Course Descriptions

The courses in this catalog are current as of April 12, 2006. Check the University Catalogs Web site at www.catalogs.umn.edu for the most current course information. The courses in this catalog are not offered every semester. To find out whether a course is offered during a particular semester, consult the online Class Schedule at http://onestop.umn.edu/registrar/registration/courses.html.

**Course Numbers**

| 0xxx | Courses that do not carry credit toward any University degree. |
| 1xxx | Courses primarily for undergraduate students in their first year of study. |
| 2xxx | Courses primarily for undergraduate students in their second year of study. |
| 3xxx | Courses primarily for undergraduate students in their third year of study. |
| 4xxx | Courses primarily for undergraduate students in their fourth year of study; graduate students may enroll in such courses for degree credit. 4xxx courses can be counted for a Graduate School degree if the course is taught by a member of the graduate faculty or an individual appointed to Limited Teaching Status (LTS). |
| 5xxx | Courses primarily for graduate students; undergraduate students in their third or fourth year may enroll in such courses. |

**Abbreviations**

The following abbreviations are used throughout the course prerequisites of most University catalogs to denote common and recurring items of information.

- **Prereq:** Course prerequisites.
- **cr:** Credit.
- **div:** Division.
- **DUS:** Director of undergraduate studies.
- **equiv:** Equivalent.
- **fr, soph, jr, sr:** Freshman, sophomore, junior, senior.
- ** honors:** Honors. Courses with an H following the course number satisfy honors requirements.
- **Writing Intensive:** Courses with a W following the course number satisfy the writing intensive requirement for liberal education.

**Course Designators**

In conjunction with course numbers, departments and programs are identified by a 2-, 3-, or 4-letter designator prefix (e.g., CE for Civil Engineering, Pol for Political Science, WoSt for Women’s Studies). When no designator precedes the number of a course listed as a prerequisite, that prerequisite course is in the same department as the course being described.

**Course Symbols**

The following symbols are used throughout the course prerequisites of most University catalogs to denote common and recurring items of information.

- **$** Credit will not be granted if credit has been received for the course listed after this symbol.
- **f** Concurrent registration is required (or allowed) in the course listed after this symbol.
- **#** Approval of the instructor is required for registration.
- **Δ** Approval of the department offering the course is required for registration.
- **q** Approval of the college offering the course is required for registration.
- **X** In prerequisite listings, comma means “and.”

1-4 cr [max 6]. The course can be taken for 1 to 4 credits and may be repeated for up to 6 credits.

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### Course Listing Sample

**Xology**

**Xology and Diometrics**

**College of Liberal Education**

**Xolo 3101. Methods in Xology.** (3-4 cr [max 8 cr]; A-F only. §5101. Prereq—3100 or #)

Historical, numerical, sociological, and Freudian methods of research in xology with applications to contemporary problems.

Credit will not be granted if credit has been received for the course listed after this symbol.

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For definitions of course numbers, symbols, and abbreviations, see page 300.
Course Descriptions

Academic Health Center

Shared (AHS)

AHS 1101, Orientation to the Health Sciences. (1 cr)
Interest/personality assessment, health-related academic majors/professions, professionalism/ethics in health care. Students integrate information about self and career-related information to move towards a major and career choice.

AHS 1102, Orientation to Health Sciences. (1 cr)
Semester-long Web course. Interest/personality assessment, health-related academic majors/ professions, professionalism/ethics in health care. Students integrate information about self and career-related information to move towards a major and career choice.

AHS 1601, The Future Physician. (1 cr. Prereq—[ACT 30 or higher or SAT 1340 or higher], #)
A career in medicine. Life/work of physicians, what it takes to be successful. Issues/trends including Institute of Medicine core competencies, medical ethics, concept of health teams, multiculturalism, global issues, disparities in accessing medical care.

AHS 1602, Experiences in Health. (1 cr. Prereq—1601, #)
Students plan for and select a community-based volunteer experience, develop tools/skills to make connections in the community and secure a volunteer opportunity. Four hours per week at program site.

Accounting (ACCT)

Department of Accounting

Curtis L. Carlson School of Management

ACCT 2050, Introduction to Financial Reporting. (4 cr; A-F only, §APEC 1251, Prereq—Completion of 30 credits)
Introduction to financial accounting for U.S. organizations. Reading financial statements.

ACCT 2050H, Honors: Introduction to Financial Reporting. (4 cr; A-F only)
Introduction to financial accounting for U.S. organizations. Reading financial statements.

ACCT 3001. Introduction to Management Accounting. (3 cr; A-F only, Prereq—2050, at least 30 cr)
Costing techniques, including activity-based costing. Applying costing methods to determine costs of products, services, and production processes. Use of costs in operating/strategic decisions.

ACCT 3199. Internship in Public Accounting. (2 cr; S-N only, Prereq—5125, #)
Full-time work for a public accounting firm plus a written report on the work experience.

ACCT 3201, Intermediate Management Accounting. (2 cr; A-F only, Prereq—3001, ACCT or finance major)
Activity-based costing techniques in specific industries including service firms. Other topics could include costing for Just-in-Time manufacturing, tracking customer profitability, and costing quality.

ACCT 3299, Internship in Management Accounting. (2 cr; S-N only, Prereq—ACCT 2001, #)
Full-time work in general accounting, cost accounting, or internal auditing in an industrial or governmental organization plus a written report analyzing the work experience.

ACCT 5100, Corporate Financial Reporting. (4 cr; A-F only, Prereq—MGMT student, non-accounting major)
Overview of asset/liability valuation and income measurement. Focus on how economic events are reported in the financial statements. Examines accounting theory and the accounting standard-setting process.

ACCT 5101, Intermediate Accounting I. (4 cr; A-F only, Prereq—Grade of at least B- in 2050, [MGMT major or MGMT grad student])
Valuation, measurement, and reporting issues related to selected assets/liabilities of a firm. Theory underlying accounting issues. Applying accounting principles.

ACCT 5102, Intermediate Accounting II. (4 cr; A-F only, Prereq—5101 [MGMT or grad MGMT student])
Basic valuation problems encountered in financial reporting. Focuses on valuation of liabilities. Accounting for leases, pensions, and deferred taxes. Introduces consolidated financial statements.

ACCT 5125, Auditing Principles and Procedures. (4 cr; A-F only, Prereq—[3101 or 5101 or 5100 or 6100], [ACCT major or grad MGMT student])
Concepts of auditing internal control/financial statements in accordance with generally accepted auditing/professional standards established by Public Company Oversight Board (PCAOB) and American Institute of Certified Public Accountants (AICPA).

ACCT 5135, Fundamentals of Federal Income Tax. (4 cr; A-F only, Prereq—[2050 or MBA 6030], [MGMT or grad MGMT student])
U.S. federal system of taxation. Concepts of gross income, deductions, credits. Analysis of structure of Internal Revenue Code, its provisions with respect to specific areas of law. Interrelationships between legislative, judicial, and administrative authority. Methods, tools, and techniques to conduct tax research.

ACCT 5160, Financial Statement Analysis. (2 cr; A-F only, Prereq—[5100/6100 or 3101/5101], [accounting or finance major])
Interpretation/analysis of financial statements. Introduces basic techniques of financial statement analysis and applies them in different settings (e.g., in investment/credit decisions).

ACCT 5180, Consolidations and Advanced Reporting. (2 cr; A-F only, Prereq—[5102, MGMT or grad MGMT student])
Theory underlying the preparation of consolidated financial statements, as well as the mechanical computations needed to prepare the statements themselves.

ACCT 5236, Introduction to Taxation of Business. (2 cr; A-F only, Prereq—5135, ACCT major)
Introduction to the income tax laws governing the taxation of corporations, partnerships, limited liability companies, limited liability partnerships, and S corporations. Students will also increase their knowledge and skills related to tax research by writing research memorandums.

ACCT 5271, Accounting Information Systems. (2 cr, Prereq—3101/5101 or 5100/6100)
Applications and electronic data processing systems in accounting, including modeling, financial planning, auditing, and data security. Analysis/design of accounting information systems.

ACCT 5281, Special Topics in Financial Reporting. (2 cr; A-F only, Prereq—5102, [MGMT or grad MGMT student])
Covers areas of financial reporting frequently covered on the CPA exam, including partnerships, foreign operations, and accounting for government and nonprofit organizations.

ACCT 5310, International Accounting. (2 cr; A-F only, Prereq—2050, MGMT student)
Review of macroeconomic concepts of international economics, including trade, international markets for capital, and the role of accounting. Survey of different accounting policies and approaches among nations. Reading and understanding financial statements produced in countries other than the United States.

ACCT 5320, Current Topics in Accounting. (2 cr; A-F only)
Topics vary.

Adult Education (ADED)

Department of Work and Human Resource Education

College of Education and Human Development

ADED 3001, Adult Education Overview. (1 cr; A-F only)
Theory/practice of adult learning/development.

ADED 3001, Introduction to Strategies for Teaching Adults. (3 cr; A-F only)
Theories of adult learning, learning/teaching styles, methods/perspectives of teaching, applications of teaching in various settings.

ADED 5101. Strategies for Teaching Adults. (3 cr; A-F only)
Psychological theories of adult learning; learning styles and personality types; teaching styles; group and team learning; moderating and study circles; teaching technologies and distance learning; gender, race, and cultural communication. Applications of strategies.

ADED 5102, Perspectives of Adult Learning and Development. (3 cr)
Emphasis on major adult development theorists, theories, and current applications. Transformative learning, self-directed learning, experiential learning, and cooperative learning provide theoretical framework for exploring physiological, psychological, sociological, and cultural aspects of adult development through the life span.

ADED 5103. Designing the Adult Education Program. (3 cr; A-F only)
Designing and implementing educational programs for adults. Application of concepts, theories, and models in different adult learning situations.

ADED 5196, Field Experience in Adult Education. (3-6 cr; [max 6 cr]; S-N only)
Supervised fieldwork and practice. Presentations and evaluations of adult education practices.

ADED 5201, Introduction to Adult Literacy. (3 cr)

ADED 5202, Assessment of Adult Literacy. (3 cr. Prereq—§: ADED 5224, 5225, 5226)

ADED 5203, Methods of Teaching Adult Literacy. (3 cr)

ADED 5211, Introduction to the Undereducated Adult. (1 cr; A-F only)
Definitions of literacy in workplace, community, and family. Issues: poverty/welfare, ethnicity, cultural diversity, social class, language/learning, immigrants.

ADED 5212. Introduction to Adult Literacy in the Workplace. (1 cr; A-F only, Prereq—5211/)
Review workplace literacy programs, funding, program planning, and needs assessment. Reaching/recruiting workers. Role of employers and the unions. Writing for low literacy employees.
ADED 5213. Introduction to Adult Literacy in the Community. (1 cr; A-F only. Prereq–5211) Reviews role of the literacy programs in the United States in literacy building, the family in developing literacy skills, correctional education in reintegrating offenders back into community. Integrating people with disabilities through community literacy programs. Literacy/development in developing countries. Reaching/recruiting indigenous, migrant, and immigrant groups. Social action approaches to literacy education.

ADED 5224. Formal Assessment of Adult Literacy. (1 cr; A-F only. Prereq–5221) Assessment of adult English/literacy skills needed for work, family, community, and continuing education. Formal testing policy, techniques, standardized tests. Underlying assumptions about testing, cultural bias, and interpretation of formal tests. Test preparation programs.

ADED 5225. Informal Assessment of Adult Literacy. (1 cr; A-F only. Prereq–5221) Informal assessment of adult English/literacy skills for work, family, community, and further education. Informal testing techniques, setting educational goals, formal versus informal assessment.

ADED 5226. Advanced Assessment of Adult Literacy. (1 cr; A-F only. Prereq–5221, 5224, 5225) Applications and case studies. Educational planning for work, family, and community.

ADED 5233. Methods of Teaching Beginning Adult Literacy. (1 cr; A-F only. Prereq–5211) Learning English and literacy as an adult: initial approaches to teaching reading, writing, and communications skills. Theories of learning and curriculum design. Technology as a teaching tool: teaching students with disabilities or with cultural/ gender differences.


ADED 5235. Methods of Teaching Advanced Adult Literacy. (1 cr; A-F only. Prereq–5211, 5234) Advanced approaches to teaching reading, writing, communication and social skills. Preparing students for college and continuing education. Reading/study skills. English in workplace and on Internet. Problem solving, analytical thinking. Technology as teaching tool. Evaluating commercial material/software.

ADED 5302. Continuing Education for Professionals. (3 cr) Analysis of philosophies, issues, policies, trends, professional needs and statutory requirements in continuing professional education programs. Role of the program director and organization.

ADED 5303. Working with Volunteers in Community Settings. (3 cr) Uses collaborative, experiential methods to address fundamental issues and practices in volunteer development. Explore personal philosophies, staffing, and key issues and trends in the administration of volunteer programs.

ADED 5700. Special Topics in Adult Education. (1-8 cr [max 12 cr]) Exploration of issues, methods, and knowledge in areas of adult education. Content varies.

Aerospace Engineering and Mechanics (AEM) Department of Aerospace Engineering and Mechanics

Institute of Technology


AEM 3011. Deformable Body Mechanics. (3 cr; A-F only. Prereq–[2011 or 2021 or BMEN 3001, BMEN major], [Math 2374 or equiv], [Math 2373 or equiv], II) Uniaxial loading/deformation. Stress/strain at a point, Mohr’s circle. Internal forces in beams. Material behavior, linear elasticity. Torsion of circular shafts. Bending of beams of symmetrical section. Column buckling. Statically indeterminate structures.

AEM 4201. Fluid Mechanics. (4 cr; A-F only. Prereq–2111, 2221, [Math 2373 or equiv], [Math 2374 or equiv], [Math 2273 or equiv], II) First course in fluid mechanics. Stress/strain rate descriptions, fluid statics. Use of differential and finite control volume analysis with continuity. Momentum/energy equations, Bernoulli/Euler equations, vorticity, potential flow, incompressible viscous flow using Navier-Stokes equations, dimensional analysis, pipe flow, boundary layers, separation, introduction to turbulence.


AEM 4295. Problems in Fluid Mechanics. (1-3 cr [max 6 cr], Prereq–A) Topics of current interest. Individual projects with consent of faculty sponsor.

AEM 4301. Spaceflight Dynamics. (3 cr; A-F only. Prereq–[2021 or equiv], [Math 2373 or equiv], [IT upper div or grad student]) Two-body problem, Earth-satellite operations, rocket performance, reentry dynamics, space environments, restricted three-body problem, interplanetary trajectories, numerical simulations, elementary spacecraft attitude control. Design project.


AEM 4331. Aerospace Vehicle Design I: Aircraft. (3 cr; A-F only. Prereq–[2301, AEM cr or #], [WNC 1101 or equiv]) Students teams/disciplines design atmospheric flight vehicle with realistic constraints and engineering standards: Design process, project environment, mission requirements, trade studies, vehicle sizing, performance, stability/control, propulsion, trajectory analysis, CAD/vehicle integration, systems/equipment, operating envelopes, baseline specification, certification. Professional ethics/ responsibilities. Students keep design log or notebook, present a Conceptual Design Review (oral presentation) with written report.

AEM 4332W. Aerospace Vehicle Design II: Space Vehicles, Missions, and Systems. (4 cr; A-F only. Prereq–[4331 or #], [WNC 1101 or equiv]) Students design space vehicle, system, or mission with realistic design constraints, detailed design proposals, schedules/milestones, CAD/CAM, space environments, atmosphere entry, attitude determination/control, configuration/structure, thermal environment, power propulsion, and telecommunications. Students keep design log/ notebook, prepare status reports, write final report, and oral presentation.

AEM 4333. Aerospace Design III-Special Projects. (3 cr [max 6 cr], Prereq–4331 or #) Student teams design, build, and test major aerospace projects. Projects include designs from 4331/4332 or projects such as microgravity experiments. Students keep a design log/notebook, prepare status reports, and give a final oral presentation.


AEM 4495. Problems in Dynamics and Control. (1-3 cr. [max 6 cr], Prereq–A) Topics of Current interest. Individual projects with consent of faculty sponsor.
AEM 4501. Aerospace Structures. (3 cr; A-F only, Prereq—IT upper div or grad, 3031 or equiv)
Advanced strength of materials analysis of elastic structures with aerospace applications; failure
modes and criteria, buckling, matrix methods for analysis, plane truss design; energy and Castigliano
methods for statically determinate and indeterminate structures; torsion and bending of asymmetrical thin-
walled sections. Design project.

AEM 4502. Computational Structural Analysis. (3 cr; Prereq—[of at least C in 4501, [IT upper div or grad
student]] or #)
Application of finite element methods to problems in structural analysis. Emphasizes properly posing
problems and interpreting calculation results. Use of commercial FEA packages. Introduction to theory
of finite elements.

AEM 4511. Mechanics of Composite Materials. (3 cr; Prereq—3531, [IT upper div or grad student])
Analysis, design, and applications of laminated and chopped fiber reinforced composites. Micro-/macro-
mechanical analysis of elastic constants, failure, and environmental degradation. Design project.

AEM 4581. Mechanics of Solids. (3 cr; Prereq—3031, [Math 2373 or equiv], [Math 2374 or equiv], [IT upper div or grad
student])
Continuum mechanics in one dimension: kinematics; mass, momentum/energy, constitutive theory.
Wave propagation, heat conduction. Strings. Euler-Bernoulli theory. 3-D deformations/stress.
Topics from fracture mechanics, structural stability, vibrations, thin films, layered media, smart materials,
phase transformations, 3-D elastic wave propagation. Elasticity, viscoelasticity, plasticity.

AEM 4595. Problems in Mechanics and Materials. (1-3 cr; max 6 cr, Prereq—A)
Topics of current interest. Individual projects with consent of faculty sponsor.

AEM 4601. Instrumentation Laboratory. (3 cr; A-F only, Prereq—CSCI 1113, EE 3005, EE 3006, [upper div IT or grad
student])
Introduction to lab instrumentation. Computerized data acquisition. Statistical analysis of data.
Time series data, spectral analysis. Transducers for measurement of solid, fluid, and dynamical
quantities. Design of experiments.

AEM 4602W. Aeromechanics Laboratory. (4 cr; A-F only, Prereq—IT upper div or grad, 4201, 4501, 4601, ENGS 1011 or
equiv)
Experimental methods/design in fluid/solid mechanics. Wind tunnel/water channel experiments
with flow visualization, pressure, velocity, force measurements. Measurement of stresses/strains/displacements
in solids/structures: stress concentrations, materials behavior, structural dynamics. Computerized
data acquisition/analysis, error analysis, data reduction. Experiment design, Written/oral reports. Lab ethics. Writing intensive.

AEM 4796. Professional Experience. (1-3 cr [max 3 cr]; A-F only, Prereq—IIT upper div, AEM major, A)
Work experience with substantive engineering component. Written report. Number of credits
awarded based on extent of experience.

AEM 5245. Hypersonic Aerodynamics. (3 cr; A-F only, Prereq—4202, [grad student] or upper div IT)
Importance/properties of hypersonic flow, Hypersonic shock and expansion-wave relations.
Local surface inclination methods. Approximate/exact methods for hypersonic inviscid flow fields.
Viscous flow: boundary layers, aerodynamic heating, hypersonic viscous interactions, computational
methods. Hypersonic propulsion and vehicle design.

AEM 5251. Computational Fluid Mechanics. (3 cr; A-F only, Prereq—[202 or equiv], [CSCI 1113 or equiv], [IT upper div or grad
student])
Introductory concepts in finite difference and finite volume methods as applied to various
ordinary/partial differential model equations in fluid mechanics. Fundamentals of spatial discretization
and numerical integration. Numerical linear algebra. Introduction to engineering and scientific computing
environment. Advanced topics may include finite element methods, spectral methods, grid generation,
turbulence modeling.

AEM 5401. Intermediate Dynamics. (3 cr; Prereq—IT upper div or grad, 2012, Math 2243)
Three-dimensional Newtonian mechanics, kinematics of rigid bodies, dynamics of rigid bodies,
generalized coordinates, holonomic constraints, Lagrange equations, applications.

AEM 5431. Trajectory Optimization. (3 cr; A-F only, Prereq—4311 or equiv or #)
Parameter optimization problems. Topics in calculus of variations; necessary conditions of nonlinear
optimal control problems; classification of trajectory optimization algorithms; steady-state aircraft flight;
minimum-time climb aircraft trajectory; aero-assisted orbital transfer trajectories; optimal space
trajectories.

AEM 5441. Structural Dynamics. (3 cr; A-F only, Prereq—Pre2012, 3031, [grad student or IT upper div])
Frequency, time domain analysis of multi-degree of freedom mechanical systems. Natural frequencies,
normal modes of vibration. Free/fixed vibrations of strings, rods, and shafts beams. Introduction to finite
elements in structural dynamics.

AEM 5451. Optimal Estimation. (3 cr; A-F only, Prereq—[Math 2243, STAT 3021] or equiv, 4311 or #)
systems using Kalman and extended Kalman filters. Applications to sensor fusion, fault detection, and
system identification.

AEM 5495. Topics in Aerospace Systems. (1-4 cr [max 4 cr]; A-F only, Prereq—A)
Topics of current interest. Individual projects with faculty sponsor.

AEM 5501. Continuum Mechanics. (3 cr; Prereq—IT upper div or grad, 3031, Math 2243 or equiv or #)
Concepts common to all continuous media; elements of tensor analysis; motion, deformation, vorticity;
material derivatives; mass, continuity equation; balance of linear, angular momentum; geometric
characterization of stress; constitutive equations.

AEM 5503. Theory of Elasticity. (3 cr; A-F only, Prereq—4501 or equiv, Math 2243 or equiv or #)
Introduction to the theory of elasticity, with emphasis on linear elasticity. Linear and nonlinear strain
measures, boundary-value problem for linear elasticity, plane problems in linear elasticity, three
dimensional problems in linear elasticity. Topics from nonlinear elasticity, micromechanics, contact
problems, fracture mechanics.

AEM 5651. Aeroelasticity. (3 cr; A-F only, Prereq—4202, 4301, [grad student or IT upper div])
Static aeroelastic phenomena, torsional divergence of a lifting surface, control surface reversal. Aeroelastic
flutter, unsteady aerodynamics. Problems of gust response, buffetting. Design project.

Aerospace Studies (AIR)
Department of Aerospace Studies (Airforce ROTC)
Office of the Senior Vice President for Academic Affairs and Provost
AIR 1000. Leadership Laboratory. (1 cr; S-N only)
Air Force customs and courtesies, drill and ceremonies, military commands, the environment of
the Air Force officer, and learning about areas of opportunity available to commissioned officers.
Interviews, guidance, and information to increase the understanding, motivation, and performance of
other cadets.

AIR 1104. Introduction to the Air Force Today I. (1 cr; A-F only)
Mission and organization of the Air Force, officership and professionalism, military customs
and courtesies, Air Force officer opportunities, group leadership problems, and introduction to
communication skills.

AIR 1105. Introduction to the Air Force Today II. (1 cr; A-F only)
Structure and missions of Air Force organizations. Communicative skills. How cadets are selected for the
Professional Officer Course, categorization into specific career areas (pilot and navigator) occurs in the
AFROTC junior year, and selection for specific career fields is made in a cadet’s senior year.

AIR 1204. History of Airpower and Communication Skills. (1 cr; A-F only)
Air Force heritage and leaders, Quality Air Force, and introduction to ethics and values, introduction
to leadership, group leadership problems, and continuing application of communication skills.

AIR 1205. Quality Air Force, Group Leadership Problems, and Presentation Techniques. (1 cr; A-F only)
Leadership and followship. Officer ethics, and values; Air Force’s core values. Air Force
eritage and leaders, Quality Air Force, group leadership problems, and continuing application of
communicative skills.

AIR 3301. Air Force Leadership, Quality, and Communication. (3 cr; A-F only)
Study of leadership, quality management fundamentals, and communication skills required of
an Air Force junior officer. Case studies.

AIR 3302. Air Force Officership, Quality, and Communication. (3 cr; A-F only, Prereq—3301 recommended)
Focus on completing Quality Air Force training, learning the Officer Professional Development
system, exploring leadership styles, ethics, core values, character development, and standards of
conduct. Improve written and oral communication skills. Case studies.

AIR 3401. National Security Policy. (3 cr; A-F only)
National security process, regional studies, advanced leadership ethics, Air Force doctrine, and military
justice. Military as a profession, officership, civilian control of the military, preparation for active duty,
and current issues affecting military professionalism. Focus on refining communication skills.

AIR 3402. Preparation for Active Duty. (3 cr; A-F only)
National security process, regional studies, advanced leadership ethics, and Air Force doctrine. Military
law, current issues affecting military professionalism, and preparation for active duty as a second lieutenant in the U.S. Air Force.
AFRO-American Studies (AFRO)
Department of African American and African Studies

College of Liberal Arts
AFRO 1009. History of Women in Africa: 1500 to the Present. (3 cr)
Histories of women on African frontiers. Women in relations with their families, with other African/non-African people. Women of borders of Sahil-Savanna, Savanna-Forest, within country of Morocco, and of Swahili Coast and Atlantic Coast frontiers.

AFRO 1011. Introduction to African American Studies. (4 cr)
The study of peoples of African descent including the evolution of African American culture, comparative race relations, feminism and social policy change.

AFRO 1021. Introduction to Africa. (4 cr)
Diverse themes and disciplines in African Studies from prehistory to post-colonial period. Introduction to methodologies of inquiry.

AFRO 1131. Contemporary Issues in Africa. (3 cr)

AFRO 1221. Beginning Swahili, Semester I. (5 cr)
Comprehension, speaking, reading, writing.

AFRO 1222. Beginning Swahili II. (5 cr. Prereq–1221 or equiv)
Continuation of skill development from 1221.

AFRO 1902. Freshman Seminar. (3 cr. Prereq–Fr)
Topics specified in Class Schedule.

AFRO 1904. Freshman Seminar. (3 cr; A-F only, Prereq–Fr or less than 30 cr)
Topics specific in Class Schedule.

AFRO 1909FW. Freshman Seminar. (3 cr [max 6 cr]; A-F only. Prereq–Fr with no more than 30 cr)
Topics specified in Class Schedule.

AFRO 3001. West African History: Early Times to 1800. (3 cr)
West Africa from late prehistoric times to establishment/histories of states. Relations with North African, Mediterranean, Asian, and American worlds. Examines non-centralized patriarchal authority.

AFRO 3002. West African History: 1800 to Present. (3 cr)
West African history from late 18th century to present. Themes include study of continuities with the past and profound changes including new 19th century state formation, European colonialism, and post-colonial issues.

AFRO 3006. Impact of African Migrations in the Atlantic World. (3 cr; A-F only)

AFRO 3061. The Black Family. (3 cr)
A sociological view of African American family life in the United States.

AFRO 3072. Racism: Social and Psychological Consequences for Black Americans. (5 cr)
Racism and its effects on African Americans; definitions, determinants, and dynamics. Examined in an experiential context to reflect individual and institutional racism.

AFRO 3108. Black Music: A History of Jazz. (3 cr)
The development of jazz in America and in the world, with special emphasis on the roots or jazz in the African American experience.

AFRO 3110. Study of an African Language. (4 cr [max 6 cr]; Prereq–Enrolled in Minnesota Studies in International Development in-country language course in [Swahili or Wolof or Twi])
Introduction to a selected African language. Emphasizes oral communication skills and cultural context.

AFRO 3112. In the Heart of the Beat: the Poetry of Rap. (3 cr; A-F only)
Contemporary African American poetry as expressed by popular culture contributors. Students analyze/evaluate poems used in rap, in context of African American literature, American culture, and aesthetics.

AFRO 3120. Social and Intellectual Movements in the African Diaspora. (3 cr; A-F only. §AFRO 5120)

Why peace has been elusive throughout history of Africa, from period of slave raids through colonialism and until today. Intractable conflicts in Great Lakes Region, Horn of Africa, South Africa, Nigeria, Liberia/Sierra Leone, Mauritania, Sudan. Why no peaceful resolution despite multiple mediation efforts. Case studies.

AFRO 3141. Africa. (3 cr §EGEO 3141)
Regional differentiation of human groups and environments; cultural contact and problems of underdeveloped countries south of the Sahara.

AFRO 3204. History of South Africa to 1910. (3 cr. §HIST 3434)
Introductory survey of the history of South Africa from early humans to the arrival of the first Dutch settlers at the Cape of Good Hope in 1652 to the formation of the Union of South Africa in 1910.

AFRO 3205. History of South Africa from 1910. (3 cr. §HIST 3435)
The history of South Africa from the Union to the present. Focus on such issues as African and Afrikaner nationalism, structures of apartheid, forced population removals, divestment and sanctions, and the post-apartheid era.

AFRO 3225. Third Semester Swahili. (4 cr. Prereq–1 yr Swahili or equiv)
Readings of contemporary Swahili texts. Review of grammar and complex verb forms, building vocabulary and communication skills.

