written consent of instructor. Maximum of 6 credits allowed in course.

ANEQ 500 Var [1-6]. Recent Developments. SS. Prerequisite: Graduate standing.
Recent developments in animal science, avian science, and food technology. ($)

ANEQ 510 04(3-2-0). Bovine Reproduction Management. F. Prerequisite: ANEQ 310.
Role of reproduction in economic efficiency of cattle production systems. Causes of delayed breeding and nonpregnancy, abortion and perinatal mortality. ($)

*ANEQ 520 03(3-0-0). Applied Comparative Nutrition. F. Prerequisite: ANEQ 320 or FSHN 550 and FSHN 551.
Comparative digestion strategies and mechanisms of nutrient utilization for terrestrial vertebrates: livestock, pets, wildlife, and zoo animal models.

ANEQ 522 03(3-0-0). Animal Metabolism. F. Prerequisite: CHEM 245 and CHEM 246 or CHEM 346.
Nutrient digestion, absorption, transport and metabolism in monogastric and ruminant domestic species as affected by physiological changes.

**+ANEQ 548 04(2-2-1). Issues in Manure Management. F. Prerequisite: Three credits 100-level chemistry. Credit allowed for only one of the following courses: ANEQ 448, ANEQ 548, SOCR 448, SOCR 548. Required field trips.
Manure management practices maximizing benefits to soils and crops while minimizing hazards to air and water quality and complying with regulations.

0 Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCC-subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
ANEQ 550A-B 02(1-2-0). Basic Research Surgery. Basic principles and techniques of animal surgery to meet ACUC requirements for experimental procedures. A) Farm animal. F. Prerequisite: ANEQ 230 or ANEQ 305 or BMS 300 or BMS 305; junior, senior, or graduate standing. ($) B) Rodent. S. Prerequisite: ANEQ 230 or ANEQ 305 or BMS 300 or BMS 305 or VS 333; junior, senior, or graduate standing. ($)

ANEQ 551 02(1-2-0). Field Necropsy. F. S. Prerequisite: ANEQ 230 or ANEQ 305 or BMS 300 or BMS 305 or VS 313; junior or senior standing. Field necropsy techniques for collection of animal tissues for submission to a diagnostic laboratory. ($)

ANEQ 565 03(3-0-0). Interpreting Animal Science Research. S. Prerequisite: ANEQ 101 or ANEQ 102; 3 credits statistics. Designing, conducting, analyzing, and reporting of animal science research.

ANEQ 567 02(2-0-0). HACCP Meat Safety. S. Prerequisite: ANEQ 460. This is a partial-semester course. Control of health problems in meat products through hazard analysis critical control point (HACCP) and total quality management (TQM) practices.

ANEQ 575 03(2-2-0). Computational Biology in Animal Breeding. F. Prerequisite: Graduate standing. Numerical analysis and use of computers to solve problems in animal improvement.

ANEQ 587 Var [1-9]. Internship. F, S, SS. Prerequisite: Written consent of instructor.

ANEQ 610 02(2-0-0). Hormonal Regulation of Growth. S. Prerequisite: BMS 501. Cellular and molecular regulation of animal growth by hormones and growth factors.

ANEQ 621 03(3-0-0). Vitamin and Mineral Metabolism. S. Prerequisite: Graduate standing. Vitamin and mineral metabolism in domestic animals.

ANEQ 631 03(2-0-1). Selection Index Theory. S. Prerequisite: Graduate standing. Quantitative methods for genetic evaluation: selection index theory and introduction to best linear unbiased prediction.

ANEQ 660 01(1-0-0). Topics in Meat Safety. F, S. Prerequisite: ANEQ 567. Topics of current concern in meat safety.

ANEQ 676 03(4-0-0). Molecular Approaches to Food Safety. F. Prerequisite: MIP 300 or MIP 334. Molecular subtyping, tracking, and control; molecular ecology and evolution of food-borne pathogens; molecular pathogenesis of food-borne diseases. ($)

ANEQ 699 Var. Thesis. F, S, SS. Prerequisite: Written consent of instructor.

ANEQ 730 03(3-0-0). Advances in Cattle Breeding. S. Prerequisite: Graduate standing. Literature and research methods in beef cattle breeding.

ANEQ 731 03(3-0-0). Advanced Genetic Prediction. S. Prerequisite: ANEQ 575; graduate standing. Models and methods for prediction of genetic merit in livestock population.

ANEQ 784 Var. Supervised College Teaching. F, S, SS. Prerequisite: Graduate standing; written consent of instructor.


ANEQ 795 Var. Independent Study. F, S, SS. Prerequisite: Graduate standing; written consent of instructor.

ANEQ 799 Var. Dissertation. F, S, SS. Prerequisite: Graduate standing; written consent of instructor.

° Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCC-subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
# ANTHROPOLOGY COURSES

## Department of Anthropology

## College of Liberal Arts

**ANTH 100 03(3-0-0), Introductory Cultural Anthropology.** (GT-SS3, AUCC 3C) F, S. Prerequisite: None.

- Human societies and their cultural settings; variation in beliefs, social customs, and technologies; human differences in anthropological terms. (NT-O)

**ANTH 120 03(3-0-0), Human Origins and Variation.** (GT-SC2, AUCC 3A) F, S. Prerequisite: None.

- Mechanisms of evolution; genetics. Living primate biology, behavior, and history. Human evolutionary history. Human variation and adaptation. (NT-O)

**ANTH 121 01(0-2-0), Human Origins and Variation Laboratory.** (GT-SC1, AUCC 3A). F, S, SS. Prerequisite: ANTH 120 or concurrent registration.

- Labs demonstrating genetic and evolutionary processes, comparative skeletal anatomy, human evolution through fossil casts, and modern human variation. (NT-O) ($)

**ANTH 140 03(3-0-0), Introduction to Prehistory.** (GT-HI1, AUCC 3D) F, S, SS. Prerequisite: None.

- Origins of human society from the Stone Age to urban civilization using architecture, art, tools, and other material remains. (NT-O)

**ANTH 200 03(3-0-0), Cultures and the Global System.** (GT-SS3, AUCC 3E) F, S. Prerequisite: None.

- Analyze diversity, cultural responses, and adaptations of smaller-scale societies to emerging global trends. (NT-O)

**ANTH 260 02(1-2-0), Introduction to Field Archaeology.** F, S, SS. Prerequisite: ANTH 140.

- Field methods including map preparation and interpretation, site location and recording, site excavation, and stratigraphy.

**ANTH 295 Var[1-3], Independent Study.** F, S, SS. Prerequisite: None.

- *ANTH 310 03(3-0-0), Peoples and Cultures of Africa.** S. Prerequisite: ANTH 100.

  - Sub-Saharan life styles including marriage and family, traditional government, religion and magic, ecology and economy, art, music, and literature.

- *ANTH 312 03(3-0-0), Modern Indian Culture and Society.** S. Prerequisite: ANTH 100 or ANTH 200.

  - Anthropological contributions to the understanding of contemporary India.

- *ANTH 313 03(3-0-0), Modernization and Development.** F, S, SS. Prerequisite: ANTH 100 or ANTH 200.

  - Processes by which cultures change and modernize, 1989 to the present. (NT-O)

- *ANTH 314 03(3-0-0), Southeast Asian Cultures and Societies.** S. Prerequisite: ANTH 100 or ANTH 200.

  - Colonial and post-colonial cultures, globalization processes, and changing ethnic and gender identities in Southeast Asian societies.

- *ANTH 318/*ETST 318 03(3-0-0), Peoples and Cultures of the Southwest.** F, S. Prerequisite: ANTH 100. Credit not allowed for both ANTH 318 and ETST 318.

  - Analyze development of cultures of the American Southwest; colonialism, migration, political incorporation, and socioeconomic processes. (NT-O)

- *ANTH 319/ETST 319 03(3-0-0), Latin American Peasantries.** F, S. Prerequisite: ANTH 100 or ANTH 200 or ETST 100. Credit not allowed for both ANTH 319 and ETST 319.

  - Socio-cultural, economic, and political responses of Latin American peasants to poverty and global processes.

* Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCC subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
ANTH 370 03(3-0-0). Primate Behavior and Ecology. F, S, SS. Prerequisite: ANTH 120 or BZ 101. Behavioral patterns, ecological relationships, and communication of nonhuman primates. (NT-O)

ANTH 372 03(2-2-0). Human Osteology. F. Prerequisite: ANTH 120 or BZ 101 or BZ 110 or LIFE 102. Human bones and teeth in a review of functional human evolution.

ANTH 373 03(3-0-0). Human Evolution. S. Prerequisite: ANTH 120 or BZ 110. Current topics and debates in human evolution concentrating on biocultural changes in the human lineage.

*ANTH 374 03(2-0-1). Human Biological Variation. S. Prerequisite: ANTH 120 or BZ 101 or BZ 110 or LIFE 102. Biological diversity of human populations; history of development of race concept.

*ANTH 375 03(3-0-0). Evolution of Primate Behavior. F. Prerequisite: ANTH 120 or BZ 101 or BZ 110. Primate behavior from an evolutionary perspective, drawing on a variety of studies of humans, primates, and mammals.

ANTH 376 03(2-0-1). Evolution of Human Adaptation. F. Prerequisite: ANTH 120 or BZ 101 or BZ 110 or LIFE 102. Unique characteristics of humans: bipedalism, encephalization, dentition, birth process, an attenuated period of development.

ANTH 400 03(3-0-0). History of Anthropological Theory. F, S, SS. Prerequisite: ANTH 100 or ANTH 200; ANTH 120; ANTH 121; ANTH 140; senior standing.

Anthropological theory from its beginnings in 19th century through recent developments in the latter half of the 20th century. (NT-O)

ANTH 411 03(0-0-3). Indians of South America. F, S, SS. Prerequisite: ANTH 100 or ANTH 200 or ANTH 413 or ANTH 414/ETST 414. Ethnographic and cultural characteristics of South American indigenous groups and the current critical issues they face. (NT-O)

ANTH 412 03(3-0-0). Indians of North America. F, S, SS. Prerequisite: ANTH 100 or ANTH 200 or ANTH 413 or ANTH 414/ETST 414. Native American peoples, their cultural variation across the continent, and cultural encounters with colonial expansion. (NT-O)

ANTH 413 03(3-0-0). Indigenous Peoples Today. F. Prerequisite: ANTH 200 or ANTH 412 or ANTH 414/ETST 414. Contemporary cultural and social issues of indigenous peoples around the globe, including North and South American Indians and Australian Aborigines.

°ANTH 414°ETST 414 03(3-0-0). Development in Indian Country. F. Prerequisite: None. Credit not allowed for both ANTH 414 and ETST 414. Critical examination of history, public policy, and tribal strategies for economic development and natural resource management in Indian Country.

ANTH 415 03(3-0-0). Indigenous Ecologies and the Modern World. F, S, SS. Prerequisite: None. Impact of the modern world on indigenous peoples’ relationship to their environments and natural resources. (NT-O)

*ANTH 422SOC 422 03(3-0-0). Comparative Legal Systems. S. Prerequisite: ANTH 100 or SOC 100. Credit not allowed for both ANTH 422 and SOC 422. Traditional approaches to law, competing concepts of law in the global system, and experiences of minorities in state legal systems.


ANTH 438 03(0-0-3). Approaches to Community-Based Development. F, S, SS. Prerequisite: ANTH 100 or ANTH 200. Explores the structure and practice of community development globally, engaging in critical analysis of different approaches and their impact. (NT-O)

ANTH 439 03(0-0-3). Community Mobilization. F, S, SS. Prerequisite: ANTH 100 or ANTH 200. Structural, social, and psychological barriers that inhibit cooperation and collective action. (NT-O)

°ANTH 440 03(3-0-0). Theory in Cultural Anthropology. F, S. Prerequisite: ANTH 100 or ANTH 200. Theoretical paradigms used to explain culture including evolutionary, functional, ecological, political economy, postmodernism, and hegemony.

°ANTH 441 03(3-0-0). Method in Cultural Anthropology. F. Prerequisite: ANTH 100 or ANTH 200. Methodological orientations and research techniques. Ethnographic and cross-cultural approaches including quantitative and formal models.

ANTH 442 Var[3-8]. Ethnographic Field School. SS. Prerequisite: ANTH 100 or ANTH 200 or 9 credits in ANTH coursework. Directed fieldwork with American Indian communities; methodology, protocols, and social relations of ethnographic field research. ($) 

ANTH 443 03(0-6-0). Ethnographic Field Methods. S. Prerequisite: ANTH 100 or ANTH 200. Directed experiential preparation for applied ethnographic field methods and research questions.

ANTH 444 03(3-0-0). Cultures of Virtual Worlds: Research Methods. S. Prerequisite: ANTH 100 or ANTH 200; junior or senior standing. Methodologies and directed research related to virtual worlds and internet and gaming communities.

ANTH 445 03(3-0-0). Psychological Anthropology. S. Prerequisite: ANTH 100 or ANTH 200. Cross-cultural exploration of the human mind by studying the ideas, desires, and practices of individuals in various sociocultural settings.

ANTH 446 03(3-0-0). New Orleans and the Caribbean. F. Prerequisite: ANTH 100 or ANTH 200. New Orleans and the Caribbean connections through colonization, slavery, modernity, legacies of race, gender, and class, the expressive arts.

ANTH 447 03(0-0-3). Gender Equity in Development. F, S, SS. Prerequisite: ANTH 100 or ANTH 200. Various forms of women’s power, and potentials for disempowerment within the context of international development. (NT-O)

ANTH 448 03(0-0-3). Development and Empowerment. F, S, SS. Prerequisite: ANTH 100 or ANTH 200. Development as an economic process of wealth accumulation, as well as a socio-political process of empowerment. (NT-O)

ANTH 449 03(3-0-0). Participatory Monitoring and Evaluation. F, S. SS. Prerequisite: ANTH 100 or ANTH 200. Participatory methods in the monitoring and evaluation of development projects, where multiple stakeholders are involved in the process. (NT-O)

ANTH 450 03(0-0-3). Hunter-Gatherer Ecology. S. Prerequisite: ANTH 100; ANTH 120; ANTH 121; ANTH 140. Development of anthropological method and theory; study of contemporary and prehistoric foraging peoples.

° Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCCsubcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
Prerequisite: ANTH 373.

Practical discussion of techniques used to reconstruct dietary and remains.

ANTH 452 03(3-0-0). Archaeology of Mesoamerica. F. Prerequisite: ANTH 140.

Ancient cultures and civilizations in Middle America.

ANTH 453 03(3-0-0). Impacts on Ancient Environments. S. Prerequisite: ANTH 140.

Major issues and case studies in the archaeology of ancient human societies and their environmental impacts.

*ANTH 455 03(3-0-0). Great Plains Archaeology. F. Prerequisite: ANTH 140.

Prehistoric people on Great Plains from earliest hunter-gatherers to historic contact; cultural responses to changing conditions.

**ANTH 456 03(3-0-0). Archaeology and the Public. S. Prerequisite: ANTH 140; 3 additional credits of anthropology. Required field trips.

Applied archaeology in public settings, including publication, museum display, education, the illicit artifact trade, and other ethical issues.

°ANTH 457 03(2-2-0). Lithic Technology. F. Prerequisite: ANTH 140.

Method and theory behind production, use, and discard of stone tools by prehistoric peoples. Hands-on application in laboratory setting.

+ANTH 460 Var[3-8]. Field Class in Archaeology. SS. Prerequisite: Written consent of instructor. Required field trips.

Directed fieldwork in local archaeology, site survey, and excavation; recovery, preservation, cataloging, analysis of artificial and skeletal materials. (S)

ANTH 461 03(0-0-3). Anthropological Report Preparation. F. Prerequisite: ANTH 460; written consent of instructor.

Producing written and oral presentations for anthropological research, employment, or graduate work. Grant writing and manuscript preparation.

°ANTH 465 03(2-2-0). Zooarchaeology. S. Prerequisite: ANTH 120; ANTH 140.

Analysis of animal bones from archaeological sites to develop interpretations of past human behavior.

ANTH 469 03(0-0-3). Archeology Seminar in Mesopotamian Prehistory. F, S, SS. Prerequisite: 6 credits of anthropology.

Origins of human society from the stone age to urban civilizations using architecture, art, tools, and other material remains. (NT-O)

ANTH 470 04(2-4-0). Paleontology Field School. SS. Prerequisite: ANTH 120 or BZ 110 or LIFE 104.

Field methods in fossil excavation, preservation, and curation; the evolution of the primate order. (S)

ANTH 472 03(3-0-0). Human Biology. S. Prerequisite: ANTH 120 or BZ 110 or LIFE 102.

Human biological responses to environmental conditions and constraints including diet, nutrition, disease, climate, culture change, and urbanization.

°ANTH 473 03(2-0-1). The Neandertals. S. Prerequisite: ANTH 120 or BZ 110; ANTH 372 or ANTH 373 or ANTH 374 or ANTH 375 or ANTH 376.

Socio-historical foundations of questions regarding Neandertal paleobiology and culture and the Neandertal role in the evolution of Homo sapiens.

ANTH 475 03(3-0-0). Methods of Analysis in Paleoanthropology. F. Prerequisite: ANTH 373.

Practical discussion of techniques used to reconstruct dietary and locomotor behavior and evolutionary relationships in human fossil remains.

°ANTH 478/°HIST 478 03(3-0-0). Heritage Resource Management. S. Prerequisite: Junior or senior standing. Credit not allowed for both ANTH 478 and HIST 478.

Cultural resource laws and policy; practices commonly employed in management and preservation of these diverse resources.

ANTH 479/IE 479 03(3-0-0). International Development Theory and Practice. F. Prerequisite: Junior or senior standing. Credit not allowed for both ANTH 479 and IE 479.

Contemporary issues in international community and economic development, with practical and theoretical analysis from interdisciplinary perspectives.

ANTH 484 Var[1-5]. Supervised College Teaching. F, S. Prerequisite: Written consent of instructor. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.

ANTH 486 Var[1-6]. Practicum. Application of anthropological methods under actual project conditions.

ANTH 487 Var[1-9]. Internship. F, S, SS. Prerequisite: 9 credits of anthropology.

Academic-based work experience with selected organizations or agencies. Supervised application of anthropological principles.

ANTH 492 A-B 03(0-0-3). Seminar. F, S, SS. Prerequisite: Six credits of anthropology.

A) Archaeology. (NT-O) B) Biological anthropology.

ANTH 493 01(0-0-1). Capstone. F, S, SS. Prerequisite: Concurrent registration in a 4A course (see department list).

Linkages between anthropological subfields and how professional anthropologists approach issues. (NT-O)

ANTH 495 Var[1-3]. Independent Study.

ANTH 496 Var[1-3]. Group Study.

ANTH 500 03(3-0-0). Development of Anthropological Theory. F. Prerequisite: Undergraduates must have written consent of instructor.

Contemporary development of anthropological thought.

ANTH 513/ETST 513 03(3-0-0). Capitalism and Global Ethnic Conflicts. S. Prerequisite: ANTH 200 or ETST 100. Credit not allowed for both ANTH 513 and ETST 513.

Causes of global ethnic conflicts with emphasis on resource competition, capitalist development schemes, and role of the state.

ANTH 515 03(3-0-0). Culture and Environment. F. Prerequisite: Graduate standing.

Theoretical accounts of societies’ variable relationships to their environments; indigenous peoples’ interactions with nature in context of modernity.

°ANTH 520 03(3-0-0). Women, Health, and Culture. S. Prerequisite: Graduate standing.

Women’s experiences and interpretations of their health; cultural, political, and economic forces affecting women’s health.

°ANTH 521 03(3-0-0). Gender, Sexuality, and Culture. S. Prerequisite: Graduate standing.

Gender and sexuality cross-culturally; theory, cultural constructions, colonialism, class, race, ethnicity, health, violence.

ANTH 528 03(0-0-3). Economic Anthropology. S. Prerequisite: Nine credits in anthropology.

Theoretical approaches to the cultural context of economic activity.

ANTH 529 03(0-0-3). Anthropology and Sustainable Development. F. Prerequisite: Nine credits in anthropology.

Global development goals, poverty and hunger, environmental sustainability, education, and equity.
issues in development and organization of complex societies with

Prerequisite: Graduate standing.

*ANTH 532 03(0-0-3), The Culture of Disaster. S. Prerequisite: Graduate student standing.
Study of how the human impacts of disaster and the process of recovery are shaped by cultural as well as structural realities.

*ANTH 533 03(0-0-3). Globalization and Culture Change. F. Prerequisite: Nine credits in anthropology.

Evolving paradigms and patterns of globalization and international development; cultural responses--resistance, dependency, fragmented identities.

°ANTH 539 03(3-0-0). Anthropology of Modernity. F. Prerequisite: None.
Critical examination of the institutions, values, and processes which constitute the modern world. Impact of modern forces on "traditional" peoples.

*ANTH 540 03(0-0-3). Medical Anthropology. S. Prerequisite: Graduate standing.

Cultural and biocultural approaches to health, illness, and the body; theory and application in medical anthropology.

*ANTH 541 03(1-0-2), Seminar in Archaeological Method. S. Prerequisite: Nine credits in anthropology.
Methods of archaeological recovery and interpretation, and process of archaeological analysis and reporting.

°ANTH 542 03(1-0-2), Seminar in Archaeological Theory. S. Prerequisite: Nine credits in anthropology.
Theories of recovery, reconstruction, and interpretation of the archaeological record.

ANTH 544 03(1-0-2). Anthropological Method and Theory. F, S. Prerequisite: Nine credits of anthropology.
Current trends of research in archaeology; cultural and physical anthropology.

°ANTH 545 03(3-0-0), Culture and Mental Health: Theory and Method. S. Prerequisite: Nine credits in anthropology.
Anthropological contributions to the cross-cultural study of mental health; indigenous peoples' health and healing; integration of theory and method.

*ANTH 546 03(3-0-0), Culture, Mind, and Cognitive Science. S. Prerequisite: Graduate standing.

Anthropological contributions to cognitive science. Culture, mind, and social context. Theory building and practical applications.

*ANTH 547 04(3-2-0), Mind, Medicine, and Culture. S. Prerequisite: Graduate standing.
Cultural-psychological influences on health and healing; mind-body medicine; complementary and alternative medicine; indigenous and spiritual healing.

ANTH 550A-C 03(0-0-3), Regional Prehistory.

°ANTH 551 03(3-0-0), Historical Archaeology. S. Prerequisite: Graduate standing.
Theory, methods, and issues in historical archaeology.

*ANTH 553 03(0-0-3), Archaeology of Complex Societies. S. Prerequisite: Graduate standing.
Issues in development and organization of complex societies with emphasis on the Americas.

°ANTH 554/NR 554 03(2-2-0), Ecological and Social Agent-based Modeling. S. Prerequisite: Junior or senior standing. Credit not allowed for both ANTH 554 and NR 554.

Exploring the use and making of agent-based models featuring interacting individuals in ecological and social simulation, with examples and projects.

*ANTH 555 03(0-0-3), Paleoindian Archaeology. F. Prerequisite: ANTH 140.
Archaeology of the Americas during late Pleistocene/early Holocene; background and development of contemporary models.

ANTH 566 03(2-2-0), Field Methods Training in Online Environments. S. Prerequisite: Graduate standing.

Collaborative analysis of ethnographic field data collected in online virtual worlds; mixed methods applicable to other built and natural places.

ANTH 570 03(0-0-3), Contemporary Issues-Biological Anthropology. F. Prerequisite: Six credits in biological anthropology.

Theory and applications in biological anthropology focusing on syntheses and interpretations of human biology, variation, adaptability, and evolution.

*ANTH 571 03(3-0-0), Anthropology and Global Health. F. Prerequisite: Graduate standing.
Global health concerns and problems including poverty, urbanization, malnutrition, diet, war and refugees, climate, and environment.

°ANTH 572 03(0-0-3), Human Origins. S. Prerequisite: Graduate standing.
Major trends in human evolution through use of detailed case studies and regionally focused primary research.

*ANTH 573 03(3-0-0), Paleoclimate and Human Evolution. S. Prerequisite: Graduate Standing.
Methods used to reconstruct past environments and understand the effects of past climate on the major trends of human evolution.

ANTH 643 03(0-0-6), Advanced Ethnographic Field Methods. S. Prerequisite: None.
Development of applied field methods and research questions for graduate-level ethnographic field research.

°ANTH 550A-C 03(0-0-3), Regional Prehistory.

°ANTH 551 03(3-0-0), Historical Archaeology. S. Prerequisite: Graduate standing.
Theory, methods, and issues in historical archaeology.

*ANTH 553 03(0-0-3), Archaeology of Complex Societies. S. Prerequisite: Graduate standing.
Issues in development and organization of complex societies with emphasis on the Americas.

°ANTH 554/NR 554 03(2-2-0), Ecological and Social Agent-based Modeling. S. Prerequisite: Junior or senior standing. Credit not allowed for both ANTH 554 and NR 554.

Exploring the use and making of agent-based models featuring interacting individuals in ecological and social simulation, with examples and projects.

*ANTH 555 03(0-0-3), Paleoindian Archaeology. F. Prerequisite: ANTH 140.
Archaeology of the Americas during late Pleistocene/early Holocene; background and development of contemporary models.

ANTH 566 03(2-2-0), Field Methods Training in Online Environments. S. Prerequisite: Graduate standing.

Collaborative analysis of ethnographic field data collected in online virtual worlds; mixed methods applicable to other built and natural places.

ANTH 570 03(0-0-3), Contemporary Issues-Biological Anthropology. F. Prerequisite: Six credits in biological anthropology.

Theory and applications in biological anthropology focusing on syntheses and interpretations of human biology, variation, adaptability, and evolution.

*ANTH 571 03(3-0-0), Anthropology and Global Health. F. Prerequisite: Graduate standing.
Global health concerns and problems including poverty, urbanization, malnutrition, diet, war and refugees, climate, and environment.

°ANTH 572 03(0-0-3), Human Origins. S. Prerequisite: Graduate standing.
Major trends in human evolution through use of detailed case studies and regionally focused primary research.

°ANTH 573 03(3-0-0), Paleoclimate and Human Evolution. S. Prerequisite: Graduate Standing.
Methods used to reconstruct past environments and understand the effects of past climate on the major trends of human evolution.

ANTH 643 03(0-0-6), Advanced Ethnographic Field Methods. S. Prerequisite: None.
Development of applied field methods and research questions for graduate-level ethnographic field research.

°ANTH 660 Var[2-10], Field Archaeology, F, SS. Prerequisite: ANTH 460 or two seasons field experience. Required field trips.

Field application of nondestructive survey methods, advanced cartographic and excavation methods, project supervision skills. ($)

°ANTH 679/IE 679 03(3-0-0), Applications of International Development, F, S. Prerequisite: Graduate standing. Credit not allowed for both ANTH 679 and IE 679.

In-depth interdisciplinary analysis of theoretical and practical issues in implementing economic and community-based international development programs.

ANTH 684 Var. Supervised College Teaching.

ANTH 686 Var. Practicum-Field Archaeology.

Direction of anthropological fieldwork under professional supervision.

ANTH 692 03(0-0-3), Seminar.

Current trends of research in archaeology; cultural and physical anthropology.

ANTH 695 Var. Independent Study.

ANTH 696 Var[1-3], Group Study-Anthropological Theory.

Intensive analysis of selected topics and theories in anthropology, both historical and contemporary.