AFRO 3226. Fourth Semester Swahili. (4 cr. Prereq–3225 or equiv)
Advanced Swahili readings, speaking, and writing practice.

AFRO 3251W. Sociological Perspectives on Race, Class, and Gender. (5 cr; A-F only. §SOC 3251W)
Race, class, and gender as aspects of social identity and as features of social organization. Experiences of women of color in the United States. Family life, work, violence, sexuality/reproduction, possibilities for social change.

AFRO 3301. The Music of Black Americans. (3 cr)
Musical contributions of African American artists and innovators from 1619 to the present. Musical genres explored include spirituals, blues, ragtime, gospel, art music, and jazz.

AFRO 3334. Black Women: Interdisciplinary Perspectives. (4 cr)
Interdisciplinary study of the experience of African American women, including economic, political, and social factors, psycho-sexual development, and family roles.

AFRO 3405. The African American Child. (3 cr §AFRO 5405)
Research carried out by African American psychologists and behavioral/social scientists, and by experts on African American child/youth development.

AFRO 3426. African Americans, Social Policy, and the Welfare State. (3 cr)

AFRO 3429. Slavery in Africa and in the Americas, 1400 to 1880. (3 cr; A-F only. §AFRO 5429)

AFRO 3431. Early Africa and Its Global Connections. (4 cr. §HIST 3431)
Socioeconomic, political, and cultural development in precolonial Africa, from ancient Egypt through era of trans-Atlantic slave trade.

AFRO 3432. Modern Africa in a Changing World. (4 cr. §HIST 3432)
Socioeconomic, political, and cultural development in Africa, from abolition of trans-Atlantic slave trade through postcolonial era.

AFRO 3436. Historical Background to Contemporary African Conflicts: Case Studies. (3 cr)
Historical contexts in which specific contemporary political conflicts developed. Slavery, colonial conquest, indirect rule, forced labor, discretionary justice. Patterns of human rights violations and of socio-political conflict. Cases studies might include Somalia, Democratic Republic of Congo, and Rwanda.

AFRO 3437. History of East Africa. (3 cr; A-F only. §AFRO 5437, HIST 3437, HIST 5437)
Major themes in history of East Africa, from era of early human cultural development to present. Methods that historians use to reconstruct history. Varying interpretations/constructions of history over time.

AFRO 3439. Popular Narratives of the African Past. (3 cr)
Diverse ways that ordinary Africans have interpreted/portrayed particular events in African history. Popular depictions of African past, their relationships with academic histories.

AFRO 3543. Psychology and the Black American Experience. (3 cr)
Historical and contemporary perspectives of the relationship between the area of psychology and African Americans in research and practice.

AFRO 3578. Arts of Africa. (3 cr §ARTH 3578)
Survey of the diverse arts of Africa, from ancient times to present. Visual arts of several civilizations. Relation of visual arts to larger cultural issues (religion, cosmology, gender, identity, political power).
AFRO 3585. African American Art. (3 cr; A-F only §ARTH 5585W) Four hundred year history of African American art. How/why African Americans created artwork at specific times, in specific places. Arts of African Americans within their own communities, National arts movements, and American life during historical junctures.

AFRO 3591W. Introduction to African American Literature. (4 cr §ENGL 5591W) African American autobiography, fiction, essay, poetry, drama, and folklore from late-18th century to present.

AFRO 3592W. Introduction to Black Women Writers in the United States. (3 cr) The literature of African American women writers explored in novels, short stories, essays, poetry, autobiographies, and drama from the 18th to the late-20th century.

AFRO 3594W. Introduction to Contemporary Black Fiction. (3 cr; A-F only) Major contemporary Black fiction writers, such as Gayle Jones, Ernest Gaines, Charles Johnson, Toni Morrison, Gloria Naylor, and John Edgar Wideman, among others, whose works span the period from 1970 to 1990s.

AFRO 3597W. Introduction to African American Literature and Culture I. (4 cr) African American oral tradition, slave narrative, autobiography, poetry, essay, fiction, oratory, and drama, from colonial era through Harlem Renaissance.


AFRO 3591. Introduction to African Literature. (3 cr) Oral and written literature of the 19th and 20th centuries. Emphasis on literature written in English and French. All readings in English.


AFRO 3626. Literature of African American Men: Sex, Family, and Relationships. (3 cr; A-F only) African American male fiction writers’ approach to subject of family and relationships. Social, economic, and psychological consequences of race/ethnicity, and effect on African American men writing about themselves within context of family/relationships. Manhood/masculinity as interpreted/articulated in fiction.

AFRO 3628. Literature of Rebellion: the Amistad and other Revolts. (3 cr; A-F only) Amistad affair and other slave revolts in fictional or non-fictional texts. Nature of race/oppression. Historical representation of these specific incidents as settled in American consciousness. Responsibilities/challenges presented to authors in terms of accuracy, commercial viability, and literary quality. Introduction to issues concerning African American slavery.

AFRO 3634. Blues & Rhythm and Blues. (3 cr) Black American culture as expressed by blues and rhythm and blues. Evolution of blues from work songs and field hallors of slavery/emancipation through postwar blues sounds of Louis Jordan, through expressions of pre-rock-n-roll rhythm and blues, and to more current expressions of performers like Brian McKnight.

AFRO 3654. African Cinema. (4 cr) Films by African filmmakers from West, Central, and Southern Africa. Aesthetic, theoretical, and sociocultural issues will be explored through class screenings and critical readings.

AFRO 3741. People of Color and the Mass Media. (3 cr; A-F only) Past and present depictions of minority individuals and groups in movies, literature, radio/TV, etc., as seen against anthropological, psychological, and sociological knowledge and experience. Emphasis on personal and political effects of media depictions.

AFRO 3756. Social and Cultural History of Blacks in Sports. (3 cr §AFRO 5756W) Social/cultural contexts surrounding eras of athletes such as Jack Johnson, Jackie Robinson, Joe Louis, Jesse Owens, Althea Gibson, Wilma Rudolph, Muhammad Ali, Michael Jordan, and Tiger Woods. Impact of these athletes on national/international events. Periods when it was not uncommon for black entertainers/athletes to become involved in politics and community activism.


AFRO 3865. African American History: 1865 to the Present. (4 cr §HIST 3865) Internal migrations, industrialization/unionization, the Great Depression, world wars, large scale movements for social/political change.


AFRO 3868. Race, War, and Race Wars in American History. (3 cr) Role that race has played in American war history. Impact that wars have had on race and race relations in the U.S. and the world.

AFRO 3910. Topics in African American and African Studies. (1-3 cr max 9 cr) Topics specified in Class Schedule.

AFRO 3993. Directed Study. (1-13 cr max 5 cr) Prerrt-#. (A, ∆) Guided individual research and study.

AFRO 4001. Seminar: History of Women in South Africa. (3 cr §HIST 4348) The changing role and status of women in South Africa from colonial era to the present, and relationships to political, social, and economic development.


AFRO 4231. The Color of Public Policy: African Americans, American Indians, and Chicanos in the United States. (3 cr §GAAS 4231, AMIN 4231, CHIC 4231) Examination of structural or institutional conditions through which people of color have been marginalized in public policy. Critical evaluation of social theory in addressing the problem of contemporary communities of color in the United States.


AFRO 4302H. Honors: Women's Personal Narratives. (3 cr) Focus is on literary autobiography, journals, travel narratives, essays, slave narratives, testimonials, and ethnographies to consider the content and the methodological, theoretical, and aesthetic issues of the construction and production of women’s experience.


AFRO 4432. Colloquium: Before the Field: Internships, Community Service, and Study Abroad. (3 cr) Theoretical and practical preparation for internships, community work, and study abroad.

AFRO 4478. Contemporary Politics in Africa and the Colonial Legacy. (3 cr; A-F only §AFRO 5478, POL 4478, POL 5478) How current politics in mainly, though not exclusively, sub-Saharan Africa have been shaped by pre-colonial/colonial processes. Reality of independence, recurrent political/economic crises, global context, prospects for effective democracy.

AFRO 4593. The African American Novel. (3 cr §ENGL 5593) Contextual readings of 19th- and 20th-century black novelists, including Chestnut, Hurston, Wright, Baldwin, Petry, Morrison, and Reed.

AFRO 4597. Seminar: Harlem Renaissance. (3 cr §ENGL 5597) A multidisciplinary review of the Jazz Age’s Harlem Renaissance: literature, popular culture, visual arts, political journalism, and major black and white figures.


AFRO 4632. Black Francophone Writers in Translation. (3 cr) Exploration of ideas, particularly negritude and issues of creoleness, central to male and female writers in French from Africa and the Caribbean. Novels, essays, short stories, and plays.

AFRO 4655. African American Cinema. (3 cr §ARTH 5655) Exploration of African American cinematic achievements, from the silent films of Oscar Micheaux through contemporary Hollywood and independent films, using class screenings and critical readings.

AFRO 4800. African Studies Seminar. (3 cr) Topics vary and reflect instructor’s research interests. Topics specified in Class Schedule.

AFRO 4991W. Thesis Research and Writing. (2 cr; A-F only. Prerrt-Δ) Preparing a research paper that satisfies major project requirement. Defining a research problem. Collecting/analyzing data. Writing the research paper.

AFRO 4992. Thesis. (1 cr; A-F only. Prerrt–4991W, Δ) Work with thesis adviser to complete final copy of senior project.

AFRO 5072. Racism: Social and Psychological Consequences for Black Americans. (3 cr) Racism and its effects on African Americans; definitions, determinants, and dynamics. Examined in an experiential context to reflect individual and institutional racism.
AFRO 5101. Seminar: Introduction to Africa and the African Diaspora. (3 cr)
Comparative frameworks, related theories, and pivotal texts in study of Africa and African Diaspora.

AFRO 5103. African History from the Perspective of the African Diaspora. (3 cr; A-F only)

AFRO 5120. Social and Intellectual Movements in the African Diaspora. (3 cr; A-F only)

AFRO 5181. Blacks in American Theatre. (3 cr; §AFRO 3181)
Historical survey of significant events in development of American black theater traditions. Essays, plays, playwrights, and theaters from early colonial references to the Black Arts Movement to the present.

AFRO 5191. Seminar: The African American Experience in South Africa. (3 cr; §HST 5438)
Ideolectical, political, religious, and cultural ties that have informed African American and black South African relations from late 18th century to present.

AFRO 5401. Field Studies in African American and African Studies. (1-6 cr [max 6 cr]; Prereq—[African American or African Studies] major or minor, #)
Supervised field study/internship focused on African American or African culture(s), language(s), and development.

AFRO 5405. The African American Child. (3 cr; §AFRO 3405)
Research carried out by African American psychologists and behavioral/social scientists, and by experts on African American child/youth development.

AFRO 5429. Slavery in Africa and in the Americas, 1400 to 1860. (3 cr; A-F only) [AFRO 3429]

AFRO 5437. History of East Africa. (3 cr; A-F only) [AFRO 3437, HST 5437]
Major themes in history of East Africa, from era of early human cultural development to present. Methods that historians use to reconstruct history. Varying interpretations/constructions of history over time.

AFRO 5478. Contemporary Politics in Africa and the Colonial Legacy. (4 cr; A-F only) [AFRO 4478, POL 4478, POL 5478. Prereq—POL 1054 or POL 3051 or non-pol sci grad student or #)
How current politics in mainly, though not exclusively, sub-Saharan Africa have been shaped by pre-colonial/colonial processes. Reality of independence, recurrent political/economic crises. Global context, prospects for effective democracy.

AFRO 5551. Methods: Use of Oral Traditions as Resources for History. (3 cr)
Use of spoken information through time as a source for writing history. Use of canons of history to analyze and critique oral traditions and integrate them into written history.

AFRO 5701. Proseminar: Classic Works in African American Studies. (3 cr)

AFRO 5702. Proseminar: Major Figures in African American Studies. (3 cr)
Major figures from various fields in African American studies. Bio-critical focus.

AFRO 5741. Minorities and Mass Media. (3 cr; A-F only, Prereq—jur major or minor, JUR 3004, &)
Analysis of relationships between mass media and communities of color in the United States. Focuses on issues of content and control.

AFRO 5756. Social and Cultural History of Blacks in Sports. (3 cr [§AFRO 3756])
Social/cultural contexts surrounding eras of athletes such as Jack Johnson, Jackie Robinson, Joe Louis, Jesse Owens, Althea Gibson, Wilma Rudolph, Muhammad Ali, Michael Jordan, and Tiger Woods. Impact of these athletes on national/international events. Periods when it was not uncommon for black entertainers/athletes to become involved in politics and community activism.

AFRO 5866. Proseminar: African-American History. (3-4 cr [max 4 cr]; Prereq—#)
Examination of issues including slavery, Reconstruction, the Great Depression, and civil rights movement using cultural and intellectual history and autobiography/biography. Focuses on dynamics of race, gender, class, region, sexuality, and religion.

AFRO 5965. Proseminar: African-American History. (3-4 cr [max 4 cr; Prereq—#]
Construction of a detailed research agenda, locating appropriate depositories of primary materials and secondary sources, and developing appropriate methodologies and frameworks.

AFRO 5966. The Civil Rights and Black Power Movement, 1954-1964. (3 cr; A-F only [§AFRO 3966])
The “second reconstructive” period, the ascent and decline of the civil rights movement, the struggle for Black Power by new organizations/ideologies/leaders. Ascendancy of Reagan, conservative assault on movement.

AFRO 5976. Proseminar: Approaches to African Development. (3 cr)
Study, critical analysis, and comparison of primary documents relevant to African development.

AFRO 5910. Topics in African American and African Studies. (1-3 cr [max 9 cr])
Topics specified in Class Schedule.

AFRO 5993. Directed Study. (1-3 cr [max 3 cr]; Prereq—#)
Guided individual reading/study for qualified seniors and graduate students.

Agricultural Industries and Marketing (AIM)

College of Food, Agricultural and Natural Resource Sciences
AIM 4011. Student Project/Field Investigation. (3 cr)
Application of marketing knowledge that involves building a complete marketing plan for an agricultural product or device. Team projects are used.

For definitions of course numbers, symbols, and abbreviations, see page 300.
AFEE 5111. Agricultural Education: Methods of Teaching. (4 cr)
Use of teaching resources; principles of teaching and learning; problem-solving techniques, lesson plan construction for large group, small group and individual investigations; student management; and assessment.

AFEE 5112. Agricultural Education Program Organization and Curriculum for Youth. (3 cr)
Development of community school program in agriculture, agribusiness, and environmental science. Program to meet graduation outcomes and determine student needs.

AFEE 5113. Adult Agricultural Education Program Development and Technology. (3 cr; A-F only)
Organization and implementation of education programs for farmers, farm managers, and agribusiness personnel using community and environmental resources, agricultural and instructional technology, and management information systems to attain family and business goals.

AFEE 5114. Agricultural Education Teaching Seminar. (1 cr)
Reflective learning on teacher preparation experience; identify issues and problems facing the discipline; needs for continual preparation and program adjustment.

AFEE 5116. Coordination of SAE Programs: Work-based Learning. (2 cr; A-F only. Prereq—Agricultural education major or #)

AFEE 5118. Strategies for Managing and Advising the FFA Organization. (2 cr; A-F only. Prereq—Agricultural education major or #)
Principles/techniques to advise an FFA chapter. Historical/philosophical basis of FFA, organization/structure. Integration with classroom instruction, public relations, recruitment, and administration of FFA chapters.

AFEE 5220. Special Topics in Agriculture Education and Extension. (1-3 cr [max 12 cr])
Content varies by offering.

AFEE 5231. Agricultural Education Curriculum K-12. (2 cr; A-F only)
Philosophy, organization, and administration of instruction in agricultural education programs at the elementary, middle, and high school levels.

AFEE 5233. Advanced Procedures in Teaching Agricultural Education. (2 cr; A-F only)
New developments in methodology; assessment of innovations and procedures; consideration of various levels of instruction.

AFEE 5235. Advanced Supervised Agricultural Experience Programs. (2 cr)
The organization and administration of agricultural experience programs for middle and secondary level students; career exploration, improvement projects, experiments, placement in production/business/community settings, entrepreneurship. Current state and national programs and resource material.

AFEE 5237. Mentorship for Supervising Agricultural Education Teachers. (2 cr)
Professional development training for experienced teachers to serve as mentors for beginning and student teachers of agricultural education. Emphasis on supervision and assessment of teaching performance. Focus on critical period of induction into the teaching profession.

AFEE 5239. Program Organization and Management in Agricultural Education. (2 cr)
Analysis of organization, management, and assessment of agricultural education programs at the middle, high school, and adult levels.

AFEE 5280. Current Issues for the Beginning Agricultural Education Teacher. (1-3 cr [max 3 cr])
Reflection, analysis on current issues and problems confronting beginning teachers in agricultural education. Issues in teaching methods, classroom and program management, discipline, curriculum, FFA and SAE development, school-to-work relationships.

AFEE 5290. Seminar: Current Issues in Agricultural Education and Extension. (1-3 cr [max 6 cr])
Exploration of current issues in agricultural education and extension, strategies of response, implications of response actions, and related leadership roles.

AFEE 5296. Professional Experience Practicum in Agricultural Education and Extension. (1-4 cr [max 4 cr])
Observation, study, and experience in agriculture education and industry; identification of educational problems observed in the agricultural industry; evaluation of personal experience.

AFEE 5331. History, Philosophy, and Systems of Extension. (3 cr; A-F only)
History and philosophy of extension; modification and adaptation to worldwide methods and approved practices; extension methodologies; innovative approaches; systems appropriate to development environments.

AFEE 5361. World Development Problems. (3 cr; A-F only)
Introduction to defining problems throughout the world. Development in Third World countries. Examples of First World development problems. Interdisciplinary focus on population, health and disease, education, industry, finance, politics, and human rights.

AFEE 5371. Farming Systems Research and Extension. (3 cr; A-F only)
Introduction to the theory and practice of linking farming systems, research, and extension. An interdisciplinary and holistic approach to rural development for individuals and communities throughout the world.

AFEE 5401. Introduction to Farm Business Management Education Teaching. (3 cr; A-F only)

AFEE 5405. Advanced Farm Financial Analysis Methodology and Concepts. (1 cr)
Farm financial analysis concepts, whole entity financial analysis issues/tools, enterprise analysis options/methodologies. Evaluation of industry standardization efforts. Analysis of where each option fits.

AFEE 5407. Application of Advanced Farm Financial Analysis Tools and Methods. (1 cr)
Use of advanced farm financial analysis tools/methodology to analyze financial performance of actual farm businesses. Case farms are used to apply whole entity financial analysis tools/concepts and enterprise analysis methodologies.

AFEE 5409. Seminar: Teaching Strategic Farm Business Planning. (1 cr [max 4 cr]; A-F only)
Teaching strategic business planning to farm managers and agricultural professionals. Philosophy of strategic management, components of a strategic business plan. Materials/tools to apply strategic farm business planning in educational programs. Students apply strategic planning methods/concepts to farm business scenarios.

AFEE 5411. Seminar: Farm Financial Planning Teaching Tools and Methods. (1 cr [max 4 cr]; A-F only)
Preparation to teach farm financial planning to farm managers and agricultural professionals. Principles/concepts of long range financial planning and short range cash flow planning. Farm financial planning software tools, case farm situations, practical farm planning experience.

AFEE 5413. Seminar: Teaching Effective Use of Commodity Marketing Tools. (1 cr [max 4 cr]; A-F only)
Teaching commodity marketing tools to farm managers and agricultural professionals. Commodity marketing tools, including cash forward contracts, futures, and options, and how to use them to enhance price and protect income. How to choose marketing tools, given financial/market conditions.

AFEE 5415. Seminar: Teaching Commodity Marketing Strategies. (1-4 cr [max 4 cr]; A-F only)
Teaching commodity market planning to farm managers and agricultural professionals. Development of marketing plans to enhance price and protect income. Introduction to tools to simulate implementation of plans against actual price scenarios.

AFEE 5993. Directed Study in Agricultural Education and Extension. (1-9 cr [max 9 cr])
Topics may be chosen to permit study of areas within education or to supplement areas of inquiry not provided in the regular course structure.

AFEE 5995. Integrating Paper—Master of Education: Agricultural and Extension Education. (1-4 cr [max 4 cr]; A-F only)
Students prepare paper dealing with issues in agricultural education applied to professional responsibilities.

Agronomy and Plant Genetics (AGRO)

AGRO 1007. Horse in Your Backyard. (2 cr; A-F only. §ANSC 1007)
Role of horses in society. How to keep a horse well fed and healthy. Fundamentals of horse nutrition, feedstuffs, pasture, and horse health. How to seek/interpret information to make decisions on vaccination, worming, nutrition, grazing management, hay selection, manure handling, and use of dietary feed additives/enhancers.

AGRO 1093. Directed Studies. (1-4 cr [max 12 cr]). Prereq—4 cr in AGRONomy, #)
Allows study of agronomy in greater depth or in areas not currently offered in formal courses. Tutorial instruction under staff guidance.

AGRO 1110. Biology of Plant Food Systems. (4 cr)
Fundamental concepts of biology at the molecular, cellular, organismal, and ecosystem levels. Plants and plant use by humans. Lab, greenhouse, field, and classroom discussions.

AGRO 1103. Crops, Environment, and Society. (4 cr. §AGUM 2222)
Plants that supply food, fiber, beverages, and medicine to humans. Plant identification, plant physiology, plant breeding/biotechnology, plant ecology, crop culture/management.

AGRO 1660. First-Year Colloquium/Experience in AGROecosystems Analysis. (2 cr; A-F only. Prereq—1st yr in major hosted by Department of AGRONomy and Plant Genetics) Agroecosystems and their impacts on the environment, landscapes, and rural communities. Students develop a course plan within their major, explore career options, and increase their familiarity with the department, its history, and its faculty/staff. Field trips, discussions, readings, reflective writings.

AGRO 2101. Biology of Food, Land, People, and the Environment. (4 cr; A-F only. Prereq—Elementary education major)
Biological basis of food, land, people, and environmental systems. Biology at cellular, organism and ecosystems level in relation to human activity systems. Active learning, project-based approach.
AGRO 2104. Grain and Seed Technology. (2 cr. Prereq–
[1103, APEC 3411] recommended) Practical/technical aspects of grading using Federal Grain Inspection Service (FGIS) standards with examples of commodity, classes, subclasses, defects, and special grades. Seed analysis identifying common crops and weed seeds. Seed laws, seed handling, conditioning/viability testing. Primarily laboratory discussion, practicum, and problem solving.

AGRO 2501. Plant Identification for Urban and Rural Landscapes. (2 cr. §AGUM 2240, PRBL 1009 or equiv) Plant/weed species important in turf, horticulture, forestry, and crop production systems. Emphasizes identification of native grasses/forbs, field crops, and weed species in Minnesota and Upper Midwest. Plant life cycles, habitats, and relationships to human systems.

AGRO 3203H. Environment, Global Food Production, and the Citizen. (3 cr. §AGUM 2224, ANSC 3553W, PRBL 1009 or equiv) Ecological and ethical concerns of food production systems in global agriculture—past, present, future. Examining underlying ethical positions about how agroecosystems should be configured. Decision cases, discussions, videos, other media.

AGRO 4005. Applied Crop Physiology and Development. (4 cr. [max 6 cr] Prereq–CHEM 1011 or CHEM 1021 or equiv) §BIOL or plant science) Applications of crop physiology processes of water relations, photosynthesis, mineral uptake/function, transpiration, translocation, and their relationships to plant growth/development from seed germination to maturation and dry down for harvest. Emphasizes inquiry, field problems, and group activity. Lecture, laboratory.

AGRO 4093. Directed Studies for Advanced Students. (1-4 cr [max 12 cr]. Prereq–15 cr in Agronomy, #) Allows study of agronomy in greater depth or in areas not currently offered in formal courses. Tutorial instruction under staff guidance.

AGRO 4096. Professional Experience Program: Internship. (1-3 cr [max 6 cr]. S-N only. Prereq–AGUM 4096, COAFES undergrad, complete internship contract available in COAFES Career Services before enrolling; UC only) Supervised professional experience in agribusiness firms or government agencies; evaluative reports and consultations with faculty advisers and employers.

AGRO 4101. Agricultural Decision Making and Experimentation. (3 cr. Prereq–JR or sr) Principles of field plot techniques and design applied to fields/crops/production experiments. Inductive/deductive reasoning, analysis of data, tests of significance. Treatment comparisons, decision making. Computers used for data processing and statistical analysis.

AGRO 4103. World Food Problems. (3 cr. §APEC 4103, CMV 6002, FSCN 4103, Prereq–JR or sr or grad) Multi-disciplinary look at problems and possible solutions for food production, storage, and utilization in developing countries. Presentations and discussions introduce conflicting views on population, use of technology, and ethical and cultural values held in various parts of the world.

AGRO 4401. Plant Genetics and Breeding. (4 cr. §HORT 4401, PRBL 1009 or equiv or grad, #) Principles of plant genetics and environmental variation. Applications of genetics to crop evolution and breeding. Use of plasmid/polylinker, cross-pollinated, and sexually propagated crops. Lab experiments in hybridization, variation, and selection.


AGRO 4603. Field Crop Scouting and Problem Diagnosis. (3 cr. Prereq–3001, SOL 3416, [IGSC 3001, PLPA 2002] or Agri 3007) [Jr or sr, 15-20 cr in major] Insects, diseases, weeds, Nutrient status, Environmental stresses due to wind, hail, frost, soil conditions, and chemical injury. Calibration of equipment associated with crop protection. Pesticide use, safety procedures. Crop growth stage growing degree day as components of decision-making and precision agriculture. Intensive summer training sessions at selected Minnesota agricultural research and outreach centers.

AGRO 4805. Development Strategies for Crop Production. (4 cr. [Prereq-JR or sr or grad student with program committee approval]) Crop management strategies/solutions for various climate zones, soil types, from seed selection to crop storage. Focuses on cropping systems involving corn, soybeans, small grains, and forages. Emphasizes long term productivity, profitability, and sustainability. Lecture, discussion, problem sets, laboratory.

AGRO 4860. Senior Capstone: Leadership, Decision Making, and Problem Solving. (2 cr. A-F only. Prereq–4006 or ScAg 4009 or #) Professional leadership and decision making from ethical, technical, societal, and personal reflection perspectives. Links to undergraduate internship and other experiential learning opportunities. Problems, decision-centered cases, interviews.

AGRO 4888. Issues in Sustainable Agriculture. (2 cr. Prereq–1103, SOL 1125 or 2125 or equiv) Agroecology, sustainable practices, production economics, environmental quality, holistic resource management, healthy food/water, rural communities. Meet sustainable-agriculture advocates, including farmers, faculty, and representatives of non-profit sustainable-agriculture organizations.

AGRO 5021. Introduction to Plant Breeding. (3 cr. Prereq–GCH 3022 or background in plant science) For majors not specializing in plant breeding. How genetics is applied to plant improvement. Emphasizes sustainable-production scenarios.

AGRO 5121. Applied Experimental Design. (4 cr. §ENFT 5121, Prereq–STAT 5021 or equiv or #) Principles of sampling methodologies, experimental design, and statistical analyses. Methods/procedures in generating scientific hypotheses. Organizing, initiating, conducting, and analyzing scientific experiments, using experimental designs and statistical procedures.

AGRO 5311. Research Methods in Crop Improvement and Production. (1 cr. S-N only. Prereq–Applied plant sciences grad) Demonstrations and discussions of techniques in crop improvement and/or production research. Presentations integrate biotechnology with traditional breeding methods; production sessions emphasize ecologically sound cropping systems.

AGRO 5321. Ecology of Agricultural Systems. (3 cr; A-F only. §ENFT 5321, Prereq–GCH 3022 or above course in [AGRO or ANSC or Ent or Hort or PLPA or Sol] or #) Ecological approach to problems in agricultural systems. Formal and informal ecological systems inquiry have been developed/ applied.

AGRO 5999. Special Topics: Workshop in Agronomy. (1-6 cr [max 6 cr]. Prereq–JR or sr or grad student) Workshops on various topics in agronomy and plant genetics. Presenters/faculty may include guest lecturers/experts. Topics specified in Class Schedule.

American Indian Studies (AMIN)

College of Liberal Arts

AMIN 1001. American Indian Peoples in the United States. (3 cr) Introduction to how voices/visions of indigenous peoples have contributed to history of cultural expression in North America. Historic contexts/ varieties of this expression by region, tribal cultures. Emphasizes contributions in literature, philosophy, politics, fine arts.

AMIN 1002. Indigenous Peoples in Global Perspective. (3 cr; A-F only. §POL 1019) Colonial experiences of selected indigenous peoples in Americas, Eurasia, Pacific Rim.

AMIN 1003. Indigenous Peoples: a Minnesota Perspective. (3 cr; A-F only) History, culture, and lived experience of American Indian people in Minnesota. Self-representation and histories of Anishinabek (Ojibwe) and Dakota peoples through film, music, oral traditions, and written texts. Work by non-Indian scholars that focuses on distinctive cultural, philosophical, and linguistic perspectives of Anishinabe and Dakota peoples.

AMIN 1101. Beginning Ojibwe I. (5 cr) Acquisition of speaking skills, fundamentals of grammar, writing systems.

AMIN 1102. Beginning Ojibwe II. (5 cr. Prereq–1101) Acquisition of speaking skills, fundamentals of grammar, and writing systems.

AMIN 1121. Beginning Dakota I. (5 cr) Development of the four skills of language acquisition: listening, speaking, reading, and writing. Oral drills and in-class participation focused on questions and answers.

AMIN 1122. Beginning Dakota II. (5 cr. Prereq–1121) Further development of language acquisition skills with oral drills and in-class participation focused on questions and answers.

AMIN 1902. Freshman Seminar. (3 cr; A-F only) Prereq–Freshman Topic specified in Course Guide.

AMIN 1905. Freshman Seminar. (3 cr. Prereq–or at least 30 cr) Topics specified in Course Guide.

AMIN 1908W. Freshman Seminar. (3 cr [max 6 cr]; A-F only) Prereq–Freshman Topics specified in Class Schedule.


AMIN 3104. Intermediate Ojibwe II. (5 cr. Prereq–1101, 1102, 3103) Improving speaking skills; grammatical structure; storytelling, oral history, and translation projects.

AMIN 3107. Structure of Anishinaabemowin, the Ojibwe Language. (3 cr; A-F only) §AMIN 5107. Prereq–3103 Analysis of grammatical structures of Anishinaabemowin.

For definitions of course numbers, symbols, and abbreviations, see page 300.
AMIN 3108. History of Anishinaabemowin, the Ojibwe Language. (3 cr; A-F only. §AMIN 5108. Prereq–3107) Historical development of Anishinaabemowin.

AMIN 3109. Anishinaaeb Literature. (3 cr; A-F only. §AMIN 5109. Prereq–3109) Readings in Anishinaabe oral literature.

AMIN 3123. Intermediate Dakota I. (5 cr. Prereq.–1122) Development of listening, speaking, reading, and writing skills with oral drills and in class participation focused on questions and answers.

AMIN 3124. Intermediate Dakota II. (5 cr. Prereq.–1121, 1122, 3123) Further development of the listening, speaking, reading, and writing skills with oral drills and in class participation focused on questions and answers.


AMIN 3143. Language in American Indian Culture and Society. (3 cr; A-F only. §SANTI 3143) Survey of North American indigenous languages in social/cultural contexts, from before European contact to present.

AMIN 3201W. American Indian Literature. (3 cr) Comparative studies of oral traditions, modern literature from various tribal cultures.

AMIN 3203W. American Indian Aesthetics. (3 cr; A-F only) Ways in which American Indians have distinguished themselves as artistic thinkers. Regional traditions of American Indian art. Ways in which art was connected with everyday life and with religious practices. How American Indians thought about art differently from their Western counterparts. Innovations that contemporary American Indian artists have made in the way art is done and thought about by Indians/non-Indians.

AMIN 3301. American Indian Philosophies. (4 cr) World views of the indigenous people of the Americas. Topics include native medicines and healing practices, ceremonies and ritual, governance, ecology, humor, tribal histories, and status of contemporary native people.

AMIN 3303. American Indians and Photography. (3 cr. §AMIN 5303) Historical/comparative overview of photos in which American Indian people are central subjects. Primary features of images in American Indian photos. Relationships among those involved in making/viewing photos. Ways in which photos are interpreted. Relation of photos to social contexts in which they are produced and to agencies of those who stand behind their making.

AMIN 3401. American Indian Art. (4 cr) Visual arts depicting rituals, traditions, values, and worldviews of major American Indian populations. Creative processes of art from pre-contact times through contemporary art. Emphasis placed on style, technique, materials and imagery, and symbolism.

AMIN 3402. American Indians and the Cinema. (3 cr; A-F only) Representations of American Indians in film, historically/contemporarily. What such representations assert about Native experience and cultural viability. What they reflect about particular relationships of power.

AMIN 3409. American Indian Women: Ethnographic and Ethnohistorical Perspectives. (3 cr. §AMIN 5409, WOST 3413) Comparative survey of ethnographic/ethnohistorical writings by/about American Indian women.


AMIN 3601. American Indian Oral Traditions. (3 cr; A-F only. Prereq–1001 or 1002 or 1003) Survey of oral traditions of indigenous peoples of North America.

AMIN 3701. Ojibwe Culture and History. (3 cr) Ojibwe culture, history, and traditions including philosophy, religion, and lifestyle. Students develop an appreciation for the values and belief systems of traditional Indian people.

AMIN 3711. Dakota Culture and History. (3 cr) An overview of Dakota culture, language, history, literature, contemporary issues, and the arts.

AMIN 3713. American Indian Communities of the Great Lakes. (3 cr) American Indian communities of the Great Lakes over time, with particular attention to Ojibwe, Dakota, and HoChunk experiences. How the richness of the world created by Great Lakes tribes was damaged, depressed, and altered but not destroyed by the arrival of EuroAmericans.

AMIN 3870. Topics in American Indian History. (3 cr. §HIST 3870) Topics may include social history, oral history, history of particular regions, political systems, education, and policy. Designed for undergraduates.

AMIN 3871. American Indian History: Pre-Contact to 1830. (4 cr. §HIST 3871) American Indian history from the era of ancient Native America to the removal era. Social, cultural, political, and economic diversity of Native American peoples and Native American experiences with European colonialism.

AMIN 3872. American Indian History: 1830 to the Present. (4 cr. §HIST 3872) American Indian history from 1830 to the present. Impact of federal Indian policy on American Indian cultures and societies.

AMIN 3876. American Indian Education. (3 cr) Educational processes in American Indian cultures; history of school programs established for tribes by missionaries and the U.S. and Canadian governments; the importance of boarding schools in shaping the lives, families, communities, and educational expectations of Indian people in the late-19th and early-20th centuries.

AMIN 3920. American Indian Studies Topics. (1-3 cr [max 6 cr; A-F only]) Various topics in American Indian Studies.

AMIN 4201. Topics in American Indian Literature. (3 cr) Topics organized around issues of theme or genre or region or tribe or gender.

AMIN 4231. The Color of Public Policy: African Americans, American Indians, and Chicanos in the United States. (3 cr. §AM 4231, AMPO 4231, CHIC 4231) Structural or institutional conditions through which people of color have been marginalized in public policy. Critical evaluation of social theory in addressing the problem of contemporary communities of color in the United States.

AMIN 4301. American Indian Intellectuals. (3 cr; A-F only) Contributions that American Indians have made to understanding American Indian topics and the world around them. Works that have stood as paradigms of American Indian thinking. Emphasizes works written after 1945.


AMIN 4511. American Indian Political Economy. (3 cr. Prereq.–1001) Sources, nature, consequences of social/economic development/change in Indian communities. Precontact Indian communities. Effect of European contact. Social movements into 20th century, including phenomenon of urban Indian communities.

AMIN 4515. Contemporary American Indian Movements. (3 cr. Prereq–1001) American Indian organizations and social movements of the 20th century. Explorations of political activism on and off reservations; treaty disputes; economic development strategies; the revival of traditional beliefs.

AMIN 4525W. Federal Indian Policy. (3 cr. §POLI 4525W) Formulation, implementation, evolution, comparison of Indian policy from pre-colonial times to self-governance new millennium. Theoretical approaches to federal Indian policy. Major federal Indian policies. Views/attitudes of policy-makers, reactions of indigenous nations to policies. Effect of bodies of literature related to policies.

AMIN 4990. Topics in American Indian Studies. (1-4 cr [max 8 cr]) Topics specified in Class Schedule.

AMIN 4991. Independent Study. (1-12 cr [max 18 cr]. Prereq.–#, Δ, ♦) Individually arranged research with faculty to meet student needs and interests.

AMIN 4996. Field Study. (1-12 cr [max 18 cr]. Prereq.–#, Δ, ♦) Opportunities for experiential learning in a variety of American Indian community settings. Consult department faculty at least one term before enrolling.

AMIN 5107. The Structure of Anishinaabemowin, the Ojibwe Language. (3 cr; A-F only. §AMIN 5107. Prereq–5104) Analysis of grammatical structures of Anishinaabemowin.

AMIN 5108. History of Anishinaabemowin, the Ojibwe Language. (3 cr; A-F only. §AMIN 5108. Prereq–5107 or #) Historical development of Anishinaabemowin.

AMIN 5109. Anishinaaeb Literature. (3 cr; A-F only. §AMIN 5109. Prereq–5107 or 5107 or #) Readings in Anishinaabe oral literature.


AMIN 5303. American Indians and Photography. (3 cr. §AMIN 5303) Historical/comparative overview of photos in which American Indian people are central subjects. Primary features of images in American Indian photos. Relationships among those involved in making/viewing photos. Ways in which photos are interpreted. Relation of photos to social contexts in which they are produced and to agencies of those who stand behind their making.
AMST 3111W. America’s Diverse Cultures. (3 cr)
Diverse cultural (racial, ethnic, class) groups in America. Institutions/processes that shape their relations and create domination, resistance, hybridity, nationalism, racism, alliance. Specific content may vary.

AMST 3114. America in International Perspective. (3 cr. §JPN 3167)
The nature of international cultural exchange. The impact of U.S. cultures and society on other countries of the world as well as the impact of other cultures and societies on the United States.

AMST 3116. Jews and Popular Culture in 20th Century United States. (3 cr. §JWST 3116)
How theater, film, music, humor, and television were affected by Jews. innovations, social marginality, and wish to assimilate or resist assimilation to the culture. How the nation was and was not reshaped in the process.

AMST 3232. Disresident Sexualities in U.S. History. (3 cr. §A-F only. Prereq—AMST [5 cr. or §])
History of sexuality in the United States. Emphasizes sexualities that have challenged dominant social/cultural norms. Development of transgender, bisexual, lesbian, and gay identities/communities. Politics of sex across lines of race/ethnicity. Historical debates over controversial practices, including sex work.

AMST 3252W. American Popular Culture and Politics: 1900 to 1940. (4 cr)

AMST 3253W. American Popular Culture and Politics: 1940 to the Present. (4 cr. §A-F only)

AMST 3301W. Senior Proseminar in American Studies. (3 cr. §Prereq—AMST 32 cr or §)
Problem related to representative theme, figure, or period. Students research/write senior theses.

AMST 3402. American Indians and the Cinema. (3 cr. §A-F only)
Representations of American Indians in film, historically/contemporary. What such representations assert about Native experience and cultural viability. What they reflect about particular relationships of power.

AMST 3632W. Jewish Women in the United States. (3 cr. §JWST 3632W, §WST 3403W)
History of American Jewish women. Uses literary/religious texts, primary documents, films, and histories to analyze Jewish women’s experiences in the United States and their transformation of Judaism, political activism, and their role in the bourgeois family. How they are represented, how they represent themselves. Interdisciplinary approach.

AMST 3920. Topics in American Studies. (2-4 cr. [max 8 cr.]: Prereq— or §)
Topics specified in Class Schedule.

AMST 3993. Directed Studies. (1-9 cr: [max 9 cr.]; Prereq—§)
Guided individual reading or study.

AMST 4101. Gender, Sexuality, and Politics in America. (3 cr. §A-F only)
Ways public and private life intersect through the issues of gender, sexuality, family, politics, and public life; ways in which racial, ethnic, and class divisions have been manifest in the political ideologies affecting private life.

AMST 5402. American Indians and the Cinema. (3 cr. §A-F only)
Representations of American Indians in film, historically/contemporary. What such representations assert about Native experience and cultural viability. What they reflect about particular relationships of power.

AMIN 5890. Problems in American Indian History. (3 cr. §HIST 5890. Prereq—§)
Intensive consideration of topics in American Indian history. Possible topics include social history, Indian history of particular regions, political systems, education, and American Indian policy.

AMIN 5920. Topics in American Indian Studies. (3 cr. [max 12 cr.: §A-F only])
Various topics in American Indian Studies depending upon instructor and semester.

American Sign Language (ASL)

Department of Educational Psychology

College of Education and Human Development

ASL 1701. American Sign Language I (5 cr)
First of a 4-course sequence. American Sign Language (ASL), cultural values/rules of behavior of Deaf community in the United States. Receptive/expressive readiness activities, sign vocabulary, grammatical structure, receptive/expressive fingerspelling, aspects of Deaf culture. Lab sessions.

ASL 1702. American Sign Language II. (5 cr. Prereq—1701 with a final grade of at least [S or C-] or §)

ASL 3703. American Sign Language III. (3 cr. Prereq—1702 with final grade of at least [S or C-] or §)
Third of a four-course sequence. American Sign Language (ASL), cultural values/rules of behavior of Deaf community in the United States. Receptive/expressive readiness activities, sign vocabulary, grammatical structure, receptive/expressive fingerspelling, aspects of Deaf culture. Lab sessions.

ASL 3704. American Sign Language IV. (5 cr. Prereq—3703 with final grade of at least [S or C-] or §)
Fourth of a four-course sequence. American Sign Language (ASL), cultural values/rules of behavior of Deaf community in the United States. Receptive/expressive readiness activities, sign vocabulary, grammatical structure, receptive/expressive fingerspelling, aspects of Deaf culture. Lab sessions.

ASL 3705. Cultural Perspectives of Deafness. (3 cr)
Introduction to the Deaf community as a linguistic and cultural minority group. Role of deaf people in the larger society; political activism; laws; access to information; educational philosophies and methods; and communication systems.


American Studies

Department of American Studies

College of Liberal Arts

AMST 1001. American Popular Arts and Public Life, 1900-1940. (4 cr)
Interdisciplinary study of American society from precontact to industrialization. American literature, art, music, and popular culture in historical context.

AMST 1001H. Honors: American Popular Arts and Public Life, 1900-1940. (4 cr)
Interdisciplinary study of American society from precontact to industrialization. American literature, art, music, and popular culture in historical context.

AMST 1002. American Popular Arts and Public Life, 1940 to present. (4 cr)
Interdisciplinary study of American society from industrialization through the present. Examination of American literature, art, music, and popular culture in historical context.

AMST 1011. Religions and American Identity in the United States, from World War II to the Present. (3 cr)
Political changes of last 60 years through lens of religion. Diversity of religious experience within U.S. How religious communities have shaped and been shaped by political events. Historical context of religion’s role in current debates over race, gender, sexuality, science and foreign policy.

AMST 1401. Comparative Genders and Sexualities. (3 cr)
Gender and sexual practices/identities within a comparative (i.e. international) frame. How such practices/identities reflect/refract national ideals, that is, how gender and sexual practices express national/international division.

AMST 1902. Freshman Seminar. (3 cr; A-F only. Prereq—Freshman)
Topics specified in Class Schedule.

AMST 1907W. Freshman Seminar. (3 cr [max 6 cr.]; A-F only. Prereq—Freshman)
Topics specified in Class Schedule.

AMST 1908W. Freshman Seminar. (3 cr; A-F only. Prereq—Freshman)
Topics specified in Class Schedule.

AMST 1909W. Topics: Freshman Seminar. (3 cr; A-F only. Prereq—Freshman)
Topics specified in Class Schedule.

AMST 2011. The United States since September 11. (3 cr)
How American citizenship and nationhood have changed since 9/11. The event and its aftermath in historical perspective. Political, economic, and military antecedents. How 9/11 has changed relations between the U.S. government, U.S. citizens, immigrants, and international community. How 9/11 has been remembered.

AMST 3001. Contemporary Perspectives on Asian America. (3 cr)

AMST 3003. Public History. (3 cr; A-F only. Prereq—[AMST jr or gr, §])
Interpretations of a collective past as produced in various public venues, including museum exhibitions, films, theme parks, and Web sites. Intellectual/political issues associated with history produced for public audiences. Introduction to career opportunities in the field.

AMST 3111. American Cultures and the Arts. (3 cr)
Relationships between American cultures and artistic production through study of the works and lives of selected artists. How American societies and cultures shape, and are shaped by, artistic forms and expressions.
Course Descriptions

AMSC 4301. Workers and Consumers in the Global Economy. (3 cr. Prereq—AMSC major or advanced undergrad or #) Impact of global economy on workplaces/workers in the United States, Mexico, and Caribbean countries. Influence on consumption. Consequences for American culture/character. Effects on U.S./Mexican factory work, service sector, temporary working arrangements, offshore production jobs in Dominican Republic, and professional/managerial positions. How work/consumption is lived through race, class, gender, and nation.


AMSC 4962W. Second Proseminar in American Studies. (3 cr. Prereq—AMSC sr or #) Problem related to representative theme, figure, or period. Students research/write senior theses.

AMSC 5101. Religion and American Culture. (3 cr; A-F only) Role of religion in shaping contemporary American cultural pluralism. Institutions and processes, intellectual frameworks, aesthetic and symbolic systems that form religious communities and contribute to religious conflicts in U.S. society and culture.

AMSC 5202. Thought and Practice of American Religions. (4 cr; Prereq—#) Holidays, festivals, religious arts, organizations, spirituality, ethics, and systems of thought of “civil religion,” “women’s religion,” indigenous American religions, American versions of Christianity, Judaism, Islam, Buddhism, and other world faiths, and their interactions in the United States and worldwide.

AMSC 5402. American Indians in the Cinema. (3 cr; A-F only) Representations of American Indians in film, historically/contemporary. What such representations assert about Native experience and cultural viability. What they reflect about particular relationships of power.

AMSC 5920. Topics in American Studies. (1-4 cr [max 9 cr]) Topics specified in Class Schedule.

Animal Science (ANSC)

Department of Animal Science

College of Food, Agricultural and Natural Resource Sciences

ANSC 1001. Orientation to Animal Science. (1 cr; S-N only. Prereq—enrolling fr) Current issues, career planning, professional development. Interviews with faculty and other resource persons.

ANSC 1007. Horse in Your Backyard. (2 cr; A-F only. §AGRO 1001) Role of horses in society. How to keep a horse well fed and healthy. Nutrition, feedstuffs, pasture, health. How to seek/interpret information on vaccination, worming, nutrition, grazing management, hay selection, manure handling, and use of dietary feed additives/enhancers.


ANSC 1021. Avian Sampler. (1 cr) Aspects of avian biology. Planned environmental/conservation practices. Wildlife rehabilitation programs for maintaining healthy populations of wild birds in Minnesota. Emphasizes care, management, and health considerations of avian species such as domestic poultry, raptors, and companion birds.

ANSC 1101. Introductory Animal Science. (4 cr) Fundamental concepts of animal breeding, physiology, nutrition, and management as they apply to the production of beef, dairy, horses, poultry, sheep, swine, and other livestock.

ANSC 1403. Companion Animal Nutrition and Care. (3 cr) For those without animal or nutrition training who have an interest in animal care. Nutrition of healthy animals and factors including behavior, environmental conditions, food type and availability. Focus on companion animals.

ANSC 1511. Food Animal Products for Consumers. (3 cr. IFSDN 1511) Introduction to the compositional variation, processing, selection, storage, cookery, palatability, nutritional value, and safety of red meat, poultry, fish, and dairy products.

ANSC 2001. Animal Science Orientation for Transfer Students. (1 cr) The major, the faculty, Clubs, organizations, resources. Career exploration/preparation. Internship opportunities, working on a resume, developing interview skills.

ANSC 2011. Dairy Cattle Judging. (2 cr. Prereq—#) Evaluation of dairy animals on the basis of physical appearance, including classes of heifers and cows from the six major dairy breeds. Held in conjunction with the Minnesota State Fair. Training in oral reasons.


ANSC 3052. Equine Anatomy and Exercise Physiology. (4 cr. Prereq—# or sr; §SOJT 1 recommended) Interrelationship between physical structure/function. Emphasizes ways in which specialized aspects of anatomy/physiology contribute to unique athletic performance capabilities of horse.

ANSC 3141. Advanced Dairy Judging. (1 cr. Prereq—2011 or #) Training in presentation of oral reasons in dairy cattle judging. Selected students from this course participate in fall collegiate dairy judging contest.


ANSC 3143. Meat Judging and Grading. (2 cr. Prereq—1511, #) In-depth training in beef, pork, and lamb judging, writing reasons, and beef carcass grading and specifications. Field trips to packing plants. Students selected from course participate in collegiate meats judging contests.


ANSC 3143. Meat Judging and Grading. (2 cr. Prereq—1511, #) In-depth training in beef, pork, and lamb judging, writing reasons, and beef carcass grading and specifications. Field trips to packing plants. Students selected from course participate in collegiate meats judging contests.


ANSC 3143. Meat Judging and Grading. (2 cr. Prereq—1511, #) In-depth training in beef, pork, and lamb judging, writing reasons, and beef carcass grading and specifications. Field trips to packing plants. Students selected from course participate in collegiate meats judging contests.


ANSC 3143. Meat Judging and Grading. (2 cr. Prereq—1511, #) In-depth training in beef, pork, and lamb judging, writing reasons, and beef carcass grading and specifications. Field trips to packing plants. Students selected from course participate in collegiate meats judging contests.


ANSC 3143. Meat Judging and Grading. (2 cr. Prereq—1511, #) In-depth training in beef, pork, and lamb judging, writing reasons, and beef carcass grading and specifications. Field trips to packing plants. Students selected from course participate in collegiate meats judging contests.


ANSC 3143. Meat Judging and Grading. (2 cr. Prereq—1511, #) In-depth training in beef, pork, and lamb judging, writing reasons, and beef carcass grading and specifications. Field trips to packing plants. Students selected from course participate in collegiate meats judging contests.


ANSC 3143. Meat Judging and Grading. (2 cr. Prereq—1511, #) In-depth training in beef, pork, and lamb judging, writing reasons, and beef carcass grading and specifications. Field trips to packing plants. Students selected from course participate in collegiate meats judging contests.

Course Descriptions

ANSC 3203W. Environment, Global Food Production, and the Citizen. (3 cr. §AGRU 3203W; AGUM 2242) Ecological/ethical concerns of food production systems in global agriculture: past, present, and future. Underlying ethical positions about how agroecosystems should be configured. Interactive learning using decision cases, discussions, videos, other media.

ANSC 3221. Animal Breeding. (4 cr) Application of quantitative and quantitative genetics to animal breeding. Concepts of livestock improvement through selection and mating programs.

ANSC 3301. Systemic Physiology. (4 cr. Prereq—Biol 1009 or equiv. [CHEM 1011 or CHEM 1021]) Introduction of the physiological function of neural, circulatory, respiratory, immune, and digestive systems of domestic animals.


ANSC 3307. Artificial Insemination Techniques. (1 or 2 S-N only. Prereq—3305 recommended, #) Hands-on training and techniques of artificial insemination at an off-campus laboratory setting. Proper techniques of AI and semen handling, and criteria for selection of bulls.

ANSC 3501. FARM Animal Environment. (3 cr. Prereq—[2301, 2401, 3511 recommended] or #) Biological/physical processes involved in adjustment of animals to ambient environments. Applications to farm animal management.

ANSC 3509. Animal Biotechnology. (3 cr. Prereq—Biol 4003 or #) Scientific, social, and ethical issues related to current topics in animal biotechnology. Introduction to molecular genetics. Use of animals as biological reagents/tools, topics in reproductive biotechnology, methods for genetic modification of animals.


ANSC 4011. Dairy Cattle Breeding. (3 cr. Prereq—3221) Applying quantitative genetic principles to the breeding of dairy cattle. Primary emphasis on the evaluation of males, females, and systems of mating. Rates of genetic improvement with and without AI.

ANSC 4092. Special Problems in Animal Science. (1-4 cr [max 4 cr] Prereq—#) Research in an area of animal science under the supervision of a faculty member. Written report on the research is required.

ANSC 4093. Tutorial in Animal Science. (1-4 cr [max 4 cr] Prereq—#) Informally structured to encourage in-depth study of specific disciplines in animal science. Pertinent readings; preparation of written essays of high quality required.

ANSC 4096. Professional Experience Program: Internship. (1-3 cr [max 6 cr]; S-N only. Prereq—CoAFAE undergrad, #). complete internship contract available in CoAFAE Career Services before enrolling. UC only) Supervised professional experience in animal industries and farm enterprise systems with study of various aspects of the industry and related fields; evaluative reports and consultations with faculty advisers and employers.

ANSC 4099. Special Workshop in Animal Science. (1-4 cr [max 4 cr] Workshops on a variety of topics in animal science. Consult Class Schedule or department for offerings. Topics may use guest lecturers/experts.

ANSC 4102. Equine Management. (3 cr. Prereq—2102) Fundamentals of horse management. Record keeping (traditional, computer-based). Marketing, sales techniques. Legal aspects (e.g., contracts, zoning, liability, insurance). A management project involves establishing, maintaining, improving an equine business.

ANSC 4401. Swine Nutrition. (3 cr. Prereq—2401, 3511 recommended) A comprehensive review of major considerations in providing optimum, cost-effective nutrition to swine in all stages of production.

ANSC 4403. Ruminant Nutrition. (3 cr. Prereq—2401) Nutrient requirements of ruminants, physiology of digestion in ruminants, nutrient content of feedstuffs, primarily forages; energy utilization, protein and nonprotein nitrogen utilization; nutritional disorders; formulation of adequate rations.


ANSC 4602. Sheep Production Systems Management. (4 cr. Prereq—2401; 3221 recommended) Sheep management using feeding, breeding, selection, health, and physiological management aids for breeding flock and market lamb production. Taught via IVT’s 410 Tech Creek campus and the West Central Experiment Station, Morris.

ANSC 4603. Beef Production Systems Management. (4 cr) How to resolve problems and manage cow-calf, stocker, or feedlot operations. Various segments of the beef industry and their current challenges. Nutrition, reproduction, genetics, and health as they relate to beef cattle production. Students evaluate a beef cattle enterprise and contribute solutions to problems in areas of marketing, selection, reproduction, nutrition, or health management.

ANSC 4604. Dairy Production Systems Management. (4 cr) Practical applications of principles of animal breeding, nutrition, physiology, reproduction, housing, and economics in a problem solving context. Decision-cases, farm visits, field diagnostic techniques labs.

ANSC 4605. Poultry Production Systems Management. (4 cr. Prereq—2401; 4405 recommended) Physiology, genetics, diseases, nutrition of poultry and relation to current management practices for production of eggs, broilers, and turkeys. Technical and practical phases of production and marketing in relation to their underlying principles. Visits to commercial production units.


ANSC 4613. Advanced Beef Production Systems Management. (2 cr. Prereq—4609, 4603, #) Half semester course. Student enterprise-analysis teams evaluate a beef cattle enterprise and contribute solutions to problems in areas of marketing, selection, reproduction, nutrition, or health management.


ANSC 5099. Special Workshop in Animal Science. (1-6 cr [max 12 cr]; A-F only. Prereq—#) Topics vary. See Class Schedule or department. Topics may use guest lecturers/experts.


Anthropology (ANTH)

Department of Anthropology

College of Liberal Arts

ANTH 1001. Human Evolution. (4 cr) From ancestors of chimpanzees and humans to origins of modern humans. Principles of evolutionary theory, behavioral biology, and comparative anatomy used to reconstruct the major events in human evolution and the behavior of ourselves and our ancestors.


ANTH 1003W. Understanding Cultures. (4 cr) Introduction to social and cultural anthropology. Comparative study of societies and cultures around the world. Topics include adaptive strategies; economic processes; kinship, marriage, and gender; social stratification; politics and conflicts; religion and ritual; personality and culture.


For definitions of course numbers, symbols, and abbreviations, see page 300.
Course Descriptions

ANTH 1005W. Introduction to Cultural Diversity and the World System. (4 cr)
Anthropology of cultural diversity, in the United States and around the world. Comparative study of relationship between local cultures and global processes, Race/ethnicity, economic/social organization, political/religious systems, gender, social change.

ANTH 1111. Human Origins. (3 cr; A-F only)
World prehistory as investigated by anthropologists. Methods/concepts used to study prehistoric human biological/cultural development.

ANTH 1902. Freshman Seminar. (3 cr; A-F only, Prereq-Freshman)
Topics specified in Class Schedule.

ANTH 1904. Freshman Seminar. (3 cr; A-F only, Prereq-Freshman)
Topics specified in Class Schedule.

ANTH 1905. Freshman Seminar: Anthropology of Dreaming and Myth. (3 cr; A-F only, Prereq-Freshman)
Topics specified in Class Schedule.

ANTH 1906W. Freshman Seminar. (3 cr; A-F only, Prereq-Freshman)
Topics vary. See Course Guide.

ANTH 1907W. Freshman Seminar. (3 cr [max 6 cr]; A-F only, Prereq-Freshman)
Topics specified in Class Schedule.