# AGRICULTURAL AND RESOURCE ECONOMICS COURSES

## Department of Agricultural and Resource Economics

## College of Agricultural Sciences

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Prerequisites</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREC 202 03</td>
<td>Agricultural and Resource Economics. (GT-SS1, AUCC 3C).</td>
<td>F, S. Prerequisite: MATH 117 or concurrent registration or MATH 118 or MATH 124 or MATH 125 or MATH 126 or MATH 141 or MATH 155 or MATH 160. Credit not allowed for both AREC 202 and ECON 202.</td>
<td>Introduction to decision-making by consumers, firms, and government, and resulting allocation of resources through markets.</td>
</tr>
<tr>
<td>+AREC 224 01 (0-0-1)</td>
<td>Introduction to Agribusiness Entrepreneurship.</td>
<td>F. Prerequisite: AREC 202 or concurrent registration or ECON 202 or concurrent registration. Field trips required.</td>
<td>Introductory exposure to entrepreneurship for agribusinesses through presentations by industry professionals. ($) NT-O)</td>
</tr>
<tr>
<td>AREC 240/ECON 240 03</td>
<td>Issues in Environmental Economics. (GT-SS1, AUCC 3C).</td>
<td>F, S. Prerequisite: None. Credit not allowed for both AREC 240 and ECON 240.</td>
<td>Discussion and economic analysis of current environmental issues with special emphasis on the impact of economic growth. (NT-C)</td>
</tr>
<tr>
<td>AREC 305 03</td>
<td>Agricultural and Resource Enterprise Analysis.</td>
<td>F, S. Prerequisite: BUS 150 or CIS 120 or CS 110; AREC 202 or ECON 202.</td>
<td>Use of records in agricultural and resource enterprise management; analytical methods, budgets, and planning techniques for improved decision making. (NT-O)</td>
</tr>
<tr>
<td>AREC 310 03</td>
<td>Agricultural Marketing.</td>
<td>F, S, SS. Prerequisite: AREC 202 or ECON 202.</td>
<td>Market structure, behavior, and performance including futures market and market games theory. (NT-O)</td>
</tr>
<tr>
<td>AREC 311 03</td>
<td>Agricultural and Resource Product Marketing.</td>
<td>F. Prerequisite: AREC 202 or ECON 202.</td>
<td>Theory and practice of marketing differentiated agricultural products and natural resource amenities with focus on strategies and market trends.</td>
</tr>
<tr>
<td>AREC 325 03</td>
<td>Personal Management in Agriculture.</td>
<td>F. Prerequisite: AREC 202 or ECON 202.</td>
<td>Human resource issues for agribusiness firms. Selecting and training employees, dealing with employee problems, negotiation methods.</td>
</tr>
<tr>
<td>AREC 328 03</td>
<td>Small Agribusiness Management.</td>
<td>F. Prerequisite: AREC 202 or ECON 202.</td>
<td>Apply business principles to small agribusinesses and cooperatives.</td>
</tr>
<tr>
<td>AREC 335/ECON 335 03</td>
<td>Introduction to Econometrics.</td>
<td>F, S. Prerequisite: ECON 204; MATH 141 or MATH 155 or MATH 160; STAT 201 or STAT 204 or STAT 301 or STAT 307. Credit not allowed for both AREC 335 and ECON 335.</td>
<td>Estimating statistical regression models of economic relationships; treatment of special problems that may arise in analysis of economic data.</td>
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<tr>
<td>AREC 340/ECON 340 03</td>
<td>Introduction: Economics of Natural Resources.</td>
<td>S. Prerequisite: AREC 202 or ECON 202. Credit not allowed for both AREC 340 and ECON 340.</td>
<td>Concepts, theories, institutions; analytical methods for economic evaluation of alternative resource use patterns and land use plans.</td>
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<tr>
<td>AREC 341 03</td>
<td>Environmental Economics.</td>
<td>F. Prerequisite: AREC 202 or ECON 202; AREC 240/ECON 240.</td>
<td>Economic theories and analytic frameworks are developed and applied to contemporary problems of the use and protection of the natural environment.</td>
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</tbody>
</table>

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AREC 460 03(3-0-0). Ag- and Resource-Based Economic Development. S. Prerequisite: ECON 306. Indicators, tools, and approaches for agriculture-based and natural resource-based economic development in resource dependent countries and communities.

AREC 478 03(3-0-0). Agricultural Policy. F, S. Prerequisite: AREC 202 or ECON 202 or AREC 240/ECON 240. Formulation and administration of public policies affecting agricultural industries and rural areas in the United States. (NT-O)

AREC 484 Var[1-5]. Supervised College Teaching. F, S. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.

AREC 487 Var[1-6]. Internship. F, S, SS. Prerequisite: None. May be taken for a maximum of 6 credits. (NT-O)

AREC 495 Var[1-6]. Independent Study. F, S, SS. Prerequisite: None. May be taken for a maximum of 6 credits. (NT-O)

AREC 496 Var. Group Study.

AREC 505 03(3-0-0). Agricultural Production Economics. F. Prerequisite: AREC 405 or ECON 306; MATH 141. Empirical applications of production economic theory for use of inputs and allocation of resources in agricultural, natural resource sectors.

AREC 506/ECON 506 03(3-0-0). Applied Microeconomic Theory. F. Prerequisite: ECON 306. Credit not allowed for both AREC 506 and ECON 506. Introduction to mathematical models in modern microeconomics, including choices and demand, production and supply, and market structures and failures.

AREC 507 03(3-0-0). Applied Welfare and Policy Analysis. S. Prerequisite: ECON 306. How policies are crafted to effectively address social issues, especially for agriculture and the environment, and how they impact society.

AREC 508 03(3-0-0). Financial Management in Agriculture. S. Prerequisite: AREC 408. Systematic approach to understanding and applying financial management in farm businesses.

AREC 510 03(3-0-0). Agricultural Product Marketing. F. Prerequisite: AREC 310; AREC 335/ECON 335. Marketing techniques, industrial organization/competition for agricultural products in U.S. domestic, international trade, and developing country markets.

AREC 530 03(3-0-0). Agricultural Price Analysis. S. Prerequisite: None. Agricultural commodity prices related to neoclassical economics; current literature emphasizing management problems.

AREC 535/ECON 535 03(3-0-0). Applied Econometrics. F. Prerequisite: AREC 335/ECON 335; ECON 304 or ECON 306. Credit not allowed for both AREC 535 and ECON 535. Econometric techniques applied to testing and quantification of theoretical economic relationships drawn from both microeconomics, macroeconomics.

AREC 540/ECON 540 03(3-0-0). Economics of Natural Resources. F. Prerequisite: AREC 340/ECON 340; MATH 141. Credit not allowed for both AREC 540 and ECON 540. Public natural resources policy, effect on resource use in private sector, optimal pricing of minerals, timber and fisheries, public project analysis.

AREC 541/ECON 541 03(3-0-0). Environmental Economics. S. Prerequisite: ECON 306. Credit not allowed for both AREC 541 and ECON 541. Economics of environmental policy; partial equilibrium and general equilibrium model; pollution; natural environments; population and economic growth.

AREC 542 04(3-2-0). Applied Advanced Water Resource Economics. S. Prerequisites: AREC 342; ECON 306; MATH 141 or MATH 155 or MATH 160; STAT 301. Credit not allowed for both AREC 442 and AREC 542. Theory and application of economics in water resource planning.

AREC 547 03(3-0-0). Public Lands Planning and Management. S. Prerequisite: AREC 202 or ECON 202. Principles and techniques used by federal land management agencies including Forest Service, Park Service, Fish and Wildlife Service, and BLM.

AREC 563/ECON 563 03(3-0-0). Regional Economics-Theory, Methods, and Issues. F. Prerequisite: ECON 306; ECON 501 or concurrent registration. Credit not allowed for both AREC 563 and ECON 563. Tools and methods of regional economics, including supply, demand, and externality analyses. Applications to current urban and regional policy issues.

AREC 566/°SOC 566 03(3-0-0). Contemporary Issues of Developing Countries. S. Prerequisite: Two or more courses in AREC or ECON or SOC. Credit not allowed for both AREC 566 and SOC 566. Social, economic, and technological factors in developing countries.

AREC 570/°ECON 530 03(3-0-0). Methodology of Economic Research. F. Prerequisite: ECON 304; ECON 306. Credit not allowed for both AREC 570 and ECON 530. Philosophical foundations of science and research. Concepts and skills for planning, performing, reporting, and evaluating economic research.

AREC 572 03(3-0-0). Social Benefit Cost Analysis. F. Prerequisite: ECON 306. Theory, application of concepts relating to social benefit cost analysis of public projects, policies intended to promote social welfare, economic growth.

AREC 605 02(2-0-0). Agricultural Production and Cost Analysis. S. Prerequisite: AREC 566; AREC 535/ECON 535. Empirical application and analysis of production and cost issues in the agricultural and natural resource sectors.

AREC 606/ECON 606 03(3-0-0). Microeconomic Analysis I. S. Prerequisite: ECON 306; ECON 501. Credit not allowed for both AREC 606 and ECON 606. Advanced price/allocation theory; consumer/producer decisions; uncertainty; market structure; partial/general equilibrium; efficiency/welfare.

AREC 610 02(2-0-0). Agricultural Marketing and Demand Analysis. S. Prerequisite: AREC 506; AREC 535/ECON 535. Empirical Application and analysis of agricultural marketing and demand issues in the agricultural and natural resource sectors.

AREC 615 03(3-0-0). Optimization Methods for Applied Economics. F. Prerequisite: AREC 506. Theory and practice of optimization techniques used in economic applications with emphasis on linear and nonlinear programming.

AREC 635/ECON 635 03(3-0-0). Econometric Theory I. F. Prerequisite: AREC 535/ECON 535; ECON 501 or concurrent registration. Credit not allowed for both AREC 635 and ECON 635. Theory of mathematical statistics and classical linear regression model in context of economic application.

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AREC 660 03(3-0-0). Development of Rural Resource-Based Economics. S. Prerequisite: AREC 506.
Economic literature-based exploration of human welfare measures and implications of approaches to agriculture and resource-based economic development.

AREC 678 03(3-0-0). Agricultural and Resource Policy. F. Prerequisite: ECON 306; MATH 141.
Evaluate and analyze economic theory, applications and public incentives related to government policies for agriculture and natural resources.

AREC 695 Var. Independent Study.


°AREC 705 02(2-0-0). Advanced Production and Technological Change. S. Prerequisite: AREC 605.
Production theory is applied to real-world issues including risk, innovation, and environment, through lectures and readings of current literature.

AREC 706/ECON 706 03(3-0-0). Microeconomic Analysis II. F. Prerequisite: ECON 606. Credit not allowed for both AREC 706 and ECON 706.
Advanced topics in microtheory: game theory; market imperfections; adverse selection; principal-agent problems; social choice theory, incentives, etc.

°AREC 710 02(2-0-0). Advanced Agricultural Marketing Issues. S. Prerequisite: ECON 706; AREC 735/ECON 735.
Theoretical and modeling issues of consumer demand, market structure, product differentiation and market behavior.

AREC 735/ECON 735 02(2-0-0). Econometric Theory II. S. Prerequisite: AREC 635/ECON 635. Credit not allowed for both AREC 735 and ECON 735. This is a partial-semester course.
Econometrics models and estimators in econometrics, from fully parametric to semiparametric and nonparametric approaches.

°AREC 740 03(3-0-0). Advanced Resource and Environmental Economics. F. Prerequisite: AREC 540 or ECON 540; AREC 541 or ECON 541; AREC 635 or ECON 635; ECON 706.
Advanced theory, methods, and literature of natural resource and environmental economics, including dynamic programming and non-market valuation.

*AREC 770 03(3-0-0). Advanced Methods and Topics in AREC. S. Prerequisite: ECON 706; AREC 735/ECON 735.
Advanced research methods in applied economics: lab and field experiments, non-market valuation and discrete choice experiments.

AREC 784 Var[1-3]. Supervised College Teaching. F, S, SS.

AREC 792A-C Var. Seminar.

AREC 795 Var. Independent Study.


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<table>
<thead>
<tr>
<th>ART COURSES</th>
<th>Department of Art</th>
<th>College of Liberal Arts</th>
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</thead>
<tbody>
<tr>
<td>ART 100 03(3-0-0). Introduction to the Visual Arts. (GT-AH1, AUCC 3B). F, S, SS. Prerequisite: None.</td>
<td>Exploration of the development of visual arts.</td>
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<tr>
<td>ART 101 03(0-6-0). Visual Form. F, S, SS. Prerequisite: None.</td>
<td>Two- and three-dimensional design to develop visual awareness and insight into structure and organization of visual arts.</td>
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<tr>
<td>ART 105 01(1-0-0). Issues and Practices in Art. F, S. Prerequisite: None.</td>
<td>Current issues, practices, and resources in the visual arts; integration of unified vocabulary in various art disciplines.</td>
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<tr>
<td>ART 106D 03(0-6-0). Art Studio-Fibers. F, S, SS. Prerequisite: None.</td>
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<tr>
<td>ART 110 03(0-0-0). Art History I. F. Prerequisite: None.</td>
<td>The arts of ancient cultures and civilizations.</td>
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<tr>
<td>ART 111 03(3-0-0). Art History II. S. Prerequisite: ART 110.</td>
<td>Medieval through early modern art history.</td>
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<tr>
<td>*ART 112 03(3-0-0). History of Asian Art. F. Prerequisite: None.</td>
<td>Arts of China, Japan, and India.</td>
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<tr>
<td>°ART 113 03(3-0-0). Native Art Survey. F. Prerequisite: None.</td>
<td>Visual arts of native peoples of North America, Africa, and Oceania.</td>
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<tr>
<td>ART 135 03(0-6-0). Introduction to Drawing. F, S, SS. Prerequisite: None.</td>
<td>Elements of artistic freehand drawing emphasizing experimentation with wide variety of media.</td>
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<tr>
<td>ART 136 03(0-6-0). Introduction to Figure Drawing. F, S, SS. Prerequisite: ART 135.</td>
<td>Human form as basis for self-expression through various drawing media. ($)</td>
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<tr>
<td>ART 160 03(0-6-0). Two-Dimensional Visual Fundamentals. F, S. Prerequisite: None.</td>
<td>Concepts of organization and color theory structured for understanding and manipulation of two-dimensional space. ($)</td>
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<tr>
<td>ART 170 03(0-6-0). Three-Dimensional Visual Fundamentals. F, S. Prerequisite: None.</td>
<td>Understanding and manipulating three-dimensional form and space; use of materials and tools.</td>
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<tr>
<td>+ART 208/ETST 208 03(3-0-0). Native American Art and Material Culture. S. Prerequisite: None. Credit not allowed for both ART 208 and ETST 208. Required field trips.</td>
<td>Traditional arts and material culture of the indigenous peoples of North America.</td>
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<tr>
<td>ART 212 03(3-0-0). Art History III. F, S. Prerequisite: ART 111.</td>
<td>Modern to contemporary art history.</td>
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<tr>
<td>ART 230 03(0-6-0). Photo Image Making I. F, S. Prerequisite: ART 111; ART 136; ART 160; ART 170.</td>
<td>Photographic imagery as an art medium; exploration of silver-based (film) materials. ($)</td>
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<tr>
<td>ART 235 03(0-6-0). Intermediate Drawing I. F, S, SS. Prerequisite: ART 136.</td>
<td>Drawing using models and various still life materials. ($)</td>
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<tr>
<td>ART 240 03(0-6-0). Pottery I. F, S. Prerequisite: ART 111; ART 136; ART 160; ART 170.</td>
<td>Basic techniques of studio ceramics and wheel throwing; exploration of expressive potential in pottery. ($)</td>
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<tr>
<td>ART 245 03(0-6-0). Metalsmithing and Jewelry I. F, S. Prerequisite: ART 111; ART 136; ART 160; ART 170.</td>
<td>Basic metal techniques; forming and construction; surface treatment and finishing processes; behavior and mechanical properties of metals. ($)</td>
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<tr>
<td>ART 250 03(0-6-0). Fibers I. F, S. Prerequisite: ART 110; ART 135; ART 160 or ART 170.</td>
<td>Fibers and fabric as expressive media; weaving and basic fiber structures; fabric painting and surface techniques. ($)</td>
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<tr>
<td>ART 255 03(0-6-0). Introduction to Graphic Design. F, S. Prerequisite: ART 111; ART 136; ART 160; ART 170; 2.55. G.P.A. or better. Problems emphasizing typography, layout, symbols, illustration, and package design. ($)</td>
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<tr>
<td>ART 256 03(0-6-0). Introduction to Electronic Art. F, S. Prerequisite: ART 111; ART 136; ART 160; ART 170.</td>
<td>Introduction to digital media and internet-based art design.</td>
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<tr>
<td>ART 260 03(0-6-0). Painting I. F, S. Prerequisite: ART 111; ART 136; ART 160; ART 170.</td>
<td>Basic oil painting procedures, techniques, and concepts. ($)</td>
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<tr>
<td>ART 265 03(0-6-0). Printmaking I – Intaglio and Relief. F, S. Prerequisite: ART 110; ART 135; ART 160 or ART 170.</td>
<td>Problems in composition utilizing basic techniques and principles of printmaking processes. ($)</td>
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<tr>
<td>ART 270 03(0-6-0). Sculpture I. F, S. Prerequisite: ART 111; ART 136; ART 160; ART 170.</td>
<td>Introduction to sculptural techniques and concepts. ($)</td>
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<tr>
<td>ART 311 03(3-0-0). Art of Africa. F. Prerequisite: ART 212.</td>
<td>History of the art of Africa.</td>
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<tr>
<td>°ART 312 03(3-0-0). History of Pre-Columbian Art. F. Prerequisite: ART 212.</td>
<td>History of the art of Central and South America.</td>
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<tr>
<td>°ART 314 03(3-0-0). Women in Art History. S. Prerequisite: ART 212.</td>
<td>Women as artists in history of art and women’s media in art.</td>
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<tr>
<td>ART 316 03(3-0-0). Art of the Pacific. S. Prerequisite: ART 212.</td>
<td>Arts of Australia, Indonesia, Melanesia, Micronesia, and Polynesia.</td>
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<tr>
<td>°ART 319 03(3-0-0). History of Graphic Design. F. Prerequisite: ART 212.</td>
<td>History of graphic design emphasizing 19th- and 20th-century work.</td>
<td></td>
</tr>
</tbody>
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ART 321A-D Var[3-5]. Travel Abroad—Studio Workshop in Italy. SS.

Exploration of studio techniques in Italy. A) Drawing. Prerequisite: ART 135. B) Photo image making. Prerequisite: ART 230 or portfolio review; written consent of instructor. C) Fibers. Prerequisite: ART 250 or portfolio review; written consent of instructor. D) Sculpture. Var[3-5] Prerequisite: ART 270.

ART 325 03(3-0-0). Concepts in Art Education. S. Prerequisite: EDUC 275; admission to teacher licensure.

Artistic learning in children, adolescents, adults, and special populations.

ART 326 04(0-8-0). Art Education Studio. F, S. Prerequisite: EDUC 275; admission to teacher licensure.

Art areas required for teacher licensure as indicated by individual student needs. ($)

ART 330 04(0-8-0). Photo Image Making II. F, S. Prerequisite: ART 230 or portfolio review.

Studio course designed to develop the growth of photographic expression. ($)

ART 331 04(0-8-0). Photo Image Making III. F, S. Prerequisite: ART 330.

Studio course designed to further growth of concept, materials in photographic expression as an art medium. ($)

ART 335 04(0-8-0). Intermediate Drawing II. F, S, SS. Prerequisite: ART 235. May be taken 3 times for credit. Assigned and independent drawing projects; use of traditional and non-traditional materials. ($)

ART 336 04(0-8-0). Intermediate Drawing III. F, S. Prerequisite: ART 335.

Assigned and independent drawing projects; art theory and criticism; readings and written assignments. ($)

ART 340 04(0-8-0). Pottery II. F, S, SS. Prerequisite: ART 240.

Studio ceramic and wheel throwing techniques; surface treatment, kiln firing, clay and glaze formulation. ($)

ART 341 04(0-8-0). Pottery III. S. Prerequisite: ART 340.

Form and surface exploration; supportive ceramic technologies; expression in historical pottery. ($)

ART 345 04(0-8-0). Metalsmithing and Jewelry II. F, S. Prerequisite: ART 245.

Raising and casting techniques in combination with construction; metal spinning. ($)

ART 346 04(0-8-0). Metalsmithing and Jewelry III. F, S. Prerequisite: ART 245.

Forging and enameling techniques on nonferrous and ferrous metals; stone setting. ($)

ART 350 04(0-8-0). Fibers II. F. S. Prerequisite: ART 250.

Intermediate fiber structures and fabric and surface design; dyes and pigments; continued investigation of fibers and fabric as expressive media. ($)

ART 351 04(0-8-0). Fibers III. F. S. Prerequisite: ART 250.

Investigation of fibers and fabric as expressive media; research in historic textiles. ($)

ART 355 04(0-8-0). Typography and Design Systems. F. Prerequisite: ART 255.

Emphasis on typographic solutions for advertising, corporate identity, packaging, and publication design. ($)

ART 356 04(0-8-0). Illustration. S. Prerequisite: ART 255; 6 credits in drawing.

Problems emphasizing media, experimental techniques, and compositions. ($)

ART 357 04(0-8-0). Interactive Media. F. Prerequisite: ART 255 or ART 256.

Technical, conceptual, and historic aspects of creating interactive electronic media.

ART 358 04(0-8-0). Experimental Video. F. Prerequisite: ART 255 or ART 256.

History, theory, application of experimental video and digital special effects, animation and video techniques as they apply to experimental video.

ART 360 04(0-8-0). Painting Methods and Materials. F, S. Prerequisite: ART 361.

Experimentation with the painting process in relationship to method, material and tools. ($)

ART 361 04(0-8-0). Figure Painting. F, S. Prerequisite: ART 235; ART 260.

Compositions and techniques in oil and/or acrylic emphasizing the human figure. ($)

ART 365 04(0-8-0). Printmaking II—Lithography. F, S. Prerequisite: ART 136.

Preparation, processing, and printing techniques in stone and metal plate lithography. ($)

ART 366 04(0-8-0). Printmaking III—Studio Workshop. F, S. Prerequisite: ART 365.

Advanced intaglio, relief, planographic, and stencil processes in the workshop; continued emphasis on individual creative growth. ($)

ART 370 04(0-8-0). Sculpture II. F. Prerequisite: ART 270.

Intermediate-level exploration of materials, concepts, process, and outcomes rooted in the sculpture area. ($)

ART 371 04(0-8-0). Sculpture III. S. Prerequisite: ART 270.

Intermediate-level development of studio practice, exploration of technical process, theory and professionalism. ($)

ART 375 03(0-6-0). Figure Modeling and Drawing. F. Prerequisite: ART 270. Maximum of 9 credits allowed in course.

Studio course based on observation of the human figure in sculpture and drawing. ($)

ART 384 Var[1-4]. Supervised College Teaching. F, S. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.

Supervised assistance in instruction.

ART 392 03(0-0-3). Undergraduate Professional Practices Seminar. F. Prerequisite: 60 credits; ART 212; 6 credits from ART 135, ART 136, ART 160, ART 170.

Skills and tools beneficial in pursuing professional and/or academic goals in the visual arts.

ART 390 03(3-0-0). Greek Art. F. Prerequisite: ART 212.

Aegean and Greek architecture, painting, and sculpture.

ART 391 03(3-0-0). History of Medieval Art. S. Prerequisite: ART 212.

Early Christian, Byzantine, Islamic, Romanesque, and Gothic visual art forms.

ART 412 03(3-0-0). History of Renaissance Art. S. Prerequisite: ART 212.

Architecture, sculpture, painting, and minor arts, 1300 to 1600.

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ART 414 03(3-0-0). History of Baroque and Rococo Art. S. 
Prerequisite: ART 212.  
17th- and 18th-century visual arts.

*ART 415 03(3-0-0). History of 19th-Century European Art. F. 
Prerequisite: ART 212.  
Architecture, sculpture, painting, and other arts in Europe, 1780 to 
1900.

o ART 416 03(3-0-0). History of European Art, 1900 to 1945. S. 
Prerequisite: ART 212.  
Visual arts in Europe, 1900 to 1945.

*ART 417 03(3-0-0). Roman Art. S. Prerequisite: ART 212.  
Roman sculpture, painting, and architecture.

ART 418 03(3-0-0). Contemporary Artists and Art Critics. S. Prereq-
uisite: ART 212.  
Critical study of contemporary artists and art criticism.

ART 419 03(3-0-0). Historiography and Methodology of Art 
History. F. Prerequisite: Written consent of instructor. 
Historiography/methodology/research methods in art history.

ART 420 Var[3-5]. Travel Abroad – Art History in Italy. SS. Pre-
requisite: ART 212.  
Art historical study of painting, sculpture, and architecture in Italy.

ART 430 04(0-8-0). Advanced Photo Image Making I. F, S. Prereq-
uisite: ART 331.  
Advanced problems in use of photo image making as an art medium. ($)

ART 431 04(0-8-0). Advanced Photo Image Making II. F, S. Prereq-
uisite: ART 430.  
Studio course to refine individual directions and professional goals in 
photography as an art medium. ($)

ART 435 04(0-8-0). Advanced Drawing I. F, S, SS. Prerequisite: ART 
336.  
Independent projects and identification of personal artistic direction; 
research in art-related topics. ($)

ART 436 04(0-8-0). Advanced Drawing II . F, S, SS. Prerequisite: ART 
435.  
Capstone course; production of professional exhibition-quality work. ($)

ART 440 04(0-8-0). Pottery IV. F. Prerequisite: ART 341.  
Advanced individual research in pottery form and expression; supportive 
technology; expression in contemporary American pottery. ($)

ART 441 04(0-8-0). Pottery V. S. Prerequisite: ART 440.  
Advanced individual research in pottery form and expression of 
personal subject matter; supportive technology. ($) 

ART 445 04(0-8-0). Metalsmithing and Jewelry IV. F, S. Prerequisite: ART 
345; ART 346.  
Chasing and repoussé techniques in two- and three-dimension; inlay, 
engraving, and etching techniques. ($) 

ART 446 04(0-8-0). Metalsmithing and Jewelry V. S. Prerequisite: ART 
345; ART 346.  
Advanced techniques: granulation, electroforming, photoetching, 
makume, niello; ferrous metals techniques. ($) 

ART 450 04(0-8-0). Fibers IV. F, S. Prerequisite: ART 350; ART 351.  
Maximum of 8 credits allowed in course.  
Advanced studio problems in expressive use of fibers and fabric. ($) 

ART 451 04(0-8-0). Fibers V. F, S. Prerequisite: ART 351 or ART 450.  
Maximum of 8 credits allowed in course.  
Advanced studio problems in the expressive use of fibers and fabric. ($) 

ART 455 04(0-8-0). Advanced Typography and Design Systems. F. 
Prerequisite: ART 355. Maximum of 8 credits allowed in course.  
Two- and three-dimensional solutions for advertising, corporate 
identity, packaging, and publication design. ($) 

ART 456 04(0-8-0). Advanced Illustration. S. Prerequisite: ART 356.  
Maximum of 8 credits allowed in course.  
Projects in editorial and reportorial illustration emphasizing 
techniques applied to solving problems in advanced composition. ($) 

ART 457 04(0-8-0). Advanced Interactive Media. F, S, SS. 
Prerequisite: ART 255 or ART 256; ART 357.  
Technical, conceptual, and historic aspects of creating interactive 
electronic media.

ART 458 01(0-8-0). Advanced Experimental Video. F. Prerequisite: 
ART 255 or ART 256; ART 358.  
Advanced experimental video and visual effects.

ART 460 04(0-8-0). Advanced Painting I. F. Prerequisite: ART 360; 
ART 361. Maximum of 8 credits allowed in course.  
Advanced composition and exploration of individual creative 
expression. ($) 

ART 461 04(0-8-0). Advanced Painting II. S. Prerequisite: ART 460.  
Maximum of 8 credits allowed in course.  
Continuation in direction of individual creative expression. ($) 

ART 465 04(0-8-0). Printmaking IV–Studio Workshop. F, S. 
Prerequisite: ART 366.  
Advanced printmaking workshop; intaglio, relief, planographic, and 
stencil; continued emphasis on individual creative growth. ($) 

ART 466 04(0-8-0). Printmaking V–Studio Workshop. F, S. 
Prerequisite: ART 465. Maximum of 8 credits allowed in course.  
Advanced printmaking concepts in studio and research problems. ($) 

ART 470 04(0-8-0). Sculpture IV. F, S. Prerequisite: ART 370; ART 
371. Maximum of 12 credits allowed in course.  
Development of individual expression using sculptural techniques. ($) 

ART 471 04(0-8-0). Sculpture V. F, S. Prerequisite: ART 470. Maxi-
mum of 8 credits allowed in course.  
Advanced expression using sculptural techniques. ($) 

ART 487 Var[1-4]. Internship. 
Supervised work experience in an approved location.

ART 492A-B Var[1-4]. Seminar. 
A) Art history. Prerequisite: ART 212. B) Art education. Prerequisite: 
Concurrent registration in ART 326.

ART 495A-K Var[1-4]. Independent Study. Maximum of 8 credits 
allowed per subtopic. 
A) Painting. B) Printmaking. (S) C) Sculpture. (S) D) Fibers. ($) 
making. Prerequisite: ART 330. ($) 

ART 496A-K Var[1-4]. Group Study. Maximum of 8 credits allowed 
per subtopic. 
A) Painting. B) Printmaking. (S) C) Sculpture. (S) D) Fibers. ($) 
K) Photo image making. ($) 

° Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = 
blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCCsubcode = All 
University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
ART 510A-Q 03(3-0-0). Advanced Study in Art History. F, S. Prerequisite: Written consent of instructor.

*ART 514 03(0-0-3). Contemporary American Art Critics and Artists. S. Prerequisite: ART 510E.
    Issues in contemporary American art are explored through the work of critics and artists who visit through the Critic and Artist Residency Series.

ART 515 03(0-0-3). Seminar-Contemporary Art Theory. F. Prerequisite: ART 510E.
    Relationship between critical theory and the visual arts; how artists and critics apply theory in their work.