ANTH 1908W. Freshman Seminar. (3 cr; A-F only, Prereq-Freshman)
Topics specified in Class Schedule.

ANTH 1909W. Freshman Seminar. (3 cr; A-F only, Prereq-Freshman)
Topics specified in Class Schedule.

ANTH 1101W. Freshman Seminar. (3 cr [max 6 cr]; A-F only, Prereq-Freshman)
Topics specified in Class Schedule.

ANTH 3001. Introduction to Archaeology. (4 cr)
The fundamentals of fieldwork, laboratory analysis, and interpretation in archaeology. How field and laboratory research are designed and implemented, and how results are interpreted.

ANTH 3002. Sex, Evolution, and Behavior: Examining Human Evolutionary Biology. (4 cr; A-F only)
Methods/theories used to understand humans in an evolutionary framework. What can be known only, or primarily, form an evolutionary perspective. How evolutionary biology of humans might lead to better evolutionary theory. How physiology, development, behavior, and ecology coordinate/co-evolve in humans.

ANTH 3003. Cultural Anthropology. (3 cr; §GLOS 3003, Prereq–1003 or 1005 or #)
Areas of study may include: field research and politics of ethnographic knowledge; Marxist/feminist theories of culture; culture, language, and discourse; psychological anthropology; culture/transnational processes.

ANTH 3004. Great Controversies in Anthropology. (3 cr; A-F only)
Notable controversies in anthropology: Is human “reason” the same in all cultures? What makes up evidence/truth when we study people? Whose “voices” should be heard? Should anthropologists support contemporary attempts at economic “development”? Is it possible to agree on a set of universal individual or cultural rights? Can we make qualitative judgments about cultures? What civic/political responsibilities does the anthropologist have at home and with the people whom she or he studies? In-class debates.

ANTH 3005W. Language, Culture, and Power. (4 cr)
Studying sociocultural forms by analyzing linguistic data obtained in fieldwork settings. Students work with fluent speaker of non-English language to explore an unfamiliar culture in manner of an ethnographer working with a key informant.

ANTH 3007. Laboratory Techniques in Archaeology. (1-4 cr [max 4 cr], Prereq—#)
Plant remains, material culture, faunal remains, human osteology. Emphasizes lab experience.

ANTH 3008. Introduction to Flintknapping. (3 cr; A-F only)
Hands-on experience in replication of prehistoric stone tools, as basis for archaeological analysis and as art form in itself.

ANTH 3009. Rise of Civilization. (3 cr)
Concept of civilization, from early hunter gatherer groups through agrarian villages to rise of towns/cities. Compares processes of change in eight regions of the world.

ANTH 3010. Native North Americans in Regional Perspective. (3-4 cr [max 6 cr])
An in-depth cultural and historical survey of native peoples who inhabit a particular region of North American (e.g., the greatest southwest, prairie/woodland transition zone, Great Lakes area, Northwest coast, etc.).

ANTH 3017. Peoples and Cultures of Middle America. (3 cr; §LAS 3017)
Indian and Mestizo (Hispanic) cultures of Mexico and Guatemala and parts of Belize, Honduras, and Nicaragua. Describes both pre-Hispanic and Hispanic influences, with attention to area-wide patterns and local traditions.

ANTH 3019. Hispanic Cultures of Latin America. (3 cr; §LAS 3019)
Hispanic cultures from Mexico to South America. Economy, underdevelopment. The family and ritual kinship. Gender, religion, values, ideology, and change. Continuity/change.

ANTH 3020. Topics in the Anthropology of Africa. (3-6 cr [max 6 cr])
Perspectives on Africa using ethnographic methods and theories. Topics such as kinship and gender; ecological adaptations; economic systems; belief systems; political organization; art and aesthetics; Islamization; liberation movements and nationalism; culture change.

ANTH 3023. Culture and Society of India. (3 cr; §ALL 3676, GLOS 3961)
Contemporary society and culture in South Asia from an anthropological perspective with reference to nationalism; postcolonial identities; media and public culture; gender, kinship and politics; religion; ethnicity; and the Indian diaspora.

ANTH 3025. Pacific Island Societies. (3 cr, Prereq–1003 or 1005 or #)
Geography, prehistory, and Western exploration of Pacific Islands from Hawaii to Papua New Guinea. Culture change as these peoples become incorporated into the modern world system. Topics in regional ethnology. Relationship of societies to major issues in anthropological thought.

ANTH 3027W. Archaeology of Prehistoric Europe. (3 cr; §ANTH 5027W)
Early development of non-Mediterranean European society from Old Stone Age through Iron Age to the Roman Period, based on archaeological evidence. Principle tranformations of European culture with introduction of agriculture, development of metallurgy, and emergence of towns and cities.

ANTH 3028. Introduction to Historical Archaeology. (3 cr; A-F only)
Emphasizes research approaches. Documentary research, oral history, probate inventories/ acculturation, integration of documents/ archaeological data, analysis of community patterning, social analysis of architecture, foodways, artifact identification, mean ceramic dating, industrial archaeology, estimation of social status with cemetery data, sampling, report writing.

ANTH 3029W. Archaeology of Native Americans. (3 cr, Prereq–1003)
Pre-European contact and contact period archaeology of American Indians north of Mexico.

ANTH 3031. Altering States: After Communism. (3 cr)
Post-socialist transitions in Central/Eastern Europe from anthropological perspective. Daily life under socialism. Collapse of socialist rule in relation to key areas of social life such as gender, identity, nationalism, and ethnicity.

ANTH 3035. Anthropologies of Death. (3 cr; A-F only)

ANTH 3041. Ecological Anthropology. (3 cr; §ANTH 5041, ANTH 8213, Prereq–1003 or #)

ANTH 3043. Art, Aesthetics and Anthropology. (3 cr)
The relationship of art to culture from multiple perspectives including art as a cultural system; the cultural context of art production; the role of the artist in different cultures; methodological considerations in the interpretation of art across cultural boundaries.

ANTH 3045. Religion and Culture. (3 cr; Prereq–1003 or 1005 or #)
Religious beliefs and world views cross-culturally. Religious dimensions of human life through theories of origins, functions, and forms (e.g. myth, ritual, and symbolism) of religion in society.

ANTH 3046W. Romance and Culture. (3 cr)
Romance, aspects of this kind of love relationships from different perspectives/sociological sciences. Draws on cross-cultural materials.

ANTH 3047W. Gender in Cross-Cultural Perspectives. (3 cr)
Relationship of biology and culture; cultural construction of gender and sexuality; variations in economic organization; women’s involvement in ritual and religion; impact of colonialism on gender; rise of the state and gender relations.

ANTH 3143. American Indian Languages and Cultures. (3 cr; §AMIN 3143)
Survey of cultural developments among native peoples of North American from historic times to present.

ANTH 3122. Globalization, Markets, and Inequality. (3 cr; A-F only; §GLOS 3122)
Globalization of American business/culture, uneven relationships between developed/underdeveloped national economies, social/economic consequences of market economies and free trade. Focuses on growing inequalities in global economy. Wall Street and transnational corporations, sweatshops, consumer culture, brand-name global marketing, mass downsizings.

ANTH 3221. Archaeology Field School. (3-6 cr [max 6 cr], Prereq–1003, #)
Archaeological field excavation, survey and research. Intensive training in excavation techniques, recordation, analysis, and interpretation of archaeological materials.

ANTH 3306W. Medical Anthropology. (4 cr; A-F only, Prereq–1003 or 1005 or entry level social science course recommended)
Course Descriptions

ANTH 5041. Ecological Anthropology. (3 cr. §ANTH 3041, ANTH 8213. Prereq–Grad or §)
Concepts, theories, and methods of ecological anthropology (cultural ecology) show how humans interact with the biophysical environment. Compare biological and cultural interactions with the environment; examine adaptive strategies cross-culturally.

ANTH 5043. Colonialism and Culture. (3 cr. A-F only. §GISOS 5648)
Making of culture as colonial/anthropological object of knowledge. Relationship between colonial knowledge/formation of academic disciplines (especially anthropology). Colonial/postcolonial transformations of colony, nation, and metropole.

ANTH 5045. Urban Anthropology. (3 cr. Prereq–4003 or grad or §)
Anthropological approaches to urban life in Western and non-Western settings. Topics include social networks and voluntary organizations; class, ethnicity, gender and power; migration and immigration; urban labor and economics; and urban ‘problems.

ANTH 5221. Anthropology of Material Culture. (3 cr. A-F only)
Material culture as a social creation, studied from multiple perspectives (e.g., social anthropology, archaeology, primatology). Conceptions of how humans articulate with material world they construct.

ANTH 5244. Skeletal Materials for Archaeologists. (4 cr; A-F only. §ANTH 5243, Prereq– §)

ANTH 5269. Analysis of Stone Tool Technology. (4 cr; A-F only. Prereq–1001 or 3001 or §)
Practical lab experience. How to analyze archaeological collections of stone tools to learn about human technological behavior in past. Students analyze archaeological/experimental collections, make stone tools themselves.

ANTH 5980. Topics in Anthropology. (3 cr max 6 cr)
Topics specified in Class Schedule.

ANTH 5990. Topics in Archaeology. (3 cr max 9 cr; A-F only. Prereq– §)
Topics specified in Class Schedule.

Applied Business (ABUS)

College of Continuing Education

ABUS 4011. Historical Perspectives and Contemporary Business Challenges. (3 cr; A-F only. Prereq–At least 45 cr)
Global competitiveness, product and service quality, information revolution, and changing customer/workforce demographics. Approaches to meeting contemporary challenges studied against historical backdrop of evolving management practices. Emphasizes developing systematic ways of analyzing complex problems.

ABUS 4012. Problem Solving in Complex Organizations. (3 cr; A-F only. Prereq–At least 45 cr)

ABUS 4021. Small Group Behavior and Teamwork. (3 cr; A-F only. Prereq–At least 45 cr)

ABUS 4022. Management in Organizations. (3 cr; A-F only. Prereq–At least 45 cr completed)

ABUS 4023W. Communicating for Results. (3 cr; A-F only. Prereq–At least 45 cr completed)
Aspects of communication essential for being persuasive/influential. Organizing/presenting ideas effectively for audience analysis, choosing communication methods, making appropriate use of informal influence methods, handling dissent. Processes for intercultural communication.

ABUS 4024. Effective Oral Communication and Business Presentations. (1 cr; A-F only. Prereq–4031 or at least 45 cr)
Building/designing business presentation skills and oral communication effectiveness. Videotaping/critiques of actual presentations based on audience analysis, technique selection, and handling receptive/hostile audiences.

ABUS 4025. Negotiating for Agreement. (1 cr; A-F only. Prereq–At least 45 cr)
Practical negotiating tools, hands-on practice to engage in win-win negotiations.

ABUS 4031. Accessing and Using Information Effectively. (3 cr; A-F only. Prereq–Computer literacy, at least 45 cr)
Role of information in business operations. Information systems, data management. Accessing external information using information search services, CD-ROMs and periodicals. Accessing internal information using desktop database system, electronic mail, or computer conferencing. Typology of information applied in case studies and exercises.

ABUS 4032. Quantitative Skills for Decision Making. (3 cr; A-F only. Prereq–College algebra, college statistics, at least 45 cr)
Exploratory data analysis, visual display of data, basic mathematical/statistical techniques for analysis. Decision theory, decision modeling.

ABUS 4041. Dynamics of Leadership. (3 cr; A-F only. Prereq–At least 45 cr)
Successful leadership via flexible approach. Knowledge, skills and abilities that leaders develop from eight leadership strategies: academic, bureaucratic, eclectic, economic, organizational, military, political, social. Ways to lead diverse populations in a global environment.

ABUS 4042. Planning and Implementing Strategic Decisions. (3 cr; A-F only. Prereq–4101, [4103 or 4701], at least 45 cr)
Strategic assessment of a company’s competitive capabilities/performance. How companies allocate resources to their activities. Analyzing business environment, assessing business risk, determining what actions are needed. Evaluating choices firms make to compete successfully and sustain profitability.

ABUS 4043. Project Management in Practice. (3 cr; A-F only. Prereq–4101, at least 45 cr)
Introduction to project management, including tools/techniques to support project leader in scheduling, coordinating, and allocating resources. Students work in teams to develop/conduct a field project, putting tools of project management into practice. Requires use of MS Project (bundled w/textbook), Word, PowerPoint.

ABUS 4044. Tools for International Trade. (3 cr; A-F only. Prereq–At least 45 cr)
International forces/trends. Identifying ways in which businesses can work within context of international change. Tools used in specific transactions, ways to diagnose in what circumstances they are most appropriately applied.

ABUS 4010. Accounting for Managers. (3 cr; A-F only. Prereq–Financial accounting, at least 45 cr)

ABUS 4102. Operations in Manufacturing and Service Businesses. (3 cr; A-F only. Prereq–At least 45 cr)

ABUS 4103. Marketing and Sales. (3 cr; A-F only. Prereq–At least 45 cr)
Legal, behavioral, ethical, competitive, economic, and technological factors as they affect product pricing, promotion, and marketing. Personal selling function as integral part of distribution system. Sales force organization, selection, training, motivation, compensation, forecasting, budgeting, control.

ABUS 4104. Management and Human Resource Practices. (3 cr; A-F only. Prereq–At least 45 cr)
Providing day-to-day leadership. Organizing work, motivating employees. Delegating, coordinating, and achieving results. Factors that influence human resource practices, including selection, induction, and training of new employees, employee appraisal. Handling grievances/discipline.

ABUS 4501. Entrepreneurship. (3 cr; A-F only. Prereq–4101, [4103 or 4701], at least 45 cr)
Self-employment as alternative to employment. Phases of entrepreneurship, including identifying an opportunity, start-up, managing/harvesting a small business. Emphasizes all aspects of business plan.

ABUS 4503. Technological Change, Work Organization, and Management Practices. (3 cr; A-F only. Prereq–At least 45 cr)
Evolution of work organization in the United States. Factors responsible for changes. Effect of changes on labor-management relations. Revolutions in technology, scientific management, collective bargaining, self-directed work teams, and lean production methods.

ABUS 4505. Values and Ethics at Work. (1 cr; A-F only. Prereq–At least 45 cr)
Ways in which we look at work/our jobs. Religious, legal, social, personal, and cultural viewpoints. Topics may include equity/benefits, discrimination, product liability, corporate political contributions, loyalty, family/work conflicts, community responsibility, and role of business in society. Case examples.

ABUS 4507. Change-Agent Skills. (3 cr; A-F only. Prereq–At least 45 cr)

ABUS 4509. New Product Development. (3 cr; A-F only. Prereq–[4103 or 4701 or MKTG 3001], at least 45 cr or §)
How new consumer, industrial, and service products are planned/developed. Idea generation, concept/buyer testing, pricing, sales/profit strategies, product positioning, promotion, packaging, distribution, marketing case histories. Student projects.

ABUS 4511. Small Business Management Skills. (3 cr; A-F only. Prereq–[4501 or business plan experience]. [4101 or 4701 or equiv], at least 45 cr)
APEC 4515. Changing the American Workplace: Choice or Destiny? (3 cr; A-F only; Prereq–At least 45 cr) Evolution of work organization. Revolutions in technology, scientific management, collective bargaining, self-directed work teams, and lean production methods. Limited to 25.


APEC 4701. Introduction to Marketing. (3 cr; A-F only; Prereq–ACCT 2050, ECON 1101, 45 cr or completed) Conceptual tools for creating a marketing plan. How marketing relates to other functional areas of business. Importance of an ethical, global view.

APEC 4901. Special Topics in Applied Business. (3 cr; A-F only; Prereq–At least 45 cr) Management issues in a changing workplace. Topics vary.

APEC 4993. Directed Study. (1-3 cr [max 6 cr]; Prereq–A) Specially arranged projects, trips, or field work.

APEC 4999. Practicum. (3 cr [max 9 cr]; A-F only; Prereq–BUS 4045 student in applied business, at least 33-credit application or field work; A) Project in student’s employing organization or in organization providing an internship. Integrates projects from previous coursework or develops plans for new venture or expands existing business. Limited class meetings.

Applied Economics (APEC)

Department of Applied Economics

College of Food, Agricultural and Natural Resource Sciences

APEC 1001. Orientation to Applied Economics. (1 cr; A-F only) Introduction to curriculum offerings, liberal education requirements, employment opportunities, faculty in the Department of Applied Economics. Emphasizes historical development of the discipline, areas of specialization, coursework expectations, career planning.

APEC 1101. Principles of Microeconomics. (3 cr; §ECON 1101, ECON 1101H, ECON 1104) Theory of the household and firm; demand and supply; price determination; government in the market; market structures; agriculture and food; externalities and the environment; labor markets and unions; capital and interest; project evaluation; human capital.


APEC 1251. Principles of Accounting. (3 cr; §ACCT 2050, Prereq–20 cr; not recommended for majors in AgFoodBus majors) Fundamentals of accounting business, basic finance concepts, use of accounting data for income tax and managerial decision making.

APEC 1905. Topics: Freshman Seminar. (1-3 cr [max 3 cr]; A-F only; Prereq–?) Topics vary.

APEC 3000. Seminar in International Agriculture. (1 cr [max 3 cr]; Prereq–#) Presentation and discussion of students’ research papers, literature review of selected topics, or discussions by students and faculty of their experiences in international agriculture.

APEC 3001. Applied Microeconomics: Consumers, Producers, and Markets. (4 cr; §ECON 3101, ECON 3101H, ECON 3105; Prereq–[1101 or ECON 1101], [MATH 1142 or MATH 1271] or #) Consumer/producer decisions. Supply/demand, market structure. General equilibrium and welfare. Effects of government regulations, market failure.

APEC 3002. Applied Microeconomics: Managerial Economics. (4 cr; Prereq–[2001 or ECON 3101], [ECON 2050 or STAT 3011] or #) Microeconomic theory, its application to managerial problems. Introduction to regression analysis, demand analysis, demand function estimation, forecasting, cost function estimation, resource allocation decisions, linear programming, market structure, pricing policy, risk analysis, investment analysis.


APEC 3007. Applied Macroeconomics: Policy, Trade, and Development. (3 cr; Prereq–[1101 or ECON 1101], [1102 or ECON 1102]; 3001, 3006 recommended) Foreign trade, development, and growth. General equilibrium models for effects of trading blocks on U.S. agriculture and broader economy. Importance of growth on incomes. Foreign trade. Policies that impact world, economic growth.

APEC 3041W. Economic Development of U.S. Agriculture. (3 cr; Prereq–ECON 1101, ECON 3101, ECON 3105, 60 cr) Economic, political, social, and technical forces that have shaped development of U.S. agriculture. Role of agricultural development in national economic development in the United States. Implications for developing countries.

APEC 3071. Agriculture and Economic Growth in Developing Countries. (3 cr; Prereq–1101, 1102, ECON 1101, 1102 or #) Characteristics and performance of peasant agriculture; potential role of agriculture in economic development, and design of economic policies to achieve agriculture and economic development; role of women in agricultural development.

APEC 3411. Commodity Marketing. (3 cr; Prereq–[1101 or [ECON 1101]) Economic concepts related to marketing agricultural commodities. Conditions of competitive markets, policies/structural characteristics of markets, policies/regulations affecting agricultural marketing of livestock, crop, and dairy products.

APEC 3451. Food and Agricultural Sales. (3 cr; Prereq–[1101 or ECON 1101]) Professional selling of agricultural and food products. Students build/relate sales abilities, identify/qualify prospects, deliver sales presentations, close the sale. Principles of market research.

APEC 3501. Agribusiness Finance. (3 cr; §FIN 3001, FIN 3001; Prereq–[1251 or ACCT 2050], 60 cr or #) Analysis of financing and investment strategies for agribusiness firms and their effects on liquidity, solvency, and profitability. Analysis of financial institutions, markets, and instruments. Management problems, issues facing financial intermediaries serving agriculture.


APEC 3801. Health Economics and Policy. (3 cr; §PUH 3801) Prereq–[1101 or ECON 1101], knowledge of plane geometry or #) Economics of health care markets. Problems faced by consumers and health care services. Builds on microeconomic principles of supply/demand for health, health care, health insurance, and role of government. Theoretical/empirical models, applications.

APEC 3811. Principles of Farm Management. (3 cr; Prereq–1101 or ECON 1101) Strategic and operations aspects of farm management; financial analysis, budgeting, strategic management; marketing plan and control; enterprise and whole farm planning and control; investment analysis, quality, risk, and personnel management.

APEC 3821. Retail Center Management. (3 cr; Prereq–[1101 or ECON 1101], [1251 or ACCT 2050]) Management of garden centers, grocery stores, and other retail units selling perishable agricultural products.

APEC 3991. Independent Study in Applied Economics. (1-4 cr [max 4 cr]; Prereq–) Independent study and supervised reading and research on subjects and problems not covered in regularly offered courses.

APEC 4096. Professional Experience Program: Internship. (1-3 cr [max 6 cr]; S-N only. Prereq–COAFES § or #, complete internship contract available in COAFES Career Services before enrolling; UC only) Professional experience in agribusiness firms or government agencies gained through supervised practical experience; evaluative reports and consultations with faculty advisers and employers.

APEC 4103. World Food Problems. (3 cr; §AGRO 4103, CMW 6100, FSCN 4103, Prereq–or grad or grad) A multi-disciplinary look at problems and possible solutions affecting food production, storage, and utilization in developing countries. Presentations and discussions introduce conflicting views on population, technology, and ethical and cultural values of people in various parts of the world.

APEC 4311. Tourism Development: Principles, Processes, Policies. (3 cr; Prereq–1101 or ECON 1101, 1102) Evolution of tourism industry; economic, environmental, and sociocultural impacts of tourism development; influence of government policies and organizations; models and tools needed for successful development; consequences of development activities and ways to involve stakeholders in decisions.

APEC 4451W. Food Marketing Economics. (3 cr; §APEC 4551; Prereq–[1101 or ECON 1101], MKTG 3001, 60 cr or #) Economics of food marketing in the United States. Food consumption trends, consumer food behavior, marketing strategies, consumer survey methodology, food distribution/retailing system. Policy issues related to food marketing. Individual/group projects.

APEC 4481. Futures and Options Markets. (3 cr; §APEC 4581; Prereq–[3001 or ECON 3101], [BUS 2211 or DNS 1550 or STAT 3011], 60 cr or #) Economics of futures/options trading in theory/application. Basics/price relationship in storable/nonstorable commodities. Hedging/commercial use of futures/options contracts. Speculation. Pricing efficiency. Market performances/regularization.

APEC 4501. Financial Applications. (3 cr; A-F only; Prereq–[3001 or FIN 3001], [1251 or ACCT 2050]) Design/implementing solutions to financial problems with Microsoft Excel® spreadsheet software. Development of computer-based tools. Interpreting/implementing concepts/theories in economics/finance.

For definitions of course numbers, symbols, and abbreviations, see page 300.
Course Descriptions


APEC 5032. Economic Data Analysis for Managerial and Policy Decisions. (3 cr. Prereq–[5031 or STAT 3022 or SAS] & familiarity with SAS) Statistical/econometric methods for the analysis of large data sets to support managerial/policy decisions. Methods for organizing, accessing, and ensuring the quality of data. Estimation techniques include data sets, limited dependent variable models, and time series analysis. Emphasizes clarity of reporting and design of procedures for maintaining/updating data estimates.

APEC 5151. Applied Microeconomics: Firm and Household. (3 cr. Prereq–5001 or MATH 1271 or Math 2243 or equiv or grad student or #) Quantitative techniques for analysis of economic problems of firms and households. Links between quantitative tools and economic analysis. Regression analysis, mathematical programming, and present value analysis.

APEC 5152. Applied Macroeconomics: Income and Employment. (3 cr. Prereq–5001 or MATH 1271 or Math 2243 or equiv or grad student or #) Static general equilibrium open economy models and simple business cycle models that examine economic growth, business cycles, and fiscal and monetary policy. Input-output analysis and large scale econometric models. Sources/properties of economy and sector-wise data. Empirical applications.

APEC 5321. Regional Economic Analysis. (3 cr. Prereq–3000 or ECON 3102 or #) Regional development patterns and role of resources, transportation, and institutional constraints. Trade, migration, and investments in regional growth and diversity. Regional economic information in investment and location decisions. Evaluation of economic development policies and tools. Economic impact analysis.

APEC 5341. Public Finance. (3 cr. A-F only; Prereq–3001 or ECON 3101 or PA 5021) Which services should be provided by the public sector? Which level of government should provide them? How should governments fund these services? Which types of taxes should be levied and on whom? Applying economic theory to analyze to spending, revenue, and tax policy issues facing governments.


APEC 5481. Futures and Options Markets. (3 cr. [APEC 4481, Prereq–Grad student]) Economic concepts related to futures/options trading. Hedging, speculation.

APEC 5511. Labor Economics. (3 cr. Prereq–[3001 or ECON 3101 or PA 5021, [PA 5052 or equiv], grad student or #) Theoretical foundations of labor markets. Intertemporal/household labor supply. Demand for labor, efficiency wages. Human capital theory, unemployment, migration decisions. Analysis of econometric research applied to labor policy issues such as minimum wage, tax policy, social insurance, education.

APEC 5581. Human Capital and Household Economics. (3 cr. Prereq–5001 or ECON 3101 or #) Household economics and investment in human capital (e.g., children, education, health and nutrition); labor force participation, lifetime earnings, and nonmarket work; time allocation and substitution of capital for labor in the household in the western and third world.

APEC 5611. Economic Aspects of Environmental Management. (3 cr. Prereq–[G.spring or grad student] in [biological science or conservation biology or ecology or fisheries or forestry or public affairs or water resources or wildlife conservation] or [CLA or #]) Economist approach to environmental problems such as water/air pollution. Application of supply/demand concepts to evaluation of environmental resources. Methods of evaluation. Analysis of pollution control policies from economic point of view.

APEC 5651. Economics of Natural Resource and Environmental Policy. (3 cr. Prereq–[3001 or ECON 3101, [4611 or ECON 6111 or MRES 5201W] or #) Economic analyses, including project evaluation of current natural resource/environmental issues. Emphasizes intertemporal use of natural resources, natural resource scarcity/adequacy, environmental quality, and mechanisms for pollution control and their implications for public policy.

APEC 5711. U.S. Agricultural and Environmental Policy. (3 cr. Prereq–5001 or ECON 3101) U.S. agricultural policy in an open world economy; role of private markets and government in regulating supply and demand; income vs. price support, supply controls, environmental constraints, and export protectionism; functioning of markets; roles of public interest groups and future of American agricultural policy.

APEC 5721. Economics of Science and Technology Policy. (3 cr. Prereq–[E5511 or E5515, PA 5002] or #) Economics of technical change, research, and technology. Productivity. Methods for evaluating impacts of R&D. Intellectual property rights.


APEC 5811. Cooperative Organization. (3 cr. Prereq–3001 or ECON 3101 or PA 5021 or #) Application of economic analysis to cooperative form of organization. Producer/consumer cooperatives used to examine economic issues such as changes in market organization, financing, management incentives, taxation, and antitrust regulations. Cooperatives as a tool for economic development.

APEC 5891. Independent Study: Advanced Topics in FARM and Agribusiness Management. (1-4 cr [max 4 cr. Prereq–#]) Special topics or individual work suited to the needs of particular groups of students.

APEC 5991. Special Topics and Independent Study in Applied Economics. (1-4 cr [max 12 cr. Prereq–#]) Special classes, independent study, and supervised reading and research on subjects and problems not covered in regularly offered courses.

Arabic (ARAB)

Department of African American and African Studies

College of Liberal Arts

ARAB 1101. Beginning Arabic. (5 cr) Oral practice, reading, comprehension, basic grammar. For students with no previous training in Arabic.

ARAB 1102. Beginning Arabic. (5 cr. Prereq–1101 or equiv or #) Comprehension, oral practice, and reading of standard Arabic. Continuation of 1101.

ARAB 1201. Reading in Arabic I. (4 cr. Prereq–1101 or equiv or #) Reading authentic texts/articles in Arabic. Translation, interpretation.

ARAB 1202. Reading in Arabic II. (4 cr. Prereq–1201 or equiv or #) Reading authentic texts/articles in Arabic. Translation, interpretation.

ARAB 3036. Islam: Religion and Culture. (3 cr. [HIST 3493, HUM 3493, RELA 3493]) Religion of Islam, faith, practices, sectarian splintering, expansion outside original home to status of world religion, institutions, status in world societies—Asia, Europe, the Americas.

ARAB 3101. Intermediate Arabic I. (5 cr. Prereq–1102 or equiv or #) Advanced grammar and conversational practice. Reading Arabic texts.

ARAB 3102. Intermediate Arabic II. (5 cr. Prereq–3101 or #) Advanced grammar, analyses of readings, oral comprehension.

ARAB 3491. Classical Islamic Civilization. (3 cr. [ARAB 5491, HIST 3491, MELC 3491]) Islamic legacy in the classical age (800-1400), including medical and natural sciences, mathematics, philosophy, literature, and their transmission to Europe.

ARAB 3505. Survey of the Middle East. (3 cr. [ARAB 5505, HIST 3505, MELC 3505]) Peoples, lands, and cultures of the Middle East. Historical survey from earliest civilizations to the present.


ARAB 3524. Introduction to the Qur’an. (3 cr) Textual, thematic, interpretive, and narrative aspects of the Qur’an and its influence on modern Arabic literature. All readings in English.


ARAB 3542. Medieval Islam. (3 cr. [ARAB 5542, HIST 3542, MELC 3542]) Islamic dynasties, Mamluks and Mongols, and Crusaders and Assassins. Abbasid Caliphate’s disintegration and rise of Seljuk Turks.
ARCH 3711W. Environmental Design and the Sociocultural Context. (3 cr. Prereq–Sophr or #) Designed environment as cultural medium/product of a sociocultural process and as expression of values, ideas, and behavioral patterns. Design/construction as complex political process.

ARCH 3993. Directed Study. (1-6 cr [max 6 cr]. Prereq–#) Guided individual reading or study.

ARCH 4150. Topics in Architecture. (1-4 cr [max 24 cr] Prereq–ARCH undergrad major or #) Topics in architecture design, technology, history, theory, representation, or urbanism.

ARCH 4250. Advanced Topics in Design. (1-6 cr [max 24 cr]; A-F only. Prereq–4282, ARCH major or #) Major monuments, their relationship to theories of architecture/gardening and to urban/rural life.


ARCH 4282. Undergraduate Architecture Studio II. (6 cr; A-F only. Prereq–4281, CALA) Human response to natural forces of gravity, light, and air. Their influence on organization of material form to create places of human habitation.

ARCH 4283. Undergraduate Architecture Studio III. (6 cr. Prereq–ARCH BS or CALA) Design issue or topic, its influence on organization of material form to create places of human habitation.


ARCH 4301. Conceptual Drawing. (3 cr. Prereq–1301. [ARCH or M Arch major]) Drawing as a way of analyzing, explaining, and generating design ideas. Projection systems, diagramming, mapping. Different modes of visual perception. Nonverbal structures.

ARCH 4311. Theory of Architectural Representation. (3 cr; A-F only. §ARCH 5311. Prereq–[S301 or BA or BS or BSE] or #) Integration of emerging computer graphics with photography and architectural graphic conventions. Historical, theoretical, and critical issues of representation. Influence of visual media on architectural field.

ARCH 4313. Visual Communication Techniques in Architecture. (3 cr; A-F only. §ARCH 5313. Prereq–[S301 or # or S302, #] 0 or sr cr)] Delineation, presentation, and design techniques. Various visual media, methods of investigation.

ARCH 4321. Architecture in Watercolor. (3 cr; A-F only. §ARCH 5321. Prereq–5301 or #) Watercolor as a tool in design process. Foundation principles, techniques, medium, tools, materials. Color relationships, mixing, composition, applications to design.

ARCH 4381. 3-D Computer Architectural Modeling and Design. (3 cr; A-F only. §ARCH 5361. Prereq–3351, ARCH major) Use of 3D computer modeling for representation in abstract/realistic ways. Creation/arrangement of objects. Setting up lighting. Developing surface materials. Creating still renderings/animations. Ways computer visualization can be used for design exploration, feedback during idea development, and realistic representation of designs.

ARCH 4421W. Architecture and Interpretation: The Cave and the Light. (3 cr. §ARCH 5421. Prereq–[3411, 3412] or #) Historical/hernomological investigation of iconography of grotto. Intertwined themes of descent into earth and ascent to light, from earliest strata of human culture to present day.

ARCH 4423. Gothic Architecture. (3 cr; A-F only. §ARCH 5423. Prereq–3411 or #) History of architecture and urban design in Western Europe, from 1150 to 1400.

ARCH 4424. Renaissance Architecture. (3 cr; A-F only. §ARCH 5424. Prereq–3411 or #) History of architectural and urban design in Italy, from 1400 to 1600. Emphasizes major figures (Brullelleschi, Alberti, Bramante, Palladio) and evolution of major cities (Rome, Florence, Venice).

ARCH 4425. Baroque Architecture. (3 cr; A-F only. §ARCH 5425. Prereq–3411 or #) Architecture and urban design in Italy, from 1600 to 1750. Emphasizes major figures (Bernini, Borromini, Cortona, Guarini) and evolution of major cities (Rome, Turin).


ARCH 4431W. Eighteenth-Century Architecture and the Enlightenment. (3 cr; A-F only. §ARCH 5431. Prereq–3411, 3412, undergrad ARCH major) Architecture, urban planning, and garden design in Europe and America, 1650 to 1850.

ARCH 4432. Modern Architecture. (3 cr; A-F only. §ARCH 5432. Prereq–3412, ARCH major) Architecture and urban design in Europe and the United States from early 19th century to World War II.

ARCH 4433. Contemporary Architecture. (3 cr; A-F only. §ARCH 5434. Prereq–3412, ARCH major) Developments, theories, movements, and trends in architecture and urban design from World War II to present.

ARCH 4439. History of Architectural Theory. (3 cr; A-F only. §ARCH 5439. Prereq–ARCH 5412 or ARCH major) History of architectural theory from antiquity to 20th century.

ARCH 4445W. Suburbia. (3 cr) Suburbia, from origins in 18th-century England to present. Historical changes and present challenges, especially in America. Ideology, mythology, planning, development, geography, transportation, the family. Specific sites/designs. Representations in film, television, popular literature, and music.


ARCH 4450W. North American Indian Architecture. (3 cr; A-F only. §ARCH 5461. Prereq–ARCH 3412, ARCH or AMIN major) Historic/contemporary principles/theories of North American Indian architecture. Culture, technology, environment, art, and craft of North American Indians in their settlements/architecture.


ARCH 4521. Introduction to Environmental Technology. (3 cr; Prereq–ARCH BS) Issues related to environmental quality/design. Climate response. Heating, cooling, lighting design. Indoor air quality.


ARCH 4572. Structural Frames and Building Design/Construction. (3 cr; A-F only. Prereq–AEM 2011 or BP 3001 or BP 3393) Basic contemporary structural systems in masonry, steel, and wood framing systems. Forms/ performance of systems.

ARCH 4671. Historic Preservation. (3 cr) Philosophy, theory, and origins of historic preservation. Historic archaeology, research, descriptive analysis, and documentation of historic buildings. Government’s role in historic preservation, preservation standards and guidelines, preservation and building codes, neighborhood preservation, preservation advocacy, and future directions for historic preservation. Research on architectural/historical aspects of historic sites using primary/secondary resources and on controversial aspects of preservation.


ARCH 4701. Introduction to Urban Form and Issues. (3 cr. Prereq–4412 or #) Urban form and related issues of design/culture. Thematic history of cities. Lectures, discussions, field exercises, assignments.


ARCH 5123. Architectural Thesis. (6 cr; A-F only. Prereq–5112, 5241, BA ARCH major; students must submit thesis plan in semester before writing thesis) Student’s choice, study and solution of an architectural problem to demonstrate proficiency in all phases of design.
ARCH 5241. Principles of Design Programming. (3 cr; A-F only. Prereq—For undergrads 5122, BA ARCH major; for grad 5255, M Arch major or #) Concepts and techniques of architectural computing, including space and activity analysis, site selection, precedent study, code review, appropriate technology identification, hypothesis formulation and evaluation. Emphasis on conceptual development, research, and analytic drawing.

ARCH 5291. Accelerated Undergraduate Architecture Studio I. (8 cr; A-F only. Prereq—#) Selected architectural problems developed by faculty to deepen/enrich ideas introduced in required architectural studio sequence.

ARCH 5292. Accelerated Undergraduate Architecture Studio II. (8 cr; A-F only. Prereq—[5291, accelerated status] or #) Architectural problems. Emphasizes development of structures as integral part of design, site planning, design process.


ARCH 5311. Theory of Architectural Representation. (3 cr; A-F only. §ARCH 4311. Prereq—[5371, 5372, M Arch] or instr consent) Integration of emerging computer graphics with photography and architectural graphic conventions. Historical, theoretical, and critical issues of representation. Influence of visual media on architectural field.

ARCH 5313. Visual Communication Techniques in Architecture. (3 cr; A-F only. §ARCH 4331. Prereq—M Arch major or instr consent) Delineation, presentation, and design techniques. Various visual media and methods of investigation.

ARCH 5321. Architecture in Watercolor. (3 cr; A-F only. §ARCH 4321. Prereq—M Arch grad student or #) Watercolor as a tool in design process. Foundation principles, techniques, medium, tools, materials. Color relationships, mixing, composition, applications to design.

ARCH 5350. Topics in Architectural Representation. [1-3 cr [max 3 cr]; A-F only. Prereq—[5321, MARCH major or M Arch major (or #) or #) Selected topics in architectural representation.

ARCH 5351. AutoCAD I. (3 cr. §ARCH 5351. Prereq—M Arch major or instr consent; may be taken for graduate credit) Basic concepts, tools, and techniques of computer-aided drawing with current AutoCAD Release. Strategies and techniques for producing dimensioned and annotated drawings suitable for plotting and an introduction to 3-D drawing capabilities. Use of dimension variables, attributes, blocks, symbols, and the creation of customized menus.

ARCH 5361. 3-D Computer Architectural Modeling and Design. (3 cr; A-F only. §ARCH 4361. Prereq—M Arch major) Use of 3D computer modeling for representation in abstract/expressive ways. Computer modeling software. Creation/arrangement of objects, setting up lighting, developing surface materials, creating still rendering/animations. Ways in which computer visualization can be used for design exploration, for feedback during development of ideas, and for realistic representation of fully formed designs.

ARCH 5371. Computer Methods I. (1 cr; S-N only. §LA 5371. Prereq—Concurrent enrollment 2521, M Arch major or #) Introduction to current techniques, computer programs, and their application to architectural computing.

ARCH 5372. Computer Methods II. (1 cr; S-N only. §LA 5372. Prereq—5371, §LA 2522 and M Arch major or #) Current techniques, computer programs, and their application to architectural computing and design.

ARCH 5373. Computer Methods III. (1 cr; S-N only. §LA 5373. Prereq—5372, §LA 2523, M Arch major or #) Advanced techniques, computer programs, and their application to architectural computing in design, theory, and technology.

ARCH 5374. Computer Methods IV. (1 cr. Prereq—5373, §LA 2524, M Arch major or #) Advanced architectural computing applications in design, history, theory, representation, and technology.

ARCH 5381. Introduction to Computer Aided Architectural Design. (3 cr; A-F only. Prereq—Arch or BED or M Arch or grad student in LA or #) 2-D drawing, 3-D modeling/animation, printing, plotting. Electronic networkingcommunications, database management, spreadsheet analysis, land-use analysis, project management.

ARCH 5382. Computer Aided Architectural Design. (3 cr; A-F only. Prereq—[5381, BA or BS or BED] or #) 2-D-3-D CAD, image manipulation. Advanced multimedia visualization techniques for design, including solid modeling, photo-realistic imaging, animation, video-editing/recording.

ARCH 5410. Topics in Architectural History. (3 cr [max 12 cr; A-F only. Prereq—M Arch major or #]) Advanced study in architectural history. Readings, research, seminar reports.

ARCH 5411. Principles of Design Theory. (3 cr; A-F only. Prereq—M Arch major or #) Principles of design and their instrumentation. How and why architecture theory is generated. Types and significance of formal analysis. Theoretical positions and modes of criticism.

ARCH 5421. Architecture and Interpretation: The Cave and the Light. (3 cr. §ARCH 4421W. Prereq—[3411, 3412] or #) Historical/hermeneutical investigation of iconography of grotto. Intertwined themes of descent into earth and ascent to light, from earliest strata of human culture to present day.

ARCH 5423. Gothic Architecture. (3 cr; A-F only. §ARCH 4423. Prereq—History of architecture and urban design in Western Europe, from 1150 to 1400.)

ARCH 5424. Renaissance Architecture. (3 cr; A-F only. §ARCH 4424. Prereq—M Arch major or instr consent) History of architecture and urban design in Italy from 1400 to 1600. Emphasizes major figures (Brunelleschi, Alberti, Bramante, Palladio) and evolution of major cities (Rome, Florence, Venice).

ARCH 5425. Baroque Architecture. (3 cr; A-F only. §ARCH 4425. Prereq—M Arch major or instr consent) Architecture and urban design in Italy from 1600 to 1750. Emphasizes major figures (Bernini, Borromini, Cortona, Guarini) and evolution of major cities (Rome, Turin).


ARCH 5431. Eighteenth-Century Architecture and the Enlightenment. (3 cr; A-F only. §ARCH 4431W. Prereq—M Arch grad student or #) Architecture, urban planning, and garden design in Europe and America from 1650 to 1850.

ARCH 5432. Modern Architecture. (3 cr; A-F only. §ARCH 4432. Prereq—M Arch major or instr consent) Architecture and urban design in Europe and the United States from early 19th century to World War II.

ARCH 5434. Contemporary Architecture. (3 cr; A-F only. §ARCH 4434. Prereq—M Arch major or instr consent) Developments, theories, movements, and trends in architectural and urban design from World War II to present.

ARCH 5439. History of Architectural Theory. (3 cr; A-F only. §ARCH 4439. Prereq—M Arch major or instr consent) History of architectural theory from antiquity to 20th century.

ARCH 5445. Suburbia. (3 cr) Suburbs, from origins in 18th-century England to present. Historical changes and present challenges, especially in America. Ideology, mythology, planning, development, geography, transportation, the family. Specific sites/designs. Representations in film, television, popular literature, and music.


ARCH 5450. Topics in Architectural Theory. (1-3 cr [max 9 cr]; A-F only. Prereq—ARCH 4411 or M Arch major or #) Selected topics in architectural theory and criticism.

ARCH 5451. Architecture: Defining the Discipline. (3 cr; A-F only. Prereq—M Arch major or #) Architecture as a discipline: its nature, role, purpose, and meaning discussed within a general, philosophical, and theoretical framework. Investigation and discussion of paradigms defining architectural theory and practice.

ARCH 5452. Architecture: Design, Form, Order, and Meaning. (3 cr; A-F only. Prereq—M Arch major or #) Architecture and the issue of meaning. Explores fundamental and constituent elements of architectural form and order; their inherent tectonic, phenomenal, experiential, and symbolic characteristics; their potential and implications for the creation and structure of meaningful human places.

ARCH 5455. Typology and Architecture: Theories of Analysis and Synthesis. (3 cr; A-F only. Prereq—5411, M Arch major, #) Theoretical traditions and development of typology’s role in architecture. Investigates works of Laugier, Quatremers de Quincy, Viollet-Le Duc, Loubou, Durand, Camillo Sitte, and Le Corbusier. Recent developments and theoretical positions of neo-rational and contextual arguments for contemporary applications of the idea of type.

ARCH 5458. Architecture and Culture. (3 cr; A-F only. Prereq—4412, M Arch major or grad student or #) Architecture as a cultural medium. Relationships among architecture, people, and culture; research findings and design; vernacular and high style architecture. Physiological and symbolic messages; reception theory in architecture; cultural critique and change; implications for architectural practice.

ARCH 5459. Gender and Architecture. (3 cr. Prereq—ARCH or WS 311 or M Arch major or #) Examination of ideas related to gender and architecture, gendered and non-gendered places and practices, and their relations to cultural norms and change.


ARCH 5512. Building Methods in Architecture. (3 cr; A-F only. Prereq—5511, M Arch major or #) Analysis of architectural materials, building systems, and construction operations related to enclosure systems design, building infrastructure, and detailing. Application of legal constraints and regulations (e.g., ADA, building codes, life-safety issues) in preparation of drawings, specifications, and construction documents for building design.

ARCH 5513. Environmental Technology I: Thermal Design in Architecture. (3 cr; A-F only. Prereq—M Arch major or #) Thermal and climatic issues in the design of small and mid-size buildings. Investigations in built and mechanical methods to modify climate. Evaluation of the impact of design techniques on energy use, the environment, and architectural meaning.

ARCH 5514. Environmental Technology II: Lighting and Acoustic Design. (3 cr; A-F only. Prereq—M Arch major or #) Principles of daylighting, electric lighting, and acoustic design in architecture. Relationship between luminous and acoustical environments, human comfort and architectural experience. Analytical methods, design process, and modeling of daylighting.

ARCH 5525. Design in Masonry. (3 cr; A-F only. Prereq—5512, M Arch major or #) Design principles, construction methods, and document production for masonry structures.

ARCH 5539. Daylighting and Architecture Design. (3 cr; A-F only. Prereq—5514, M Arch major or #) Role of daylighting in architectural design: principles, strategies, energy and environmental issues, psychology of light, color, and integration of electric lighting. Design projects investigate qualitative and quantitative issues through drawing, physical models, and photometric analysis.

ARCH 5550. Topics in Technology. (1-3 cr [max 6 cr]. Prereq—4) Selected topics in architecture technology, including construction, environmental management, energy performance, lighting, or materials.


ARCH 5572. Architectural Structures II: Concrete and Masonry Design. (3 cr; A-F only. Prereq—5571, M Arch major or #) Overview of advanced materials: reinforced fiberglass, glass structural, and structural tensile fabrics. Impact of construction technology on architecture and methods of integrating knowledge of structural materials and construction methods into the design process.

ARCH 5561. Design in the Digital Age. (3 cr; A-F only. §ARCH 3317. Prereq—Grad student or upper level undergrad student) Introduction to design, design process. Developing/understanding ways of seeing, thinking, and acting as a designer. Changes in design being wrought by digital technology. Team design project.

ARCH 5562. Professional Practice in Architecture. (3 cr; A-F only. Prereq—M Arch major or #) Legal, ethical, business, and practical requirements of architectural practice. Contemporary and historical models of contract formation, business principles, accounting, project management, design services, and marketing.

ARCH 5561. Legal Contracts in Architecture. (3 cr; A-F only. Prereq—M Arch major or #) Legal subject matter relevant to the work of architects and design professionals.

ARCH 5564. Real Estate Development in Architecture. (3 cr. Prereq—For undergrads BA ARCH major; for grad M Arch major or #) Fundamentals of real estate development and investment building. Processes and rules of specialists in development of investment projects. Topics include pro forma value and depreciation, tax shelter, feasibility, market analysis, appraisal equity financing, design, construction, leasing, and property management.

ARCH 5560. Topics in Architectural Practice. (1-4 cr [max 6 cr]. Prereq—5621, ARCH major or 5621, M Arch major or #) Topics in architectural practice, methods of design production, marketing, operation, and relationships among clients, architecture, and society.

ARCH 5570. Topics in Historic Preservation. (1-3 cr [max 3 cr]. Prereq—ARCH or M Arch major or #) Selected topics in the theory, philosophy, research, and methods of architectural historic preservation.

ARCH 5571. Historical Preservation. (3 cr. Prereq—3412 or #) Philosophy, theory, and origins of historic preservation. Historical architecture and research, descriptive analysis, and documentation of historic buildings. Government’s role in historic preservation, preservation standards and guidelines, preservation and building codes, neighborhood preservation, preservation advocacy, and future directions for historic preservation. Research on architectural and historical aspects of historic sites using primary and secondary resources and on controversial aspects of preservation.


ARCH 5573. Historic Building Research and Documentation. (3 cr. Prereq—3412, 5672 or #) Philosophy, theory, and methods of historic building research, descriptive analysis of buildings, building documentation, historical archaeology, and architectural taxonomy.

ARCH 5571. Design Principles of the Urban Landscape. (3 cr; A-F only. Prereq—5571, M Arch major or M Arch major or grad student or #) Art/design of creating city, neighborhood, and development plans. Public policies, planning tools/processes, and physical models used by design professionals and private/civic institutions to shape physical environment.

ARCH 5571. Proseminar in Metropolitan Design. (3 cr; A-F only. §La 5721. Prereq—[[5711 or eqqual], enrollment in CMD prog] or #) Reading seminar. Evolution of the contemporary city. Dynamics that created contemporary urban spatial patterns. Planning/design theories that have guided public interventions in the built environment. Themistic texts, classroom discussions.

ARCH 5570. Topics in Urban Design. (1-4 cr [max 4 cr]. A-F only. Prereq—ARCH major) Special topics in theory/practice of urban design.

ARCH 5570. Special Topics in Metropolitan Design. (3 cr [max 6 cr]. A-F only. §La 5790. Prereq—Enrollment in CMD prog or #) Reading seminar. Evolution of the contemporary city. Dynamics that created contemporary urban spatial patterns. Planning/design theories that have guided public interventions in the built environment. Themistic texts, classroom discussions.

ARCH 5593. Directed Study. (1-4 cr [max 3 cr]. A-F only. Prereq—4) Guided individual reading or study.

Art (ARTS) Department of Art

College of Liberal Arts


ARTS 1101. Drawing. (4 cr) Introduction to fundamental principles and processes of drawing; exploration of various drawing media. Work from still life, nature, the life model, and imagination.

ARTS 1102. Painting. (4 cr. Prereq—1101 or #) Introduction to painting with attention to understanding and applying the fundamental principles of spatial organization and color interaction.

ARTS 1301. Sculpture. (4 cr) An introduction to sculptural practice examining materials, methods, concepts, and history with emphasis on the correlation between concepts and materials. Work in clay, plaster, metal, and wood.


ARTS 1502. Printmaking: Relief, Screen, and Digital. (4 cr) Introduction to techniques of relief (linoleum and woodcut), screenprint, and digital printmaking. Historical approaches and use through contemporary materials, concepts, and practices. Emphasizes interrelationship of process, materials, and ideas.

ARTS 1505. Papermaking. (4 cr) Introduction to approaches, forms, and aesthetic possibilities of paper as an expressive medium. Studio work in both Eastern and Western traditions and sculptural applications.

ARTS 1601. Time and Interactivity. (4 cr) Introduction to use of computer technologies as source for creative art making. Emphasizes digital time-based/interactive processes that use image/sound editing software and basic scripting languages.

ARTS 1701. Photography. (4 cr) Presents conceptual, technical, and historical aspects of photography within the fine arts context. Emphasis on the creative process through hands-on experience in use of camera, film development, enlarging, and printing.


ARTS 1801. Ceramics. (4 cr) Fundamentals of wheel-thrown and hand-built ceramics as forms of creative expression. Introduction to clay, glazes, and firing techniques.

ARTS 1902. Freshman Seminar. (3 cr [max 6 cr]; A-F only. Prereq—Freshman) Topics specified in Class Schedule.

ARTS 1905. Freshman Seminar. (3 cr; A-F only. Prereq—Freshman) Topics specified in Class Schedule.

ARTS 1910W. Topics: Freshman Seminar. (3 cr; A-F only. Prereq—Freshman) Topics specified in Class Schedule.
ARTS 3101. Intermediate Drawing. (4 cr. Prereq–1001, 1101) Further exploration and understanding of drawing elements with emphasis on developing visual judgment, drawing process, and execution. Specific problems to promote the understanding of pictorial structure and personal expression.


ARTS 3105. Dimensional Painting. (4 cr. Prereq–1001, 1101, 1102) Application of two-dimensional visual concerns as they relate to sculptural form. Exploration of how painting ideas interact in perception of real space.

ARTS 3106. Drawing: Interpreting the Site. (4 cr. Prereq–1001, 1101) Field trips to draw or paint in various metropolitan area locations. Site interpretations, experimentation with marks/symbols. Focuses on search for personal content as inspired by site.


ARTS 3112. Life Drawing II. (4 cr. Prereq–3111 or #) The human form in pictorial structure, single, and multiple figure compositions. The creative process, work toward a personal direction. Attention to representation of the human image in cultural, historical, and contemporary context.


ARTS 3401W. Critical Theories and Their Construction From a Studio Perspective. (3 cr. Prereq–1001, Jr. or #) Primary critical theories that shape the analysis of works of art. Evaluation of works from the artist’s perspective. Theory as an organizational structure from which to understand contemporary works.


ARTS 3403. Women’s Images and Images of Women. (3 cr. (SARTS 3403. Prereq–1001 or #) Women’s perspectives in art from the artist’s perspective. Women as artists and the imagery they have created. Women as the object of imagery and the social and political attitudes those images convey. Survey of women artists from late-Renaissance through contemporary feminism; relevant issues.

ARTS 3411H. Honors Tutorial in Visual Arts. (1-4 cr [max 6 cr]; A-F only. Prereq–Honors, #) Individual consultation with a faculty member on visual work, research project, presentation, paper, or bibliography.

ARTS 3415H. Honors Exhibition. (2 cr; A-F only. Prereq–Magnum or Summa Honors candidate, #. A) Advanced problems in studio and research, leading to a magna or summa exhibition.

ARTS 3416H. Honors Thesis. (1 cr; A-F only. Prereq–Summa level honors candidate, #) Summa thesis paper written in support of honors exhibition or in relation to candidate’s visual/ conceptual project.

ARTS 3420. Visiting Artists Program. (1 cr [max 2 cr] Prereq–ARTS or #) Guest speakers, artist presentations. Identification of themes, correlations between ideas presented by guest artists/critics and students’ own creative work.

ARTS 3444. Major Project. (1 cr; S-N only. Prereq–#) Individually designed independent project or exhibition.

ARTS 3496. Internship in the Arts. (1-3 cr [max 5 cr]; S-N only. Prereq–BFA Art major, #) Field work at local, regional, national, or international arts organization or with professional artist provides experience in activities/administration of art/art-based organizations.

ARTS 3499. Internship at Katherine E. Nash Gallery. (3 cr; S-N:only. Prereq–1001, #) Hands-on experience in day-to-day operation/mission of Department of Art’s professional gallery.


ARTS 3505. Papermaking as an Art Form. (4 cr. Prereq–1001, 1505) Further exploration of Eastern, Western, and sculptural applications of papermaking as an art form. Development of visual vocabulary through experimentation and focused inquiry into historical and contemporary methods.


ARTS 5104. The Nature of Abstraction. (4 cr. Prereq–3102 or #) Exploration of abstraction as concept. Studio practice with attention to developing individual work. Emphasizes understanding topics relevant to abstraction. Approached from discipline of painting, open to various material sensibilities.


ARTS 5106. Advanced Drawing: Interpreting the Site. (4 cr. Prereq–3106 or #) Search for personal content as inspired by site. Field trips (2/3 of course) to draw or paint from various metropolitan area locations. Interpretations enhanced by experimentation with new marks/symbols.


ARTS 5120. Advanced Painting. (4 cr [max 12 cr]. Prereq–3120 or #) Developing personal vision/content through painting. Emphasizes critical thinking, self-evaluation, and independent pursuit of ideas.


ARTS 5320. Advanced Sculpture: Spatial Problems. (4 cr [max 12 cr]. Prereq–3320 or #) Sculptural practice outside traditional media/approaches. Installation, theater, public art, architecture as topics for individual investigations into spatial organization.


ARTS 5403. Women’s Images and Images of Women. (3 cr. Prereq 3403. Prereq–1001 or #) Women’s place in Western art from the artist’s perspective. Women as artists and the imagery they have created. Women as the object of imagery and the social and political attitudes those images convey. Survey of women artists from late-Renaissance through contemporary feminism; relevant issues.


ARTS 5441. Professional Practices. (3 cr. Prereq–Grad or #) Intensive writing seminar provides a context for theoretical issues, business practices, and professional skills required for career management and development in the visual arts.

ARTS 5444. Bachelor of Fine ARTS Exhibition. (1 cr. Prereq–BFA candidate, sr, #) Final solo or small group exhibition and artist’s statement developed in consultation with faculty adviser. Visual documentation of work and statement as appropriate to media.

ARTS 5490. Workshop in Art. (1–4 cr [max 12 cr]) Selected topics and intensive studio activity. Topics vary yearly.


ARTS 5550. Advanced Papermaking. (4 cr [max 12 cr]. Prereq–3550 or #) Distinct expressive qualities of handmade paper, its versatility as contemporary art form. Independent research pursued in consultation with instructor.


ARTS 5670. Interdisciplinary Media Collaborations. (3 cr [max 12 cr]. Prereq–Upper division undergraduate or graduate student in art, creative writing, dance, music or theater) Interdisciplinary, collaborative artist teams explore modes of creative expression at intersections of the arts. Students collaborate to co-author/produce works of art for public presentation. Emphasizes integration of media arts with visual art, music, dance, and theater to produce interdisciplinary/collaborative art.


ARTS 5821. Ceramic Materials Analysis. (4 cr. Prereq–3801 or 3802 or #) Ceramic materials, their interrelationships. Advanced investigation of glazes, slip formulation, clay bodies in high/low temperature ranges. Individual interests related to students’ aesthetic needs.