ART 592 03(0-0-3). Art History Seminar. Prerequisite: Twenty-one credits of art history.

ART 675A-G Var[1-15]. Studio Problems. F, S, SS. Prerequisite: Ten credits of ART 575 in one concentration.

ART 684 Var. Supervised College Teaching.


ART 699A-G Var. Thesis. Prerequisite: Twelve credits in studio area of concentration.
AS 101 01(1-0-0). Foundations of the Air Force I. F. Prerequisite: None.
Air Force opportunities, benefits; emphasis on officership, customs, and communicative skills, group problem solving.

AS 102 01(1-0-0). Foundations of the Air Force II. S. Prerequisite: None.
Organizational structure and missions of Air Force organizations; emphasis on leadership, military history, and communicative skills.

AS 196 A-B 01(0-2-0). Aerospace Studies Group Study I. F, S. Prerequisite: None.
Leadership Group Study is mandatory for students who are members of ROTC or are eligible to pursue a commission as determined by the Professor of Aerospace Studies. A) Fall. B) Spring.

AS 201 01(1-0-0). Evolution of Air and Space Power I. F. Prerequisite: None.
History of the development of air power and air doctrine from Wright brothers to present emphasizing role of air power; communications skills emphasized.

AS 202 01(1-0-0). Evolution of Air and Space Power II. S. Prerequisite: None.
History of air power from World War II to present examining role of air power in Berlin Airlift, Korean War, Mideast, and Vietnam War.

AS 296A-B 01(0-2-0). Aerospace Studies Group Study II. F, S. Prerequisite: None.
Leadership Group Study is mandatory for students who are members of ROTC or are eligible to pursue a commission as determined by the Professor of Aerospace Studies. A) Fall. B) Spring.

AS 301 03(3-0-0). Air Force Leadership Studies I. F. Prerequisite: None.
Leadership and quality management fundamentals, officer professional knowledge, ethics, and values; communication skills heavily emphasized.

AS 302 03(3-0-0). Air Force Leadership Studies II. S. Prerequisite: None.
Officer professional development, emphasizing leadership, management fundamentals, knowledge, evaluation systems, ethics, and communication skills.

AS 333 02(2-0-0). Operational Air Force Writing. S. Prerequisite: CO 150.
Common writing practices and procedures encountered by junior officers in the Air Force. Emphasizes proper writing content as well as form.

AS 396A-B 01(0-2-0). Aerospace Studies Group Study III. F, S. Prerequisite: AS 296A or AS 296B.
Concept of leadership; relationship between leadership and management; importance of leadership in the operation and success of any organization. A) Fall. B) Spring.

AS 401 03(3-0-0). National Security Affairs/Active Duty I. F. Prerequisite: None.

AS 402 03(3-0-0). National Security Affairs/Active Duty II. S. Prerequisite: None.
Professionalism, military justice system, military ethics, commissioning essentials, and emphasis on communication skills.


AS 496A-B 01(0-2-0). Aerospace Studies Group Study IV. F, S. Prerequisite: AS 396A or AS 396B.
Concept of leadership; relationship between leadership and management; importance of leadership in the operation and success of any organization. A) Fall. B) Spring.

° Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCC-subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
ATS 150 03(3-0-0). Science of Global Climate Change. S. Prerequisite: None.
Physical basis of climate change. Energy budget of the earth, the greenhouse effect, carbon cycle, paleoclimate, projections of 21st-century climate.

ATS 300 02(2-0-0). Climate of Colorado. S. Prerequisite: None.
Fundamentals of climate and climate changes; seasonal and regional Colorado climate regimes; types and availability of climate information.

ATS 350 02(2-0-0). Introduction to Weather and Climate. F. S. Prerequisite: None.
Behavior of atmosphere and its influence upon human's activities.

ATS 351 01(0-3-0). Introduction to Weather and Climate Laboratory. F. S. Prerequisite: ATS 350 or concurrent registration.
Actual weather data, visualization of meteorological phenomena, in-depth discussion of current environmental issues.

ATS 495 Var. Independent Study.

ATS 555 03(3-0-0). Air Pollution. S. Prerequisite: CHEM 113, MATH 261 or MATH 340; PH 122 or PH 142.
Nature, ambient concentrations, sources, sinks, and physiological activities of pollutants; meteorology; legislation; social and economic factors.

ATS 560 02(1-3-0). Air Pollution Measurement. F. Prerequisite: CHEM 114.
Examination and application of techniques for air pollution measurement. Includes sampling and analysis of gases, aerosols, and precipitation.

ATS 601 03(3-0-0). Atmospheric Dynamics I. F. Prerequisite: MATH 261; MATH 530.
Momentum, continuity equations; circulation, vorticity, thermodynamics; boundary layer; synoptic scale motions in midlatitudes.

ATS 602 02(2-0-0). Atmospheric Dynamics II. S. Prerequisite: ATS 601.
Sound waves, gravity waves, Rossby waves; numerical weather prediction; baroclinic instability; general circulation; tropical dynamics.

ATS 604 03(3-0-0). Atmospheric Modeling. F. Prerequisite: ATS 601.
Design of numerical models of the atmosphere; applications to current problems. Emphasis on practical understanding of relevant numerical methods.

ATS 605 03(3-0-0). General Circulation of the Atmosphere. S. Prerequisite: ATS 602 or concurrent registration.
Observations and theory of the general circulation of the atmosphere, with emphasis on understanding physical mechanisms.

ATS 606 03(3-0-0). Introduction to Climate. F. Prerequisite: MATH 261; MATH 530.
Exchange of energy, water, and momentum through the atmosphere, surface, vegetation, oceans. Paleoclimate, climate change, variability, and feedbacks.

ATS 607 02(2-3-0). Computational Methods for Atmospheric Science. S. Prerequisite: ATS 601 or concurrent registration.
Computer programming tools unique to and common in the atmospheric sciences.

ATS 610 03(3-0-0). Physical Oceanography. F. Prerequisite: None.
Foundations of ocean circulation theory and the general circulation of the oceans using observational data and rotating tank experiments.

ATS 620 03(3-0-0). Thermodynamics and Cloud Physics. F. Prerequisite: MATH 340; PH 142.
Equilibrium thermodynamics, cloud microphysics, cloud dynamics, precipitation formation, and cloud electrification.

ATS 621 02(2-0-0). Atmospheric Chemistry. F. Prerequisite: CHEM 114; MATH 340; PH 142.
Overview of chemical kinetics and equilibria; sources and sinks of pollutants; photochemistry and smog formation; aqueous-phase chemistry; acid rain.

ATS 622 03(3-0-0). Atmospheric Radiation. S. Prerequisite: ATS 620.
Terrestrial, solar radiation propagation in the atmosphere; radiative components in energy budgets, weather systems, climate studies; remote sensing.

ATS 623 02(2-0-0). Atmospheric Boundary Layer. F. Prerequisite: ATS 601 or concurrent registration.
Equations for shallow atmospheric motions; thermal instability of a fluid layer; atmospheric turbulence; flow stability; 1-D mixed layer models.

ATS 631 02(1-3-0). Introduction to Atmospheric Aerosols. S. Prerequisite: None.
Physical, chemical and microphysical characteristics of atmospheric particulate matter; measurement principles and techniques.

ATS 640 03(2-3-0). Synoptic Meteorology. F. Prerequisite: ATS 601 or concurrent registration.
Synoptic-scale weather systems; moist and dry atmospheric variables; static stability; vertical motion; fronts; cyclones and anticyclones.

ATS 641 03(2-3-0). Mesoscale Meteorology. S. Prerequisite: ATS 640.
Mesoscale weather systems; mesoscale analysis techniques; upper- and low-level jets; instabilities; dynamics of convective storms; organized convection.

ATS 650 02(2-0-0). Measurement Systems and Theory. F. Prerequisite: PH 142; STAT 301.
Surface and upper air measurement systems; theory and system response, sensor design; automated data collection, analysis and display systems.

ATS 652 02(2-0-0). Atmospheric Remote Sensing. F. Prerequisite: ATS 622.
Concepts of electromagnetic and acoustic wave propagation; active and passive remote sensing techniques including radar, lidar, thermal emission systems.

ATS 655 03(3-0-0). Objective Analysis in Atmospheric Sciences. S. Prerequisite: MATH 530.
Objective analysis of geophysical data: general statistics; matrix methods; time series analysis. Emphasis on applications to real-world data.

ATS 693 01(0-0-1). Responsible Research in Atmospheric Science. S. Prerequisite: Must be admitted to an Atmospheric Science degree program.
Scientific misconduct; ethical publishing; record keeping; data management; professional skills applicable to atmospheric science.

ATS 695A-B Var. Independent Study. S, S. S. Prerequisite: None.
A. Atmospheric/Ocean Coupling. B. Atmospheric Science Topics.


*ATS 703 02(2-0-0). Numerical Weather Prediction. F. Prerequisite: ATS 602.
Quasi-geostrophic approximation; barotropic, baroclinic, primitive equation, and general circulation models; numerical methods.

*ATS 704 02(2-0-0). Large-Scale Atmospheric Dynamics. F. Prerequisite: ATS 602.
Quasi-static, quasi-geostrophic equations; planetary waves; geostrophic adjustment; barotropic, baroclinic instability; frontogenesis; tropical cyclones.

*ATS 707 03(2-0-1). Atmospheric Waves and Vortices. F. Prerequisite: ATS 605.
Atmospheric wave motions and embedded vortices spanning mountain waves to large-scale Rossby waves and critical layers.

ATS 708 03(3-0-0). Middle Atmospheric Dynamics. S. Prerequisite: ATS 602.
Dynamics of the stratosphere and mesosphere with emphasis on the lower and middle stratosphere.

*ATS 710 03(3-0-0). Geophysical Vortices. F. Prerequisite: ATS 602.
Observational, experimental, and theoretical aspects of geophysical vortices, such as hurricanes, polar lows, tornadoes, and dust devils.

*ATS 711 02(2-0-0). Micrometeorite. F. Prerequisite: ATS 623; MATH 340.
Momentum, heat, water, and trace gas fluxes near the earth’s surface, including fluxes between the atmosphere and the land/ocean/ice surfaces.

*ATS 712 03(3-0-0). Dynamics of Clouds. S. Prerequisite: ATS 623.
General theory of cloud dynamics; parameterization of microphysics and radiation; models of fog, stratocumuli, cumulonimbus, and orographic clouds.

*ATS 715 02(2-0-0). Atmospheric Oxidation Processes. F. Prerequisite: ATS 621.
Atmospheric hydrocarbon and nitrogen oxide reactions; aqueous phase scavenging and reactions; chemical pathways in the atmosphere.

ATS 716 02(1-2-0). Air Quality Characterization. S. Prerequisite: ATS 555 or ATS 621; ATS 560.
Planning, executing, and reporting on a measurement campaign to characterize local air quality.

*ATS 721 03(3-0-0). Theoretical Topics in Radiative Transfer. F. Prerequisite: ATS 622.
Physics of atmospheric radiation; theoretical techniques used to show radiation transfer equation.

*ATS 722 03(2-0-1). Atmospheric Radiation and Energetics. S. Prerequisite: ATS 622.
Radiative transfer in the atmosphere; implications on remote sensing and energetics.

*ATS 724 02(2-0-0). Cloud Microphysics. S. Prerequisite: ATS 621.
Theories and observations of nucleation; cloud droplet spectra broadening; precipitation growth and breakup; ice multiplication; cloud electrification.

*ATS 730 03(3-0-0). Mesoscale Modeling. F. Prerequisite: ATS 602; ATS 623.
Development of basic equations used in mesoscale models and methodology of solution.

*ATS 735 03(3-0-0). Mesoscale Dynamics. F. Prerequisite: ATS 602.
Analysis of physical and dynamical processes that initiate, maintain, and modulate atmospheric mesoscale phenomena.

*ATS 737 03(3-0-0). Satellite Observation of Atmosphere and Earth. S. Prerequisite: ATS 622; ATS 652.
Satellite measurements; basic orbits and observing systems; applications of remote sensing and imaging to investigations of atmospheric processes.

*ATS 741 03(3-0-0). Radar Meteorology. S. Prerequisite: ATS 652.
Radar systems; radar equation and applications; multiple Doppler observation and processing; radar studies of mesoscale systems.

*ATS 742 02(2-0-0). Tropical Meteorology. S. Prerequisite: ATS 601; ATS 602; ATS 606.
Tropical atmosphere, monsoons, intraseasonal variability, hurricanes, theory of tropical convection and the large-scale circulation.

*ATS 743 03(3-0-0). Interactions of the Ocean and Atmosphere. S. Prerequisite: ATS 602.
Ocean-atmosphere interactions in observations, theory, and models. Time mean atmosphere-ocean circulations through climate variability and change.

*ATS 745 03(3-0-0). Atmospheric General Circulation Modeling. S. Prerequisite: ATS 602; ATS 650.
Current problems in modeling of the general circulation of the atmosphere.

*ATS 750 03(3-0-0). Climate Dynamics: Atmospheric Variability. F. Prerequisite: ATS 605; ATS 655.
Analysis and interpretation of large-scale patterns of climate variability and observed climate change.

ATS 752 02(2-0-0). Inverse Methods in Atmospheric Science. F. Prerequisite: Ph.D. standing in Atmospheric Science.
Introduction to inverse modeling, with particular application to remote sensing retrievals, flux inversions and data assimilation.

*ATS 753 03(3-0-0). Global Hydrologic Cycle. S. Prerequisite: ATS 601; ATS 622 or ATS 652.
Hydrologic cycle; moisture transport and air-ground exchange; water budgets of meteorological phenomena; climatology of atmospheric water.

*ATS 755 03(3-0-0). Topics in Climate Research. F. Prerequisite: ATS 606.
Current topics in climate research.

*ATS 760 02(2-0-0). Global Carbon Cycle. S. Prerequisite: ATS 606.
Exchanges of CO2 between the atmosphere, the land surface, and oceans. Biogeochemical processes. Micrometeorological and inverse flux estimation.

*ATS 762 02(2-0-0). Biosphere-Chemistry-Climate Interactions. S. Prerequisite: ATS 621.
Explore the sensitivity of the climate system to atmospheric chemical composition with emphasis on connections to biospheric processes and feedbacks.

*ATS 765 03(3-0-0). Climate Dynamics: Ocean Variability. F. Prerequisite: ATS 606.
Climate variability on time scales of years to millennia with focus on the role of the ocean circulation. Approach through dynamical systems theory.

*ATS 770 03(3-0-0). Ocean Modeling. F. Prerequisite: ATS 601.
Conceptual and numerical ocean models and their application to current problems in climate science and biogeochemical cycles.

*ATS 772 02(2-0-0). Aerosol Chemistry. F. Prerequisite: CHEM 114; MATH 161; PH 122 or PH 142.
Physics and chemistry of atmospheric aerosols including composition, surface properties, size, interaction with radiation sources, sinks.

° Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCCSubcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
ATS 784 Var. Supervised College Teaching. F, S, SS.

ATS 786 Var. Practicum.

ATS 795 Var. Independent Study.

ATS 796 Var. Group Study.

BIOCHEMISTRY AND MOLECULAR BIOLOGY COURSES

Department of Biochemistry and Molecular Biology

College of Natural Sciences

BC 192 02(1-0-1). Biochemistry Freshman Seminar. F. Prerequisite: None.
Introduction to curriculum and career options for biochemistry majors.

BC 295 Var[1-3]. Introductory Independent Study. F, S, SS. Prerequisite: CHEM 112 or concurrent registration; LIFE 102.
Apply principles and knowledge being learned in first and second year life sciences and chemistry courses.

BC 351 04(4-0-0). Principles of Biochemistry. F, S, SS. Prerequisite: BZ 110 or BZ 120 or LIFE 102; CHEM 245 or CHEM 341 or CHEM 345. For majors in biological sciences, engineering, and preprofessional students in the health sciences.
Structure and function of biological molecules; biocatalysis; metabolism and energy transduction; gene expression. (NT-O)

BC 401 03(3-0-0). Comprehensive Biochemistry I. F. Prerequisite: CHEM 245 or CHEM 343 or concurrent registration or CHEM 346 or concurrent registration; MATH 155 or MATH 160.
Macromolecular structure and dynamics; membranes; enzymes, bioenergetics.

BC 403 03(3-0-0). Comprehensive Biochemistry II. S. Prerequisite: CHEM 245 or CHEM 341 or CHEM 345.
Metabolic pathways and their regulation; cellular biochemistry.

BC 404 02(0-6-0). Comprehensive Biochemistry Laboratory. F, S. Prerequisite: BC 401 or concurrent registration; CHEM 246 or CHEM 344 or CHEM 346; LIFE 203; LIFE 212.
Experimental approaches to studying macromolecules, metabolism, and gene expression. ($)

BC 405 01(0-0-1). Comprehensive Biochemistry II-Honors Recitation. S. Prerequisite: Concurrent registration in BC 403–Honors section. For students participating in the Honors program.
Read and discuss current literature related to material presented in BC 403.

BC 411 04(3-0-1). Physical Biochemistry. F. Prerequisite: BC 401, or BC 351 with a B or better; CHEM 113; MATH 161 or MATH 255.
Thermodynamics; reaction rates quantum chemistry; spectroscopy; macromolecular folding and interactions; ligand binding; enzyme kinetics; membranes.

BC 441 01(0-1.5-5). 3D Molecular Models for Biochemistry. F. Prerequisite: BC 401 or concurrent registration.
Computer instruction to construct 3D models of proteins and nucleic acids using leading software.

BC 463 03(3-0-0). Molecular Genetics. F. Prerequisite: BC 351 with a C or better, or BC 401 with a C or better or concurrent registration; BC 350 with a C or better or LIFE 201B with a C or better. Credit not allowed for both BC 463 and BC 563.
Molecular basis of gene structure, replication, repair, recombination, and expression.

BC 464 01(0-0-1). Molecular Genetics Recitation. F. Prerequisite: BC 351 or concurrent registration or BC 401 or concurrent registration; concurrent registration in BC 463; LIFE 201B.
Methods used to study the molecular basis of gene structure, replication, repair, recombination, and expression.

BC 465 03(3-0-0). Molecular Regulation of Cell Function. S. Prerequisite: BC 403 or concurrent registration or BC 351; LIFE 210. Credit not allowed for both BC 465 and BC 565.
Molecular regulation of cell organization, membrane formation, organelle biogenesis, cell communication, shape and motility, growth, aging, and death.

BC 466 01(0-0-1). Molecular Regulation of Cell Function-Honors. S. Prerequisite: Concurrent registration in BC 465.
Discussions of current articles in cell biology including methods and molecular mechanisms that explain cell behavior in health and disease.

BC 467 03(3-0-0). Biochemistry of Disease. S. Prerequisite: BC 401.
Biochemical basis of specific human diseases.

BC 475 03(0-6-1). Mentored Research. F, S, SS. Prerequisite: BC 404. Maximum of 9 credits allowed in course.
Plan and conduct mentored research with weekly discussion of progress, presentation at all-university symposium, and submission of written report.

BC 484 Var. Supervised College Teaching. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.
Assist in teaching selected courses in biochemistry and molecular biology.

BC 487 A Var. Internship. A) Prerequisite: BC 401; BC 403; BC 404; cumulative GPA of 2.000. Work experience with an approved preceptor outside of a university laboratory environment. B) International. Prerequisite: BC 401; BC 463; BC 495 (one credit in lab of CSU mentor); selection by department committee. Research in foreign host laboratory in contact with CSU mentor.

BC 493 01(0-0-1). Senior Seminar. F, S. Prerequisite: BC 401 or concurrent registration.
Critical analysis of selected literature in biochemistry and molecular biology.

BC 495 Var. Independent Study. Prerequisite: Minimum cumulative GPA of 3.000.
Faculty-directed exploration of areas of special interest in biochemistry and molecular biology.

BC 498 Var[1-6]. Research.
Supervised laboratory research in biochemistry and molecular biology.


BC 511 04(3-0-1). Structural Biology I. F. Prerequisite: BC 401 or concurrent registration.
Structural principles of biological macromolecules and techniques of structural analysis.

BC 512 01(1-0-0). Principles of Macromolecular Structure. F. Prerequisite: BC 411 or concurrent registration.
Physical interactions controlling folding and solution behavior of biological macromolecules, including proteins, nucleic acids, and membranes.

BC 513 01(1-0-0). Enzymology. S. Prerequisite: BC 403.
Kinetic methods, mechanism, and regulation of enzyme catalysis.
<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Description</th>
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<tbody>
<tr>
<td>BC 517</td>
<td>Metabolism</td>
<td>02(2-0-0)</td>
<td>F. Prerequisite: BC 351 or BC 403.</td>
<td>Design and regulation of metabolic pathways.</td>
</tr>
<tr>
<td>BC 521/CHEM 521</td>
<td>Principles of Chemical Biology</td>
<td>03(3-0-0)</td>
<td>F. Prerequisite: CHEM 245 or CHEM 343 or CHEM 346. Credit not allowed for both BC 521 and CHEM 521.</td>
<td>Principles of chemical biology. Chemical methods for understanding and controlling the structure and function of biopolymers.</td>
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<tr>
<td>BC 563</td>
<td>Molecular Genetics</td>
<td>04(3-0-1)</td>
<td>F. Prerequisite: BC 401; LIFE 201B. Credit not allowed for both BC 563 and BC 463.</td>
<td>Mechanisms of replication, transcription, processing, translation, and packaging of genetic material, emphasizing original literature and methods.</td>
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<tr>
<td>BC 565</td>
<td>Molecular Regulation of Cell Function</td>
<td>04(3-0-1)</td>
<td>S. Prerequisite: BC 403 or concurrent registration or BC 351; LIFE 210. Credit not allowed for both BC 565 and BC 465.</td>
<td>Molecular regulation of cell organization, membrane formation, organelle biogenesis, cell communication, shape and motility, growth, aging, and death.</td>
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<tr>
<td>BC 571</td>
<td>Quantitative Biochemistry</td>
<td>01(1-0-0)</td>
<td>S. Prerequisite: BC 511 or concurrent registration.</td>
<td>Introduction to statistics, error analysis, and curve fitting of biochemical data with a focus on practical examples.</td>
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<tr>
<td>BC 589</td>
<td>Current Trends in Molecular Biosciences</td>
<td>02(1-2-0)</td>
<td>S. Prerequisite: B.S. or B.A. in biology or chemistry; secondary school teaching certification. Offered only through Division of Continuing Education.</td>
<td>Biochemical and molecular biological foundations of molecular genetics/genetic engineering; molecular analysis of genes. (NT)</td>
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<tr>
<td>*BC 601</td>
<td>Responsible Conduct in Biochemistry</td>
<td>01(1-0-0)</td>
<td>S. Prerequisite: None. Design of experiments; error and fraud, publishing/grant application submission, scientific misconduct, classic examples of fraud, case studies.</td>
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<tr>
<td>BC 611</td>
<td>Structural Biology II</td>
<td>02(2-0-0)</td>
<td>S. Prerequisite: BC 511. Structure and interactions of biological macromolecules related to function.</td>
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<tr>
<td>BC 663</td>
<td>Gene Expression</td>
<td>02(2-0-0)</td>
<td>S. Prerequisite: BC 563. Eukaryotic transcription mechanisms with emphasis on methods of study and regulatory mechanisms.</td>
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<tr>
<td>BC 695</td>
<td>Independent Study</td>
<td>Var</td>
<td>BC 698 Var. Research.</td>
<td></td>
</tr>
<tr>
<td>BC 701</td>
<td>Grant Proposal Writing and Reviewing</td>
<td>01(1-0-0)</td>
<td>S. Prerequisite: BC 403; BC 511 or concurrent registration; BC 563 or concurrent registration. Didactic and hands-on experience with locating funding sources, writing effective grant proposals and the review process in the biomolecular sciences.</td>
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</tbody>
</table>
BIOLOGICAL SCIENCE COURSES
Life Sciences Committee
Provost and Executive Vice President’s Office

[Beginning in Fall Semester 2008, the BIO courses have been moved to BZ (BIO 310 and BIO 311), LIFE (BIO 320), or dropped.

BIO 220 changed to LAND 220/LIFE 220, effective FA07.

BIO 384 was dropped effective FA08.

BIO 310 and BIO 311 changed to BZ 310 and BZ 311, effective FA08.

BIO 221 dropped effective FA08.

BIO 320 changed to LIFE 320, effective FA08.]
BIOMEDICAL ENGINEERING COURSES
Nondepartmental
College of Engineering

BIOM 101 03(3-0-0). Introduction to Biomedical Engineering. F. Prerequisite: None.
Basic principles, fundamentals in biomedical engineering including molecular, cellular and physiological principles and major areas such as biomechanics.

BIOM 300 04(1-4-1). Problem-Based Learning Biomedical Engr Lab. S. Prerequisite: BIOM 101; MATH 340.
Group problem-based learning approach to problems spanning all core areas of biomedical engineering. (S)

BIOM 306/BTEC 306 04(3-2-0). Bioprocess Engineering. S. Prerequisite: CHEM 107 or CHEM 111; PH 121 or PH 141. Credit not allowed for both BIOM 306 and BTEC 306.
Material, energy balances; fluid flow, heat exchange, mass transfer; application to operations in food, fermentation, other bioprocess industries.

BIOM 330 03(3-0-0). Transport Phenomena in Biomedical Engineering. S. Prerequisite: BIOM 300; BMS 300; CBE 332 or MECH 344.
Engineering models of active and passive mechanisms of momentum, heat, and mass transport, in mammalian cells, tissues, and organ systems.

BIOM 400 03(3-0-0). Kinetics of Biomolecular and Cellular Systems. F. Prerequisite: BIOM 330 or CBE 320.
In-depth analysis of the systems approach to biology and biological engineering at the molecular and the cellular scales.

BIOM 441 03(3-0-0). Biomechanics and Biomaterials. F. Prerequisite: BMS 300; MECH 324 or concurrent registration; MECH 331 or concurrent registration.
Principles of biomechanics, biofluids, and biomaterials.

BIOM 470/MECH 470 03(3-0-0). Biomedical Engineering. F. Prerequisite: MATH 155 or MATH 160; PH 141. Credit not allowed for both BIOM 470 and MECH 470.
Engineering application in human/animal physiology, diagnosis of disease, treatment, rehabilitation, human genome manipulation.

BIOM 476A-B. Biomedical Clinical Practicum. F, S, SS. Prerequisite: BMS 300; BIOM 470/MECH 470.
Biomedical lab work or exposure to the hospital/clincial environment.
A) 02(1-3-0). B) 04(1-6-0).

BIOM 486A-B 04(0-0-10). Biomedical Design Practicum. F, S, SS.
A) Capstone Design I. Prerequisite: BIOM 300; BIOM 330 or BIOM 441 or ECE 441. B) Capstone Design II. Prerequisite: BIOM 300; BIOM 330 or BIOM 441 or ECE 441; BIOM 486A.

BIOM 495 Var[1-6]. Independent Study. F, S, SS.

BIOM 504/CBE 504 03(3-0-0). Fundamentals of Biochemical Engineering. F. Prerequisite: BIOM 306/BTEC 306 or CBE 320 or concurrent registration; MATH 255 or MATH 340; MIP 300. Credit not allowed for both BIOM 504 and CBE 504.
Application of chemical engineering principles to enzyme kinetics, fermentation and cell culture, product purification, and bioprocess design.

BIOM 522/CBE 522 03(2-2-0). Bioseparation Processes. F. Prerequisite: CBE 331. Credit not allowed for both BIOM 522 and CBE 522.
Analysis of processes to recover and purify fermentation products.

*BIOM 525*/MECH 525 03(3-0-0). Cell and Tissue Engineering. S. Prerequisite: BC 351 or BMS 300 or BMS 500 or BZ 310 or NB 501.
Cell and tissue engineering concepts and techniques with emphasis on cellular response, cell adhesion kinetics, and tissue engineering design. (NT-O) (S)

BIOM 526/ECE 526 03(3-0-0). Biological Physics. S. Prerequisite: MATH 340 or MATH 345; PH122 or PH142. Credit not allowed for both BIOM 526 and ECE 526.

BIOM 531/MECH 531 03(3-0-0). Materials Engineering. S. Prerequisite: MECH 331 or MECH 431.
Selection of structural engineering materials by properties, processing, and economics; materials for biomedical and biotechnology applications. (NT-O)

BIOM 532/MECH 532 03(3-0-0). Material Issues in Mechanical Design. F. Prerequisite: MECH 331. Credit not allowed for both BIOM 532 and MECH 532.
Failure mechanisms from materials viewpoint with emphasis on use in design. Fracture, creep, fatigue and corrosion. (NT-O)

BIOM 533/CIVE 533. 03(2-3-0). Biomolecular Tools for Engineers. F. Prerequisite: BMS 300 or MIP 300. Credit not allowed for BIOM 533, CIVE 533, and ECE 533.
Theoretical and practical aspects of biomolecular laboratory tools—PCR, cloning, sequencing, single-molecule optical techniques and live-cell imaging. (S)

*BIOM 537/ECE 537 03(3-0-0). Biomedical Signal Processing. S. Prerequisite: MATH 340 or ECE 311 or STAT 303. Credit not allowed for both BIOM 537 and ECE 537.
Measuring, manipulating, and interpreting biomedical signals.