ARTS 5990. Independent Study in Art. (1–4 cr [max 12 cr]. Prereq–major, #) Independent study project designed by student in consultation with instructor.
Art History (ARTH)
Department of Art History

ARTH 1001. Introduction to Art History. (3 cr. [max 4 cr])
History of art examined through selected monuments of major periods, from Paleolithic to modern times. Covers Western, other cultures.

ARTH 1002W. Why Art Matters. (4 cr)
Introduction to history of topics that investigate power/importance of art both globally and in its diverse forms, from architecture and painting to video and prints. Sacred space, propaganda, the museum, art/gender, art/authority, tourism.

ARTH 1004W. Introduction to Asian Art. (4 cr. [§ARTH 1004])
Issues/themes of South Asian, Southeast Asian, and East Asian art from earliest times to present.

ARTH 1009W. Topics: Freshman Seminar. (3 cr. Prereq-Freshman)
Topics specified on One Stop Course Guide.

ARTH 1910W. Topics: Freshman Seminar. (3 cr; A-F only. Prereq-Freshman)
Topics specified on Onestop Course Guide.

ARTH 1921W. Introduction to Film Study. (4 cr. [GSOCL 1921])
Fundamentals of film language, major theories of cinema. Detailed analysis of several films, including John Ford’s Stagecoach, Jean-Luc Godard’s Breathless.

ARTH 1940. Topics in Art History. (1-4 cr [max 4 cr])
Topics specified in Course Guide.

ARTH 3005. American Art. (4 cr)
Survey of American art from colonial to the present with special emphasis on the relationship of painting, sculpture, the decorative arts, architecture, costume, and material culture to current interpretations of American history.

ARTH 3008. History of Ancient Art. (4 cr. [§CNES 3008])
Architecture, sculpture, and painting of selected early cultures; emphasis on influences contributing to the development of Western art.

ARTH 3009. History of Medieval Art. (4 cr)
Emphasis on principal monuments, their decoration and function (e.g. Old St. Peter’s, Rome; Hagia Sophia, Istanbul; Palace Chapel, Aachen; St. Sernin, Toulouse; Cathedral of Chartres, Paris, Rheims).

ARTH 3011W. History of Renaissance and Baroque Art. (4 cr)
Major architects, sculptors, and painters in Western Europe from the 15th through the 18th centuries (e.g. Brunelleschi, Michelangelo, Raphael, Leonardo, Caravaggio, Bernini, Rembrandt, Rubens, Poussin, Watteau).

ARTH 3012. 19th and 20th Century Art. (3 cr)

ARTH 3013. Introduction to EAST Asian Art. (3 cr. [max 4 cr]. [§EAS 3013])
A selective examination of works of art produced in China, Korea and Japan from the Neolithic era to modern times. Nearly every major type of object and all major styles are represented.

ARTH 3014W. Art of India. (4 cr. [§ALL 3014W])
Indian sculpture, architecture, and painting from the prehistoric Indus Valley civilization to the present day.

ARTH 3015W. Art of Islam. (4 cr)
Architecture, painting, and other arts from Islam’s origins to the 20th century. Cultural and political settings as well as themes that unify the diverse artistic styles of Islamic art will be considered.

ARTH 3017. Islamic Culture. (4 cr)
Emphasis on visual arts and literature produced by the Muslim world, from Spain to the Indian subcontinent. Analysis of original visual and literary sources will form the basis for understanding diverse cultural developments.

ARTH 3035. Classical Myth in Western Art. (4 cr. [§CNES 3035])
An exploration of the role of myth in the visual arts through examination of major figures and stories that became popular in the ancient world and have fascinated artists and audiences ever since.

ARTH 3142. Art of Egypt. (4 cr. [§CNES 3142])
Arts and architecture of Egypt from prehistoric times to the emergence of modern Egypt, with emphasis on elements of continuity and change that have shaped Egyptian culture.

ARTH 3152. Art and Archaeology of Ancient Greece. (4 cr. [§CNES 3152])
Introduction to the civilization of ancient Greece through art and material culture. Case studies of selected monuments and sites.

ARTH 3162. Roman Art and Archaeology. (4 cr. [§CNES 3162])
Introduction to the art and material culture of the Roman World: origins, changes and continuities, “progress” or “decay” in the later Empire, legacy to the modern world.

ARTH 3201. The Olympic Games. (3 cr. [§CLOV 3301, CLOV 3301])
Surveys the Olympic Games (776 B.C. to A.D. 338) and other ancient athletic festivals, including those for women-participants. Greek art and literature serve as basic sources. Comparisons are made with modern athletic events.

ARTH 3340. Practicum in Archaeological Field and Computer Techniques. (3 cr. [§ARTH 3340, CLOV 3340, CLOV 3340], CLOV 3340). Prereq-One course in ancient art/archaeology or #)
Methods for excavation of Old/New World sites. Meets at archaeometry/computer lab for part of semester and at selected site in Minnesota for day-long sessions for 9 to 10 weeks.

ARTH 3341. Art Now. (3 cr; A-F only)
Analysis of visual representations in fine arts and popular media, in context of social issues. Obscenity, censorship, democracy, technology, commerce, the museum, propaganda, social role of artist. Understanding the contemporary world through analysis of dominant aesthetic values.

ARTH 3342. History of Graphic Arts: 1780 to 1980. (4 cr)
History and theory of the creation of lithography, social caricature (e.g., Goya and mid-century practitioners, Whistler), and color lithography (e.g., Toulouse-Lautrec, Vuillard, Bonnard). Media changes of 20th century; the revolutionary nature of new media.

ARTH 3346. Art Since 1945. (4 cr)
Broad chronological overview of U.S./international art movements since 1945. Assessment of critical writings by major theoreticians (e.g., Clement Greenberg) associated with those movements. Theoretical perspective of postmodernism.

ARTH 3348. The Art of Picasso and the Modern Movement. (4 cr)
Works of Picasso in all media. Blue, Rose, Cubist, Classical, and later periods of Picasso’s development against innovations in media; collage; utilization of found-objects, printmaking and ceramics. Autobiographical nature of imagery gives methodological basis for exploring frequently personalized themes.

ARTH 3575. The Art of Walt Disney in American Culture. (4 cr)
Walt Disney, his companies, and the influence of their products on 20th century American culture. Animation, architecture, city planning, the relationship between the fine arts and popular culture, and the creation of art under industrial conditions of collaboration and profit.

ARTH 3578. Arts of Africa. (4 cr. [§AFRO 3578])
Surveys the diverse arts of Africa, from antiquity to present. Introduces visual arts of several civilizations and their relation to larger cultural issues (e.g., religion, cosmology, gender, identity, political power).

ARTH 3585. African American Art. (3 cr; A-F only [§AFRO 3585])
Four hundred year history of African American art. How/why African Americans created artwork at specific times, in specific places. Arts of African Americans within their own communities, National arts movements, and American life during historical juncutures.

ARTH 3588. Architecture of Africa, Pre-Colonial to Present. (4 cr)
Introduces the history of architecture in West Africa, from eighth century to present. From the prosperity of early empires of Western Sudan (Ghana, Mali, Songhai), and the impact of Islam on traditional architecture, to colonial/post-colonial architecture.

ARTH 3921W. Art of the Film. (4 cr)
History of the motion picture as an art form; major films, directors, genres, and styles. Films discussed include The Birth of a Nation, Citizen Kane, Bicycle Thief, Rashomon, and Jules and Jim.

ARTH 3927. Documentary Cinema. (4 cr)
History of nonfiction filmmaking, from early forms of reportage and birth of documentary to emergence of "film-vertic" and "guerrilla television" and work by independents (e.g., Errol Morris, Michael Moore).

ARTH 3930. Junior-Senior Seminar. (3 cr; A-F only)
Prereq-Ltr or sr ARTH major)
Major art-historical theme, artist, period, or genre. Topics specified in Class Schedule.

ARTH 3930H. Honors: Junior-Senior Seminar. (3 cr; A-F only. Prereq-Honors Jr or sr ARTH major)
Major art-historical theme, artist, period, or genre. Topics specified in Class Schedule.

ARTH 3940. Topics in Art History. (1-4 cr [max 21 cr])
Topics specified in Class Schedule.

ARTH 3971W. Honors: Major Project. (1 cr; A-F only. Prereq-Honors ARTH major)
Completion of research paper begun in a 5xxx course.

ARTH 3971W. Major Project. (1 cr; A-F only. Prereq-ARTH major)
Completion of research paper begun in a 5xxx course.

ARTH 3975. Directed Museum Experience. (1-2 cr [max 2 cr]; S-N only. Prereq-#)
Internship or docentship in an approved program in an art institution or museum. Open to both majors and nonmajors. Must consult with director of undergraduate studies.

ARTH 3993. Directed Study. (1-4 cr [max 12 cr]; A-F only. Prereq-#)
ARTH 3994. Directed Research. (1-4 cr [max 12 cr]; A-F only. Prereq-#)
ARTH 5101. Myths in Art: Cross-Cultural Comparison. (3 cr. A-F only)
Relationships of text/image, efficacy of each in conveying meaning. Properties of visual/verbal communication. Ways in which artists convey mythological meanings, how much these ways differ according to place/time. Students prepare/ critique visual presentations through Web pages.

ARTH 5103. Hellenistic and Early Roman Art and Archaeology. (3 cr. [§CNES 5103. Prereq-Class ARTH 3008, or #])
Sculpture, architecture, painting, and topography in developing centers of Hellenistic culture in the eastern Mediterranean, and in Etruscan and Roman towns from 400 B.C. to the beginnings of the Roman Empire.

For definitions of course numbers, symbols, and abbreviations, see page 300.
ARTH 5108. Greek Architecture. (3 cr. §§CNES 5108. Prereq.–ArtHistClas 3003, Jr or Sr or Grad, or #) Geometric examples of religious and secular architecture and their setting at archaeological sites in Greece, Asia Minor, and Italy.

ARTH 5111. Prehistoric Art and Archaeology of Greece. (3 cr. §§CNES 5111. Prereq.–Jr or Sr or Grad Student, Greek art/archaeology course or #) Artistic and architectural forms of Neolithic period in Aegean area and Cypadic, Minoan, and Mycenaean cultures. Aims and methods of modern field archaeology; the record of human habitation in the Aegean area. Archaeological evidence as a basis for historical reconstruction.

ARTH 5112. Archai and Classical Greek Art. (3 cr. Prereq.–Jr or Sr or Grad or #) Sculpture, painting, architecture, and minor arts in Greek lands from the 9th through 5th centuries B.C. Examination of material remains of Greek culture, archaeological problems such as identifying and dating buildings; analysis of methods and techniques.

ARTH 5112. Archai and Classical Greek Art. (3 cr. Prereq.–Jr, Class/ARTH 5111) Sculpture, painting, architecture, and minor arts in Greek lands from the 9th through 5th centuries B.C. Examination of material remains of Greek culture; archaeological problems such as identifying and dating buildings; analysis of methods and techniques. Emphasis on Periklean Athens.

ARTH 5120. Field Research in Archaeology. (3-6 cr [max 6 cr. §§ARTH 5120, CLCV 5120, CNES 5120. Prereq.–#]) Field excavation, survey, and research at archaeological sites in the Mediterranean area. Techniques of excavation and exploration; interpretation of archaeological materials.

ARTH 5172. House, Villa, Tomb: Roman Art in the Private Sphere. (3 cr. §§CNES 5172. Prereq.–Intro art history course or #) The architecture, painting, and sculpture of urban houses, country estates, and tombs in the Roman World. Relationships between public and private spheres, and literary and physical evidence of useful physical evidence in illuminating gender roles.

ARTH 5182. Art and the State: Public Art in the Roman Empire. (3 cr. §§CNES 5182. Prereq.–Intro art history course or #) Origins of Roman public art; use in maintaining community; exploitation by the first Emperor, Augustus; development and diffusion through the later Empire; varying capabilities to adjust to the demands of a Christian Empire.

ARTH 5234. Gothic Sculpture. (3 cr. Prereq.–Jr or Sr or Grad or #) The origin, character, and development of Gothic sculpture in France, the German empire, and the Netherlands, 1150-1400. Emphasis on French sculpture of the cathedral age and the emergence of a court style in Paris and elsewhere in Europe (e.g., London, Prague).

ARTH 5252. History of Early Christian Art in Context. (4 cr. §§CNES 5252. Prereq.–One 5000 ARTH course or #) The role played by art in the formation of early Christian and Byzantine communities, and in establishing their relationships with the pagan world and early Islam.

ARTH 5301. Visual Culture of the Atlantic World. (3 cr; A-F only) Visual culture of Atlantic world, from Columbus to American Revolution. Visual objects, practices considered in context of Europe’s colonization of Americas. Slavery, religious conflict, international commerce, production of scientific knowledge addressed in terms of their impact upon visual imagery.

ARTH 5302. Print Culture in Early Modern Europe. (3 cr; A-F only) Cultural history of printed images in Europe from their emergence in 15th century through about 1750. Book illustration, reproductive printmaking. History of print connoisseurship. Prints and scientific knowledge. Role of print culture in major social/political events such as Protestant Reformation.

ARTH 5324. 15th-Century Painting in Northern Europe. (3 cr. Prereq.–Jr or Sr or Grad or #) The origin, character, and development of painting in France, the Netherlands area, and the German Empire during the years 1530 to 1550. Emphasis on the Flemish school (e.g., Van Eyck brothers, Campin, Van der Weyden) and its influences.

ARTH 5340. Practicum in Archaeological Field and Computer Techniques. (3 cr. §§ARTH 5340, CLCV 3340, CNES 3340, CNES 5340. Prereq.–One course in ancient archaelogy or #) Methods for excavation of Old/New World sites. Meets at archaeometry/computer lab for part of semester and at selected site in Minnesota for day-long sessions for 9 to 10 weeks.

ARTH 5411. Gender and Sexuality in Art Since 1863. (3 cr) History of art from late 19th to early 21st century. How gender/sexuality have been central to that period's artistic production, art criticism, and aesthetic theorization. How gender/sexuality are important themes for artists. How the writing of history reveals assumptions about gender/sex. Critical reading/writing.


ARTH 5417. Twentieth Century Theory and Criticism. (3 cr. Prereq.–3464 or #) Trends in 20th-century art theory, historical methodology, criticism. Key philosophical ideas of modernism/postmodernism: formalism, semiotics, poststructuralism, feminism, Marxism, psychoanalysis, deconstruction.


ARTH 5463. Early 20th-Century Painting and Sculpture. (3 cr) Primary movements of early 20th century: fauvism, German expressionism, cubism, futurism, dadaism, surrealism, non-objective painting, constructivism, Orphism, early abstraction. Framed against postimpressionism and internationalism at turn of century.

ARTH 5466. Contemporary Art. (3 cr. §§ARTH 3464 or #) Survey of the art and important critical literature of the period after 1970. Origins and full development of postmodern and subsequent aesthetic philosophies.

ARTH 5535. Style, Tradition, and Social Content in American Painting: Colonial Era to 1876. (3 cr) America’s colonial, Revolutionary era, and 19th-century painters’ responses to the influence of European aesthetics. Key American painting types: portraiture, rural genre, and landscape from Copley and Gilbert Stuart to the Hudson River School and the chroniclers of the Western frontier.

ARTH 5536. Topical Studies in American Art. (3 cr) Course description varies from year to year depending on the current research interests of the instructor and the needs and interests of advanced undergraduate and graduate students in modern and American art.

ARTH 5546. American Architecture: 1840 to 1914. (3 cr) American architecture from 1840 to 1914, examined in relation to European precedents and American sociohistorical conditions. Critical attention to problems of style, the architectural profession, vernacular vs. “high”architecture, technology, economics, urbanism, and social reform.


ARTH 5725. Ceramics in the Far East. (3 cr) Selective examination of representative pottery and ceramic wares produced in China, Korea, and Japan from the Neolithic era to the modern era. Nearly every major ceramic type is represented.

ARTH 5765. Early Chinese Art. (3 cr) Develop a more effective way to understand the unique qualities of an individual work of art. Concentration is on accessible works of art in local private and museum collections.

ARTH 5766. Chinese Painting. (3 cr) Major works from the late bronze age to the modern era that illustrate the development of Chinese landscape painting and associated literary traditions.

ARTH 5767. Japanese Painting. (3 cr) Japanese pictorial arts from the late tomb period to the modern era; special attention to the development of indigenous traditions.

ARTH 5769. Connoisseurship in Asian Art. (3 cr) A selective examination of representative works of art produced in China from the Neolithic era to the Han Dynasty. Major archaeological sites and examples of art in local collections.

ARTH 5775. Formation of Indian Art: 2500 BCE to 300 CE. (3 cr) Sculpture/architecture, from Indus Valley civilization through Kushana period.

ARTH 5776. Redefining Tradition: Indian Art, 400 to 1300. (3 cr) India’s art/architecture, from earliest free-standing temples through 13th century. Focuses on temples, associated sculpture. Mural painting, beginnings of Islamic architecture in India.

ARTH 5777. The Diversity of Traditions: Indian Art 1200 to Present. (3 cr. §§Prereq.–Art history course or #) Issues presented by sculpture, architecture and painting in India from the prehistoric Indus Valley civilization to the present day.

ARTH 5781. Age of Empire: The Mughals, Safavids, and Ottomans. (3 cr) Artistic developments under the three most powerful Islamic empires of the 16th through 19th centuries: Ottomans of Turkey; Safavids of Iran; Mughals of India. Roles of religion and state will be considered to understand their artistic production.

ARTH 5785. Art of Islamic Iran. (3 cr) Architecture, painting, and related arts in Iran from the inception of Islam (7th century) through the 20th century. Understanding the nature of Islam in Persianate cultural settings and how artistic production here compares to the Islamic world.

ARTH 5925. History of Photography as Art. (3 cr) Origins and development of photography, with attention to technology and cultural impact. Major aesthetic achievements in photography from its beginning to the present.

ARTH 5927. Documentary Cinema. (4 cr. §§Prereq.–Art history course or #) History of nonfiction filmmaking, from early forms of reportage and birth of documentary to emergence of “film-vertie” and “guerrilla television” and work by independents (e.g., Errol Morris, Michael Moore).

ARTH 5940. Topics: Art of the Film. (3 cr) Topics in film history including individual directors (e.g., Hitchcock, Welles), genres (e.g., westerns, musicals), and other topics (e.g., American independent filmmaking, film noir).
Asian American Studies (AAS)

Department of American Studies

College of Liberal Arts

AAS 1101. Imagining Asian America. (3 cr)
Issues in Asian American Studies. Historical/recent aspects of the diverse/multifaceted vision of Asian America, using histories, films, memoirs, and other texts as illustrations.

AAS 3001. Contemporary Perspectives on Asian America. (3 cr)

AAS 3270. Service Learning in the Asian Community. (1-4 cr; max 8 cr; Prereq-#) Students engage in service learning among members of local Asian communities. Readings, mentoring, English language instruction. Other activities as deemed appropriate by instructor and sponsoring agency.

AAS 3409W. Asian American Women's Cultural Production. (3 cr)
Diversity of cultures designated “Asian American.” Understanding women’s lives in historical, cultural, economic, and racial contexts.

AAS 3501. Asian America Through ARTS and Culture. (4 cr)
Interdisciplinary questions of Asian American experience, identity, and community. Literature, dance, music, photography, film, theater, other cultural forms. Students work with local Asian American arts organizations. Students express their own cultural contradictions through writing and other forms of artistic expression and attend local arts events.

AAS 3877. Asian American History, 1850 to Present. (3 cr)
Asian American history and contemporary issues, from 1850 to present. Immigration, labor, anti-Asian movements, women/families, impact of World War Two, new immigrant/refugee communities, civil rights, Asian American identity/culture.

AAS 3920. Topics in Asian American Studies. (2-4 cr; max 5 cr; Prereq-#) Topics specified in Class Schedule.

AAS 3993. Directed Studies in Asian American Studies. (1-9 cr; max 9 cr; Prereq-#)
Guided individual reading or study.

AAS 4231. The Color of Public Policy: African Americans, Asian Americans, and Chicanos in the United States. (3 cr; S/AFRO 4231, AMIN 4231, CHIC 4231)
Structural or institutional conditions through which people of color have been marginalized in public policy. Critical evaluation of social theory in addressing the problem of contemporary communities of color in the United States.

AAS 4311. Asian American Literature and Drama. (3 cr; A-F only)
Literary/dramatic works by Asian American writers. Historical past of Asian America through perspective of writers such as Sui Sin Far and Carlos Bulosan. Contemporary artists such as Frank Chin, Maxine Hong Kingston, David Henry Hwang, and Han Ong. Political/historical background of Asian American artists, their aesthetic choices.

AAS 4920. Topics in Asian American Studies. (2-4 cr; max 6 cr)
Topics specified in Class Schedule.

Asian Languages and Literatures (ALL)

Department of Asian Languages and Literatures

College of Liberal Arts

ALL 1001. Asian Film and Animation. (3 cr)

ALL 1275. Buddhism in East Asia. (3 cr)
Introduction to traditions of Buddhism in China, Korea, and Japan. Arrival of Buddhism in East Asia, impact on those cultures. Modes of Buddhist transmission/interaction within East Asia. Forms of Buddhist practice. Development of monastic communities. Evolution of Buddhist doctrinal/devotional schools.

ALL 1335W. Chinese Ways of Living: Philosophical and Literary Approaches. (3 cr)

ALL 1441. Popular Music and Media in Modern Japan. (5 cr)

ALL 1904. Freshman Seminar. (3 cr [max 6 cr; A-F only; Prereq-Freshman]) Topics specified in Class Schedule and Course Guide.

ALL 1905. Freshman Seminar. (3 cr [max 6 cr; A-F only; Prereq-Freshman]) Topics specified in Class Schedule and Course Guide.

ALL 1909W. Freshman Seminar. (3 cr [max 6 cr; A-F only; Prereq-Freshman]) Topics specified in Class Schedule and Course Guide.

ALL 1910W Freshman Seminar. (3 cr [max 6 cr; A-F only; Prereq-Freshman]) Topics specified in Class Schedule and Course Guide.

ALL 3001. Reading Asian Cultures. (3 cr; A-F only)
Introduction to primary Asian texts in translation. Emphasizes introducing/applying various methods of interpretation to a particular text in sequence. Close reading, methodological rigor. Practice, application.

ALL 3014W. Art of India. (4 cr; S/ARTH 3014W; Prereq-S/ARTH 3014W)
Indian sculpture, architecture, and painting, from prehistoric Indus Valley civilization to present.

ALL 3110. Study of an Asian Language. (1-5 cr [max 10 cr]; A-F only) Prereq-A
Study of an Asian language in another country or at other non-campus locations. Students study in situations complementary to regular University course offerings.

ALL 3220. Study Abroad Topics in Asian Culture. (1-4 cr; max 12 cr; A-F only)
Part of University of Minnesota sponsored study abroad experience.

ALL 3222W. "Short Poetry in China and Japan. (3 cr)

ALL 3265W. The Fantastic in East Asia: Ghosts, Foxes, and the Alien. (3 cr; Prereq-Some coursework in East Asia recommended)
How the strange/alien is constructed in premodern Chinese/Japanese literature. East Asian theories of the strange and their role in the classical tale, through the works of Pu Songling, Ueda Akinari, and others. Role of Buddhist cosmology/salvation in other works (e.g., Journey to the West, drama).

ALL 3270. Service Learning in the Asian Community. (1-4 cr; max 8 cr; Prereq-#) Students engage in service learning among members of local Asian communities. Readings, mentoring, English language instruction. Other activities as deemed appropriate by instructor and sponsoring agency.

ALL 3300. Topics in Chinese Literature. (1-3 cr [max 9 cr]) Selected topics in Chinese literature. Topics specified in the Class Schedule.

ALL 3320. Topics in Chinese Culture. (1-3 cr [max 9 cr]) Selected topics in Chinese culture. Topics specified in the Class Schedule.

ALL 3333. Gender and Sexuality in Traditional Chinese Literature. (3 cr)
How writers have written about gender in traditional China. Traditional Chinese attitudes toward sexuality. Poetry from early period, “stories of the strange,” later fiction/drama. Transformation of these themes in popular cinema.

ALL 3336. Revolution and Modernity in Chinese Literature and Culture. (3 cr)
Introduction to modern Chinese literature, visual culture, and critical thought from beginning of 20th century to end of Mao era. Examples of literature/culture, parallel readings of Chinese critical essays. Readings are in English translation.

ALL 3337. Chinese Literature and Popular Culture Today. (3 cr)
Introductory survey of contemporary Chinese literature and popular culture from end of Mao era in 1979 to present. Creative results of China’s “opening and reform.” Recent commercialization/globalization of culture. Literature, visual culture, popular music.

ALL 3356W. Chinese Film. (3 cr)
Survey of Chinese cinema from China (PRC), Taiwan, and Hong Kong. Emphasizes discussion/comparation of global, social, economic, sexual, gender, psychological, and other themes as represented through film.

ALL 3381W. Maps, Pictures, and Writing in the Representation of Taiwan. (3 cr;
How visual (maps, pictures, and photographs) and written (travelogues, stories, and essays) media are used to contribute to formation of identity in representing people, place, and history of Taiwan, in historical/contemporary contexts.

ALL 3383. Imagined Worlds in Ming Qing China. (3 cr)
Imaginative worlds (fictional, religious, erotic) that were available to men and women in China of the Ming and Qing dynasties. Fiction, other texts, visual materials. Ways in which texts were produced/distributed.

ALL 3371. History of Chinese Cities and Urban Life. (3 cr; A-F only)
Introduction to traditional Chinese cities, their modern transformation. Ideal city plan in Confucian classics compared with physical layout of some major cities. Models about Chinese cities, influence of the models on our understanding of Chinese history/society.
Course Descriptions

ALL 3373. Religion and Society in Imperial China. (3 cr) Introduction to religious traditions of imperial China (Buddhism, Daoism, Confucianism, “popular” religion), their relation to society. Role of gender. Conceptualizing relations with the divine. Ritual and its goals. Position of religious specialists such as monks and Daoist priests. Primary/secondary readings.

ALL 3400. Topics in Japanese Literature. (3 cr [max 9 cr]) Selected topics in Japanese literature. Topics specified in the Class Schedule.

ALL 3420. Topics in Japanese Culture. (1-3 cr [max 9 cr]) Selected topics in Japanese culture. Topics specified in the Class Schedule.

ALL 3433W. Traditional Japanese Literature in Translation. (3 cr; Prereq–No knowledge of Japanese necessary. Survey of texts in different genres, from 8th to early 19th centuries, with attention to issues such as “national” identity, gender/sexuality, authorship, and popular culture.

ALL 3436. Postwar Japanese Literature in Translation. (3 cr; Prereq–Basic knowledge of modern Japanese history helpful, knowledge of Japanese language not required) Survey of ideas/styles of recent Japanese literature. Writers include Dazai Osamu, ibuse Masuij, oe Kenzaburo, Mishima Yukio, and Yoshimoto Banana. All readings in English translation.

ALL 3437. Early 20th Century Japanese Literature in Translation. (3 cr) Survey of the principal authors and genres of the period spanning Japan’s opening to the West (1860s) to World War II. Writers include Natsume Soseki, Shiga Naoya, Kawabata Yasunari, and Tanizaki Junichiro.

ALL 3441W. Japanese Theater. (3 cr) Japanese performance traditions. Emphasizes noh, kabuki, and bunraku in their literary/cultural contexts. Relationship between these pre-modern traditions and modern theatrical forms (e.g., Takarazuka Revue).

ALL 3456. Japanese Film. (5 cr) Themes, stylistics, and genres of Japanese cinema through work of classic directors (Kurosawa, Mizoguchi, and Ozu) and more recent filmmakers (Hami, Moriota). Focuses on representations of femininity/masculinity.

ALL 3457. War and Peace in Japan Through Popular Culture. (4 cr; A-F only, Prereq–Some knowledge of modern Japanese history or #) War-related issues in Japan. Animation films, comics from 1940s to 1990s, Mobilization of culture for WWII. Conflict between constitutional pacifism and national security. Japan’s role in cold war and post-cold war worlds.

ALL 3500. Topics in Korean Literature. (1-3 cr [max 9 cr]) Selected topics in Korean literature. Topics specified in the Class Schedule.

ALL 3520. Topics in Korean Culture. (1-3 cr [max 9 cr]) Selected topics in Korean culture. Topics specified in the Class Schedule.

ALL 3632. Readings in Indian Epic Traditions: Islamic Epic and Romance. (3 cr) Literary traditions of epic/romance that arose in Islamic societies of Central/Southern Asia. How genres of love/war interacted with political, religious, and cultural authorities over centuries. Virtue, constructions of fantasy/understandings of reality in tales of heroes, beautiful princesses, evil kings, fairies, Jinn, magicians, and tricky secret agents.

ALL 3637W. Modern South Asian Literature. (3 cr; A-F only) Survey of 20th century literature from South Asian countries, including India, Pakistan, and Sri Lanka. All readings in English. Focuses on colonialism, post-colonialism, power, and representation.

ALL 3676. Culture and Society of India. (3 cr; 5ANTH 3023, GLIS 3961) Contemporary society/culture in South Asia from anthropological perspective with reference to nationalism; postcolonial identities; media and public culture; gender, kinship, and politics; religion; ethnicity; and Indian diaspora.

ALL 3720. Topics in Hmong Culture. (1-3 cr [max 9 cr]) Selected topics in Hmong culture. Topics specified in the Class Schedule.


ALL 3900. Topics in Asian Literature. (3 cr [max 9 cr]) Topics specified in Class Schedule.

ALL 3920. Topics in Asian Culture. (3 cr [max 9 cr]) Topics specified in Class Schedule.

ALL 3990. Directed Study. (1-3 cr [max 12 cr]; Prereq–#, Δ, Λ) Individual reading/study, with guidance of a faculty member, on topics not covered in regular courses.

ALL 4900W. Major Project. (1 cr; A-F only) Prereq–ALL major, ir., sr. Directed research/writing on topic selected according to individual interest and in consultation with faculty advisor.

ALL 5220. Pedagogy of Asian Languages and Literatures. (1-3 cr [max 9 cr] Prereq–Grad student) Second language acquisition theory, methods, testing, and technology applicable to teaching of modern Asian languages/literatures.


ALL 5333. Poetry and Power in Early China: Book of Songs and Songs of the South. (4 cr; Prereq–Upper div undergrad or grad student) How to read/analyze poems from early anthologies in terms of their display/invocation of different types of cultural power. Power that poems have held over Chinese literary tradition in subsequent millennia, their literary influence/position in intellectual/political lives of Chinese readers. Studies that relate to the poetry and social/material culture.


ALL 5356. Gender and Sexuality in Chinese Film. (4 cr; Prereq–Upper div undergrad or grad student) How gender/sexuality have been depicted, constructed, and subverted in Chinese cinemas (including mainland China, Hong Kong, Taiwan) from 1930s to present. Weekly film screenings, readings on Chinese film, key works of feminist film theory.

ALL 5357. Chinese Cinematic Realisms. (4 cr) Various styles of realism in Chinese cinemas (mainland, Taiwan) from silent era to present. Theories of realism, conceptions of “the Real” applied in close readings of major films, placed in historical context. China’s negotiation of modernity during 20th century.

ALL 5366. The Nation in Modern Chinese Film and Literature. (4 cr; Prereq–Grad student or advanced undergrad) Chinese nationhood as represented/negotiated in film/literature from early 20th Century to present. How China was re-imagined as a modern nation in culture, from Republican era to Mao era to the reform era. How alternative national visions of nationhood arose in Hong Kong and Taiwan.

ALL 5374W. Representing the Past: Chinese Myth, Legend, and Ideology. (4 cr) Analysis of texts that contain early Chinese myths, legends, and historical narratives in their construction of an understandable world. How such materials have been incorporated into different cultural formations from later periods, including contemporary popular culture. How they have figured into the construction of China and Chineseness in 20th Century.


ALL 5436. Literature by 20th-Century Japanese Women in Translation. (4 cr) Literary and historical exploration of selected works by Japanese women writers in a variety of genres. All literary texts read in English.


ALL 5636. South Asian Women Writers. (4 cr; A-F only, Prereq–Grad student or advanced undergrad) Survey of South Asian women’s writing, from early years of nationalist movement to present. Contemporary writing includes works by immigrant writers. Concerns, arguments, and nuances in works of women writing in South Asia and diaspora.

ALL 5900. Topics in Asian Literature. (4 cr [max 16 cr]) Topics specified in Class Schedule.

ALL 5920. Topics in Asian Culture. (4 cr [max 16 cr]) Topics specified in Class Schedule.

ALL 5990. Directed Study. (1-4 cr [max 16 cr]; Prereq–#, Δ, Λ) Individual reading/study, with guidance of a faculty member, on topics not covered in regular courses.
Astronomy (AST)
Department of Astronomy

AST 1001. Exploring the Universe. (4 cr. §AST 1005, AST 1101H)
The human place in the Universe. Study of Earth, other planets, sun, stars, galaxies. Background and fragility of life on Earth. Scale, origin, history of universe and our relationship to it.

AST 1005. Descriptive Astronomy. (3 cr. §AST 1001, AST 1101H)

AST 1011H. Exploring the Universe, Honors. (4 cr. §AST 1001, AST 1005. Prereq—high school trigonometry, high school physics or chemistry)

AST 1901. Freshman Seminar. (1-3 cr [max 3 cr]. Prereq—Freshman)
Topics vary. See Class Schedule.

AST 1905. Freshman Seminar. (1-3 cr [max 3 cr]. Prereq—Freshman)
Topics vary. See Class Schedule.

AST 1910W. Freshman Seminar, Writing Intensive. (1-3 cr [max 3 cr]. Prereq—Freshman)
Topics vary. See Class Schedule.

AST 2001. Introduction to Astrophysics. (4 cr. Prereq—1 yr calculus, PHYS 2303 or 2601)
Physical principles and study of solar system, stars, galaxy, universe. How observations and conclusions are made.

AST 2990. Directed Studies. (1-3 cr [max 3 cr]. Prereq—Upper div honors student  in Astronomy (AST)

AST 4001. Astrophysics I. (4 cr; A-F only. Prereq—2001, PHYS 2601)
Topics vary. See Class Schedule.

AST 4101. Computations Methods in the Physical Sciences. (4 cr. Prereq—Upper div IT or CLA, inst consent)

AST 5012. The Interstellar Medium. (4 cr. Prereq—2001, PHYS 2601 or 2610)
Survey of physical processes in the interstellar medium. Dynamic processes, excitation processes, emission and absorption by gas and dust. Hot bubbles, HI regions, molecular clouds.

AST 5022. Relativity, Cosmology, and the Universe. (4 cr. §PHYS 5022, Prereq—2001, PHYS 2601 or 2610)
Large-scale structure/history of universe. Introduction to Newtonian relativistic world models. Physics of early universe, cosmological tests, formation of galaxies.

AST 5201. Methods of Experimental Astrophysics. (4 cr. Prereq—Upper div IT or grad or #)
Contemporary astronomical techniques and instrumentation. Emphasizes data reduction and analysis, including image processing. Students make astronomical observations at O’Brien Observatory and use department’s computing facilities for data analysis. Image processing packages include IRAF, AIPS, IDL, MIRA.

Bio-based Products (BP)
Department of Bio-based Products

College of Food, Agricultural and Natural Resource Sciences

BP 1001. Bio-based Products Orientation. (1 cr; S-N only)
Introduction to professions/careers related to bio-based products. One half-day field trip required.

BP 1002. Wood and Fiber Science. (3 cr; A-F only, §BP 5202)
Wood as a bio-material. Wood’s anatomical/cellular structure compared with other plant-derived materials. Wood’s physical properties/characteristics in various applications. Non-wood fiber, bio-product characteristics.

BP 1003. Wood and Fiber Science Lab. (1 cr; A-F only. Prereq—recommend concurrent enrollment in BP 1002)
Structure/properties of wood and agricultural plants and of fibers derived from them.

BP 1005. Introduction to Pulp and Paper Technology. (3 cr)
Technology of pulp/paper manufacturing. Terminology, key parameters. Stepwise description of processes, from harvesting of trees through fiber production and papermaking. Vista based online course.

BP 1302. Wood as a Raw Material. (3 cr. Prereq—4 or 5 yr math, distance learning)
Physical/chemical nature of wood and wood fiber. Raw material requirements, manufacturing processes, product characteristics for principal forest products. World wood supply, consumption trends.

BP 1901. Freshman Seminar. (3 cr [max 6 cr]. Prereq—Freshman)
Issues/topics related to natural resources and the environment. Topics vary each semester.

BP 1906W. Freshman Seminar. (3 cr [max 3 cr. Prereq—Freshman)
Issues/topics related to natural resources and the environment. Topics vary each semester.

Fundamental statics and engineering principles of structural materials. Safe/efficient engineering design skills. Emphasizes structural bio-based products.

BP 3101. Introductory Statics and Structures for Construction Management. (3 cr. A-F only. Prereq—Working knowledge of [trigonometry, geometry, algebra])
Statics, engineering wood design principles, mechanical properties of wood. Design techniques for individual components. Trusses, beams, columns. Using conventional lumber products, engineered wood products, and steel. Simple structures explored through examples, assignments.

BP 3102. Residential Indoor Air Quality. (3 cr; A-F only, §BP 5102. Prereq—[1 yr of college-level [physics or chemistry or biology]] or #)
Indoor air pollution issues found in residential structures, especially in north central region of the United States. Pollutant descriptions, including measurement techniques and typical ranges of concentrations. Health effects 3) Pathways and transport mechanisms. Control strategies, including mitigation and prevention.

BP 3393. Directed Study. (1-3 cr [max 12 cr]. Prereq—#)
Opportunity to pursue projects not available through independent study or extra credit. In consultation with an advisor, students develop a prospectus and complete progress reports and a final report on the project.

BP 3396. Industrial Internship (Industrial Assignment). (1 cr; A-F only. Prereq—WPS cooperative ed student)
Industrial work assignment in forest products cooperative education program. Evaluation based on formal report written by student at end of each semester of work assignment.

BP 3411. Introduction to Residential Construction. (2 cr)
Housing/construction terminology, building materials/components. Design, construction, and sales process: basic building science concepts, blueprint reading, computer-aided design, construction site logistics.

BP 3412. Introduction to Residential Building Materials Estimating. (1 cr; A-F only)

BP 3503. Marketing of Bio-based Products. (4 cr; A-F only, §BP 5503)
Intro to marketing function as it relates to current/emerging bio-based products industries (building materials, paper, fuels, etc.). Product positioning, pricing, promotion, and channel management within strategic planning and environmental marketing management.

BP 4001. Chemistry of Plant Materials. (4 cr; A-F only. GECON 1033, ECOD 4031, Prereq—CHEM 2302, [jr or sr or #])
Chemical principles underlying structure, properties, processing, and performance of plant materials.

BP 4200H. Honors Seminar. (1 cr; A-F only. Prereq—BP upper div honors, #)
Current topics presented by faculty/students. Lecture/discussion.

BP 4301. Surface and Colloid Science in Bio-based Products Manufacturing. (3 cr. §BP 5301. Prereq—CHEM 3501, [jr or sr or #])
Principles of surface/colloid science, their application to understanding manufacturing/performance of bio-based products.

BP 4302. Organisms Impacting Bio-based Products. (3 cr. §BP 5302. Prereq—1002 or WPS 1301 or #)

BP 4303. Bio-based Materials Science. (3 cr. §BP 5303. Prereq—CHEM 3501, [jr or sr or #])
Basic principles of materials science, their application to bio-based materials.

BP 4305. Pulp and Paper Technology. (3 cr. §BP 5305. Prereq—# or #)


BP 4355. Design of Wood Structures. (3 cr. Prereq–3001 or WPS 4303 or CE student or #) Design of wood structures using Allowable Stress Design. Wood properties/characteristics important to structural design. Heavy/light frame wood construction.


BP 4401. Bio-based Products Engineering. (4 cr. A-F only. §BP 5401. Prereq–4301, 4303, 4413, 4441, 4443, fr writing req, Jr or Sr or #) Students develop, formulate, and complete an open-ended, engineering process-design project at conceptual level.

BP 4402W. Process and Product Design II. (3 cr. Prereq–4401, fr writing req, Jr or Sr or #) Students develop, select, formulate, and complete an open-ended, comprehensive engineering process/product design project.


BP 4801H. Honors Research. (2 cr.; A-F only. Prereq–BP upper div honors) First semester of independent research project supervised by faculty member.


BP 5001. Chemistry of Plant Materials. (4 cr. A-F only. Prereq–Grad student or #) Chemical principles underlying structure, properties, processing, and performance of plant materials.

BP 5002. Fundamentals of Bio-renewable Resources. (3 cr. A-F only. Prereq–Grad student or sr who has undergrad training in engineering or physical or biological science or degree in agriculture or one or more of the above) Science/engineering of converting bio-renewable resources into bioenergy and biobased products. Defining resource base. Physical/chemical properties of biorenewable resources. Biobased products. Methods of production for biorenew resources. Processing technologies for fuels, chemicals, fibers, and energy. Environmental impacts. Economics of biobased products and bioenergy.

BP 5102. Residential Indoor Air Quality. (3 cr. A-F only. §BP 5102. Prereq–Grad student or #) Indoor air pollution issues found in residential structures, especially in the north central region of the United States. Pollutant descriptions, including measurement techniques and typical ranges of concentrations. Health effects. Pathways, transport mechanisms. Control strategies including mitigation and prevention.

BP 5202. Wood and Fiber Science. (3 cr.; A-F only. §BP 5202. Prereq–Grad student or #) Wood as a bio-material. Wood’s anatomical/cellular structure compared with other plant-derived materials. Wood’s physical properties/characteristics in various applications. Non-wood fiber, bio-product characteristics.

BP 5301. Surface and Colloid Science in Bio-based Products Manufacturing. (3 cr. §BP 4301. Prereq–Grad student or #) Principles of surface and colloid science, their application to manufacturing/performance of bio-based products.

BP 5302. Organisms Impacting Bio-based Products. (3 cr. §BP 4302. Prereq–Grad student or #) Organisms and their importance to bio-based products: deterioration, control, bioprocesses for benefit.

BP 5303. Bio-based Materials Science. (3 cr. §BP 4303. Prereq–Grad student or #) Basic principles of materials science, their application to bio-based materials.


BP 5362. Pulping and Bleaching. (4 cr. §BP 4362. Prereq–Grad student or #) Chemistry/technologies in producing paper-making raw material. Focuses on wood pulping/bleaching, including non-wood fibers and recycled fiber materials. Online course.


BP 5411. Application and Performance of Wood-based Composites in Services. (2 cr.; A-F only. Prereq–[1002 or WPS 1303 or 4401 or WPS 4406 or #] Junior or Div) Physical/mechanical properties of composites. Composite applications/installations.

Course Descriptions

Biochemistry (BioC)
Department of Biochemistry, Molecular Biology, and Biophysics

**Course Descriptions**

**BIOC 1001. Elementary Biochemistry.** (3 cr. Prereq.–High school CHEM or college general chem) Chemistry and biochemistry as they apply to the organization, function, and regulation of living systems, especially humans. Suitable for undergraduates who desire an introduction to biochemistry. Enroll in receipt of health science programs such as dental hygiene or occupational therapy.

**BIOC 2111. Biochemistry for the Agricultural and Health Sciences.** (3 cr. BIOC 1012, BIOC 3001. Prereq.–CHEM 1011, BIOL 1009, not for biology majors) Survey of organic chemistry/biochemistry outlining structure/metabolism of biomolecules, metabolic regulation, and principles of molecular biology.

**BIOC 3021. Biochemistry.** (3 cr. BIOC 6021, Prereq.–BIOL 1002 or 1009) CHEM 2301) Fundamentals of biochemistry including structure and function of proteins, nucleic acids, lipids and carbohydrates; metabolism and regulation of metabolism; quantitative treatments of chemical equilibria, enzyme catalysis and bioenergetics; the chemical basis of genetic information flow.

**BIOC 3960. Research Topics in Biochemistry.** (1 cr) [max 2 cr]; S-N only. Prereq.–3021 or 30321 or 4331 or 43331 or #) Lectures, discussion on current research in the department.

**BIOC 4025. Laboratory in Biochemistry.** (2 cr. Prereq.–3021 or 4331 or BIOL 3021) Theory, principles, and practical use of fundamental techniques in modern biochemistry laboratories.

**BIOC 4125. Laboratory in Molecular Biology and Biotechnology.** (3 cr. Prereq.–BIOC 4185, BIOL 4125, BIOL 4185. Prereq.–3021 or BIOL 3021 or BIOL 4003) [4025 or GCD 4015 or GCD 4025 or MBG 3301]) Basic recombinant DNA techniques: methods for cloning DNA and cloning vectors, DNA sequencing and sequence analysis, gene expression, Polymerase Chain Reaction (PCR), other current techniques.

**BIOC 4185. Laboratory in Molecular Biology and Biotechnology.** (3 cr. Prereq.–BIOC 4185, BIOL 4125, BIOL 4185. Prereq.–Enrollment in summer undergraduate Research program in the sciences [biochemistry or genetics course], [intermediate level lab in [BICHEM or genetics or cell BIOL or microbiol]]. Basic recombinant DNA techniques: methods for growing, isolating, and purifying recombinant DNA and cloning vectors, DNA sequencing and sequence analysis, gene expression, Polymerase Chain Reaction (PCR), other current techniques.

**BIOC 4331. Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems.** (4 cr. Prereq.–[BIOC 1002 or 1009 or equiv], CHEM 2302 or equiv) Advanced survey of structure/catalysis, metabolism/bioenergetics.

**BIOC 4332. Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression.** (4 cr. Prereq.–4331 or #) Advanced survey of molecular biology, mechanisms of gene action, and biological regulation.

**BIOC 4521. Introduction to Physical Biochemistry.** (3 cr. Prereq.–CHEM 1022, MATH 1272, PHYS 1202) Introduction to physical chemistry principles and their applications in biochemistry. Thermodynamics, kinetics, spectroscopy, and solution dynamics as applied to biochemical reactions and biopolymers.

**BIOC 479W3. Directed Studies: Writing Intensive.** (1-7 cr [max 7 cr]; S-N only. Prereq.–#) Individual study on selected topics or problems. Emphasizes readings, use of scientific literature. Written report.

**BIOC 479W4. Directed Research: Writing Intensive.** (1-6 cr [max 42 cr]; S-N only. Prereq.–#) Laboratory or field investigation of selected areas of research, including written report.

**BIOC 4993. Directed Studies.** (1-7 cr [max 7 cr]; S-N only. Prereq.–#) Individual study on selected topics or problems. Emphasizes selected readings, use of scientific literature.

**BIOC 4994. Directed Research.** (1-6 cr [max 42 cr]; S-N only. Prereq.–#) Laboratory or field investigation of selected areas of research.

**BIOC 5001. Biochemistry, Molecular and Cellular Biology.** (3 cr. BIOC 6001. Prereq.–Undergraduate course in biochemistry, molecular biology, cell biology, and developmental biology.

**BIOC 5309. Biocatalysis and Biodegradation.** (3 cr. Prereq–Chemistry through organic chemistry, knowledge of word processing, e-mail access to World Wide Web, access to college-level science library) Assess validity of information on biocatalysis and biodegradation; learn fundamentals of microbial catalytic metabolism as it pertains to biodegradation of environmental pollutants; bio catalysis for specialty chemical synthesis; display of this information on the Web.

**BIOC 5352. Microbial Biochemistry and Biotechnology: Proteins.** (3 cr; A-F only, MICB 5352. Prereq.–[3021 or 4331 or BIOL 3021 or MICB 4111], [BIOL 3301 or MICB 3301]) or #) Protein biotechnology. Microorganisms used as hosts for protein expression, protein expression, and engineering methods. Production of enzymes of industrial interest. Applications of protein biotechnology in biotechnology/bioelectronics. Formulation of therapeutic biochemicals.

**BIOC 5353. Microbial Biochemistry and Biotechnology: Small Molecules.** (3 cr; A-F only, MICB 5352 or 4331 or BIOL 3021 or MICB 4111, [BIOL 3301 or MICB 3301]) or #) Small molecule biotechnology. Screening strategies for drug discovery. Secondary metabolite and antibiotic biosynthesis. Combinatorial methods for generating new pharmaceutically active natural products. Production of organic acids and vitamins. Introduction to metabolic engineering.

**BIOC 5361. Microbial Genomics and Bioinformatics.** (3 cr. Prereq.–College-level courses in [organic chemistry, biochemistry, microbiology]) Introduction to genomics. Emphasizes microbial genomics. Sequencing methods, sequence analysis, genomics databases, genome mapping, prokaryotic/horizontal gene transfer, genomics in biotechnology, intellectual property issues.

**BIOC 5401W. Advanced Metabolism and Its Regulation.** (3 cr. Prereq.–3021 or 4331 or BIOL 3021) Underlying principles that determine metabolism of common/unalusual compounds in plants, animals, microorganisms. Regulation of carbon, energy flow in whole organisms.

**BIOC 5444. Muscle.** (3 cr. Prereq.–3021, 4331 or BIOL 3021, [MICE 6001]) Muscle structure/function: molecular mechanism by which force is generated.

**BIOC 5527. Introduction to Modern Structural Biology.** (4 cr. Prereq.–[intro biochemistry, intro physics] or physical chemistry or #) Methods employed in modern structural biology to elucidate macromolecular structures. Primary focus on X-ray diffraction, nuclear magnetic resonance (NMR) spectroscopy and mass spectrometry. Principles underlying structural biology and structure/function relationships.


**BIOC 5531. Macromolecular Crystallography I: Fundamentals and Techniques.** (1 cr; S-N only. Prereq.–[One organic chemistry or biochemistry course], [two calculus or college physics courses] or instr approval) Macromolecular crystallography for protein structure determination/engineering. Determining macromolecular structure by diffraction.

**BIOC 5532. Macromolecular Crystallography II: Techniques and Applications.** (1 cr; S-N only. Prereq.–5531) Determining structure of macromolecule by diffraction. Using software in macromolecular crystallography.
Bioinformatics (BINF)

Department of Laboratory Medicine and Pathology

Medical School

BINF 5480. Bioinformatics Journal Club. (1 cr; max 12 cr.; S-N only)
Bioinformatics Journal Club

BINF 5490. Topics in Bioinformatics. (1-6 cr; max 12 cr.; Prereq—#)
Independent or group study in bioinformatics.

Biology (BIOL)

College of Biological Sciences

BIOL 1001. Introductory Biology I: Evolutionary and Ecological Perspectives. (4 cr. §BIOL 1009, BIOL 1009H)
Biological diversity from genetic variation to diversity of species/ecosystems. Genetic, evolutionary, and ecological processes governing biological diversity. Genetic, evolutionary, and ecological perspectives on issues concerning human diversity, human population growth, health, agriculture, and conservation. Lab.

BIOL 1002V. Introductory Biology II: Molecular, Cellular, and Developmental Perspectives. (5 cr; A-F only; Prereq—[1001 or equiv], CHEM 1021)
Chemistry of living things, cell structure/transport, energy processing in cells, introduction to primary metabolism, molecular genetics, cell physiology, cell cycles, principles of animal/plant development, regulation of development. Lab focuses on molecular scientific techniques, investigative designs. Discussion session focuses on scientific problem solving, experimental design, analysis of recent research.

BIOL 1002W. Introductory Biology II: Molecular, Cellular, and Developmental Perspectives. (5 cr; A-F only; Prereq—[1001 or equiv], CHEM 1021)
Chemistry of living things, cell structure/transport, energy processing in cells, introduction to primary metabolism, molecular genetics, cell physiology, cell cycles, principles of animal/plant development, regulation of development. Lab focuses on molecular scientific techniques, investigative designs.

BIOL 1009. General Biology. (4 cr. §BIOL 1001, BIOL 1009H)
Prep-grad high school chemistry; 1 term college chemistry recommended

BIOL 1009H. Honors: General Biology. (4 cr. §BIOL 1001, BIOL 1009. Prereq—high school chemistry, honors; one term of college chemistry recommended)

BIOL 1011. General Biology for Institute of Technology Students. (4 cr. Prereq—High school chemistry; one term college chemistry recommended)

BIOL 1020. Biology Colloquium. (1 cr; max 2 cr.; S-N only)
Introduction to the diverse fields of biology through seminars, lab tours, trips to Itasca Biological Station, and faculty with other biology students and faculty. Course may be repeated once.

BIOL 1041. Preparation for Graduate Programs in Science. (1 cr; S-N only; Prereq—#)
Necessary elements for excelling in mathematics, physical and biological sciences to prepare for graduate work in science. Required for new freshmen in the Mathematics and Science Tutorial (MST) Program.

BIOL 1093. Biology Colloquium: Directed Study. (1 cr; S-N only, Prereq—1002 and §1005)
Individual study or research undertaken by a student concurrently enrolled in BIOL 1020 with oversight by a faculty sponsor.

BIOL 1101W. Heredity and Human Society. (3 cr. Prereq—no cr taken after 4003 or GB 3022)
Principles of heredity and their social and cultural implications.

BIOL 1105. Introduction to Biology, Society, and the Environment. (2 cr; A-F only)
Social context of biology, relevance of biology to social/environmental issues. How biology shapes and is shaped by current events, legislation, ethical concerns, and history. Case studies, discussion.

BIOL 1805. Nature of Life: Introducing New Students to the Biological Sciences. (2 cr. Prereq—Fr in College of Biological Sciences)
Biological sciences, from molecules to ecosystems and from laboratory science to field biology. Introduction to the College of Biological Sciences community and opportunities. Held at Itasca Biological Station and Laboratories. Transportation, board, and lodging fee.

BIOL 1901. Freshman Seminar for the Biological Sciences. (1-2 cr; max 2 cr; A-F only; Prereq—Freshman)
Orientation to University environment. Special topics illustrate importance of biological issues.

BIOL 1903. Freshman Seminar for the Biological Sciences. (1-2 cr; max 2 cr; A-F only; Prereq—Freshman)
Orientation to University environment. Special topics illustrate importance of biological issues.

BIOL 1905. Freshman Seminar for the Biological Sciences. (1-3 cr; max 5 cr; Prereq—Freshman)
Orientation to University environment. Special topics that illustrate the importance of biological topics/issues in modern society.

BIOL 1910W. Freshman Seminar for the Biological Sciences. (2 cr; A-F only; Prereq—Freshman)
Orientation to University environment. Special topics that illustrate the importance of biological topics/issues in modern society. Writing-intensive.

BIOL 1981. Intersections of Biology at Lake Itasca. (1 cr; A-F only)
Prerequisite—1001 or 1009)
Experiences at Lake Itasca Biological Station and Laboratories in regard to the intersection of biology, society, and the environment. Field work.

BIOL 2022. General Microbiology with Laboratory. (4 cr. §MICB 3301, Prereq—1002 or 1009, CHEM 1022, intended primarily for non-microbiology majors)

BIOL 2201. Introduction to Computing in Biology. (1 cr; S-N only, Prereq—[1003 or 1002 or equiv], biological sciences major)
Hands-on use of microcomputers to show how computers manipulate data, prepare graphs/graphics, acquire/analyze scientific data, perform literature searches, prepare scientific presentations, communicate via network.

BIOL 2960. Field Zoology. (4 cr. Prereq—Beginning biology)
Major animal groups. Native Minnesota organisms in their natural habitat. Lecture, lab, and field experiences emphasize morphological, physiological, and developmental characteristics to define evolutionary relationships. Parasitic forms affecting human welfare. Labs require dissections, including mammals.

BIOL 2922. General botany. (3 cr; A-F only; §BIOL 2022)
Prerequisites—[1001 or 1009], §)
Principles of plant biology. Organization, function, growth/development, and reproductive biology of plants and plant-like organisms. Lab, field work.

BIOL 2960H. Explorations in the Biological Sciences: Honors Colloquium. (1 cr; A-F only; Prereq—CBS honors program, soph, §)
Students explore various areas of biological research, interact with scientists and fellow students, and prepare an in-depth review paper.

BIOL 3002. Plant Biology: Function. (2 cr. Prereq—[1002 or 1009, one sem chemistry with some organic content [e.g., CHEM 1011], ¶3005 or AGRO 3005 or HORT 3005)
How plants make and use food; mineral function and uptake; water relations; transport processes; growth and development.

BIOL 3005W. Plant Function Laboratory. (2 cr. Prereq—Concurrent enrollment 3002)
Various plant processes at subcellular, organ, whole plant levels. Lab, recitation.

BIOL 3007W. Plant Biology: Diversity and Adaptation. (4 cr. Prereq—1002 or 1009, CHEM 1021)
Evolution/diversity of plants, their adaptations for survival in varied environments. Includes lab.

BIOL 3211. Animal Physiology. (3 cr. Prereq—[1002 or 1009], CHEM 1021; ¶2005 strongly recommended)
Compares ways different animals solve similar physiological problems.

BIOL 3407. Ecology. (3 cr. §BIOL 3807, BIOL 5407, EEB 3001, Prereq—[1001 or 1009 or equiv], ¶MATH 1142 or ¶MATH 1271 or equiv)
Principles of population growth/interactions and ecosystem function applied to ecological issues. Regulation of human populations, dynamics/impacts of disease, invasions by exotic organisms, habitat fragmentation, biodiversity. Lab.

BIOL 3409. Evolution. (3 cr. §BIOL 5409, Prereq—1002 or 1009)
Diversity of forms in fossil record and in presently existing biology. Genetic mechanisms of evolution Examples of ongoing evolution in wild/domesticated populations and in disease-causing organisms. Lab.