BIOM 543/CBE 543 03(3-0-0). Membranes for Biotechnology and Biomedicine. F. Prerequisite: CHEM 341; CHEM 343; or CBE 310. Credit not allowed for both BIOM 543 and CBE 543.
Polymeric membrane formation, modification, module design and applications to bioseparation and biomedical separations and tissue engineering. (NT-O)

BIOM 570/MECH 570 03(3-0-0). Bioengineering. S. Prerequisite: MECH 307; MECH 324. Credit not allowed for both BIOM 570 and MECH 570.
Physiological and medical systems analysis using engineering methods including mechanics, fluid dynamics, control, electronics, and signal processing. (NT-O)

BIOM 573/MECH 573 03(3-0-0). Structure and Function of Biomaterials. S. Prerequisite: MECH 331. Credit not allowed for both BIOM 573 and MECH 573.
Structure-function relationships of natural biomaterials; application to analysis of biomimetic materials and biocomposites used in medical devices. (NT-O)

BIOM 586A-B. Biomedical Clinical Practicum. F, S, SS. Prerequisite: BIOM 570/MECH 570; BMS 300 or BMS 500. A) 02(1-3-0). B) 04(1-6-0).
Graduate-level activity, such as biomedical research or design of a new medical device, for exposure to the hospital/clinical environment.

BIOM 592 Var[1-3]. Seminar. F, S. Prerequisite: None.
Student and research faculty presentations, guest and invited extramural speakers. (NT-O)

*BIOM 671/MECH 671 03(3-0-0). Orthopedic Tissue Biomechanics. F. Prerequisite: CIVE 560. Credit not allowed for both BIOM 671 and MECH 671 or for BIOM 671/MECH 671 and BIOM 571/MECH 571.
Linear elastic, finite deformation, and viscoelastic theories applied to the mechanical behavior of orthopedic tissues (bone, tendon, cartilage).

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BIOM 684 Var. Supervised College Teaching.
Maximum of 6 credits allowed in course; may not be used to satisfy degree requirements requiring bioengineering courses.

BIOM 695 Var. Independent Study.


BIOM 750 01(1-0-0). Grant Proposal Writing and Reviewing. F.
Prerequisite: Written consent of instructor.
Preparation and review of applications for fellowships and grants.

BIOM 784 Var[1-6]. Supervised College Teaching.

BIOM 786 Var. Practicum-Laboratory Rotations.

BIOM 795 Var[1-6]. Independent Study.

BIOM 798 Var[1-6]. Research-Laboratory Rotation

BIOM 799 Var. Dissertation.

° Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCC-subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
BIOMEDICAL SCIENCES
Department of Biomedical Sciences
College of Veterinary Medicine and Biomedical Sciences

BMS 192 01(0-0-1). First Year Seminar in Biomedical Sciences. F. Prerequisite: None.
The university and its resources, college survival skills, careers in the biomedical sciences; current issues in health and biotechnology.

BMS 200 01(0-0-1). Concepts in Human Anatomy and Physiology. F, S. Prerequisite: Concurrent registration in BMS 300.
Basic concepts in the anatomy and physiology of the human body.

BMS 260 03(2-0-1). Biomedical Sciences. S. Prerequisite: LIFE 102.
Opportunities and challenges in biomedical sciences; business of science, ethics, model systems, cellular and systemic physiology.

BMS 300 04(4-0-0). Principles of Human Physiology. F, S, SS. Prerequisite: BZ 101 or BZ 110 or LIFE 102; CHEM 103 or CHEM 107 or CHEM 111.
Physiology of humans. (NT-O)

BMS 301 05(3-2-1). Human Gross Anatomy. F, S, SS. Prerequisite: BZ 110 or LIFE 102.
Structure and function of the human body. Study of prosected human cadavers; clinical applications; living anatomy. ($) BMS 302 02(1-3-0). Laboratory in Principles of Physiology. F, S. Prerequisite: BMS 300 or concurrent registration or BMS 360 or concurrent registration.
Basic physiology lab exercises. ($) BMS 305 04(3-3-0). Domestic Animal Gross Anatomy. S. Prerequisite: BZ 110 or LIFE 102. Credit not allowed for both BMS 305 and VS 333.
Comparative gross anatomy of domestic carnivores, ruminants, and horses. ($) BMS 310 04(3-3-0). Anatomy for the Health Professions. F, S, SS. Prerequisite: One semester of college level biology. Offered as an online course only through the Division of Continuing Education.
Gross anatomy of the human body from a regional perspective, utilizing clinical applications as a basis for anatomical understanding. (NT-O)

BMS 320 02(0-4-0). Virtual Laboratory in Physiology. F, S. Prerequisite: BMS 300 or concurrent registration or BMS 360 or concurrent registration. Credit not allowed for both BMS 320 and BMS 302. Offered only online.
Physiology lab exercises using a virtual laboratory simulation system. (NT-O)

BMS 325 03(3-0-0). Cellular Neurobiology. F. Prerequisite: BMS 300 or BMS 360.
Cellular and molecular bases of nervous system function and behavior.

BMS 326 03(3-0-0). Neural Integration and Behavior. S. Prerequisite: BMS 300; BMS 325.
Functional organization of the nervous system; cellular mechanisms of integration of information to organize simple and complex behaviors.

BMS 330 04(3-3-0). Microscopic Anatomy. S. Prerequisite: BMS 300 or BMS 360. Credit not allowed for both BMS 330 and VS 331.
Microscopic anatomy of mammalian tissue.

BMS 345 04(3-2-0). Functional Neuroanatomy. F. S. Prerequisite: BMS 300 or BMS 360.
Functional systems and circuits of the human brain and spinal cord. ($) BMS 360 04(4-0-0). Fundamentals of Physiology. S. Prerequisite: BZ 110 or LIFE 102; CHEM 245 or concurrent registration or CHEM 341 or concurrent registration.
Cell, tissue, and organ function related to integrated whole body function.

BMS 384 Var[1-5]. Supervised College Teaching. Prerequisite: BMS 300 or BMS 360. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.
Supervision by and work with graduate teaching assistants in small group learning sessions involving students enrolled in BMS 300.

+BMS 400 01(0-0-1). Neuroanatomy Through Clinical Case Studies. S. Prerequisite: BMS 345 or concurrent registration; Biomedical Sciences majors only. Required field trips.
Neuroanatomical case studies to reinforce and apply information gained in BMS 345, Functional Neuroanatomy.

BMS 405 03(3-0-0). Nerve and Muscle—Toxins, Trauma and Disease. S. Prerequisite: BMS 325 or BMS 345.
Structure, composition, function of nerves and muscles, etiology of genetic and autoimmune neuromuscular diseases, alteration by toxins and nerve gas.

BMS 409 03(3-0-0). Human and Animal Reproductive Biology. F. Prerequisite: BMS 300 or BMS 360.
Basics for male and female reproductive function in humans and animals.

BMS 420 03(3-0-0). Cardiopulmonary Physiology. F. Prerequisite: BMS 300 or BMS 360.
Normal and pathophysiology of cardiovascular and pulmonary systems.

BMS 430 03(3-0-0). Endocrinology. F. Prerequisite: BMS 300 or BMS 360.
Physiology of the glands of internal secretion.

BMS 450 03(3-0-0). Pharmacology. S. Prerequisite: BMS 300 or BMS 360.
Pharmacologic principles, absorption, distribution, metabolism, excretion, side effects, and actions of drugs.

BMS 460 04(4-0-0). Essentials of Pathophysiology. F. Prerequisite: BMS 300 or BMS 360; concurrent registration in BMS 492; biomedical sciences majors only.
Integration of different facets of mechanisms underlying health and disease.

BMS 484 03(3-0-0). Seminar—Pathophysiology of Disease. S. Prerequisite: Concurrent enrollment in BMS 460.
Capstone seminar in biomedical sciences.

BMS 492 01 (0-0-1). Seminar-Pathophysiology of Disease. F. Prerequisite: Concurrent enrollment in BMS 460.
Capstone seminar in biomedical sciences.

BMS 495 Var[1-6]. Independent Study.
BMS 496 Var[1-3]. Group Study. F, S. Prerequisite: BMS 301 or concurrent registration or BMS 305 or concurrent registration or BMS 360 or concurrent registration.
Faculty-supervised investigation of areas of special interest in anatomy and physiology.

BMS 498 Var[1-3]. Research. Prerequisite: BMS 300 or BMS 360.
Faculty-directed research in biomedical sciences.

BMS 500 04(4-0-0). Mammalian Physiology I. F. Prerequisite: BMS 300 or BMS 360. Credit not allowed for both BMS 500 and NB 501.
Cell physiology of nerve, skeletal, cardiac and smooth muscle with an

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emphasis on how cellular functions integrate into systems behavior. (NT-O)

**BMS 501 04(4-0-0). Mammalian Physiology II.** S. Prerequisite: BMS 300 or BMS 360.
- Respiratory, renal, digestive, endocrine, metabolic, and reproductive function.

**BMS 503/NB 503 03(3-0-0). Developmental Neurobiology.** S. Prerequisite: One college-level course in each: biology, biochemistry, physics, calculus. Credit not allowed for both BMS 503 and NB 503.
- Molecular mechanisms involved in development of nervous system including differentiation, growth, pathfinding, and synaptogenesis.

**BMS 505/NB 505 03(3-0-0). Neuronal Circuits, Systems, and Behavior.** S. Prerequisite: BMS 325 or BMS 500 or NB 501. Credit not allowed for both BMS 505 and NB 505.
- Anatomical and physiological organization of the nervous system.

**BMS 531 03(0-9-0). Domestic Animal Dissection.** S. Prerequisite: BMS 305.
- Dissection of domestic animals. ($)

**BMS 545 05(3-4-0). Neuroanatomy.** S. Prerequisite: Written consent of instructor.
- Nervous system structure and function presented from a systems perspective; applied and comparative aspects are emphasized. ($)

**BMS 575 04(0-8-0). Human Anatomy Dissection.** F. Prerequisite: None.
- Regional approach to human gross anatomy through laboratory dissection of human cadaver. ($)

**BMS 610A-B 01(1-0-0). Managing a Career in Science.** F.
- A) Survival skills for coursework (M.S.). Prerequisite: Written consent of instructor.
- B) Survival skills for research (M.S. and Ph.D.).

**BMS 619 02(0-0-2). Advanced Human Gross Anatomy.** F. Prerequisite: Written consent of instructor.
- Clinical application of human anatomy through case-based study.

°**BMS 631 02(2-0-0). Mechanisms of Hormone Action.** F. Prerequisite: BMS 430 or BMS 501.
- Synthesis, secretion, and mechanisms of action of hormones.

°**BMS 632 02(2-0-0). Metabolic Endocrinology.** F. Prerequisite: BMS 631.
- Endocrine regulation of metabolic homeostasis; effects of exercise or pregnancy.

**BMS 633 02(0-0-2). Domestic Animal Anatomy-Case Discussions.** S. Prerequisite: Concurrent registration in BMS 531.
- Clinical case discussions utilized in advanced understanding of domestic animal anatomy and physiology.

°**BMS 640 04(4-0-0). Reproductive Physiology and Endocrinology.** F. Prerequisite: BMS 501.
- Reproductive physiology and endocrinology of vertebrate animals.

**BMS 642 01(0-3-0). Research Techniques for Gametes and Embryos.** F. Prerequisite: Admission to a Biomedical Sciences graduate program.
- Collection, storage, evaluation, in vitro manipulation, and replacement of sperm, oocytes, embryos, and other reproductive tissues.

**BMS 684 Var. Supervised College Teaching.**

**BMS 692 A-C Var[1-5]. Seminar.**

**BMS 695A-F Var. Independent Study.**

**BMS 696 Var[1-3]. Group Study-Neurosciences.** F. Prerequisite: None.
- Current topics in neuroscience; how to evaluate scientific presentations.

**BMS 699 Var. Thesis.**

**BMS 784 Var. Supervised College Teaching.**

**BMS 792A-C Var[1-5]. Seminar.**

**BMS 795A-E Var. Independent Study.**

**BMS 796A-C Var. Group Study.**
- A) Neurophysiology. B) Cardiopulmonary physiology.
- C) Reproductive physiology.

**BMS 799 Var. Dissertation.**

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BIOAGRICULTURAL SCIENCES AND PEST MANAGEMENT COURSES
Department of Bioagricultural Sciences and Pest Management
College of Agricultural Sciences

BSPM 102 03(3-0-0). Insects, Science, and Society. (GT-SC2, AUCC 3A). F, S. Prerequisite: None.
How insects develop, behave, and affect human activity. What every student should know about the most diverse life form on Earth.

BSPM 201 03(3-0-0). Weed Management and Control. F, S. Offered only through the Division of Continuing Education.
Basic overview of weeds and weed control. (NT-O)

BSPM 300/AEQ 300B 01(1-0-0). Topics in Livestock Entomology. S. Prerequisite: 3 credits of BS or LIFE at the 100-level. Credit not allowed for both BSPM 300 and AEQ 300B.
Identification, biology, and management of insect, tick, and mite pests.

BSPM 302 02(2-0-0). Applied and General Entomology. F. Prerequisite: None.
Biology and management of insects.

BSPM 303A-C. Entomology Laboratory. F. Prerequisite: BSPM 302 or concurrent registration.
Biology and recognition of insects. A) General 02(0-4-0). ($) B) Horticultural 01(0-2-0). *C) Agricultural 01(0-2-0).

*BSPM 308 03(2-3-0). Ecology and Management of Weeds. F. Prerequisite: BS 120 or LIFE 103; CHEM 105 or CHEM 111. Required field trips.
Classification, characteristics; weed biology and ecology; control by cultural, mechanical, chemical, and biological means; succession management. ($)

*BSPM 310 03(3-0-0). Understanding Pesticides. S. Prerequisite: Three credits 100-level BS or CHEM.
Biology and the recognition of major orders and families of aquatic insects.

BSPM 350 02(1-2-0). Science Illustration. S. Prerequisite: None.
Fundamentals of science illustration emphasizing observational and drawing skills.

BSPM 361 03(2-2-0). Elements of Plant Pathology. S. Prerequisite: BS 104 or BS 120 or HORT 100 or LIFE 102.
Diseases of economic plants. ($)

+BSPM 365 04(3-3-0). Integrated Tree Health Management. F. Prerequisite: BS 120 or LIFE 102. Required field trips.
Insects and diseases in forest and urban ecosystems. Effects, diagnosis, prevention, and action. ($)

BSPM 384 Var[1-3]. Supervised College Teaching. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.

*BSPM 423 03(1-4-0). Evolution and Classification of Insects. F. Credit not allowed for both BSPM 423 and BSPM 523.
Major groups of insects, living and fossil; major evolutionary trends in structure and behavior.

*BSPM 424*/BZ 424 03(3-0-0). Principles of Systematic Zoology. S. Prerequisite: BS 110 and BS 111 or LIFE 103. Credit not allowed for both BSPM 424 and BZ 424.
Principles and methods of classification, zoological nomenclature, taxonomic decisions regarding species and higher categories.

*BSPM 445 04(2-4-0). Aquatic Insects. F. Prerequisite: BS 111 or LIFE 103.
Biology and recognition of major orders and families of aquatic insects; a collection is required. ($)

*BSPM 450 03(3-0-0). Molecular Plant-Microbe Interactions. S. Prerequisite: Three credits BS, BZ 346 or SOCR 330. Credit not allowed for both BSPM 450 and BSPM 550.
Principles of plant-microbe/insect interactions, physiological and molecular aspects of plant defense, genomics approaches to study plant defense.

*BSPM 451 03(3-0-0). Integrated Pest Management. S. Prerequisite: BSPM 302 or BSPM 308 or BSPM 361.
Concepts of integrated pest management and the strategies and tactics employed in the application of these concepts.

BSPM 462/MIP 462/BZ 462 05(3-4-0). Parasitology and Vector Biology. F. Prerequisite: BS 110 or LIFE 103; BS 212 or LIFE 206 or MIP 302. Credit allowed for only one of the following: BSPM 462, MIP 462, BZ 462.
Protozoa, helminthes, and insects and related arthropods of medical importance; systematic, epidemiology, host damage and control.

BSPM 487 Var. Internship.

BSPM 492 Var[1-3]. Seminar.

BSPM 495 Var[1-3]. Independent Study.

BSPM 496 Var[1-3]. Group Study.

BSPM 502A-G 01. Topics in Plant Pathology.
*A) Plant viruses 01(1-0-0). F. Prerequisite: Three credits 300- or 400-level BIO or BSPM or BS or LIFE. *B) Plant bacteriology 01(1-0-0). F. Prerequisite: Three credits 300- or 400-level BIO or BSPM or BS or LIFE. *F) Plant disease epidemiology 01(1-0-0). F. Prerequisite BSPM 361.

*BSPM 507 03(3-0-0). Insect Behavior. S. Prerequisite: None.
Behavior of insects and related arthropods with special attention to social behavior.

*BSPM 508 03(3-0-0). Environmental Fate of Pesticides. S. Prerequisite: BS 440 or CHEM 245 or SOCR 240.
Processes that affect fate of pesticides and their metabolites in the environment with emphasis on soil and water.

*BSPM 509 03(3-0-0). Herbicide Selectivity and Action. F. Prerequisite: BSPM 308; BS 440.
Selectivity of major photosynthetic and growth inhibitor herbicides based on herbicide transport, metabolism, and mode of action.

*BSPM 510 03(3-0-0). Insect-Plant Disease Relationships. F. Prerequisite: BSPM 302 or BSPM 361.
Relationships between insects and various plant pathogens as they affect survival and transmissions of pathogens.

*BSPM 520/*BZ 520 03(3-4-0). Advanced Systematics. S. Prerequisite: BSPM 424/BZ 424 or BS 325. Credit not allowed for both BSPM 520 and BZ 520.
Theory and practice of modern systematics.

*BSPM 521 03(3-0-0). Forest Health Issues. F. Prerequisite: None.
Current topics related to forest and shade tree health from ecosystems to tree defense physiology.

*BSPM 523 04(1-4-1). Advanced Evolution/Classification of Insects. F. Credit not allowed for both BSPM 523 and BSPM 423.
Major groups of insects, living and fossil; major evolutionary trends in structure and behavior.

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*BSPM 525 03(3-0-0). Insect Physiology. S. Prerequisite: BSPM 302. Principles of insect function.

°BSPM 526/°BZ 526 03(3-0-0). Evolutionary Ecology. F. Prerequisite BZ 320 or LAND 220/LIFE 220. Credit not allowed for both BSPM 526 and BZ 526. Adaptation to abiotic and biotic environments; how current ecological processes interact with evolutionary history.

°BSPM 528 03(3-0-0). Invasive Plants/Weeds: Ecosystems to Molecules. S. Prerequisite: BZ 120; LAND 220/LIFE 220 or LIFE 320; LIFE 102 or LIFE 103. Contributions of disciplines of weed science and invasion ecology to understanding the biology, ecology and management of "problem plants."

BSPM 530/SOCR 530 01(1-0-0). Scientific Writing. S. Prerequisite: None. Credit not allowed for both BSPM 530 and SOCR 530. Skills necessary to prepare complete scientific journal articles including writing, editing, and literature searching and assessment.

BSPM 540 03(3-0-0). Understanding Genomes. F. Prerequisite: None. Harnessing genome information and related -omics level technologies for use in answering biological questions.

°BSPM 550 03(3-0-0). Molecular Plant-Microbe Interactions. S. Prerequisite: Three credits BZ; BZ 346 or SOCR 330. Credit not allowed for both BSPM 550 and BZ 346. Principles of plant-microbe interactions, physiological and molecular aspects of plant defense, genomic approaches to study plant defense.

°BSPM 551 04(3-0-1). Advanced Integrated Pest Management. S. Prerequisite: BSPM 302 or BSPM 308 or BSPM 361. Concepts of integrated pest management and the strategies and tactics employed in the practical application of these concepts.

°BSPM 555 03(1-4-0). Immature Insects. S. Prerequisite: BSPM 303A or BSPM 303B or BSPM 303C. Characteristics of immature forms of orders and families of insects emphasizing those important to humans.

°BSPM 556 03(3-0-0). Biological Control of Plant and Insects. F. Prerequisite: BZ 120 or LIFE 103; LIFE 320 or LAND 220/LIFE 220. Management of insect pests of plants and weeds using biological control agents such as insects, bacteria, viruses, and fungi.

°BSPM 570 03(3-0-0). Chemical Ecology. S. Prerequisite: None. Chemical interactions among animals, plants, fungi, and microorganisms.

°BSPM 571 01(0-2-0). Techniques in Chemical Ecology. S. Prerequisite: None. Practical experience with chemical techniques for separation, analysis, and synthesis of natural products together with biological assays for activity.

°BSPM 575/°BZ 575 03(3-0-0). Molecular and Genomic Evolution. S. Prerequisite: BZ 220; BZ 350. Credit not allowed for both BSPM 575 and BZ 575. Molecular biological mechanisms of evolutionary change; mutation; selection; gene expression/regulation; changes in whole-genome architecture.

BSPM 576/MIP 576 03(3-0-0). Bioinformatics. F. S. Prerequisite: BC 463 or BZ 310 or BZ 350 or CM 501 or CS 155 or ERHS 332 or MIP 275 or MIP 300 or MIP 450 or STAT 307. Credit not allowed for both BSPM 576 and MIP 576. Technical computing across platforms using bioinformatics tools in molecular analyses.

BSPM 584 Var[1-3]. Supervised College Teaching.

BSPM 587 Var. Internship.

BSPM 592 Var[1-3]. Seminar. F. S. Prerequisite: None. Major questions and theory pertinent to understanding current and relevant science topics.

BSPM 594 Var[1-3]. Independent Study.

BSPM 596 Var[1-3]. Group Study.

BSPM 698 Var. Research.


BSPM 710/CM 710 03(0-4-1). Techniques in Molecular Biology and Genetics. S. Prerequisite: BC 463 or BZ 346 or BZ 350 or MIP 450 or SOCR 330. Credit not allowed for both BSPM 710 and CM 710. Genetic manipulation of bacteria, bacteriophage, and yeast including experiments in molecular cloning and gene expression.

°BSPM 740/°SOCR 740 03(3-0-0). Plant Molecular Genetics. F. Prerequisite: BC 351; SOCR 330. Credit not allowed for both BSPM 740 and SOCR 740. Advances in study of organization and function of nuclear and organelar genomes, gene expression in higher plants, and plant-microbe interactions.

BSPM 784 Var[1-3]. Supervised College Teaching.

BSPM 787 Var. Internship.

BSPM 792 Var[1-2]. Seminar.

BSPM 794 Var[1-3]. Independent Study.

BSPM 798 Var. Research.


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BIOTECHNOLOGY COURSES
Nondepartmental
College of Veterinary Medicine and Biomedical Sciences

BTEC 306/Biom 306 04(3-2-0). Bioprocess Engineering. S. Prerequisite: CHEM 107 or CHEM 111; PH 121 or PH 141. Credit not allowed for both BTEC 306 and BIOM 306. Material, energy balances; fluid flow, heat exchange, mass transfer; application to operations in food, fermentation, other bioprocess industries.

BTEC 499 Var[1-3]. Biotechnology Thesis. Prerequisite: Twelve credits from biotechnology core; approval of program coordinator.
BUS 100 01(1-0-0). Introduction to Business. F, S. Prerequisite: None. Overview of functional areas of business: accounting, finance, information systems, management, marketing, and international business.

BUS 150 03(3-0-0). Business Computing Concepts and Applications. F, S, SS. Prerequisite: None. Credit not allowed for both CS 110 and BUS 150. System hardware, operating environments, and software applications. (NT-O)


BUS 205 03(3-0-0). Legal and Ethical Issues in Business. F, S, SS. Prerequisite: None. Credit not allowed for both BUS 205 and BUS 260. Ethical, legal and regulatory issues in the U.S. business environment. (NT-O)

BUS 220 03(3-0-0). Ethics in Contemporary Organizations. (GT-AH3, AUCC 3B). F, S. Prerequisite: None. Examination and application of the ethical principles that are fundamental to managing a successful, high-integrity business or organization.

BUS 222 02(2-0-0). Interpersonal and Professional Skills. F, S. Prerequisite: None. Development of effective interpersonal leadership skills built on self-awareness, understanding of others, and life experiences.

BUS 260 03(3-0-0). Social-Ethical-Regulatory Issues in Business. F, S, SS. Prerequisite: None. Credit not allowed for both BUS 260 and BUS 205. Legal issues, business ethics, corporate responsibility, and the business interface within the U.S. regulatory and business environment.

BUS 300 03(3-0-0). Business Writing and Communication. (GT-CO3, AUCC 2B) F, S, SS. Prerequisite: CO 150 or HONR 193. Advanced writing for business using recursive process and appropriate means given audience and message purpose. Preparation, presentation of reports.

BUS 350 03(3-0-0). Travel Abroad – International Comparative Management. SS. Prerequisite: Six credits of business courses. Travel tour of European business to compare and contrast their business strategies to those of U.S. firms.


BUS 425 03(3-0-0). Starting and Managing Your Own Business. F. Prerequisite: Written consent of instructor. Business aspects of starting and managing your own small enterprise.

BUS 479 03(3-0-0). Strategic Management. F, S, SS. Prerequisite: FIN 300 or FIN 305; MGT 301; MGT 305 or MGT 320; MKT 300 or MKT 305. An integration of various business subject areas in terms of top-level policy and decision making.

BUS 495 Var. Independent Study.

BUS 496 Var. Group Study.

BUS 500 02(2-0-0). Business Systems and Processes. F, S, SS. Prerequisite: Admission to a master’s program in business. Introduction to core concepts from Business Process Management (BPM) and Operations Management (OM).

BUS 505 03(3-0-0). Legal and Ethical Environment of Business. S. Prerequisite: Admission to a master’s program in business. Legal and regulatory issues impacting business operation. Ethical and social responsibility concepts applied to business setting.

BUS 510 01(1-0-0). Career Assessment and Development. F, S, SS. Prerequisite: Admission to a master’s program in Business. Identify career goals based on personal skills, interests and values and understand how to compete in the global job market.

BUS 515 01(1-0-0). Career Management and Placement Strategy. F, S, SS. Prerequisite: Admission to a master’s program in Business. Tools to create a career strategy and personal brand.

BUS 601 02(2-0-0). Quantitative Business Analysis. S. Prerequisite: Admission to a master’s program in business. Uses and management of information; decision tools and concepts; quality control. (NT-V)

BUS 604/STAT 604 02(2-0-0). Managerial Statistics. F. Prerequisite: Admission to the MBA Program. Credit not allowed for both BUS 604 and STAT 604. Introduction to statistical thinking and methods used to support managerial-decision making. (NT-V)

BUS 615 04(4-0-0). Accounting Systems. F. Prerequisite: None. Financial, managerial accounting information systems. Use of accounting information for purposes of management decision making, planning, and control. (NT-V)

BUS 616 02(2-0-0). Financial Reporting and Analysis. S, SS. Prerequisite: BUS 615 or ACT 600. Tools and techniques for analysis of financial reports of public companies. (NT-V)

BUS 620 02(2-0-0). Leadership and Teams. F. Prerequisite: Admission to a master’s program in business. Ethical leadership and team dynamics; basic models of motivation utilized by leaders. (NT-V)

BUS 621 02(2-0-0). Strategic Decision Making. F. Prerequisite: None. Key decision concepts, processes and tools that help managers formulate and implement competitive strategy. (NT-V)

BUS 625 02(2-0-0). Organizational Communication. S. Prerequisite: None. Improving understanding and application of managerial communication skills and negotiation tools and their implications for effective management. (NT-V)

BUS 626 02(2-0-0). Managing Human Capital. S. Prerequisite: Admission to a graduate program in Business. Management of human capital for competitive advantage and superior results. (NT-V)

BUS 630 02(2-0-0). Information Management. S. Prerequisite: BUS 615 or ACT 600. Role and value of information in business functions; risks and rewards of enterprise information; fundamentals of information storage and retrieval. (NT-V)

BUS 631 02(2-0-0). Strategic Uses of Information Technology. F. S. Prerequisite: BUS 630 or concurrent registration. Strategic and tactical uses of information technology in the global business environment. (NT-V)

BUS 635 02(2-0-0). Business Economics for the World Market. F, S. Prerequisite: BUS 601 or BUS 604/STAT 604; BUS 615.
Application of economic principles to current business problems within context of global marketplace. (NT-V)

**BUS 640 02(2-0-0). Financial Principles and Practice.** F, S. Prerequisite: BUS 601 or BUS 604/STAT 604.
Financial environment; tools and techniques of corporate financial decision making. (NT-V)

**BUS 641 02(2-0-0). Financial Markets and Investments.** F, S. Prerequisite: BUS 640 or concurrent registration.
Operating of financial markets, techniques for security valuation, and portfolio management. (NT-V)

**BUS 645 02(2-0-0). Enterprise Electronic Business Strategies.** S. Prerequisite: BUS 630.
Technology for electronic commerce; regulation and strategies for competitive usage. (NT-V)

**BUS 650 02(2-0-0). Supply Chain Management.** S. Prerequisite: Admission to a master’s program in Business.
Value-driven supply chain principles, design and management of supply chains, and supply chain management software and applications. (NT-V)

**BUS 655 02(2-0-0). Marketing Management.** F. Prerequisite: BUS 635.
Examines processes of customer value creation (e.g., product development, communications, distribution) and value capture (e.g., pricing). (NT-V)

**BUS 656 02(2-0-0). Marketing Strategy and Planning.** F. Prerequisite: BUS 616; BUS 640; BUS 655.
Basic marketing strategy analysis, formulation, evaluation and implementation concepts and tools. (NT-V)

**BUS 660 02(2-0-0). Ethical, Legal, and Regulatory Issues.** S. Prerequisite: Admission to a master’s program in business.
Legal, regulatory, societal and ethical issues encountered by business professionals; analytical skills for making judgments. (NT-V)

**BUS 662 02(2-0-0). International Business.** F, S, SS. Prerequisite: BUS 625; BUS 635; BUS 641; BUS 650.
Role of government regulations and how international firms affected; cultural aspects of business, global marketing, finance, management. (NT-V)

**BUS 665 04(4-0-0). MBA Capstone.** S. Prerequisite: BUS 641; BUS 650; BUS 656.
To integrate business disciplines through strategic thinking and experiential learning. (NT-V)

**BUS 678 03(3-0-0). Business Research.** F. Prerequisite: QNT 270.
Techniques for designing, conducting, and evaluating business research.

**BUS 686 Var. Practicum.** F, S, SS. Prerequisite: Written consent of instructor. (NT-O)

**BUS 687 Var. Internship.** Prerequisite: Written consent of instructor.

**BUS 690A-H Var[1-6]. Contemporary Issues in Business.** F, S, SS. Prerequisite: Admission to a College of Business graduate program.

**BUS 695 Var. Independent Study.**

**BUS 696 Var. Group Study.** Prerequisite: Written consent of instructor.

**BUS 699 Var. Thesis.**
**BOTANY/ZOOLOGY COURSES**

**Department of Biology**

**College of Natural Sciences**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BZ 100 03</td>
<td>Introduction to Biology</td>
<td>F, S, SS. Prerequisite: None. Offered as telecourse only. Basic concepts in biology, including genetics, the human body, and interactions with their environment. (NT-T)</td>
<td></td>
</tr>
<tr>
<td>BZ 101 03</td>
<td>Humans and Other Animals</td>
<td>F, S. Prerequisite: None. Credit not allowed for students who have already taken BZ 110 or LIFE 102 or LIFE 103. Characteristics of animals, their evolution and diversity; humans considered as an animal. (NT-O)</td>
<td></td>
</tr>
<tr>
<td>BZ 104 03</td>
<td>Basic Concepts of Plant Life</td>
<td>(GT-SC2, AUCC 3A). F, S. Prerequisite: For non-science and physical science majors. Credit not allowed for students who have already taken BZ 120 or LIFE 102 or LIFE 103. Broad concepts of biology with major emphasis on plant life.</td>
<td></td>
</tr>
<tr>
<td>BZ 105 01</td>
<td>Basic Concepts of Plant Life Laboratory</td>
<td>(GT-SC1, AUCC 3A). F, S, SS. Prerequisite: BZ 104 or concurrent registration. Modern biology exercises including viruses, Monera, Protista, fungi, plants, genetics, physiology, and ecology. ($)</td>
<td></td>
</tr>
<tr>
<td>BZ 110 03</td>
<td>Principles of Animal Biology</td>
<td>(GT-SC1, AUCC 3A). F, S, SS. Prerequisite: None. General features (body form, physiology, life history, ecology) and evolutionary relationships of major phyla of animals.</td>
<td></td>
</tr>
<tr>
<td>BZ 111 01</td>
<td>Animal Biology Laboratory</td>
<td>(GT-SC2, AUCC 3A). F, S, SS. Prerequisite: BZ 110 or concurrent registration. Laboratory exercises demonstrating major features of animal biology and major phyla of animals. ($)</td>
<td></td>
</tr>
<tr>
<td>BZ 120 04</td>
<td>Principles of Plant Biology</td>
<td>(GT-SC2, AUCC 3A). F, S. Prerequisite: None. Diversity of relationships of plants and their structural and functional characteristics. ($)</td>
<td></td>
</tr>
<tr>
<td>BZ 212 04</td>
<td>Animal Biology-Invertebrates</td>
<td>F. Prerequisite: BZ 110; BZ 111 or LIFE 103. General biology of invertebrates; their characteristics, classification, and adaptations. ($)</td>
<td></td>
</tr>
<tr>
<td>BZ 220 03</td>
<td>Introduction to Evolution</td>
<td>F, S, SS. Prerequisite: BZ 110; BZ 111 or BZ 120 or LIFE 103. Fundamental concepts in evolutionary biology.</td>
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</tr>
<tr>
<td>BZ 223 03</td>
<td>Plant Identification</td>
<td>F, SS. Prerequisite: BZ 120 or LIFE 103. Relationships and identification of flowering plants.</td>
<td></td>
</tr>
<tr>
<td>BZ 300 03</td>
<td>Animal Behavior</td>
<td>S, SS. Prerequisite: BZ 110 and (BZ 111 or LIFE 103). Principles of ethology, behaviors of nonhuman animals emphasizing their adaptive significance and phylogenetic relationships.</td>
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</tr>
</tbody>
</table>

*BZ 301 02 (0-4-0). Animal Behavior Laboratory. S. Prerequisite: BZ 300 or concurrent registration. Laboratory experiments in animal behavior; demonstrations and independent investigations. |

*BZ 302 03(2-2-0). Poisonous Plants. F. Prerequisite: BZ 120 or LIFE 103. Identification and toxic properties of certain plants; animal reactions to more important ones. |

*BZ 310 04(3-3-0). Cell Biology. F, S, SS. Prerequisite: BZ 110 or BZ 120 or LIFE 103; CHEM 245 with a C or better or CHEM 345 with a C or better. Structure and function of cells emphasizing molecular mechanisms. Communication, metabolism, motility, genetics, growth, reproduction. ($) |

*BZ 311 04(3-2-0). Developmental Biology. S, SS. Prerequisite: BZ 310. Developmental aspects of growth and differentiation stressed in higher plants and animals. ($) |

*BZ 315 03(2-0-1). Marine Ecology. F. Prerequisite: BZ 110; BZ 111; BZ 120 or LIFE 103; CHEM 245 or CHEM 345. Marine organisms, habitats, and communities. |

*BZ 321 03(1-4-0). Aquatic Vascular Plants. F. Prerequisite: BZ 223 or BZ 325. Taxonomic relationships and identification of aquatic vascular plants. |


*BZ 329 03(2-2-0). Herpetology. S. Prerequisite: (BZ 110; BZ 111) or LIFE 103. Biology of amphibians and reptiles. |

*BZ 330 03(2-2-0). Mammalogy. F. Prerequisite: BZ 110; BZ 111 or LIFE 103. Evolution, classification, and biology of mammals; practice in identifying and preparing specimens. ($) |

*BZ 331 04(2-4-0). Developmental Plant Anatomy. F. Prerequisite: BZ 120 or LIFE 103. Structure of plant cells, tissues, and organs as they develop. |

*BZ 332 04(3-2-0). Introductory Phycology. F. Prerequisite: BZ 120 or LIFE 102; BZ 220. Evolution, diversity, ecology and global impact of algae. |

*BZ 333 04(2-4-0). Introductory Mycology. F. Prerequisite: BZ 120 or LIFE 103. Groups of fungi including classification, structure, morphogenesis, phylogeny, and genetics and reproduction. |

*BZ 335 03(2-3-0). Ornithology. S. Prerequisite: BZ 110; BZ 111 or LIFE 103. Required field trips. Biology of birds, especially behavior, ecology, and identification in the laboratory and field. ($) |

*BZ 338 04(2-4-0). Comparative Morphology of Vascular Plants. S. Prerequisite: BZ 120 or LIFE 103. Origin, evolution, structure, and reproduction of the vascular plants, including comparative study of organs occurring in each group. |

*BZ 346 03(3-0-0). Population and Evolutionary Genetics. F. Prerequisite: BZ 220; MATH 155; STAT 301 or STAT 307. Evolutionary theories and history; heredity mechanisms that are basis for variation, evolution, and biological communication between generations. |

*BZ 348/MATH 348 04(3-3-0). Theory of Population and Evolutionary Ecology. F. Prerequisite: MATH 155 or MATH 160. Credit allowed for only one of the following: BZ 348, BZ 548, MATH 348. Principles and methods for building, analyzing, and interpreting mathematical models of ecological and evolutionary problems in biology. |

° Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCC-subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
BZ 349 03(3-0-0). Tropical Ecology and Evolution. F. Prerequisite: BZ 220.
Broad introduction to terrestrial and aquatic tropical biodiversity and the ecological and evolutionary processes that generate and maintain it.

BZ 350 04(3-0-1). Molecular and General Genetics. F, S, SS. Prerequisite: BZ 110 or BZ 120 or LIFE 102; STAT 201 or concurrent registration or STAT 301 or concurrent registration or STAT 307 or concurrent registration. Primarily for students in biological sciences. Mendelian, molecular, and population genetics emphasizing the molecular basis of genetics.

BZ 353/NR 353 03(3-0-0). Global Change Ecology, Impacts and Mitigation. S. Prerequisite: LAND 220/LIFE 220 or LIFE 320. Credit not allowed for both BZ 353 and NR 353. Ecological impacts of human-induced global change, and the strategies that can/are being used to adapt to and mitigate these impacts.

BZ 384 Var[1-5]. Supervised College Teaching. F, S. Prerequisite: 3.000 overall GPA; written consent of instructor; grade of A in course with which student assists. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.

BZ 401 03(3-0-0). Comparative Animal Physiology. S. Prerequisite: BZ 214. Physiological mechanisms of digestion, metabolism, osmoregulation, excretion, circulation, and respiration in vertebrate and invertebrate animals.

BZ 402 04(3-3-0). Molecular Cytogenes. S. Prerequisite: BZ 310 or concurrent registration or LIFE 210 or concurrent registration; BZ 350 or concurrent registration or LIFE 201A or concurrent registration or LIFE 201B or concurrent registration or SERV 330 or concurrent registration. Structure, function, and behavior of chromosomes during interphase, mitosis, and meiosis.

BZ 403 03(3-0-0). Comparative Endocrinology. F. Prerequisite: BZ 310. Comparison of endocrine molecules, responses, and control mechanisms in vertebrates and invertebrates emphasizing molecular aspects.

*BZ 420 03(3-0-0). Evolutionary Medicine. F. Prerequisite: BZ 220. Integration of evolutionary biology with behavior, genetics, and ecology to understand health and disease.

*BZ 424/BSPM 424 03(3-0-0). Principles of Systematic Zoology. S. Prerequisite: BZ 110; BZ 111 or LIFE 103. Credit not allowed for both BZ 424 and BSPM 424. Principles and methods of classification, zoological nomenclature, taxonomic decisions regarding species and higher categories.

*BZ 425 03(3-0-0). Molecular Ecology. F. Prerequisite: BZ 220; BZ 350; STAT 301 or STAT 307. Credit not allowed for both BZ 425 and BZ 525. Introduction to molecular genetic markers for questions in ecology, evolution, behavior and conservation.

+BZ 433 04(3-0-1). Behavioral Genetics. F. Prerequisite: BZ 310. Required field trips. An integrative view of genetic basis of animal behavior, with emphasis on complex behaviors and societal implications of genetics research.

BZ 440 03(3-0-0). Plant Physiology. S. Prerequisite: BZ 120 or LIFE 103. Functions and activities of plants. (NT-O)

BZ 441 02(0-2-1). Plant Physiology Laboratory. S. Prerequisite: BZ 440 or concurrent registration. Laboratory applications of plant physiology principles.

BZ 450 04(3-2-0). Plant Ecology. S. Prerequisite: LIFE 103 or BZ 120. Relation of plants to their environment.

BZ 455 03(3-0-0). Human Heredity and Birth Defects. S. Prerequisite: BZ 110 and BZ 111 or LIFE 103. Human heredity and its individual and social implications; causes of congenital defects.

BZ 460 04(3-0-1). Genome Evolution. S. Prerequisite: BZ 220; BZ 350. Evolution of DNA, RNA, and proteins; use of genomic data to infer evolutionary history and processes.

BZ 462/MIP 462/BSPM 462 05(3-4-0). Parasitology and Vector Biology. F. Prerequisite: BZ 110 or LIFE 103; B2 120 or LIFE 206 or MIP 302. Credit allowed for only one of the following: BZ 462, BSPM 462, MIP 462. Protozoa, helminths, and insects and related arthropods of medical importance; systematics, epidemiology, host damage and control.


+BZ 472 01(0-3-0). Stream Biology and Ecology Laboratory. F. Prerequisite: BZ 471 or concurrent registration. Required field trips. Field sampling and laboratory analysis of habitats, biota, and ecological relationships in running waters. ($)}

*BZ 474 03(2-2-0). Limnology. F. Prerequisite: LAND 220/LIFE 220 or LIFE 320. Required field trips. Biology, chemistry, and physics of lakes including limnological methods. ($)}

*BZ 476/BZ 576 03(3-0-0). Genetics of Model Organisms. F. Prerequisite: BZ 350 or LIFE 201A or LIFE 201B or SOC 330; junior standing. Credit not allowed for both BZ 476 and BZ 576. Advanced topics in model genetic systems including molecular and developmental genetics.

BZ 479/VS 479 03(3-0-0). Biology and Behavior of Dogs. F, S. Prerequisite: BZ 110 or LIFE 103. Credit not allowed for both BZ 479 and VS 479. Interactions of physiology, neurobiology, and genetics on behavior of domestic dogs, and how evolution and domestication influence behavioral traits. (NT-O)

BZ 482 04(0-0-4). Ecology/Conservation: Biodiversity of Ecuador. SS. Prerequisite: BZ 220; junior or senior standing. Study abroad experience focused on understanding the diversity of tropical habitats and organisms in Ecuador, and how to conduct ecological research.

BZ 487 Var[1-12]. Internship. Supervised work-related research experience in laboratory or field setting with consultation and approval of a regular faculty member.


BZ 495 Var[1-3]. Independent Study. Maximum of 7 credits allowed in course.

BZ 498 Var[1-6]. Laboratory or Field Research. Prerequisite: Written consent of research mentor. Supervised lab or field research in biology, botany, or zoology.

*BZ 505 03(3-0-0). Cognitive Ecology. S. Prerequisite: BZ 300. The evolutionary ecology of mechanisms related to information processing and decision-making in animals.

° Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT_subcode = State Guarantee Transfer course and AUCC_subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
Various aspects of plant development at the molecular level.

Prerequisite: BC 463 or BZ 350 or MIP 450 or SOCR 330.

*BZ 510 03(3-0-0). Zoophysiological Ecology. S. Prerequisite: BMS 300 or BMS 360 or BZ 401; LAND 220/LIFE 220 or LIFE 320.

Concepts, principles, and examples of adaptive physiological strategies used by animals.

*BZ 515 03(3-0-0). Physiological Ecology of Marine Vertebrates. S. Prerequisite: BZ 214; BZ 330; BC 351 or BC 401 or BMS 300 or BZ 401.

Physiological adaptations of vertebrates to different marine environments.

*BZ 520/*BSPM 520 03(3-0-0). Advanced Systematics. S. Prerequisite: BSPM 424/BZ 424 or BZ 325. Credit not allowed for both BZ 520 and BSPM 520.

Theory and practice of modern systematics.

*BZ 525 04(3-0-1). Molecular Ecology. F. Prerequisite: BZ 220; BZ 350; STAT 301 or STAT 307. Credit not allowed for both BZ 525 and BZ 425.

Molecular genetic markers for questions in ecology, evolution, behavior and conservation.

*BZ 526/*BSPM 526 03(3-0-0). Evolutionary Ecology. F. Prerequisite: LAND 220/LIFE 220 or LIFE 320. Credit not allowed for both BZ 526 and BSPM 526.

Adaptation to abiotic and biotic environments; how current ecological processes interact with evolutionary history.

*BZ 530 02(2-0-0). Ecological Plant Morphology. S. Prerequisite: BZ 220; BZ 450 or LIFE 320.

Adaptive significance and evolution of plant form and structure.

*BZ 535 03(3-0-0). Behavioral Ecology. S. Prerequisite: BZ 220; graduate standing or written consent of instructor.

Evolutionary and theoretical perspectives in animal behavior using examples from model empirical systems; emphasis on decision rules and social behavior.

*BZ 537 03(2-2-0). Topics in Mycology. S. Prerequisite: BZ 333.

Features common to all fungi; trends in structure, function, and behavior.

*BZ 540 02(2-0-0). Translocation in Plants. S. Prerequisite: BZ 331; BZ 440.

Transport of sugars, organic and inorganic ions, water, and hormones across membranes and through vascular systems of plants.

BZ 544 02(2-0-0). Presenting Research in Biology. F. Prerequisite: Written consent of instructor.

Procedures for preparing and presenting results of biological research in scientific journals and at professional meetings.

*BZ 548 04(3-3-0). Theory of Population and Evolutionary Ecology. F. Prerequisite: MATH 155 or MATH 160. Credit allowed for only one of the following: BZ 548, BZ 348, MATH 348.

Principles and methods for building, analyzing, and interpreting mathematical models of ecological and evolutionary problems in biology; research module.

*BZ 555 03(3-0-0). Reproductive Biology of Higher Plants. S. Prerequisite: BZ 310 or LIFE 210; BZ 350 or LIFE 201A or LIFE 201B or SOCR 330.

Reproductive processes influencing evolution in higher plant groups.

*BZ 561 03(3-0-0). Landscape Ecology. F. Prerequisite: LIFE 320; STAT 301 or STAT 307; written consent of instructor.

Concepts, methods, and models for examining spatial patterns and processes of natural and managed landscapes and their effects on ecological dynamics.

*BZ 570 03(3-0-0). Molecular Aspects of Plant Development. S. Prerequisite: BC 463 or BZ 350 or MIP 450 or SOCR 330.

Various aspects of plant development at the molecular level.

*BZ 572 03(3-0-0). Phytoremediation. F. Prerequisite: BZ 120 or LIFE 101.

Environmental cleanup using plants.

*BZ 575/BSPM 575 03(3-0-0). Molecular and Genomic Evolution. S. Prerequisite: BZ 220; BZ 350. Credit not allowed for both BZ 575 and BSPM 575.

Molecular biological mechanisms of evolutionary change; mutation selection; gene expression/regulation; changes in whole-genome architecture.

*BZ 576/BZ 476 04(3-0-1). Genetics of Model Organisms. F. Prerequisite: BZ 350 or LIFE 201A or LIFE 201B or SOCR 330. Credit not allowed for both BZ 576 and BZ 476; junior standing.

Advanced topics in model genetic systems including molecular and developmental genetics.

BZ 577/MIP 577 02(0-4-0). Computer Analysis in Population Genetics. F. Prerequisite: BZ 578/MIP 578 or concurrent registration. Credit not allowed for both BZ 577 and MIP 577.

Computational and statistical techniques and practical exercises in discrete and quantitative genetics.

BZ 578/MIP 578 04(3-0-1). Genetics of Natural Populations. F. Prerequisite: BZ 350 or LIFE 201A or LIFE 201B or SOCR 330; STAT 201 or STAT 301 or STAT 307. Credit not allowed for both BZ 578 and MIP 578.

Theoretical and empirical aspects of the genetics of natural populations; current molecular techniques and statistical analysis.

BZ 584 Var[1-3]. Supervised College Teaching. Maximum of 6 credits allowed in course.

BZ 587A-B Var[1-6]. Internship. Prerequisite: Written consent of instructor.


BZ 594 Var[1-3]. Independent Study.

*BZ 642 03(3-0-0). Plant Metabolism. F. Prerequisite: BC 351; BZ 440.

Biosyntheses and transformations of important plant metabolites.

BZ 692A-H Var[1-3]. Seminar.


BZ 695 Var[1-3]. Independent Study.

BZ 698 Var. Research.


BZ 784 Var[1-3]. Supervised College Teaching. Maximum of 6 credits allowed in course.

BZ 792 01(0-0-1). Seminar.

BZ 795 Var[1-3]. Independent Study.

BZ 798 Var. Research.


° Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCC-subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
### CHEMICAL AND BIOLOGICAL ENGINEERING COURSES

**Department of Chemical and Biological Engineering**

**College of Engineering**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Prerequisites</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBE 101 03(2-2-0)</td>
<td>Chemical and Biological Engineering I. F.</td>
<td>Engineering design and problem solving; technical presentation skills; basic computer programming. ($)</td>
<td>(S)</td>
</tr>
<tr>
<td>CBE 102 03(2-2-0)</td>
<td>Chemical and Biological Engineering II. S.</td>
<td>Prerequisite: CBE 101. Applications of engineering design and problem solving; computer programming to solve engineering problems; team project. ($)</td>
<td></td>
</tr>
<tr>
<td>CBE 201 03(3-0-0)</td>
<td>Material and Energy Balances. F.</td>
<td>Prerequisite: CBE 102 or MATH 151 or concurrent registration in MATH 151; CHEM 111; LIFE 102 or concurrent registration; PH 141. Principles of chemistry, physics, and mathematics applied to development of material and energy balances; illustration of concepts.</td>
<td></td>
</tr>
<tr>
<td>CBE 210 03(3-0-0)</td>
<td>Thermodynamic Process Analysis. S.</td>
<td>Prerequisite: CBE 201 with a C or better; MATH 261 or concurrent registration. Thermodynamic fundamentals and applications to ideal and non-ideal mixtures, power cycles, and chemical equilibria.</td>
<td></td>
</tr>
<tr>
<td>CBE 310 03(3-0-0)</td>
<td>Molecular Concepts and Applications. F.</td>
<td>Prerequisite: CBE 210 with a C or better; MATH 340. Application of modern molecular theory to chemical and biological engineering programs in thermodynamics, chemical kinetics, and transport phenomena.</td>
<td></td>
</tr>
<tr>
<td>CBE 320 03(3-0-0)</td>
<td>Chemical and Biological Reactor Design. S.</td>
<td>Prerequisite: CBE 310 with a C or better; CBE 330 with a C or better. Mechanisms and rates of chemical reactions; design of homogeneous and heterogeneous reactors; biological reactions and reactors.</td>
<td></td>
</tr>
<tr>
<td>CBE 330 03(3-0-0)</td>
<td>Process Simulation. F.</td>
<td>Prerequisite: CBE 210 with a C or better; MATH 340. Analysis of chemical and biological engineering problems by numerical simulation.</td>
<td></td>
</tr>
<tr>
<td>CBE 331 03(3-0-0)</td>
<td>Momentum Transfer and Mechanical Separations. F.</td>
<td>Prerequisite: CBE 210 with a C or better; MATH 340. Fluid properties; conservation equations; compressible and incompressible flow; pumping and metering; mixing; separation of fluid-solid mixtures.</td>
<td></td>
</tr>
<tr>
<td>CBE 332 03(3-0-0)</td>
<td>Heat and Mass Transfer Fundamentals. S.</td>
<td>Prerequisite: CBE 310 with a C or better; CBE 330 with a C or better; CBE 331 with a C or better. Thermal processes; steady and unsteady conduction; convective heat transfer; radiation; heat exchanger design; mass transfer by diffusion and convection.</td>
<td></td>
</tr>
<tr>
<td>CBE 333 02(0-5-0)</td>
<td>Chemical and Biological Engineering Lab I. S.</td>
<td>Prerequisite: CBE 332 or concurrent registration. Laboratory experiments involving material balances, thermodynamics, and momentum and heat transfer. Data analysis; written and oral reports. ($)</td>
<td></td>
</tr>
<tr>
<td>CBE 406 03(3-0-0)</td>
<td>Introduction to Transport Phenomena. F.</td>
<td>Prerequisite: CBE 332. Fundamental treatment of momentum and mass transport processes; dimensional analysis for parameter identification and order of magnitude estimation.</td>
<td></td>
</tr>
<tr>
<td>CBE 430 03(3-0-0)</td>
<td>Process Control and Instrumentation. S.</td>
<td>Prerequisite: CBE 320 with a C or better; CBE 442 with a C or better. Measurement and control of process variables; transient chemical and biological processes; feedback, feedforward, and computer control concepts.</td>
<td></td>
</tr>
<tr>
<td>CBE 431(0-0-3)</td>
<td>Applied Thermodynamics. S.</td>
<td>Prerequisite: CBE 330 with a C or better. Application of chemical principles to environmental engineering problems.</td>
<td></td>
</tr>
<tr>
<td>CBE 442 04(4-0-0)</td>
<td>Separation Processes. F.</td>
<td>Prerequisite: CBE 332 with a C or better. Analysis of chemical and biological separations based on thermodynamics, diffusion, and convective mass transfer; design of separations equipment.</td>
<td></td>
</tr>
<tr>
<td>CBE 443 02(0-5-0)</td>
<td>Chemical and Biological Engineering Lab II. F.</td>
<td>Prerequisite: CBE 442 or concurrent registration. Laboratory experiments involving advanced chemical and biological engineering concepts. Data analysis; written and oral reports. ($)</td>
<td></td>
</tr>
<tr>
<td>CBE 451 03(3-0-0)</td>
<td>Chemical and Biological Engineering Design I. F.</td>
<td>Prerequisite: CBE 320 with a C or better; CBE 442 or concurrent registration. Chemical and biological process synthesis and simulation; engineering economics principles.</td>
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<tr>
<td>CBE 452 04(4-0-0)</td>
<td>Chemical and Biological Engineering Design II. S.</td>
<td>Prerequisite: CBE 451 with a C or better. Projects requiring students to design a chemical and/or biological process with cost estimation and constraint analysis; written and oral reports.</td>
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<tr>
<td>CBE 493 01(0-0-1)</td>
<td>Professional Development Seminar. F.</td>
<td>Topics in engineering professional development, including ethics, role of engineers in society, and life-long learning.</td>
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<tr>
<td>CBE 495 Var. Independent Study.</td>
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<tr>
<td>CBE 496 Var. Group Study.</td>
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<tr>
<td>CBE 501 03(3-0-0)</td>
<td>Chemical Engineering Thermodynamics. F.</td>
<td>Prerequisite: CBE 210; MATH 340. Definition, correlation, and estimation of thermodynamic properties; nonideal chemical and physical equilibria.</td>
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<tr>
<td>CBE 503 03(3-0-0)</td>
<td>Transport Phenomena Fundamentals. S.</td>
<td>Prerequisite: CBE 406. General topics in transport phenomena; analytical and numerical solutions of laminar flows; perturbation techniques; coupled transport.</td>
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<tr>
<td>CBE 504/BIOM 504</td>
<td>Fundamentals of Biochemical Engineering. F.</td>
<td>Prerequisite: BIOM 306/BTEC 306 or concurrent registration or CBE 320 or concurrent registration; MATH 255 or MATH 340; MIP 300. Credit not allowed for both CBE 504 and BIOM 504. Application of chemical engineering principles to enzyme kinetics, fermentation and cell culture, product purification, and bioprocess design.</td>
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<tr>
<td>CBE 505 01(0-3-0)</td>
<td>Biochemical Engineering Laboratory. F.</td>
<td>Prerequisite: CBE 504/BIOM 504 or concurrent registration. Fermentation technology, bioprocess control, and protein purification.</td>
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<tr>
<td>CBE 514 03(3-0-0)</td>
<td>Polymer Science and Engineering. S.</td>
<td>Prerequisite: CHEM 343 or CHEM 346; or CHEM 474 or CBE 310.</td>
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</table>

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CBE 521 03(3-0-0). Mathematical Modeling for Chemical Engineers.  
F. Prerequisite: MATH 340.  
Application of mathematical models to analysis and design of chemical reactors and separation processes.

CBE 522/BIOM 522 03(2-2-0). Bioseparation Processes.  
F. Prerequisite: CBE 331. Credit not allowed for both CBE 522 and BIOM 522.  
Analysis of processes used to recover and purify fermentation products.

*CBE 524 01(1-0-0). Bioremediation.  
F. Prerequisite: CBE 540/CIVE 540.  
Use of biotechnology for site remediation. Biodegradation, bioreactor design, and in situ bioremediation. (NT-V)

CBE 540/CIVE 540 03(3-0-0). Advanced Biological Wastewater Processing.  
S. Prerequisite: CIVE 438/ENVE 438 or CBE 320. Credit not allowed for both CBE 540 and CIVE 540.  
Fundamentals of environmental biotechnology: environmental microbiology, microbial kinetics, basic reactor design, wastewater treatment.

CBE 543/BIOM 543 03(3-0-0). Membranes for Biotechnology and Biomedicine.  
F. Prerequisite: CHEM 343; CBE 310. Credit not allowed for both CBE 543 and BIOM 543.  
Polymeric membrane formation, modification, module design and applications to bioseparation and biomedical separations and tissue engineering. (NT-O)

*CBE 613 03(3-0-0). Advanced Transport Phenomena.  
F. Prerequisite: ATS 601 or CBE 503 or CIVE 502; MATH 530.  
Fundamental studies of multi-component mass, energy, and momentum transport, with applications in advanced materials, biomedical and biochemical systems.

CBE 621 03(3-0-0). Advanced Process Control.  
F. Prerequisite: CBE 430.  
Application of modern control theory to chemical processes. Computer control aspects emphasized.

*CBE 660 03(3-0-0). System and Parameter Identification.  
S. Prerequisite: Graduate standing.  
Principles and methods for selecting the most appropriate equations, and properties within those equations, to mathematically simulate physical phenomena.

CBE 693 Var. Seminar I.

CBE 695 Var. Independent Study.


CBE 707 01(1-0-0). Advanced Topics in Biochemical Engineering.  
F.  
Advanced biochemical engineering topics.

CBE 793 Var. Seminar II.

CBE 795 Var. Independent Study.

CBE 799 Var. Dissertation.

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## CHEMISTRY COURSES
### Department of Chemistry
### College of Natural Sciences

**CHEM 103 03(3-0-0).** Chemistry in Context. (GT-SC2, AUCC 3A). F, S, SS. Prerequisite: None. For students who do not plan to take additional courses in chemistry.

Chemistry, chemical principles from more conceptual, less mathematical perspective; how chemical substances, chemical reactions affect our daily lives. (NT-O)

**CHEM 104 01(0-2-0).** Chemistry in Context Laboratory. (GT-SC1, AUCC 3A). F, S, SS. Prerequisite: CHEM 103 or concurrent registration.

Laboratory applications of principles covered in CHEM 103. (NT-O, S)

**CHEM 107 04(4-0-0).** Fundamentals of Chemistry. (GT-SC2, AUCC 3A). F, S, SS. Prerequisite: (MATH 117 or placement out of MATH 117) or MATH 141 or MATH 155 or MATH 160 or MATH 161 or MATH 229 or MATH 261 or concurrent registration in MATH 141 or MATH 155 or MATH 160 or MATH 161 or MATH 229 or MATH 261. For students in science-related programs requiring one semester of general chemistry. Quantitative reasoning but with less focus on mathematical calculations than CHEM 111/CHEM 113. Credit allowed for only one of the following: CHEM 107, CHEM 111, and CHEM 117. Atomic/molecular theory, gases, liquids, solids, solutions, acid/base equilibria, kinetics, selected topics.

**CHEM 108 01(0-2-0).** Fundamentals of Chemistry Laboratory. (GT-SC2, AUCC 3A). F, S, SS. Prerequisite: CHEM 107 or concurrent registration. Credit not allowed for both CHEM 108 and CHEM 112. Laboratory applications of principles presented in CHEM 107. ($)

**CHEM 111 04(3-1-0).** General Chemistry I. (GT-SC1, AUCC 3A). F, S, SS. Prerequisite: (MATH 118 or placement out of MATH 118) or MATH 141 or MATH 155 or MATH 160 or MATH 161 or MATH 229 or MATH 261. Intended for science majors. Students should complete the sequence: CHEM 111, CHEM 112, CHEM 113 and CHEM 114. Credit allowed for only one of the following: CHEM 107, CHEM 111, or CHEM 112. Fundamental aspects of chemistry and chemical principles; emphasis on structure, bonding, and stoichiometry.

**CHEM 112 01(0-3-0).** General Chemistry Laboratory I. (GT-SC1, AUCC 3A). F, S, SS. Prerequisite: CHEM 111 or concurrent registration or CHEM 117 or concurrent registration. Credit not allowed for both CHEM 112 and CHEM 108. Laboratory applications of principles covered in CHEM 111. ($)

**CHEM 113 03(3-0-0).** General Chemistry II. F, S, SS. Prerequisite: CHEM 107 or CHEM 111 or CHEM 117; (MATH 124 or placement out of MATH 124) or MATH 141 or MATH 155 or MATH 160 or MATH 161 or MATH 229 or MATH 261 or concurrent registration in MATH 141 or MATH 155 or MATH 160 or MATH 161 or MATH 229 or MATH 261. Acid/base equilibria, kinetics, thermodynamics, solubility, oxidation-reduction reactions, electrochemistry, selected topics.

**CHEM 114 01(0-3-0).** General Chemistry Laboratory II. F, S, SS. Prerequisite: CHEM 112; CHEM 113 or concurrent registration. Laboratory applications of principles covered in CHEM 113. ($)

**CHEM 115 01(0-0-1).** General Chemistry II Recitation. S. Prerequisite: Concurrent registration in CHEM 113. Problem solving applied to topics in e.g., acid/base equilibria, kinetics, thermodynamics, solubility, oxidation-reduction reactions, electrochemistry.

**CHEM 117 03(3-0-0).** General Chemistry I for Chemistry Majors. F. Prerequisite: Concurrent registration in CHEM 192; (MATH 118 or placement out of MATH 118) or MATH 141 or MATH 155 or MATH 160 or MATH 161 or CHEM 229 or MATH 261. Credit allowed for only one of the following: CHEM 107, CHEM 111, or CHEM 117. Fundamental aspects of chemistry and chemical principles with an emphasis placed on atomic and molecular structure, bonding, and stoichiometry.

**CHEM 192 01(0-0-1).** Introductory Seminar in Chemistry. F. Prerequisite: Concurrent registration in CHEM 117. Small group discussions of aspects of chemistry.

**CHEM 245 04(4-0-0).** Fundamentals of Organic Chemistry. F, S, SS. Prerequisite: CHEM 107 or CHEM 113. Credit allowed for only one of the following: CHEM 245, CHEM 341, and CHEM 345. Intended for students in science-related programs requiring one semester of organic chemistry. Nomenclature, structure, bonding, reactions, mechanisms, synthesis, stereochemistry of organic compounds.

**CHEM 246 01(0-3-0).** Fundamentals of Organic Chemistry Laboratory. F, S. Prerequisite: CHEM 108 or CHEM 112 or CHEM 114; CHEM 245 or concurrent registration. Credit not allowed for students who have already taken CHEM 344. Laboratory applications of principles presented in CHEM 245. ($)

**CHEM 261 03(3-0-0).** Fundamentals of Inorganic Chemistry. S. Prerequisite: CHEM 113 or concurrent registration. Preparation, structures, properties, and reactions of chemical elements and inorganic compounds; periodic trends, organizing principles; applications.

**CHEM 301 03(1-4-0).** Advanced Scientific Writing—Chemistry. (AUCC 2B). S. Prerequisite: CO 150; CHEM 334 or CHEM 345 or a 300-level science laboratory course with written approval of instructor. Advanced scientific writing using the read-analyze-write approach and scientific poster preparation and presentation.

*CHEM 311 03(3-0-0). Introduction to Nanoscale Science. S. Prerequisite: CHEM 113; CHEM 343 or CHEM 346. Synthesis, characterization, and applications of nanoscale materials.

**CHEM 320 03(3-0-0).** Chemistry of Addictions. S. Prerequisite: CHEM 103 or CHEM 107 or CHEM 111. Chemical processes of addiction; receptor binding, molecular deactivation, and feedback in the context of protein-substrate molecular interactions.

**CHEM 334 01(0-3-0).** Quantitative Analysis Laboratory. F, S. Prerequisite: CHEM 114; CHEM 335 or concurrent registration. Credit not allowed for both CHEM 334 and CHEM 332. Laboratory applications of principles presented in CHEM 335. ($)

**CHEM 335 03(3-0-0).** Introduction to Analytical Chemistry. F, S. Prerequisite: CHEM 113 with a C or better; CHEM 334 or concurrent registration. Credit not allowed for both CHEM 335 and CHEM 331. Modern and classical applications and methods in analytical chemistry including statistical, kinetic, spectroscopic, and chromatographic analysis.

**CHEM 341 03(3-0-0).** Modern Organic Chemistry I. F, S, SS. Prerequisite: CHEM 113. Credit allowed for only one of the following: CHEM 245, CHEM 341, and CHEM 345. Structures, nomenclature, dynamics, spectroscopy, and reactions of organic molecules.

**CHEM 343 03(3-0-0).** Modern Organic Chemistry II. F, S, SS. Prerequisite: CHEM 245 or CHEM 341 or CHEM 345. Credit not allowed for both CHEM 343 and CHEM 346. Continued studies of reactions and mechanisms of organic molecules and biological chemistry.

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CHEM 344 02(0-6-0). Modern Organic Chemistry Laboratory. F, S, SS. Prerequisite: CHEM 113; CHEM 114. Intended for science majors. Credit not allowed for both CHEM 344 and CHEM 246.

Laboratory applications of modern organic chemistry. ($)

CHEM 345 04(3-3-0). Organic Chemistry I. F, S. Prerequisite: CHEM 113; CHEM 114. Intended for science majors. Students should plan to complete the sequence CHEM 345, CHEM 346. Credit allowed for only one of the following: CHEM 245, CHEM 341, and CHEM 345.

Structure, nomenclature, dynamics, spectroscopy, reactions of organic molecules. Laboratory applications of principles presented in lecture. ($)

CHEM 346 04(3-3-0). Organic Chemistry II. F, S. Prerequisite: CHEM 345. Credit not allowed for both CHEM 343 and CHEM 346. Intended for science majors. Students should plan to complete the sequence CHEM 345, CHEM 346.

Continue studies of reactions and mechanisms of organic molecules. Laboratory applications of principles presented in lecture. ($)

CHEM 384 Var[1-3]. Supervised College Teaching. Prerequisite: Twenty credits in chemistry; written consent of department head. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements. Maximum of 12 credits for any combination of CHEM 384, CHEM 487, CHEM 495, CHEM 498.

CHEM 386 04(3-3-0). Instrumental Analysis. F. Prerequisite: CHEM 334; CBE 310 or concurrent registration or CHEM 474 or concurrent registration. Instrumental methods of chemical analysis. ($)

*CHEM 433 03(2-3-0). Clinical Chemistry. S. Prerequisite: CHEM 334; BC 351 or BC 401. Principles and methodology of clinical chemistry. Laboratory experience in methodology and method development. ($)

CHEM 440 02(0-6-0). Advanced Organic Chemistry Laboratory. F. Prerequisite: CHEM 344 or CHEM 346.

Advanced techniques in organic synthesis, mechanisms of reactions, structure determination. ($)

CHEM 461 03(3-0-0). Inorganic Chemistry. S. Prerequisite: CHEM 261; CHEM 472 or CHEM 474.

Concepts, models to explain structural, spectroscopic, magnetic, thermodynamic, and kinetic properties of inorganic compounds; symmetry, group theory.

CHEM 462 02(0-6-0). Inorganic Chemistry Laboratory. S. Prerequisite: CHEM 461 or concurrent registration.

Synthetic techniques and instrumental methods in inorganic chemistry. ($)

CHEM 4704(4-0-0). Foundations of Physical Chemistry. S. Prerequisite: CHEM 113; MATH 161 or MATH 255; PH 122 or PH 142.

Quantum chemistry; molecular structure and spectroscopy; equilibrium thermodynamics; kinetics.

CHEM 474 03(3-0-0). Physical Chemistry I. F. Prerequisite: CHEM 113; MATH 261; PH 142; concurrent registration in CHEM 475. Credit allowed for only one of the following: CHEM 471, CHEM 472, or CHEM 474.

Quantum chemistry; applications to bonding, molecular structure, and spectroscopy.

CHEM 475 01(0-3-0). Physical Chemistry Laboratory I. F, S. Prerequisite: CBE 310 or concurrent registration or CHEM 473 or concurrent registration or CHEM 474 or concurrent registration. Physicochemical experiments; emphasis on quantum mechanics/spectroscopy; interpretation/presentation of data; formal lab reports. ($)

CHEM 476 03(3-0-0). Physical Chemistry II. S. Prerequisite: CHEM 474.

Statistical thermodynamics; applications to phase and chemical equilibria; kinetics.

CHEM 477 01(0-3-0). Physical Chemistry Laboratory II. S. Prerequisite: CHEM 475.

Physicochemical experiments; emphasis on thermodynamics/statistical mechanics/kinetics; interpretation/presentation of data; formal lab reports. ($)

CHEM 487 Var. Internship. Prerequisite: CHEM 476. Maximum of 12 credits allowed for any combination of CHEM 384, CHEM 487, CHEM 495, CHEM 498.

Supervised work experience in approved off-campus chemical laboratory setting. Consultation with faculty adviser/instructor.

CHEM 493 02(0-0-2). Seminar. S. Prerequisite: CHEM 474.

Critical analyses of selected literature; develop presentation of technical topic; required oral presentation.

CHEM 495 Var[1-3]. Independent Study. Prerequisite: Nine credits in chemistry; written consent of laboratory mentor and department chair. Maximum of 12 credits for any combination of CHEM 384, CHEM 487, CHEM 495, CHEM 498.

Satisfactory completion of course requires a written report, an oral presentation at a research group meeting, or a poster presentation.

CHEM 498 Var[1-3]. Research. Prerequisite: Twenty credits in chemistry; written consent of research mentor and department chair. Maximum of 12 credits for any combination of CHEM 384, CHEM 487, CHEM 495, CHEM 498.

Supervised laboratory research in chemistry; written report consistent with ACS guidelines required.

CHEM 511 03(3-0-0). Solid State Chemistry. F. Prerequisite: CHEM 461; CHEM 476.

Physical and descriptive chemistry of solids including characterization and synthetic methods.

*CHEM 515 03(3-0-0). Polymer Chemistry. F. Prerequisite: CHEM 436; CHEM 476.

Fundamentals of polymer chemistry: synthesis, characterization, physical properties.

*CHEM 517 03(3-0-0). Chemistry of Electronic Materials. F. Prerequisite: CHEM 571 or concurrent registration.


CHEM 521/BC 521 03(3-0-0). Principles of Chemical Biology. F. Prerequisite: CHEM 245 or CHEM 343 or CHEM 346. Credit not allowed for both CHEM 521 and BC 521.

Principles of chemical biology. Chemical methods for understanding and controlling the structure and function of biopolymers.

CHEM 530A-F 01(1-0-0). Advanced Topics in Chemical Analysis. F. Prerequisite: CHEM 431 or concurrent registration.


CHEM 532 03(3-0-0). Advanced Chemical Analysis II. S. Prerequisite: CHEM 431.

Advanced optics; instrumentation and methodology for analytical spectroscopy; computer applications.

*CHEM 533 03(3-0-0). Chemical Separations. F, S. Prerequisite: CHEM 335; CHEM 431.

Fundamentals and applications of chemical separations.

*CHEM 537 03(3-0-0). Electrochemical Methods. S. Prerequisite: CHEM 431.

Theory and methods of electrochemistry; applications of modern electrochemical techniques.

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CHEM 539A-C 01(1-0-0). Principles of NMR and MRI. S. Prerequisite: CHEM 474.

Modern experimental methods in inorganic chemistry. A) Basic NMR principles. B) NMR diffusion measurements-2D NMR and MRI. C) Advanced NMR and MRI techniques.

CHEM 541 03(3-0-0). Organic Spectroscopy. SS. Prerequisite: CHEM 440.

Organic structure determination by spectroscopic methods.

CHEM 543 03(3-0-0). Structure/Mechanisms in Organic Chemistry. F. Prerequisite: CHEM 346.

Structure including stereochemistry and conformational isomerism; reactivity and mechanisms in organic chemistry.

CHEM 545 03(3-0-0). Synthetic Organic Chemistry I. S. Prerequisite: CHEM 543.

Reactions and synthesis in organic chemistry.

CHEM 547 03(3-0-0). Physical Organic Chemistry. S. Prerequisite: CHEM 543.

Mechanisms, theory, kinetics, and thermodynamics.

CHEM 549 03(3-0-0). Synthetic Organic Chemistry II. F. Prerequisite: CHEM 545.

Modern synthetic methods. Strategies for total synthesis of natural products.

CHEM 550A 01(1-0-0). Materials Chemistry—Hard Materials. F. Prerequisite: CHEM 343 or CHEM 346; CHEM 461; CHEM 476.

Structure and bonding; crystallography; properties; synthesis; characterization of metals, semiconductors, and network solids.

CHEM 550B 01(1-0-0). Materials Chemistry—Soft Materials. F. Prerequisite: CHEM 343 or CHEM 346; CHEM 461; CHEM 476.

Structure and bonding, mechanisms, properties, applications, synthesis, characterization of polymers, complex fluids, and biomaterials.

CHEM 550C 01(1-0-0). Materials Chemistry—Nanomaterials. F. Prerequisite: CHEM 343 or CHEM 346; CHEM 461; CHEM 476.

Structure and bonding, synthesis, properties, characterization of carbon nanotubes, metal and semiconductor nanocrystals, and nanocomposites.

CHEM 551 03(3-0-0). Organometallic Chemistry. F, S. Prerequisite: CHEM 346.

Descriptive and mechanistic organometallic chemistry applied to homogeneous catalysis and organic synthesis.

CHEM 555 03(3-0-0). Chemistry of Sustainability. F. Prerequisite: BC 411 or CBE 310 or CHEM 476; CHEM 343 or CHEM 346.

The central role of chemistry for achieving sustainability in key areas including chemicals and materials, energy, and environment.

CHEM 560 01(1-0-0). Foundations of Inorganic Synthesis. F. Prerequisite: CHEM 461.

Preparation for advanced studies in metal-mediated chemistry; essential aspects of inorganic structure, thermodynamics and reactivity.

CHEM 561 02(2-0-0). Inorganic Synthesis. F. Prerequisite: CHEM 560.

Chemistry of compounds of representative elements and transition metals.

CHEM 563A-F 01(1-0-0) Physical Methods in Inorganic Chemistry. F, S. Prerequisite: CHEM 461.


*CHEM 565 03(3-0-0). Inorganic Mechanisms. F. Prerequisite: CHEM 476.

Fundamental tools, key principles, selected classic case histories of inorganic and organometallic mechanistic chemistry, emphasizing kinetic methods.

*CHEM 566 03(3-0-0). Bioinorganic Chemistry. S. Prerequisite: CHEM 461.

Biological-inorganic chemistry, including key principles, prototype systems, classic papers, and problems.

CHEM 567 01(1-0-0). Crystallographic Computation. F, S. SS. Prerequisite: CHEM 474.

Theory and practice of structural computations using single crystal X-ray diffraction data.

*CHEM 569 03(3-0-0). Chemical Crystallography. S. Prerequisite: CHEM 474.

Theory and practice of determination of crystal and molecular structure by single crystal X-ray and neutron diffraction.

*CHEM 570 03(3-0-0). Chemical Bonding. F. Prerequisite: CHEM 474 or CBE 310.

Electronic structure methods; chemical bonding models; intermolecular interactions.

*CHEM 571 03(3-0-0). Quantum Chemistry. F. Prerequisite: CHEM 474 or CBE 310.

Simple systems, symmetry; approximate methods; time dependent methods; molecular structures.

*CHEM 575 03(3-0-0). Chemical Thermodynamics. F. Prerequisite: CHEM 476 or CBE 310.

Thermodynamic concepts and their applications to chemical problems.

*CHEM 576 03(3-0-0). Statistical Mechanics. S. Prerequisite: CHEM 476 or CBE 310.

Principles of statistical mechanics with application in the chemical sciences.

*CHEM 577 03(3-0-0). Surface Chemistry. S. Prerequisite: CHEM 476 or CBE 310.

Capillarity; interfacial thermodynamics, electrical aspects of surface chemistry, adsorbed layers.

*CHEM 579 03(3-0-0). Chemical Kinetics. F. Prerequisite: CHEM 476 CBE 310.

Elementary reactions, unimolecular reactions, reactions in solution, gas phase ion chemistry, photochemistry, and kinetic modeling.

*CHEM 601 01(1-0-0). Responsible Conduct in Chemistry Research. S. Prerequisite: None.

Appropriate conduct in research, publishing, intellectual property decisions, job hunting, and negotiating; social responsibilities of scientists.

CHEM 641 02(2-0-0). Organic Reaction Mechanisms. S. Prerequisite: CHEM 545.

Organic reaction mechanisms, including using arrows to show electron movement; heterolytic, radical, and pericyclic reactions.

CHEM 651A-D Var[1-4]. Special Topics in Chemistry. F, S. Prerequisite: Written consent of instructor.


CHEM 695 Var[1-3]. Independent Study.

CHEM 698 Var[1-9]. Research. F, S, SS. Prerequisite: Graduate standing in chemistry.

Graduate research in chemistry for students who do not plan to write an M.S. thesis.


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CHEM 702 01(0-0-1). Independent Research Proposal. F, S.
Prerequisite: Admission to Ph.D. candidacy.
Preparation, submission, and defense of an independent research proposal; creative and original thinking about research problems in modern chemistry.

CHEM 751 01(1-0-0). Methods of Chemistry Laboratory Instruction. F. Prerequisite: None.
Basic materials, methods, and skill development related to teaching undergraduate chemistry laboratory courses.

CHEM 752 01(0-0-1). Advanced Methods of Chemistry Instruction. S. Prerequisite: CHEM 751.
Advanced materials, methods, and presentation skills development related to teaching undergraduate chemistry courses.

*CHEM 773 03(3-0-0). Atomic and Molecular Spectroscopy. S. Prerequisite: CHEM 571.
Time-dependent methods; multiphoton and nonlinear spectroscopy; fundamentals of rotational, vibrational, electronic and magnetic resonance spectroscopy.

CHEM 784 Var[1-2]. Supervised College Teaching.

CHEM 793 01(0-0-1). Seminar.

CHEM 795A-D Var[1-5]. Independent Study.


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CIS 120 03(3-0-0). Business Programming Fundamentals.  F, S. Prerequisite: None. Credit not allowed for both CIS 120 and CIS 210.

File and operating systems for business application development. Business program development using a high-level programming language.

CIS 200 03(3-0-0). Business Information Systems.  F, S, SS. Prerequisite: BUS 150 or CS 110.

Use of information technology (IT) to enable knowledgeable workers, support business processes, and grow the business.

CIS 210 03(3-0-0). Information Technology in Business.  F, S, SS. Prerequisite: CIS 200 or concurrent registration. Credit not allowed for both CIS 210 and CIS 120.

Introduction to information systems: the IS profession; hardware, software, and programming; web and database applications; data analysis tools.

CIS 220 03(3-0-0). Object-Oriented Information Design.  F, S, SS. Prerequisite: CIS 120. Credit not allowed for both CIS 220 and CIS 340.

Object-oriented information design and programming; design and manipulation of data structures.


Software engineering methods including design, implementation, and testing using structured and event-driven techniques, logic, and data structures. (NT-O)

CIS 301 03(3-0-0). End User Computing.  F, S, SS. Prerequisite: None.

End user applications in a Graphical User Interface environment including spreadsheet, word processing, and presentation graphics; Internet concepts. (NT-O)

CIS 320 03(3-0-0). Project Management for Information Systems.  F, S. Prerequisite: CIS 120 or CIS 210.

Project management concepts including work breakdown structure, estimating, scheduling, tools, and reports.

CIS 340 03(3-0-0). Advanced Application Design and Development.  F, S. Prerequisite: CIS 240. Credit not allowed for both CIS 340 and CIS 220.

Design and construction of business applications using object-orientation and advanced data structures.

CIS 350 03(3-0-0). Operating Systems and Networks.  F, S. Prerequisite: CIS 210.

Multituser and network operating systems; basic networking concepts including security, transmission, performance, and topologies.

CIS 355 03(3-0-0). Business Database Systems.  F, S. Prerequisite: CIS 120 or CIS 210.

Physical and logical design, implementation, and administration of databases. (NT-O)

CIS 360 03(3-0-0). Systems Analysis and Design.  F, S. Prerequisite: CIS 240.

Traditional and cutting-edge systems analysis and design techniques, with emphasis on object-oriented approaches.

CIS 370 03(3-0-0). Business Intelligence. SS. Prerequisite: CIS 200; MKT 300.

Techniques and technologies for deriving business value from the integration, analysis, mining, and transformation of data.

CIS 400 03(3-0-0). Information Management in the Enterprise.  F, S. Prerequisite: Any two of FIN 300, MGT 301, MGT 320, MKT 300.

Role of information in business functional areas; value of information in business; risks and rewards of enterprise information.

CIS 410 03(3-0-0). Web Application Development.  F. Prerequisite: CIS 240; CIS 355.

Web development techniques and strategies including Active Server Pages using VBScript, JavaScript, ColdFusion; security, web design.

CIS 411 03(3-0-0). Enterprise Resource Planning Systems.  S. Prerequisite: ACT 220; FIN 300 or FIN 305; MGT 305 or MGT 320; MKT 300 or MKT 305.

Introduction to enterprise resource planning (ERP) systems concepts, business processes impacted by ERP, systems and software integration.

CIS 412 03(3-0-0). Issues and Cases in Electronic Commerce.  S. Prerequisite: CIS 355.

Business models for B2B or B2C e-commerce, technology infrastructure, electronic payment mechanisms, information privacy.

CIS 413 03(3-0-0). Advanced Networking and Security.  F. Prerequisite: CIS 240; CIS 350.

Modern communication standards, protocol systems; network security, security policies, attack and protection mechanisms, legal and ethical issues.

CIS 455 03(3-0-0). Advanced Database Management.  S. Prerequisite: CIS 355.

Advanced data management topics including performance tuning, concurrency control, security, object-oriented databases, and data warehousing.

CIS 460 03(3-0-0). Object-Oriented Systems.  F. Prerequisite: CIS 355; CIS 360.

Object-oriented concepts, development methodologies, techniques, and languages.

CIS 462 03(3-0-0). Systems Development Project.  F, S. Prerequisite: CIS 320; CIS 360.

Application of concepts, techniques, and tools used in analysis, design, and implementation of computer-based information systems in applied setting.

CIS 487 03(0-9-0). Internship.

Supervised and planned work experience paralleling concentration in industry.

CIS 492 03(3-0-0). Seminar. Prerequisite: CIS 460.

Current topics in computer-based information systems.

CIS 495 Var. Independent Study.

CIS 496B-E Var. Group Study.


CIS 498 Var[1-3]. Research.

CIS 570 03(3-0-0). Business Intelligence.  F, S, SS. Prerequisite: Admission to the M.B.A., M.C.I.S., M.S.B.A., or M.E. program.

Harnessing vast data stores to solve problems, enhance decision-making, discover new business opportunities, and to derive additional benefits. (NT-O)

CIS 575 03(3-0-0). Applied Data Mining and Analytics in Business.  F, S, SS. Prerequisite: STAT 204.

Data mining is a process of selecting, exploring and modeling large amounts of data to identify patterns and relationships among key variables. (NT-O)

Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCCsubcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
CIS 600 03(3-0-0). Information Technology and Project Management. F, SS. Prerequisite: Admission to the M.B.A., M.C.I.S., M.S.B.A., or M.E. program
Strategic role and management of information technology and software development projects. (NT-O/T/V)

CIS 601/MGT 601 03(3-0-0). Enterprise Computing and Systems Integration. F. Prerequisite: Admission to the M.B.A., M.C.I.S., M.S.B.A., or M.E. program. Credit not allowed for both CIS 601 and MGT 601.
Integrated extended enterprise planning and execution systems concepts including ERP, CRM, SCM, MRPII, business processes, front/back office systems. (NT-O)

CIS 605 03(3-0-0). Business Visual Application Development. F. Prerequisite: Admission to the M.B.A., M.C.I.S., M.S.B.A. or M.E. program
Design, construction, and testing of business application systems including leading-edge visual, E-commerce languages and tools. (NT-O)

CIS 606 03(3-0-0). Application Software Infrastructure. F. Prerequisite: Admission to the M.B.A., M.C.I.S., M.S.B.A., or M.E. program
Design, construction, and testing of business application software infrastructure including hardware, operating software, and communications network. (NT-O)

CIS 610 03(3-0-0). Software Development Methodology. F. Prerequisite: Admission to the M.B.A., M.C.I.S., M.S.B.A., or M.E. program
Methods for all phases of software development focusing upon the establishment of economical software that is reliable and cross platform. (NT-O/T/V)

CIS 611 03(3-0-0). Object-Oriented Systems. S. Prerequisite: CIS 610; Admission to the M.B.A., M.C.I.S., M.S.B.A., or M.E. program.
Object-oriented and web-based software; object model describing classes; relationships to other objects, attributes, and operations. (NT-O)

CIS 620 03(3-0-0). IT Communications Infrastructure. S. Prerequisite: Admission to the M.B.A., M.C.I.S., M.S.B.A., or M.E. program.
Technical aspects of information communications, business considerations; wireless technology, architecture, and applications. (NT-O)

CIS 655 03(3-0-0). Business Database Systems. S. Prerequisite: Admission to the M.B.A., M.C.I.S., M.S.B.A., or M.E. program.
Database analysis, design, administration; data modeling; data sublanguages, query facilities; distributed database systems. (NT-O)

CIS 665 03(3-0-0). E-Business Application Technologies. S. Prerequisite: CIS 605; CIS 606; CIS 610; admission to the M.B.A., M.C.I.S., M.S.B.A., or M.E. program.
Developing E-business (B2B and B2C) through construction and deployment. (NT-O)

CIS 670 03(3-0-0). Advanced IT Project Management. F, S, SS. Prerequisite: CIS 600.
Advanced tools, techniques and skills for advanced risk management, change movement, and performance/control measures in cross-functional projects. (NT-O)

CIS 695 Var. Independent Study.
CIS 696 Var. Group Study.

*Alternate year offering (odd); °Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCCsubcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
CIVIL ENGINEERING COURSES
Department of Civil and Environmental Engineering
College of Engineering

CIVE 102 03(2-3-0). Introduction: Civil/Environmental Engineering. F. Prerequisite: None.
   Civil engineering profession, computer applications and programming related to civil engineering; introduction to surveying.

CIVE 103 03(2-2-0). Engineering Graphics and Computing. S. Prerequisite: CIVE 102 or ENGR 101.
   Introduction to the profession and academia; principles of civil engineering design; graphical, oral, and written communication; team projects. ($)

CIVE 202 03(2-2-0). Numerical Modeling and Risk Analysis. F. Prerequisite: CIVE 103; MATH 160 or concurrent registration.
   Civil engineering systems, simulation and optimization techniques, statistical tools and their use in civil engineering, risk analysis.

CIVE 203 03(2-2-0). Engineering Systems and Decision Analysis. S. Prerequisite: CIVE 202.
   Civil engineering infrastructure systems, numerical and decision analysis techniques, applications of risk analysis.

CIVE 260 03(3-0-0). Engineering Mechanics-Statics. F, S, SS. Prerequisite: MATH 160; PH 141 or concurrent registration.
   Forces using vector notation; static equilibrium of rigid bodies; friction, virtual work, centroids, and moments of inertia. (NT-O)

   Kinematics and kinetics of particles and rigid bodies; concepts of work-energy and impulse-momentum; computer applications; vector notation. (NT-O)

CIVE 300 03(3-0-0). Fluid Mechanics. F, S. Prerequisite: CIVE 261; MATH 340 or concurrent registration; MECH 237 or concurrent registration or MECH 337 or concurrent registration.
   Fluid properties; statics, kinematics, and dynamics of fluid motion including viscous and gravitational effects. (NT-O)

CIVE 301 01(0-3-0). Fluid Mechanics Laboratory. F, S. Prerequisite: CIVE 300 or concurrent registration.
   Fluid properties; statics, kinematics, and dynamics of fluid motion including viscous and gravitational effects.

CIVE 302 03(2-3-0). Evaluation of Civil Engineering Materials. F. Prerequisite: CHEM 111; CIVE 360.
   Behavior and properties of construction materials, instrumentation, use of statistical tools, material standards, material selection, quality control. ($)

CIVE 303 03(3-0-0). Infrastructure and Transportation Systems. S. Prerequisite: CIVE 260.
   Principles of infrastructure systems, transportation systems, applications of spatial data and GIS, project management and engineering economy.

CIVE 305 03(2-2-0). Intermediate AutoCAD. F. Prerequisite: CIVE 103.
   Creating layouts and templates, objects, graphic patterns and symbols, inserting and managing external references, and creating isometric drawings.

CIVE 322 03(3-0-0). Basic Hydrology. F, S. Prerequisite: CBE 331 or CIVE 300 or WR 416; CIVE 202 or STAT 301 or STAT 315. Credit not allowed for both CIVE 322 and ENVE 322.
   Hydrologic cycle, soil moisture, groundwater, runoff processes, applications in water resources and environmental engineering. (NT-O)

CIVE 330 03(3-0-0). Ecological Engineering. S. Prerequisite: (BZ 110; BZ 111) or BZ 120 or LIFE 102; CHEM 113; CIVE 300 or LIFE 320.
   Principles of ecological engineering and design of sustainable ecosystems.

CIVE 355 03(3-0-0). Introduction to Geotechnical Engineering. F, S. Prerequisite: CIVE 360.
   Soil behavior, stress-strain and strength properties, application to earth pressure, slope and foundation problems.

CIVE 356 01(0-3-0). Geotechnical Engineering Laboratory. F, S. Prerequisite: CIVE 355 or concurrent registration.
   Laboratory to demonstrate standard methods of soils testing, methods of data collection, analysis of results. ($)

CIVE 360 03(3-0-0). Mechanics of Solids. F, S. Prerequisite: CIVE 260 or MECH 262.
   Stresses and deformations in structural members and machine elements, combined stresses, stress transformation.

CIVE 363 01(0-3-0). Material Properties. F, S. Prerequisite: CIVE 360.
   Mechanical properties of metals, woods, and plastics; testing techniques and standards.

CIVE 367 03(3-0-0). Structural Analysis. F, S. Prerequisite: CIVE 360.
   Determination of actions in and deformations of determinate and indeterminate structures.

CIVE 390 Var[1-3]. Civil Engineering Student Projects Workshop. F, S. Prerequisite: None.

CIVE 401 03(3-0-0). Hydraulic Engineering. S. Prerequisite: CIVE 300.
   Basic principles of fluid mechanics applied to practical problems in hydraulic engineering.

CIVE 402 03(2-2-0). Senior Design Principles. F. Prerequisite: CIVE 300; CIVE 303 or CHEM 245.
   Design of civil engineering systems, nontechnical and economic design considerations, project organization, design project development and presentation.

CIVE 403 03(2-2-0). Senior Project Design. S. Prerequisite: CIVE 402.
   Design of civil engineering systems, nontechnical and economic design considerations; project organization, design project development and presentation.

CIVE 413 03(3-0-0). Environmental River Mechanics. F. Prerequisite: CIVE 300 or WR 416.
   Fluvial geomorphology, river hydraulics, sediment transport, and river response with special emphasis on environmental aspects. (NT-O/V)

CIVE 423 03(2-0-0). Groundwater Engineering. S. Prerequisite: CBE 331 or CIVE 300 or WR 416.
   Development of groundwater resources; origin, movement, distribution of water below ground surface.

CIVE 425 03(2-3-0). Soil and Water Engineering. S. Prerequisite: CBE 331 or CIVE 300 or SOCR 240.
   Control of the soil-water-plant medium for optimum plant growth and environmental protection.

CIVE 437 03(3-0-0). Wastewater Treatment Facility Design. S. Prerequisite: CIVE 300; CIVE 438/ENVE 438 or concurrent registration. Credit not allowed for both CIVE 437 and ENVE 437.
   Design concepts and principles for wastewater treatment systems and unit processes, principles of treatment plant operation.

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CIVE 438 03(3-0-0). Environmental Engineering Concepts. F. S. Prerequisite: CBE 331 or CIVE 300 or MECH 342; CHEM 113. Credit not allowed for both CIVE 438 and ENVE 438.
Environmental engineering approaches to designing water supply, wastewater removal, and pollution control systems.

CIVE 439/CBE 439 03(2-3-0). Environmental Engineering Chemical Concepts. F. Prerequisite: CHEM 113; MATH 340. Credit not allowed for both CIVE 439 and CBE 439.
Application of chemical principles to environmental engineering problems.

CIVE 440 03(3-0-0). Nonpoint Source Pollution. F. Prerequisite: CIVE 300 or CIVE 322/ENVE 322 or SOCR 240 or WR 416.
Principles, processes, impacts, and control of nonpoint source pollution of surface and groundwater. (NT-O)

CIVE 441 03(2-3-0). Water Quality Analysis and Treatment. S. Prerequisite: CIVE 438/ENVE 438 or concurrent registration or CIVE 440 or concurrent registration. Credit not allowed for both CIVE 441 and ENVE 441.
Physical, chemical and biological methods for the characterization of waters and wastewaters. ($)

CIVE 455 03(3-0-0). Applications in Geotechnical Engineering. S. Prerequisite: CIVE 355.
Geotechnical engineering applications of earth retaining structures, foundations, dams and embankments, geosynthetics, waste containment systems.

CIVE 466 03(3-0-0). Design and Behavior of Steel Structures. S. Prerequisite: CIVE 367.
Loads acting on a structure; behavior and design of steel members, connections, and systems.

CIVE 467 03(3-0-0). Design of Reinforced Concrete Structures. F. Prerequisite: CIVE 367.
Design and behavior of reinforced concrete structural members.

CIVE 495 Var[1-3]. Independent Study.

CIVE 496 Var. Group Study.

CIVE 502 03(3-0-0). Fluid Mechanics. F. Prerequisite: CIVE 300.
Fundamental physical concepts of fluid mechanics; ideal and viscous fluid flows; boundary-layer concepts. (NT-V)

CIVE 504 03(3-0-0). Wind Engineering. F. Prerequisite: CIVE 300.
Influence of wind on humanity. Applications to structures, air pollution, wind energy, agricultural aerodynamics, snow movement, human comfort. (NT-O)

CIVE 506 03(3-0-0). Wind Effects on Structures. S. Prerequisite: CIVE 504.
Analysis of wind effects on buildings and structures; deterministic and probabilistic methods; aerodynamic loading and response; codes and standards.

CIVE 507 03(3-0-0). Transportation Engineering. F. Prerequisite: CIVE 261; CIVE 305; CIVE 367. Credit not allowed for both CIVE 478 and CIVE 507.
Principles of highway engineering, transportation engineering, and bridge engineering with a focus on design.

CIVE 510 03(3-0-0). Applied Hydraulic System Design. F. Prerequisite: CIVE 401.
Operational management systems, data collection, real-time control, management modeling, rehabilitation and retrofit, maintenance.

CIVE 512 03(3-0-0). Irrigation Systems Design. F. Prerequisite: CIVE 322/ENVE 322 or CIVE 425.
Irrigation systems principles and design procedures for operation of sprinkler, trickle, and surface irrigation systems. (NT-O)

CIVE 514 03(3-0-0). Hydraulic Structures/Systems. F. Prerequisite: CIVE 401.
Analysis and design of hydraulic structures which make up components of water resource systems.

CIVE 516 03(3-0-0). Water Control and Measurement. S. Prerequisite: None.
Flow regulation and measurement in gravity flow irrigation systems for efficient and equitable water distribution among users. (NT-O)

CIVE 518 03(3-0-0). Sprinkler and Trickle Irrigation Systems. S. Prerequisite: CIVE 300; CIVE 425.
Basic principles, design, and evaluation of pressurized irrigation systems.

CIVE 519 03(3-0-0). Irrigation Water Management. F. Prerequisite: CIVE 425.
Apply soil, plant, water, and atmospheric engineering principles to determine crop water need to sustain agricultural production and the environment. (NT-O)

CIVE 520 03(3-0-0). Physical Hydrology. F. Prerequisite: CIVE 322/ENVE 322.
Hydrologic, atmospheric processes in the water cycle; linear systems, hydrologic response; geomorphologic description of hydrologic processes, response. (NT-O)

*CIVE 521 03(2-3-0). Hydrometry. F. Prerequisite: CIVE 322/ENVE 322.
Principles, methods, instruments, and equipment for measuring water quantity and water quality variables in nature. ($)

CIVE 522 03(3-0-0). Engineering Hydrology. S. Prerequisite: CIVE 520.
Hydrologic design under uncertainty; conventional and remote sensing; design flows and storms; river routing; reservoir design; watershed models. (NT-O/V)

*CIVE 524/WR 524 03(2-2-0). Modeling Watershed Hydrology. S. Prerequisite: CIVE 322/ENVE 322 or WR 416; CIVE 202 or STAT 301 or STAT 315. Credit not allowed for both CIVE 524 and WR 524.
Development and application of watershed models: structure, calibration, evaluation, sensitivity analysis, simulation.

*CIVE 525 03(3-0-0). Water Engineering: International Development. F. Prerequisite: CIVE 401 or CIVE 425 or CIVE 438/ENVE 438.
Planning and design of small-scale and low-cost drinking water, wastewater, and irrigation systems for rural communities in developing countries. (NT-O)

CIVE 531 03(3-0-0). Groundwater Hydrology. F. Prerequisite: CBE 331 or CIVE 300 or MECH 342.
Groundwater occurrence, distribution, movement, exploration and recharge, well hydraulics and design, interaction of ground and surface water.

CIVE 532 03(3-0-0). Wells and Pumps. S. Prerequisite: CIVE 423; CIVE 531 or GEOL 452; CHEM 111.
Well field hydraulics, well drilling methods, well design, aquifer test methods, pumping systems, well maintenance, storage/distribution systems.

CIVE 533/BIOM 533. 03(2-3-0). Biomolecular Tools for Engineers. F. Prerequisite: BMS 300 or MIP 300. Credit not allowed for BIOM 533, CIVE 533, and ECE 533.
Theoretical and practical aspects of biomolecular laboratory tools—PCR, cloning, sequencing, single-molecule optical techniques and live-cell imaging. ($)

CIVE 534 03(2-2-0). Applied and Environmental Molecular Biology. S. Prerequisite: CIVE 540.
Environmental microbiology and molecular biology tools used to investigate both natural systems and engineered processes. ($)
CIVE 537 03(3-0-0). Residuals Management. S. Prerequisite: CIVE 300.
Planning and design for processing and disposal of residuals including solid wastes, sludges, hazardous wastes.

CIVE 538 03(3-0-0). Aqueous Chemistry. S. Prerequisite: CHEM 113; MATH 340.
Principles of solution chemistry applied to aquatic systems.

°CIVE 539 03(2-3-0). Water and Wastewater Analysis. F. Prerequisite: CHEM 113; MATH 340.
Chemical and biological methods of assessing water quality; significance of chemicals in aquatic systems.

CIVE 540/CBE 540 03(3-0-0). Advanced Biological Wastewater Processing. S. Prerequisite: CIVE 438/ENVE 438 or CBE 320. Credit not allowed for both CIVE 540 and CIVE 540.
Fundamentals of environmental biotechnology: environmental microbiology, microbial kinetics, basic reactor design, wastewater treatment.

CIVE 541 04(3-3-0). Environmental Unit Operations-Treatment-Design. S. Prerequisite: CIVE 439/CBE 439. Reactor theory, filtration, adsorption, ion exchange, gas transfer, oxidation, membranes, biological reactors, disinfection.

°CIVE 542 03(3-0-0). Water Quality Modeling. S. Prerequisite: Two semesters of chemistry; one course in hydrology or water quality.
Chemical, physical, and biological processes defining surface water quality, construction and application of computer models for lakes and streams.

CIVE 543 03(2-3-0). Instrumental Environmental Analysis. F. Prerequisite: CHEM 113; MATH 340.
Environmental sampling and preservation techniques followed by the instrumental analysis of the samples.

CIVE 544 03(3-0-0). Water Resources Planning and Management. F. Prerequisite: CIVE 322/ENVE 322.
Management and planning of natural and constructed water systems. Integrated management and case studies of water use and environmental resources. (NT-O)

CIVE 546 03(2-2-0). Water Resource Systems Analysis. S. Prerequisite: CIVE 322/ENVE 322 or concurrent registration; ENGR 510 or concurrent registration or MATH 510 or concurrent registration.
Applications of systems analysis and optimization techniques in water resources planning and management. (NT-O)

CIVE 547/STAT 547 03(3-0-0). Statistics for Environmental Monitoring. S. Prerequisite: STAT 301. Credit not allowed for both CIVE 547 and STAT 547.
Applications of statistics in environmental pollution studies involving air, water, or soil monitoring; sampling designs; trend analysis; censored data. (NT-O)

CIVE 549 03(3-0-0). Drainage and Wetlands Engineering. S. Prerequisite: CIVE 425 or CIVE 322/ENVE 322.
Drainage and wetlands design for agricultural and natural resource applications. Water table modification for nonpoint sources pollution control. (NT-O)

CIVE 550 03(3-0-0). Foundation Engineering. F. Prerequisite: CIVE 355.
Mechanics and methodology of foundation engineering; selection and design of foundation systems on soft, firm, and expansive soils; special problems. (NT-O)

°CIVE 553 03(3-0-0). Slope Stability and Retaining Structures. S. Prerequisite: CIVE 355.
Slope stability theory and application, retaining walls, sheet-pile walls, braced excavations, geosynthetic uses. (NT-O)

*CIVE 556 03(3-0-0). Seepage and Earth Dams. S. Prerequisite: CIVE 355.
Hydraulic conductivity measurements; seepage analysis and control; earth dam and embankment design; computer applications.

*CIVE 558 03(3-0-0). Containment Systems for Waste Disposal. F. Prerequisite: CIVE 355.
Basic principles governing the design of containment systems used in waste disposal applications. (NT-O)

*CIVE 559 03(3-0-0). Special Topics in Geotechnical Engineering. S. Prerequisite: CIVE 355.
Advanced topics in geotechnical engineering including expansive soils, unsaturated soil mechanics, soil-structure interaction and mining geotechnics.

Analysis of stress and strain failure theory; selected topics in solid mechanics, plate analysis; introduction to elastic stability. (NT-O)

CIVE 561 03(3-0-0). Advanced Steel Behavior and Design. S. Prerequisite: CIVE 466.
Behavior of steel components and systems. Design of composite members, plate girders, and bolted and welded connections. (NT-O)

CIVE 562 03(3-0-0). Fundamentals of Vibrations. S. Prerequisite: CIVE 261; CIVE 360.
Free and forced vibrations of single, two, and multiple degree of freedom systems. Closed-form and numerical solutions. (NT-O)

CIVE 563 03(3-0-0). Structural Reliability Theory. S. Prerequisite: CIVE 203 or STAT 315.
Theory of structural reliability as it relates to analysis, design, construction, and maintenance of structural and mechanical systems. (NT-O)

CIVE 565 03(3-0-0). Finite Element Method. S. Prerequisite: MATH 340.
Theory and application in elasticity, porous flow, heat conduction, and other engineering problems. (NT-O)

CIVE 566 03(3-0-0). Intermediate Structural Analysis. F. Prerequisite: CIVE 367.
Work and energy concepts, curved members and arches, matrix analysis of linear systems, numerical techniques. (NT-O)

CIVE 567 03(3-0-0). Advanced Concrete Design. S. Prerequisite: CIVE 467.
Behavior of reinforced and prestressed concrete members; development of design methods; behavior and design of slabs, shearwalls, and buildings. (NT-O)

CIVE 568 03(3-0-0). Design of Masonry and Wood Structures. S. Prerequisite: CIVE 466 or CIVE 467.
Behavior and design of structures and structural components constructed of masonry or engineered wood. (NT-O)

CIVE 571 03(3-0-0). Pipeline Engineering and Hydraulics. S. Prerequisite: CIVE 300.
Water supply, wastewater, stormwater, oil and gas, and industrial applications. Emphasis on pressurized water pipelines. (NT-O)

*CIVE 572 03(2-2-0). Analysis of Urban Water Systems. F. Prerequisite: CIVE 300; CIVE 401.
Behavior and interaction of urban water distribution and collection systems; how system state and driving variables affect system performance.

*CIVE 573 03(3-0-0). Urban Stormwater Management. S. Prerequisite: CIVE 322/ENVE 322; CIVE 401.
Effects of urbanization on watershed hydrology and receiving waters; control practices to mitigate effects using mathematical models. (NT-O).

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CIVE 574 03(3-0-0). Civil Engineering Project Management. F. 
Prerequisite: None.
Principles of civil engineering project management including proposals, contracts, scheduling, quality assurance, budgeting, and risk management.

CIVE 575 03(3-0-0). Sustainable Water and Waste Management. S. 
Prerequisite: CIVE 322/ENVE 322. Credit not allowed for CIVE 445 and CIVE 575.
The science, engineering, and policy behind sustainable water and waste practices. Sustainable urban water and wastewater management. (NT-O)

CIVE 576 03(2-2-0). Engineering Applications of GIS and GPS. F. 
Prerequisite: None.
Integration of GIS and GPS in the planning and decision making process, application to case study. (NT-O)

CIVE 577 03(2-2-0). GIS in Civil and Environmental Engineering, S. 
Prerequisite: CIVE 300; CIVE 322/ENVE 322.
GIS technology for spatial design/analysis; applications in facilities management, urban infrastructure, water resources, environmental engineering. (NT-O)

CIVE 578 03(3-0-0). Infrastructure and Utility Management. S. 
Prerequisite: Ten credits of engineering, economics, public administration, or planning courses.
Infrastructure and utility planning, management, and security. Systems approach to life cycle management. Problems, analysis, decision support systems. (NT-O/V)

CIVE 579 03(3-0-0). Risk and Security of the Built Environment. F. 
Prerequisite: None.
Infrastructure security and safety to prepare the built environment against natural and human-caused threats. (NT-O)

CIVE 584 Var. Supervised College Teaching.

CIVE 592A-L 01(0-0-1). Seminar.

CIVE 595A-J Var. Independent Study, F, S, SS. Prerequisite: None.

CIVE 596A-J Var. Group Study, F, S, SS. Prerequisite: None.

CIVE 604 03(3-0-0). Fluid Turbulence and Modeling. S. Prerequisite: CIVE 502 or CIVE 504.
Engineering concepts for transport of pollutants, toxic and flammable species, sand, and snow. Fluid modeling, numerical and analytical approaches.

CIVE 607 03(3-0-0). Computational Fluid Dynamics. S. Prerequisite: CIVE 300.
Numerical methods used in computational solutions of hydraulics, environmental and wind engineering problems.

CIVE 610 03(3-0-0). Special Topics in Hydraulics. S. Prerequisite: CIVE 502.
Advanced topics in hydraulics, hydromechanics, environmental hydraulics, and computational hydraulics.

CIVE 612 04(4-0-0). Open Channel Flow. S. Prerequisite: CIVE 502.
Steady, uniform, and non-uniform flow; backwater curves; flow through bridge piers, transitions, and culverts; spatially varied and unsteady flow.

CIVE 613 03(3-0-0). Stream Rehabilitation Design. S. Prerequisite: CIVE 401.
Analysis and design of streams and channels in harmony with the environment.

CIVE 622 03(3-0-0). Risk Analysis of Water/Environmental Systems. F. Prerequisite: CIVE 322/ENVE 322, STAT 315.
Risk and uncertainty analysis applied to hydrology, hydraulics, groundwater, water resources, and environmental engineering systems.

*CIVE 624 03(3-0-0). Control of Floods and Droughts. S. Prerequisite: CIVE 522.
Flood and drought characteristics, impacts; structural, nonstructural flood control measures; drought prediction, drought control, drought response.

CIVE 625 03(3-0-0). Quantitative Eco-Hydrology. F. Prerequisite: CIVE 322 or WR 416.
Quantitative examination of the hydrologic and ecologic mechanisms underlying climate-soil-vegetation and soil moisture dynamics.

CIVE 626 03(3-0-0). Integrated Analysis of Coupled Water Issues. F. Prerequisite: GR 304/WR 304.
Integrative systems and policy analysis applied to coupled human-water systems from interdisciplinary technical and institutional perspectives.

CIVE 631 03(3-0-0). Computational Methods in Subsurface Systems. F. Prerequisite: CIVE 531; MATH 340.
Numerical flow models; finite difference and finite element methods; parameter identification, stochastic modeling and advanced analytical solutions.

CIVE 638 03(3-0-0). Groundwater Quality and Contaminant Transport. S. Prerequisite: CIVE 531.

*CIVE 645 03(2-2-0). Computer-Aided Water Management and Control. F. Prerequisite: CIVE 546 or CIVE 577.
Real-time management and control of water resource systems; applications of computer control concepts to improve system performance.

*CIVE 654 03(2-3-0). Experimental Soil Mechanics. F. Prerequisite: CIVE 355.
Experimental design; data acquisition; soil fabric; isotropic/Ka condensation; swelling; stiffness; shear wave velocity; triaxial; hollow cylinder; partial saturation.

CIVE 655 03(3-0-0). Advanced Soil Mechanics. F. Prerequisite: CIVE 355.
Advanced topics in shear strength and consolidation of soils; stress paths; anisotropy; submergence; partial and radial drainage; numerical methods. (NT-O)

CIVE 658 03(3-0-0). Remediation Systems-Subsurface Contamination. F. Prerequisite: None.
Applications in geoenvironmental engineering practice involving design of in situ containment and remediation systems. (NT-O)

CIVE 662 03(3-0-0). Foundations of Solid Mechanics. F. Prerequisite: CIVE 560.
Analysis of stress and strain in solids emphasizing linear elasticity and plasticity; introductions to creep, viscoelasticity, and finite deformations.

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CIVE 664 03(3-0-0). Mechanics of Fatigue and Fracture. S. Prerequisite: CIVE 560.
Fracture mechanics including linear elastic, elastic-plastic, and dynamic fracture; on ductile and cleavage fracture in metals. (NT-O)

CIVE 667 03(3-0-0). Advanced Structural Analysis. S. Prerequisite: CIVE 566.
Analysis program development, application of finite element analysis, computer-assisted analysis, introduction to nonlinear analysis.

CIVE 684 Var. Supervised College Teaching.

CIVE 695A-K Var. Independent Study. F, S, SS. Prerequisite: None.


CIVE 699A-K Var. Thesis. F, S, SS. Prerequisite: None.

* CIVE 703 03(3-0-0). Special Topics in Fluid Mechanics. F. Prerequisite: CIVE 502.
Advanced topics in fluid mechanics; associated experimental and numerical techniques.

CIVE 716 03(3-0-0). Erosion and Sedimentation. F. Prerequisite: CIVE 502.
Sediment properties; resistance to flow; incipient motion and bedforms; sediment transport, reservoir sedimentation.

CIVE 717 03(3-0-0). River Mechanics. S. Prerequisite: CIVE 716.
Characteristics of rivers, mechanics of sediment and water discharge emphasizing alluvial systems, channel stabilization, control, response.

* CIVE 721 03(3-0-0). Stochastic Water and Environmental Systems. S. Prerequisite: CIVE 622.
Stochastic analysis of water and environmental systems. Simulation, forecasting, spatial analysis, modeling changes, stochastic differential equations.

* CIVE 722 03(3-0-0). Large Scale Hydrology. F. Prerequisite: CIVE 520.
Global and regional scale hydrologic processes; land/atmosphere interaction; scaling in hydrology, geomorphoclimatic structure of hydrologic response.

* CIVE 724 03(3-0-0). River Basin Morphology. S. Prerequisite: Written consent of instructor.
Analysis of river basin properties including their connections to statistical theories and erosion processes and their hydrologic implications.

* CIVE 742 03(2-3-0). Advanced Topics in Environmental Engineering. S. Prerequisite: CIVE 540/CBE 540.
Selected topics from current environmental engineering research including molecular methods, water/wastewater treatment, hazardous waste remediation.

*Alternate year offering (odd); * Alternate year offering (even); + Field trips; S Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCC-subcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
CM 501 04(4-0-0). Advanced Cell Biology. F. Prerequisite: BZ 310.
Cell structure and organelle function.

CM 502/NB 502 02(1-3-0). Techniques in Molecular & Cellular Biology. F. Prerequisite: One college-level course with laboratory in each: biology, biochemistry, physics; written consent of instructor. Credit not allowed for both CM 502 and NB 502.
Current methods in molecular and cellular neurobiology.

CM 510 01(1-0-0). Introduction to Cell and Molecular Biology. F.
Prerequisite: None.
Overview of CMB program and research opportunities; enhances writing and oral communication skills.

*CM 520 03(2-0-1). Proteolytic Regulation of Cellular Processes. S.
Prerequisite: CM 501.
Functions of proteolytic pathways in the regulation of eukaryotic cellular processes, such as mitosis, apoptosis, signal transduction and gene regulation.

CM 595 Var. Independent Study.

CM 601 01(0-0-1). Responsible Conduct of Research in CMB. S.
Prerequisite: Enrollment in the CMB graduate program.
Key aspects of responsible conduct of research and ethical considerations in cell and molecular biology.

CM 640 03(3-0-0). Creative Science Writing. S. Prerequisite: None.
Consideration of creative writing techniques and their relevance to traditional science/nature writing.

°CM 666/°PHIL 666 03(3-0-0). Science and Ethics. S. Prerequisite: None. Credit not allowed for both CM 666 and PHIL 666.
Ethical issues of research on humans and animals; biosafety; fraud and deception in science; genetic engineering.


CM 700 01(0-0-1). Critical Analysis of Scientific Literature. F, S.
Prerequisite: BC 565; CM 510. May be repeated for a maximum of 4 credits.
Presentation and discussion of current literature of cell and molecular biology. Content varies each semester to include the major focus groups.

CM 701D-I. Topics in Cell and Molecular Biology. F, S. Prerequisite:
BC 403; CM 510; MATH 255. B) Radiation cytogenetics 01(1-0-0). D) Immunological techniques 01(0-3-0). E) Flow cytometry and cell sorting 02(0-4-0).

CM 702B-E Methods in Cell and Molecular Biology. F, S.
Bi) Mammalian cell culture techniques 01(0-3-0). Prerequisite: BC 403; CM 501. C) Immunochemical techniques 01(0-3-0). Prerequisite: BC 403; CM 501; MATH 255. D) Radiation cytogenetics 01(0-3-0). Prerequisite: BC 403; CM 501; E) Flow cytometry and cell sorting 02(0-4-0). Prerequisite: BC 403; CM 501.

CM 710/BSPM 710 03(0-4-1). Techniques in Molecular Biology and Genetics. S. Prerequisite: BC 463 or BZ 346 or BZ 350 or MIP 450 or SOCR 330. Credit not allowed for both CM 710 and BSPM 710.
Genetic manipulation of bacteria, bacteriophage, and yeast including experiments in molecular cloning and gene expression.

CM 792 01(1-0-0). Cell and Molecular Biology Seminar. F, S.
Prerequisite: CM 501 or concurrent registration.
Preparation and presentation of cell and molecular biology seminars.

CM 793 01(0-0-1). Seminar.

CM 795 Var. Independent Study.

COMPOSITION COURSES

Department of English
College of Liberal Arts

CO 130 03(3-0-0). Academic Writing. (GT-CO1). F, S. Prerequisite: composition challenge/placement exam.
Academic writing, critical thinking, and critical reading through study of a key academic issue.

CO 150 03(3-0-0). College Composition. (GT-CO2, AUCC 1A). F, S, SS. Prerequisite: SAT critical reading score of 600 or above or ACT English score of 26 or above or composition placement/challenge exam (score of 3, 4, or 5) or CO 130. (For students registered at CSU prior to Fall 2008, SAT verbal score of 500 or above or ACT English score of 20 or above.)
Understanding and writing for rhetorical situations; critical reading and response; writing source-based argument for academic and public audiences. (NT-O)

CO 300 03(3-0-0). Writing Arguments. (AUCC 2). F, S, SS. Prerequisite: CO 150 or HONR 193.
Reading, analyzing, researching, and writing arguments. (NT-O)

CO 301A-D 03(3-0-0). Writing in the Disciplines. (AUCC 2). F, S, SS. Prerequisite: CO 150 or HONR 193.

CO 302 03(3-0-0). Writing Online. (AUCC 2). F, S. Prerequisite: CO 150 or HONR 193.
Writing and analysis of electronic texts.

CO 401 03(3-0-0). Writing and Style. F, S. Prerequisite: CO 300 or CO 301A or CO 301B or CO 301C or CO 301D or CO 302.
Advanced expository and persuasive writing emphasizing modes, strategies, and styles for a variety of audiences and purposes.

CO 402 03(3-0-0) Advanced Writing Online. F, S. Prerequisite: CO 302 or JTC 372 or SPCM 346.
Advanced study of rhetorical contexts shaping online texts. Builds on fluency in coding and familiarity with online document design.

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CONSTRUCTION MANAGEMENT COURSES

Department of Construction Management
College of Health and Human Sciences

CON 101 03(3-0-0). Introduction to Construction Management. F, S. Prerequisite: None.
  Identify and understand relationships among participants in the construction process and its history.

CON 131 02(0-4-0). Graphic Communications/CAD. F, S, SS. Prerequisite: None.
  Reading technical drawings, manual drafting techniques, reprographic technologies. CAD applications are introduced.

CON 151 03(3-0-0). Construction Materials and Methods. F, S. Prerequisite: None.
  Materials and methods utilized in the design and construction of buildings.

  Testing of construction materials for standards and quality. Conduct common quality tests and document the results.

CON 261 03(2-3-0). Construction Surveying. F, S, SS. Prerequisite: CON 131 or INTD 166; MATH 125 or MATH 160.
  Surveying fundamentals to field of construction, building layout, measurement procedures, vertical controls, line and grade, surveying, instrument operation.

CON 265 03(2-2-0). Construction Estimating I. F, S. Prerequisite: CON 131; CON 151.
  Integration of construction materials and methods into construction systems that will be incorporated in projects.

CON 267 01(0-0-1). Construction Management Pre-Internship. F, S, SS. Prerequisite: None.
  Skills and concepts related to successful internships within the construction management industry.

CON 270 03(3-0-0). Introduction to Road Construction. F. Prerequisite: None.
  Steps necessary to construct a paved roadway from conception, land acquisition and finance through paving operations and trafficking.

CON 317 02(2-0-0). Safety Management. F, S. Prerequisite: None.
  Safety management in construction, corporate, and institutional environments.

CON 351 02(1-2-0). Construction Field Management. F, S. Prerequisite: CON 251 or concurrent registration; CON 317 or concurrent registration.
  Materials and methods used in construction, administrative and organizational planning used to complete a project. ($)

CON 352 02(1-2-0). Metal Fabrication for Construction. F, S. Prerequisite: CON 251.
  Shaping, cutting, and joining of structural and non-structural metal. Emphasis on jobsite safety, economics, and efficiency.

CON 359 04(4-0-0). Structures I. F, S. Prerequisite: MATH 125; junior or senior standing.
  Behavior of structural components and systems, overview of structural engineering analysis/design process.

CON 360 03(2-2-0). Electrical and Control Systems. F, S. Prerequisite: CON 265.
  Electrical and control systems and their application in the construction industry. ($)

CON 365 03(2-2-0). Construction Estimating II. F, S. Prerequisite: CON 265.
  Industry-recognized methods for work item analysis, quantity surveying, resource estimating, and bid development using work breakdown structures.

CON 366 03(2-2-0). Construction Equipment and Methods. F, S. Prerequisite: CON 261.
  Equipment/methods in heavy and highway construction; equipment selection, productivity, and costs. Infrastructure, tunneling, and trenchless technology.

CON 367 03(3-0-0). Construction Contracts/Project Administration. F, S. Prerequisite: CON 265; CON 351 or concurrent registration.
  Construction management majors and minors only.
  Utilization of field engineering systems and procedures to effectively meet project objectives.

CON 370 03(2-2-0). Asphalt Pavement Materials and Construction. F, S. Prerequisite: None.
  Constituents of asphalt pavements; manufacture of asphalt cement, emulsions, and cutbacks; material properties and behavior. ($)
CON 476 03(3-0-0). Sustainable Practices-Design and Construction.  
F. Prerequisite: None.  
Major components of sustainable design/construction: energy, healthy buildings, cultural, natural resources, use, other environmental/economic issues.

CON 477 03(3-0-0). Residential Aging-in-Place and Green Building.  
S. Prerequisite: CON 265.  
Aging-in-place and green building aspects of the residential construction market.

CON 487A-B Var[3-6]. Internship.  
F. S. SS.  
A) Construction Management I.  (06(0-0-18). Prerequisite: CON 267; CON 367.  
B) Construction Management II. Prerequisite: CON 267; CON 367; 500 hours of documented work experience.

CON 495 Var. Independent Study-Construction.  
CON 496 Var. Group Study-Construction.

CON 500 03(3-0-0). Models of Disciplined Inquiry.  
F. Prerequisite: Admission to master’s program.  
Models and methods of disciplined inquiry used in diverse organizations; applying disciplined inquiry methods to solve problems.

CON 560 03(3-0-0). Applied Project Management.  
F. Prerequisite: Admission to master’s program.  
Project development, planning, and control relevant to construction, manufacturing and technology education professionals.

CON 561 03(3-0-0). Applied Productivity Improvement.  
S. Prerequisite: Admission to master’s program.  
Existing and emerging tools for productivity enhancement in project and production environment.

CON 562 03(3-0-0). Issues and Trends in Construction Management.  
F. Prerequisite: Admission to master’s program.  
Current issues and trends related to management of technology in fields associated with manufacturing and construction industries.

CON 565 03(3-0-0). Legal Aspects of Construction Process.  
S. Prerequisite: Admission to master’s program.  
Common points of dispute; methods of avoiding disputes among owner, architect, engineer, and contractor.

CON 566 03(3-0-0). Advanced Construction Estimating.  
F. Prerequisite: Admission to master’s program.  
Advanced estimating procedures dealing with special application and techniques in construction.

CON 567 03(3-0-0). Preservation and Rehabilitation of Buildings.  
F. Prerequisite: Admission to master’s program.  
Theory and applications of preservation technology used in the management and rehabilitation of historic and archaic buildings.

CON 568 03(3-0-0). Construction Industry Institute Practices.  
F. Prerequisite: CON 367.  
Senior executives from the Construction Industry Institute (CII) present best practices developed by CII over the last 25 years.

CON 569 03(3-0-0). Managerial Decision Making for Constructors.  
F. Prerequisite: Admission to master’s program.  
Construction and real estate development applications of multidisciplinary managerial analysis and decision-making techniques.

CON 571 03(3-0-0). Facility Planning and Management.  
S. Prerequisite: Admission to master’s program.  
Planning, organizing, and managing large educational and/or commercial facilities.

CON 576 03(2-0-1). Sustainable Technology in Built Environments.  
S. Prerequisite: CON 450/INTD 450 or CON 476.  
Major components of creating environmentally sustainable built environments.

CON 577 03(2-0-1). Leadership of Sustainable Community Projects.  
S. Prerequisite: CON 450/INTD 450 or CON 476. Required background check.  
Learn and apply principles of sustainable construction management through leading and building service-learning projects.

CON 590 Var. Workshop.  
CON 592 Var. Seminar.  
CON 684 Var. Supervised College Teaching.  
CON 687 Var[1-6]. Internship. Maximum of 6 credits allowed in course.

CON 695 Var. Independent Study.  
CON 696 Var. Group Study. Prerequisite: Admission to master’s program.

CON 698 Var. Research.  
CON 699 Var[1-6]. Thesis.

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<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Co-Requisites</th>
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</thead>
<tbody>
<tr>
<td>CS 110 04</td>
<td>Personal Computing. F., S., SS.</td>
<td>None.</td>
<td>Credit not allowed for both CS 110 and BUS 150.</td>
</tr>
<tr>
<td>CS 122/MATH 122 01(0-0-1)</td>
<td>Theory for Introductory Programming. F., S.</td>
<td>Prerequisite: MATH 118; concurrent registration in C or better.</td>
<td>MATH 118; concurrent registration. Credit not allowed for students who have completed MATH 118.</td>
</tr>
<tr>
<td>CS 150 04(3-0-1)</td>
<td>Interactive Programming with Java. F., S.</td>
<td>Prerequisite: Placement into MATH 117 or MATH 130.</td>
<td>Introduction to object-oriented programming with Java; problem solving, creating applets for Web pages, and graphical user interfaces.</td>
</tr>
<tr>
<td>CS 155 01(1-0-0)</td>
<td>Introduction to Unix. F., S., SS.</td>
<td>None.</td>
<td>Unix shell commands, utilities (editors, sorting, file management), shell scripting.</td>
</tr>
<tr>
<td>CS 156 01(1-0-0)</td>
<td>Introduction to C Programming I. F., S., SS.</td>
<td>Prerequisite: CS 155 or concurrent registration; MATH 118.</td>
<td>Basic elements of language structure, data types, expressions, program control flow and modularity.</td>
</tr>
<tr>
<td>CS 157 01(1-0-0)</td>
<td>Introduction to C Programming II. F., S., SS.</td>
<td>Prerequisite: CS 161; concurrent registration; MATH 118.</td>
<td>More basic design types, function usage and strings. Arrays, user-defined types and structures, enumerated types, recursion, dynamic storage allocation.</td>
</tr>
<tr>
<td>CS 158/MATH 158 01(0-2-0)</td>
<td>Mathematical Algorithms in C. S.</td>
<td>Prerequisite: CS 156; MATH 151; MATH 160.</td>
<td>Credit not allowed for both CS 158 and MATH 158.</td>
</tr>
<tr>
<td>CS 160 04(3-2-0)</td>
<td>Foundations in Programming.  F., S.</td>
<td>Prerequisite: MATH 118 with a C or better.</td>
<td>Introduction to computer theory, programming and systems. Sets, functions, logic. Procedural programming in Java. Computer and data models.</td>
</tr>
<tr>
<td>CS 161 04(3-2-0)</td>
<td>Object-Oriented Problem Solving. F., S.</td>
<td>Prerequisite: CS 160 with a C or better; MATH 141 or concurrent registration or MATH 155 or concurrent registration or MATH 160 or concurrent registration.</td>
<td>Fundamental object oriented concepts, inheritance, polymorphism, basic algorithms, linked lists, assertions, recursion, induction, counting.</td>
</tr>
<tr>
<td>CS 192 02(1-0-1)</td>
<td>First Year Seminar in Computer Science. F., S.</td>
<td>Prerequisite: Computer science majors only.</td>
<td>Introduction to the computer science major; basic computer skills; campus resources, and various subject-specific topics.</td>
</tr>
<tr>
<td>CS 200 04(3-2-0)</td>
<td>Algorithms and Data Structures. F., S.</td>
<td>Prerequisite: CS 161 with a C or better; MATH 141 with a C or better or MATH 155 with a C or better or MATH 160 with a C or better.</td>
<td>Data structures; abstract data types; algorithm correctness; complexity analysis; sorting, searching, hashing.</td>
</tr>
<tr>
<td>CS 253 04(3-0-1)</td>
<td>Problem Solving with C++. F., S.</td>
<td>Prerequisite: CS 200 with a C or better; CS 270 with a C or better or ECE 251 with a C or better.</td>
<td>C++ programming techniques for experienced programmers. UNIX tools for editing, compiling, debugging, and testing C++ programs.</td>
</tr>
<tr>
<td>CS 270 04(3-2-0)</td>
<td>Computer Organization. F., S.</td>
<td>Prerequisite: CS 161 with a C or better; CS 200 or concurrent registration; MATH 141 with a C or better or MATH 155 with a C or better or MATH 160 with a C or better.</td>
<td>Data representation, arithmetic, assembly and C language, digital logic and systems, Boolean algebra, circuits, CPU and memory models, state machines.</td>
</tr>
<tr>
<td>CS 314 03(3-0-0)</td>
<td>Software Engineering. F., S.</td>
<td>Prerequisite: CS 253 with a C or better.</td>
<td>Methods used to develop large-scale software projects in industry emphasizing design, implementation, and testing.</td>
</tr>
<tr>
<td>CS 320 03(3-0-0)</td>
<td>Algorithms—Theory and Practice. F., S.</td>
<td>Prerequisite: CS 200 with a C or better; MATH 161 with a C or better; MATH 229 with a C or better or MATH 369 with a C or better.</td>
<td>Analysis, design, implementation and applications of algorithms.</td>
</tr>
<tr>
<td>CS 356 03(3-0-0)</td>
<td>Systems Security. F., S.</td>
<td>Prerequisite: CS 253 with a C or better; CS 270 with a C or better or ECE 251 with a C or better; STAT 201 or STAT 204 or STAT 301 or STAT 307 or STAT 311 or STAT 315.</td>
<td>Computer and system security, authentication, access control, malicious software, and software security.</td>
</tr>
<tr>
<td>CS 370 03(3-0-0)</td>
<td>Operating Systems. F., S.</td>
<td>Prerequisite: CS 200 with a C or better; CS 270 with a C or better or ECE 251 with a C or better.</td>
<td>Introduction to operating systems including memory organization, I/O control, multitasking, process control, coordination, and resource management.</td>
</tr>
<tr>
<td>CS 410 04(3-2-0)</td>
<td>Introduction to Computer Graphics. F.</td>
<td>Prerequisite: CS 253 with a C or better; MATH 229 with a C or better or MATH 369 with a C or better.</td>
<td>UNIX, C programming techniques for experienced programmers. Tools for editing, compiling, debugging, and testing C++ programs.</td>
</tr>
<tr>
<td>CS 414 04(3-3-0)</td>
<td>Object-Oriented Design. F.</td>
<td>Prerequisite: CS 314 with a C or better.</td>
<td>Object-oriented methods for large-scale software systems. Software design for reuse using patterns. Development of WWW applications in languages, c.g., Java.</td>
</tr>
<tr>
<td>CS 420 04(3-0-1)</td>
<td>Introduction to Analysis of Algorithms. F.</td>
<td>Prerequisite: CS 320 with a C or better.</td>
<td>Efficiency analysis, correctness proofs, design strategies, illustrations from domains such as graph theory, scheduling and optimization, geometry.</td>
</tr>
<tr>
<td>CS 425 04(3-2-0)</td>
<td>Introduction to Bioinformatics Algorithms. F.</td>
<td>Prerequisite: CS 320 with a C or better.</td>
<td>Algorithms for analysis of large scale biological data.</td>
</tr>
<tr>
<td>CS 430 04(3-2-0)</td>
<td>Database Systems. S.</td>
<td>Prerequisite: CS 314 with a C or better or CS 570 with a C or better.</td>
<td>Database analysis, design, administration, implementation, hierarchical, network relational models; data sublanguages; query facilities.</td>
</tr>
<tr>
<td>CS 440 04(3-2-0)</td>
<td>Introduction to Artificial Intelligence. F.</td>
<td>Prerequisite: CS 253 with a C or better; CS 320 with a C or better.</td>
<td>Concepts, representations, and algorithms for applications of problem solving search, logical reasoning and machine learning.</td>
</tr>
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CS 451 04(3-3-0). Operating Systems. S. Prerequisite: CS 370 with a C or better.
Operating system design and implementation, file systems, distributed operating systems, case studies.

CS 453 04(3-0-1). Introduction to Compiler Construction. S. Prerequisite: CS 314 with a C or better.
Functional components of a compiler: modules, interfaces, lexical and syntax analysis, error recovery, resource allocation, code generation. (NT-O)

CS 454 04(3-3-0). Principles of Programming Languages. S. Prerequisite: CS 253 with a C or better; CS 320 with a C or better.
Language design concepts; functional programming; interpreter support for environments, procedures, recursion, types, objects; language paradigms.

CS 455 04(3-2-0). Introduction to Distributed Systems. S. Prerequisite: CS 370 with a C or better.
Fundamentals of distributed systems: concurrency, thread pools, scalable servers, graphs, data formats, transactions, secure systems, and overlays.

CS 457 04(3-3-0). Computer Networks and the Internet. F, S. Prerequisite: CS 253 with a C or better; CS 370 with a C or better; STAT 301 with a C or better or STAT 303/ECE 303 with a C or better or STAT 307 with a C or better or STAT 311 with a C or better or STAT 315 with a C or better.
Principles of communications, local area networks, communication protocols, TCP/IP, and the Internet. (NT-O/V)

CS 464 04(3-2-0). Principles of Human-Computer Interaction. S. Prerequisite: CS 253 with a C or better.
History and trends in human-computer interaction; user-centered design techniques; prototyping; experimental methods for the evaluation of technology.

CS 470 04(3-2-0). Computer Architecture. S. Prerequisite: CS 370. Instruction set; hardwired, microprogramming; memory; arithmetic; I/O and buses; performance evaluation; pipelining; RISC. (NT-O)

CS 475 04(3-3-0). Parallel Programming. F. Prerequisite: CS 370 with a C or better.
Parallel programming techniques for shared-memory and message-passing systems; process synchronization, communication; example languages. (NT-O)

Supervised work experience in approved computer science setting with periodic consultation of faculty.

CS 495 Var. Independent Study. Maximum of 12 credits allowed for any combination of CS 466, CS 495.

CS 498 Var[1-4]. Research. F, S, SS. Prerequisite: Written consent of instructor; computer science majors only.
Supervised research in computer science.

CS 510 04(3-3-0). Image Computation. S. Prerequisite: CS 410.
Image generation theory and implementation, image manipulation/interpretation. Ray tracing, geometric and photometric manipulation, image matching.

CS 514 04(3-3-0). Software Product and Process Evaluation. F. Prerequisite: CS 414.
Software development process modeling and evaluation; software metrics, testing verification, validation; experimental methods in software engineering. (NT-O)

CS 517 04(3-3-0). Software Specification and Design. S. Prerequisite: CS 414.
Rigorous techniques for modeling, specifying, and analyzing software requirements and designs; reusable software development. (NT-O)

CS 518 04(3-2-0). Distributed Software System Development. S. Prerequisite: CS 414.
Principles of developing distributed systems; middleware technologies and techniques for building complex distributed component-based systems.

CS 520 04(3-3-0). Analysis of Algorithms. S. Prerequisite: CS 420.
Asymptotic complexity, algorithm complexity, and problem complexity; the Master Method; parallel algorithms; algorithm design.

CS 530 04(3-3-0). Fault-Tolerant Computing. S. Prerequisite: CS 370.
Achieving high reliability and fault tolerance. Fault modeling, testing, reliability evaluation, redundancy, fault tolerance. (NT-O)

CS 533 04(3-2-0). Database Management Systems. F. Prerequisite: CS 430.
Theory and implementation of concurrency control, recovery, and query processing as it applies to centralized and distributed systems. (NT-O)

CS 540 04(3-3-0). Artificial Intelligence. S. Prerequisite: CS 440.
Knowledge representation and reasoning, search, planning, evolutionary computation, data mining, information retrieval, intelligent Web, agent systems. (NT-V)

CS 545 04(3-3-0). Machine Learning. F. Prerequisite: CS 440.
Computational methods that allow computers to learn; neural networks, decision trees, genetic algorithms, bagging and boosting. (NT-O)

CS 548/STAT 548 04(3-2-0). Bioinformatics Algorithms. F. Prerequisite: STAT 301 or STAT 307 or STAT 315; knowledge of a contemporary programming language.
Computational methods for analysis of DNA/protein sequences and other biological data.

CS 551 04(3-3-0). Distributed Operating Systems. F, SS. Prerequisite: CS 370 with a C or better or CS 451 with a C or better.
Distributed operating systems, memory management, computer security, client-server computing, distributed resource management failure recovery. (NT-O)

CS 553 04(3-3-0). Algorithmic Language Compilers. F. Prerequisite: CS 453.
Compiler construction; lexical scanner generators, parser generators, dataflow analysis, optimization.

CS 555 04(3-3-0). Distributed Systems. F. Prerequisite: CS 455.
Principles, paradigms, protocols and algorithms underlying modern distributed systems.

CS 556 04(3-2-0). Computer Security. F. Prerequisite: CS 356 or CS 455.
Topics in computer security: Concepts, threats, risks, access control models, trusted systems, cryptography, authentication. (NT-O)

CS 557 04(3-3-0). Advanced Networking. S. Prerequisite: CS 457.
Core internet protocols including transport, routing, and security protocols. Protocol design principles. Network measurements and assessment. (NT-O)

CS 560/ECE 560 04(3-2-0). Foundations of Fine-Grain Parallelism. S. Prerequisite: CS 475. Credit not allowed for both CS 560 and ECE 560.
Programming novel architectures; performance tuning; automatic parallelization; program transformation; polyhedral model; equational programming. (NT-O, CS 560 only)

CS 561/ECE 561 04(3-3-0). Hardware/Software Design of Embedded Systems. S. Prerequisite: CS 270 or CS 470 or ECE 251 or ECE 452. Credit not allowed for both CS 561 and ECE 561.
Embedded systems design including system level modeling, design space exploration, hardware/software partitioning, high-level synthesis.

*Alternate year offering (odd); * Alternate year offering (even); + Field trips; $ Special course fee; NT Approved for nontraditional course offering (B = blended, C = correspondence, O = online, T = telecourse, V = videotape/DVD); GT-subcode = State Guarantee Transfer course and AUCCSubcode = All University Core Curriculum, where the subcode refers to the specific category the course fulfills. (See Introduction for more information.)
CS 570 04(3-3-0). Advanced Computer Architecture. F. Prerequisite: CS 470.
Pipelined CPU design. Superscalar architectures and instruction-level parallelism. Cache and memory hierarchy design. Storage systems.

CS 575 04(3-3-0). Parallel Processing. F. Prerequisite: CS 475.
Parallel and distributed computing models, algorithms, mapping and performance evaluations, parallel computing tools and applications. (NT-O)

CS 612 04(3-2-0). Topics in Computer Graphics. F. Prerequisite: CS 510.
Computer graphics research topics.

CS 614-E 04(3-3-0). Advanced Topics in Software Engineering. F, S. Prerequisite: CS 514 or CS 517 or CS 518.

*CS 620 04(3-2-0). Advanced Topics in Algorithms. F. Prerequisite: CS 520.
Designing and analyzing algorithms and data structures; illustrations from variety of problem domains.

CS 635 04(3-3-0). Advanced Fault-Tolerant Computing. F. Prerequisite: CS 530.
Advanced topics and recent developments in high reliability and fault-tolerant systems.

CS 640 02(2-0-0). Advanced Artificial Intelligence I. F. Prerequisite: CS 540.
Research topics in artificial intelligence: genetic algorithms, neural networks, connectionist models; machine learning; planning, automated reasoning.

CS 641 02(2-0-0). Advanced Artificial Intelligence II. S. Prerequisite: CS 640.
Advanced research topics in artificial intelligence.

CS 645 04(3-2-0). Advanced Machine Learning: Neural Networks. S. Prerequisite: CS 545 with a C or better.
Study of machine learning research literature and implementations of algorithms for neural networks and reinforcement learning.

CS 646 04(3-2-0). Machine Learning in Bioinformatics. S. Prerequisite: CS 545 or STAT 560.
Recent research on the applications of machine learning in bioinformatics.

CS 653 04(3-3-0). Topics in Programming-Language Implementation. S. Prerequisite: CS 553.
Data dependence analysis; code generation.

CS 655 04(3-2-0). Advanced Topics in Distributed Systems. F. Prerequisite: CS 555.
Issues related to robustness, replication, consistency, scalability, isolation and privacy in large-scale distributed systems.

CS 656A-C 04(3-2-0). Advanced Topics in Computer Security. F, S. Prerequisite: CS 556.

CS 657 04(3-2-0). Advanced Topics in Computer Networking. F. Prerequisite: CS 557.
Advanced research topics in computer networks.

CS 658/ECE 658 04(3-3-0). Internet Engineering. F. Prerequisite: CS 457 or ECE 456. Credit not allowed for both CS 658 and ECE 658.
Link technologies, multiple access, hardware and software for internetworks routing, switching flow control, multicast, performance, and applications. (NT-O)

CS 670 B-D/ECE 670B-D Var[1-4]. Topics in Architecture/Systems. F, S. Prerequisite: CS 570 or ECE 554. Credit not allowed for both CS 670B-D and ECE 670B-D.

*CS 674/ECE 674 03(3-0-0). Heterogeneous Computing. S. Prerequisite: CS 551 or CS 570 or CS 575 or ECE 550 or ECE 554. Credit not allowed for both CS 674 and ECE 674.
Allocation of resources to tasks in parallel and distributed heterogeneous computing systems. A variety of computational environments are considered.

CS 675 04(3-3-0). Advanced Parallel Computing. S. Prerequisite: Written consent of instructor.
Parallel computing, computational models, parallel languages and algorithms, distributed simulation, Internet and mobile computing, parallel search.

CS 692 Var. Seminar.

CS 695 Var. Independent Study.

CS 696 Var. Group Study.


CS 787 01(0-3-0). Internship. SS.

CS 793 04(0-0-4). Research Seminar in Computer Science. F, S. Prerequisite: Graduate standing in computer science.
Research methods in specific areas of computer science.


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COMPUTING TECHNOLOGY
COURSES

Department of Computer Science
College of Natural Sciences

CT 310 04(3-3-0), Web Development. S. Prerequisite: CS 200.
Web development languages used to create fully functional
dynamic web sites; server and client scripting, database access and
security issues.

CT 320 04(3-3-0), Network and System Administration. F.
Prerequisite: (CS 155 and CS 156) or CS 253.
Installation of network and operating systems services,
management and support; upgrades, security, backups.