BIOL 3411. Introduction to Animal Behavior. (3 cr. §BIOL 3811, Prereq—1002 or 1009 or #)
Biological study of animal behavior. Mechanism development, function, and evolution. Emphasizes evolution of adaptive behavior, social behavior in the natural environment. Lab.

BIOL 3503. Biology of Aging. (2 cr. Prereq—[1002 or 1009])
Age-related changes in individuals/populations. Evolution of senescence. Genes that influence aging. Interventions. Prospects for an aging human society,
BIOL 3600. Directed Instruction. (1-2 cr [max 6 cr]; S-N only. Prereq--2000, upper div, application, #; up to 4 cr may apply to major.) Students assist with biology colloquium.

BIOL 3610. Internship: Professional Experience in Biological Sciences. (1-6 cr [max 6 cr]; S-N only. Prereq--Acceptance into CBS Internship Program, internship workshop.) Matches student's academic or career goals with opportunities in industry, non-profit organizations, and government agencies.

BIOL 3700. Undergraduate Seminar. (1 cr [max 3 cr]; S-N only.) Faculty members lead groups of students in discussions on topics of current interest.

BIOL 3807. Ecology. (4 cr; A-F only. §Biol 3407, Biol 5407, EEB 3007. Prereq--[1001 or 1009 or equiv]). Principles of population growth/interactions and ecosystem function applied to ecological issues. Regulation of human populations, dynamics/impacts of disease, invasions by exotic organisms, habitat fragmentation, biodiversity. Lab, field work.

BIOL 3811. Introduction to Animal Behavior. (4 cr; A-F only. §Biol 3411. Prereq--[1002 or 1009] or #) Biological study of animal behavior. Mechanism development, function, and evolution. Emphasizes evolution of adaptive behavior, social behavior in the natural environment. Lab, field work.

BIOL 3820. Aquatic Toxicology. (2 cr; Prereq--Courses in general biology, chemistry) Principles of Aquatic Toxicology. Environmental, industrial, and natural chemicals. Fate/interactions of chemicals with organisms and the aquatic environment. Insecticides, endocrine disruptors, biomarkers/bioassays, molecular sensors, risk assessment.

BIOL 3960H. Honors Seminar. (1 cr [max 2 cr] Prereq--Limited to participation in CBS honors program, #) Oral reports on topics of current interest to biologists. Progress reports on laboratory and field research by students.

BIOL 4003. Genetics. (3 cr. GDCG 3022. Prereq--Biol 3021 or BIOC 4331) Introduction to the nature of genetic information, its transmission from parents to offspring, its expression in cells and organisms, and its course in populations.


BIOL 4185. Recombinant DNA Laboratory. (3 cr; A-F only. §Biol 4172, Biol 4185, Biol 4125. Prereq--Biochemistry or genetics course). (Intermediate level lab in biochemistry or genetics cell or cell biology or microbiology), enrollment in Summer Undergraduate Research Program in Life Sciences, #) Basic recombinant DNA techniques. Methods for growing, isolating, and purifying recombinant DNAs and for cloning vectors.

BIOL 4501. Social Uses of Biology. (3 cr. Prereq--7 cr in sciences) Influence of biological science on the quality of human life: agriculture, medicine, occupational health, environmental science, and theories of human nature. Responsibilities and roles of biologists in policy formulation in the scientific and political world.

BIOL 4850. Special Topics in Biology. (2-5 cr [max 10 cr] Prereq--Beginning biology) Offered at Itasca Biological Station and Laboratories. Topics include telemetry/animal behavior, aquatic botany, and field evolution.


BIOL 4894. Directed Research at Itasca. (1-7 cr [max 7 cr]; S-N only. Prereq--4001 or 4984 or 4993 or 4994) (May count toward major requirements) Field investigation of selected areas of research at Itasca Field Station.

BIOL 4950. Special Topics in Biology. (1-4 cr [max 10 cr]. Prereq--[1009 or equiv or basic biology/genetics], #) Science used to make genetically modified plants. Potential benefits/dangers of releasing these plants into the environment and including them in global food supply.

BIOL 5407. Ecology. (3 cr. §Biol 3407, Biol 3807, EEB 3001, Prereq--[1001 or 1009 or equiv], [MATH 1142 or MATH 1271 or equiv]) Principles of population growth/interactions and ecosystem function applied to ecological issues, including regulation of human populations, dynamics/impacts of disease, invasions by exotic organisms, habitat fragmentation, and biodiversity. Lab.


BIOL 5485. Introductory Bioinformatics. (3 cr. Prereq--4003 or 4003 or equiv) Modern computational tools used in molecular biology and genomics research. When/how to use particular tools, how to interpret results. Principles and advantages/disadvantages of various methods.

BIOL 5511. Teaching the Biological Sciences. (3 cr; A-F only. Prereq--6 cr in the life sciences) Methods and teaching styles used by outstanding university teachers including reviews and critiques from research on teaching. Opportunities for students to practice and evaluate teaching strategies.

BIOL 5910. Special Topics in Biology for Teachers. (1-4 cr [max 12 cr. Prereq--BA or BS in science or science education or elementary education or K-12 licensed teacher]) Courses developed for K-12 teachers depending on topics or subtopics which might include any of the following: plant biology, animal biology, genetics, cell biology, biochemistry, microbiology.

BIOL 5913. Biology for Teachers: Monarchs in the Classroom. (3 cr. Prereq--[Elementary or middle school or high school or preschool] teacher or #, application) Two-week summer workshop. Week one focuses on monarch butterfly biology taught through fieldwork, labs, lecture, and research projects. A 2- to 3-week break follows, when students raise monarchs, conduct simple experiments. Week two focuses on designing classroom activities/projects based on monarch biology. Follow-up meetings held during academic year.

Biomedical Engineering (BMEN)

Biomedical Engineering Institute

Institute of Technology

BMEN 1601. Biomedical Engineering Undergraduate Seminar. (1 cr) Introduction to biomedical engineering from academic/industrial perspectives. Survey of current/ emerging areas.


BMEN 2602. Biomedical Engineering Undergraduate Seminar II. (1 cr. Prereq--2601 or #) Continuation of 2601. Emphasizes biomedical engineering design and numerical analysis.

BMEN 3001. Biomechanics. (4 cr; A-F only. Prereq--Math 2374, Phys 1302, [BME upper div or #]) Statics, dynamics, and deformable body mechanics applied to biological/biomedical problems. Mechanical properties of biological and commonly used biomedical engineering materials. Techniques for numerical solution of biomechanics problems. Lecture/laboratory.

BMEN 3002. Biomechanics Laboratory. (1 cr; A-F only. Prereq--Math 2374, Phys 1302, [BME upper div or #]) Laboratory experiments in statics, dynamics, and deformable body mechanics applied to biological/biomedical problems.


BMEN 3201. Bioelectricity and Bioinstrumentation. (4 cr; A-F only. Prereq--Math 2263 or Math 2374, Phys 1302, [BME upper div or #]) Principles of electrical phenomena, instruments relevant to biomedical applications. Lecture/laboratory.

BMEN 3202. Bioelectricity and Bioinstrumentation Laboratory. (1 cr; A-F only. Prereq--Math 2374, Phys 1302, [BME upper div or #]) Laboratory experiments in physiological phenomena. Instruments relevant to biomedical applications.


BMEN 3701. Physiology Lab. (2 cr; A-F only. §Phys 3061, Phys 3063, Phys 3701. Prereq--[Math 2263 or Math 2374], Phys 1302, [BME upper div or #]) Laboratory experiments in physiology. Emphasizes quantitative aspects, including analysis of organ systems.

BMEN 4001W. Biomedical Engineering Design I. (3 cr [max 4 cr; A-F only. Prereq--2501, 3001, 3001, 3001, 3001, 3001]) Design and analysis of biomedical devices/technologies. Students work in teams on open-ended design project, present completed work at design show.

BMEN 4002W. Biomedical Engineering Design II. (3 cr; A-F only. Prereq--4001W) Continuation of 4001W.
Course Descriptions

BMEN 4710. Directed Research. (1-4 cr; [max 4 cr]; A-F only. Prereq–A; △) Independent laboratory research under faculty supervision.

BMEN 4720. Directed Study. (1-4 cr; [max 4 cr]; A-F only. Prereq–A; △) Directed study under faculty supervision.

BMEN 4910. Special Topics in Biomedical Engineering. (1-4 cr; [max 4 cr]; A-F only. Prereq–#) New or experimental special topics.

BMEN 5001. Advanced Biomaterials. (3 cr; A-F only. Prereq–3301 or MATS 3011 or grad student or △) Continuously used biomaterials. Chemical/physical aspects. Practical examples from such areas as cardiovascular/orthopedic applications, drug delivery, and cell encapsulation. Methods used for chemical analysis and for physical characterization of biomaterials. Effect of additives, stabilizers, processing conditions, and sterilization methods.

BMEN 5041. Tissue Engineering. (3 cr. Prereq–IT upper div or grad student or △) Fundamentals of wound healing and tissue repair; characterization of cell-matrix interactions; case study of engineered tissues, including skin, bone marrow, liver, vessel, and cartilage; regulation of biomaterials and engineered tissues.

BMEN 5010. Advanced Bioelectricity and Instrumentation. (3 cr. Prereq–IT upper div, grad student or △) Instrumentation, computer systems, and processing requirements for clinical physiological signals. Electrode characteristics, signal processing, and interpretation of physiological events by ECG, EEG, and EMG. Measurement of respiration and blood volume/flow.

BMEN 5102. Bioelectric Measurements and Therapeutic Devices II. (3 cr. Prereq–5101 or △) Theory/application of electrical stimulation in areas of therapeutic/functional neuromuscular stimulation and pain control, cardiac pacing, defibrillation, tissue heating, and electrotherapy. Safety of electric fields. Electrical tissue impedance measurements.


BMEN 5212. Tissue Mechanics. (2 cr; A-F only. Prereq–5201 or AEM 5501) Fundamental principles of continuum mechanics applied to physiological systems. Systematic consideration of individual tissues and organs. Relationships among histology, anatomy, physiology, and mechanical function in these tissues. Changes in mechanical properties related to pathology. Emphasizes tissues in the cardiovascular system.


BMEN 5351. Cell Engineering. (3 cr. Prereq–[2501 or 5501], CS 1107, Math 2324 or Math 2373, [IT upper div or grad student or △]) Engineering approaches to cell-related phenomena important to cell/tissue engineering. Receptor/ligand binding. Trafficking/signaling processes. Applications to cell proliferation, adhesion, and motility. Cell-matrix interactions.

BMEN 5371. Biomedical Applications of Heat Transfer in Humans. (3-4 cr [max 4 cr]. Prereq–PHSL 3061, PHSL 3071, PHSL 5061) Overview of physiology underlying thermoregulation in humans, clinical applications of heat transfer in humans, framework for design project.

BMEN 5401. Advanced Functional Biomedical Imaging. (3 cr; A-F only. Prereq–IT upper div or grad student or △) Functional biomedical imaging modalities. Principles/applications of representative functional imaging technologies that offer high spatial resolution or temporal resolution. Emphasizes principles and methodological foundations of bioluminescent imaging and magnetic resonance imaging. Other functional biomedical imaging modalities.

BMEN 5444. Muscle. (3 cr.) Muscle structure/function: molecular mechanism by which force is generated.

BMEN 5501. Biology for Biomedical Engineers. (3 cr; A-F only. Prereq–IT upper div or grad student or △) Fundamentals of cell/tissue structure/function. Basic principles of cell biology. Tissue engineering, artificial organs.

BMEN 5502. Pathobiology of Medical Devices. (3 cr; A-F only. Prereq–IT upper div or grad student) Biological response to biomaterials presented in context of fundamental principles of cell injury, adaptation, repair, or death. Diversity of medical uses of biomaterials, by organ system. Unique features of specific biological systems in which medical devices are used.

BMEN 5910. Special Topics in Biomedical Engineering. (1-4 cr [max 4 cr])

BMEN 5920. Special Topics in Biomedical Engineering. (2-3 cr [max 6 cr])

Biosystems and Agricultural Engineering (BAE)

Institute of Technology

College of Food, Agricultural and Natural Resource Sciences

BAE 1011. Biosystems and Agricultural Engineering Orientation. (1 cr; S-N only) Introduction to biosystems and agricultural engineering profession through readings and discussions by faculty, practicing engineers, and students; curriculum and intern, undergraduate research, and honors opportunities. Ethics, safety, environmental issues.


BAE 3013. Engineering Principles of Molecular and Cellular Processes. (3 cr; A-F only. Prereq–BIOL 1000, [CHEM 1022 or MOBiol 1022]) Applied engineering principles in biological processes, classification of microbes of industrial importance, parameters for cellular control, modeling of cell growth/metabolism, enzymatic catalysis, bioconductor design, product recovery, operations design, case studies.


BAE 3093. Directed Studies. (1-5 cr [max 5 cr]. Prereq–△) Independent study of topic(s) involving physical principles as applied to agricultural production and land resources.

BAE 4013. Transport in Biological Systems. (4 cr; A-F only. Prereq–IT [3013 or CHEM 3701], CE 3502, [CHEM 4011], upper div IT) Application of thermodynamics, fluid flow, heat/mass transfer to design problems involving biological processes and materials at cell, organism, and system level. Agricultural, environmental, food, and bioprocess applications. Solution of equations involving computer programming assignments. Hands-on instruction in Visual Basic.

BAE 4023. Instrumentation and Control for Biological Systems. (3 cr; A-F only. Prereq–EE 3005 or EE 3005, STAT 3021, upper div IT) Measurement of force, motion, pressure, flow, temperature, size, shape, color, texture, rheology, moisture, water mobility, fat, and pH. Linking physical and biological control systems.

BAE 4114W. Capstone Design Project. (4 cr; A-F only. Prereq–IT [3113], upper IT or IT or △) Design concepts, design process. Case studies involving engineering design. Health, safety, and ethical issues facing engineers. Proposal for capstone design team project, including oral presentation of written proposal. Comprehensive design project, including written report, poster, and oral presentation of final design.


BAE 4523. Water Management Engineering. (3 cr; A-F only. Prereq–3023 or CE 3001, CE 3502, upper div IT) Applying engineering principles to management of water for production and environmental protection in agricultural systems. Design of facilities to irrigate/drain croplands and enhance water quality.

BAE 4533. Agricultural Waste Management Engineering. (3 cr; A-F only. Prereq–3023, upper div IT) Sources and characteristics of agricultural wastes, including livestock, food processing, and domestic wastes. Physical, biological, chemical, rheological, and microbiological properties. Effects on environment. Collection, storage, treatment (aerobic and anaerobic), and use/disposal. Land application.
BAE 4713. Bioproduct Engineering. (3 cr; A-F only. Prereq–[4013 or 4103], upper div II) Fermentation/separation as applied to biological systems. Product recovery in bioproduct technology. Topics in bioremediation. Modeling of separation processes in biological systems.

BAE 4723. Food Process Engineering. (3 cr; A-F only. Prereq–[4013 or 4103], upper div II) Application of principles of heat transfer and fluid flow to design of food processing operations such as thermal/aseptic processing, freezing, pumping, drying, evaporation, extrusion. Marketing, government regulation, nutrition issues.

BAE 4744. Engineering Principles for Biological Scientists. (4 cr; A-F only. FSYS 4351. Prereq–[MATH 1142 or MATH 1271]. PHYS 1101-intended for non-engineering students) Material/energy balances applied to processing systems. Principles of fluid flow, thermodynamics, heat, mass transfer applied to food and bioprocess unit operations such as pumping, heat exchange, refrigeration/freezing, drying, evaporation, and separation.

BAE 4900. Intern Reports. (2 cr [max 4 cr]; S-N only. Prereq–IT or COAFES student in BAE, #) Reports on intern work assignments reviewed by faculty and industry advisers.

BAE 5095. Special Problems. (1-5 cr [max 5 cr]. Prereq–#) Advanced individual-study project. Application of engineering principles to specific problem.

BAE 5203. Environmental Impacts of Food Production. (3 cr; A-F only. Prereq–intended for non-engineering students; Credit will not be granted if credit has been received for AGET 5203) Crop production intensity, animal raising options, food processing waste alternatives, pest control.

BAE 5212. Safety and Environmental Health Issues in Plant and Animal Production and Processing. (3 cr; A-F only. Prereq–Grad student or # or #, Credit will not be granted if credit has been received for BAE 5212) Safety/health issues in food production, processing and horticultural work environments using public health, injury control, and health promotion frameworks: regulation, engineering, education. Traumatic injury, occupational illness, ergonomics, pesticide health effects, biotechnology, air contaminants.

BAE 5513. Watershed Engineering. (3 cr; A-F only. Prereq–3202, upper div II) Application of engineering principles to managing surface run-off from agricultural, range, and urban watersheds. Design of facilities and selection of land use practices for controlling surface run-off to mitigate problems of flooding and degradation of surface-water quality.

Business Administration (BA)

Curtis L. Carlson School of Management

BA 1001. Introduction to Information Technology. (1 cr; S-N only) Assess computing skills. Identify resources to develop skills in word processing, spreadsheets, presentation software, e-mail, LUMINA, remote access, and Web. Self-paced.


BA 1998. Independent Study. (1-4 cr. Prereq–#) Special project or independent study.

BA 3000. Career Skills. (1 cr; A-F only. Prereq–CSOM pre-major with 30 credits or upper division major) Career planning. Use of Carlson School of Management’s Business Career Center. Students gain awareness, knowledge, skills associated with career/job search process.

BA 3033V. Honors: Business Communication. (3 cr; A-F only. Prereq–60 cr, CSOM honors) Written/oral communication skills for effective participation in contemporary organizations. From basic principles to communication strategy. Communication technology. Cases, simulations of “real-world” situations. Student small groups meet with instructor three times for presentation coaching/feedback. Recitation times are arranged with instructor at start of semester.

BA 3033W. Business Communication. (3 cr; A-F only. Prereq–Fr composition, CSOM upper-div, at least 60 cr) Written/oral communication skills for effective participation in contemporary organizations. From basic principles to communication strategy. Communication technology. Cases, simulations of “real-world” situations. Student small groups meet with instructor three times for presentation coaching/feedback. Recitation times are arranged with instructor at start of semester.


BA 3200H. Securian Foundation Leadership Colloquium. (2 cr. Prereq–Honors) How to cultivate, evaluate, and apply leadership concepts in all phases of life. Emphasizes real leadership experiences. Ethical leadership, leadership communication, management vs leadership, motivation/empowerment, leading in a diverse environment, leading during change.


BA 3900. Topics. (1-4 cr [max 12 cr]) Topics in business vary.

BA 3999H. Honors Topics. (2-4 cr [max 8 cr]; A-F only. Prereq–Honors) Topics vary.

BA 3999. Independent Study. (1-6 cr [max 16 cr]. Prereq–CSOM upper div, #) Student-initiated project or independent study.

BA 3999. Internship Seminar. (1 cr; S-N only. Prereq–30 cr, approved internship, #) Integrates students’ internship experiences with in-class discussions, relevant readings/assignments on issues related to world of work, workplace, and transition from college to work.

BA 4000H. Honors Seminar. (4 cr; A-F only. Prereq–CSOM honors, 2nd sem sr) Capstone course for Carlson honors program. Organizational or cross-functional topics.

Business and Industry Education (BIE)

Department of Work and Human Resource Education

College of Education and Human Development

BIE 1396. Supervised Career and Technical Education Teaching. (4 cr; S-N only. Prereq–Q) Supervised teaching for beginning teachers, or teaching activities for preservice teachers.

BIE 3061. Professional Sales Management. (3 cr; A-F only) Examination of the sales manager’s role in training and mentoring sales representatives in strategic selling, customer-oriented service, and problem-solving tactics. Includes recruitment, hiring, training, and retention of a sales force.

BIE 3111. Exploring Technology Systems. (3 cr) Communication, information, construction, manufacturing, design, technical drawing, biotechnology, energy, power, and transportation technologies. Students develop problem solving and manipulative skills as well as understanding of the principles and processes through hands-on activities in a multiple activity laboratory.

BIE 3112. Technical Drawing and Production Technologies. (3 cr; A-F only. S# or E#) Instruction and laboratory experiences in technical drawing and design technologies; production technologies related to construction and manufacturing. Students will develop manipulative skills and techniques and an understanding of principles and processes of the technologies through hands-on work and lab activities.


BIE 3114. Construction Technology. (3 cr. Prereq–Concurrent enrollment 3111) Introduction to principles, concepts, and techniques involved in civil, commercial, and residential construction. Laboratory experiences in planning, designing, organizing, producing, and testing structures.

BIE 3122. Communication and Information Technology. (3 cr; A-F only. Prereq–Concurrent enrollment 3121) Information/communication systems, electronic publishing, printing technology, broadcasting/recorded media technologies, telephone/internet communication, photography, multimedia, and computer technology. Lab.

BIE 3123. Energy, Power, and Transportation Technology. (3 cr; A-F only. Prereq–Concurrent enrollment 3121) Mechanical, fluid, and electrical power/technologies associated with transportation of people/materials. Lecture, lab.


BIE 3993. Directed Study. BIE. (1-4 cr [max 4 cr]) Self-directed study preceded by classroom instruction in basic research procedures.

BIE 5001. Teaching Marketing Promotion. (3 cr; A-F only) Materials, methods, and approaches to teaching marketing promotion. Covers the basic elements of the marketing mix: advertising, promotion, public relations, direct selling, visual merchandising, and direct marketing.

BIE 5011. Introduction to Computer Applications. (3 cr) Instructional uses of computers and representative business/marketing education applications, including word processing, databases, spreadsheets, and graphics.
Course Descriptions

BIE 5012. Advanced Word Processing. (3 cr. Prereq—5011 or equiv) Develop/apply solution methods for office problems using word processing software including advanced editing, printing, and desktop publishing capabilities.

BIE 5013. Spreadsheet Analysis Using Computers. (3 cr. Prereq—5011 or equiv) Using spreadsheets to analyze data, monitor business records, and create models.

BIE 5014. Database Computer Applications. (3 cr. Prereq—5011 or equiv) Business needs for computerized databases. Using database software to develop, maintain, and prepare reports.

BIE 5015. Integrated Computer Applications in Business and Marketing Education. (3 cr. Prereq—5011, 5012, 5013, 5015 or equiv) Realistic business computer problems requiring integration of two or more application packages. Pedagogical issues of learning/teaching advanced computer applications.

BIE 5080. Special Topics in Business and Industry Education. (1–4 cr [max 4 cr]) Content varies by offering.

BIE 5101. Technical Problem Solving. (3 cr; A-F only) Prereq—5011–5111, 3112, 3121, 3122) Capstone technology education course in which students research problems relative to various technological systems and develop solution(s) to the identified problems.

BIE 5151. Technical Development: Specialized. (1–12 cr [max 12 cr]; A-F only. Prereq—4) Students select/study technical processes/principles based on subjects they plan to teach, integrate specialized technical instruction in advanced/emerging areas.

BIE 5321. Vocational Guidance in Business and Industry Education. (2 cr; A-F only) Self-assessment, use of occupational and labor market information, job seeking skills, work and work satisfaction. For industrial teachers and trainers in school and industry settings.

BIE 5325. Foundations of Industrial Education. (3 cr) Social, economic, psychological, philosophical, legislative, and pedagogical foundations of industrial education in the United States. Comparison with selected foreign systems. Analysis of contemporary trends against backdrop of early foundations.

BIE 5344. Facilities Management in Business and Industry. (3 cr; A-F only. Prereq—3112) Planning, evaluating, and managing industrial education shop and lab facilities.

BIE 5365. Curriculum Development in Technology Education. (3 cr) Conceptualization and derivation of content for the K-12 technology curriculum. Comparison of U.S. approaches to technology curriculum with selected countries.

BIE 5440. Business and Industry Observation and Seminar. (1–3 cr [max 6 cr]) Current work setting practices and career opportunities in business and industry. Planned experiences in work environments and related seminars.

BIE 5452. Methods of Teaching Business and Marketing Concepts. (3 cr; A-F only) Recent research/developments in teaching business concepts related to economics, business organization/management, business law, entrepreneurship, marketing, international business, information systems, accounting, risk management, and personal finance.

BIE 5457. Methods of Teaching Business Employment and Marketing Employment. (3 cr; A-F only) Recent research/developments in teaching for business employment. Administrative support positions, accounting/information processing, marketing/sales, computer operations, other occupations using desktop computing.

BIE 5463. Methods in Teaching Keyboarding and Word Processing. (2 cr; A-F only) Implementing keyboarding and word processing: effective teaching strategies; expected learner outcomes; evaluation methods; selecting hardware; instructional materials (including print, software, Internet); organizing and managing labs.

BIE 5475. Curriculum Development for Business and Marketing Education. (3 cr; A-F only) Introduction to conceptual models for design/delivery of business/marketing education programs in secondary/postsecondary schools, in adult education settings, and in business/industry. Preparing programs of instruction for secondary/postsecondary level. Making decisions regarding course content.

BIE 5596. Occupational Experience in Business and Industry. (1–10 cr [max 10 cr]; S-N only. Prereq—4) Observation/employment in business/industry to develop technical/occupational competencies. Includes 100 clock hours of supervised work experience per credit.

BIE 5597. Internship: Business and Industry Education. (1–12 cr [max 12 cr]; S-N only) Practical experience in business or industry as a professional educator or supervisor. Requires an integrative paper.


BIE 5662. Computer Training in School and Industry Settings. (3 cr; S&HR 5662. Prereq—5011 or equiv) Alternative teaching methods for business applications software word processors, spreadsheets, graphics, desktop publishing, databases, and communications; public school and industry settings.

BIE 5796. Field Based Projects in Business and Industry. (1–4 cr [max 4 cr]; S-N only) Curricular, instructional, developmental, or evaluative projects and problems applicable to local school or business and industry situations.

BIE 5801. The Business of Tourism. (3 cr; A-F only) Introduction to major theories, concepts, skills, and issues and of major analysis of tourism industry.


BIE 5803. Tourism Studies Capstone Seminar. (3 cr; S-N only. Prereq—Tourism studies major) Students present, critique, and discuss implications of supporting programs for tourism.

BIE 5993. Directed Study in Business and Industry. (1–4 cr [max 4 cr]) Supervised study and research in specialized areas. Requires an integrative paper.

CSPH 5000. Explorations in Complementary Therapies and Healing Practices. (1–4 cr [max 12 cr.] Prereq—Jr or sr or grad student or #) Research/practice on therapies, delivery of complementary therapies, regulatory issues.

CSPH 5101. Introduction to Complementary Healing Practices. (3 cr. Prereq—Jr or sr or grad student or #) Cultural contexts of healing traditions. Complementary therapies presented by practitioners, including traditional Chinese medicine, meditation, mind-body healing, spiritual practices, energy healing, naturopathy, herbalism, movement therapies, homeopathy, manual therapies and nutrition.

CSPH 5102. Art of Healing: Self as Healer. (1 cr. Prereq—Jr or sr or grad student or #) Introduction to individual transformational journey as part of health science education. Students become aware of their responsibility/resources to facilitate development of the self. Research data, experiences of self that is part psychoneuroimmunology, mind-body-spirit approaches. Lecture, scientific literature, meditation, imagery, drawing, group interaction.


CSPH 5115. Cultural Knowledge, Health, and Contemporary Cultural Communities. (3 cr. Prereq—Jr or sr or grad student or #) How personal cultural experience affects one’s view of health, illness, and healing and one’s professional practice. Wisdom of cultural communities, Cultural construct underpinning the medical system. Role of culture in interaction between practitioner and patient. Reconnecting to cultural heritage in healing.

CSPH 5201. Spirituality and Resilience. (2 cr. Prereq—Jr or sr or grad student or #) Links between resilience and spirituality. Applications of resilience/healing realization model to students’ personal/professional lives. Review of literature, theory, and research.

CSPH 5211. Peacemaking and Spirituality: A Journey Toward Healing and Strength. (2–3 cr [max 3 cr.] A-F only. Prereq—Jr or sr or grad student or #) Influence of spirituality upon process of resolving conflict and making peace in intense interpersonal/intrapersonal conflicts in multiple health care and social work settings, including in families, between patients/clients and nurses/social workers, within communities, among friends, between co-workers, or within ourselves.

CSPH 5215. Forgiveness and Healing: A Journey Toward Wholeness. (2 cr. Prereq—Jr or sr or grad student or #) Impact of forgiveness on process of interpersonal personal healing. Forgiveness/healing in health care and social work settings from multiple spiritual/ secular traditions.

CSPH 5221. Significant Spiritual Texts of the 20th Century. (3 cr. Prereq—Jr or sr or grad student or #) Diverse “spiritual classics” (i.e., elements of western canon that have proven over time to be resources of values). Resources of meaning for inner-life healers. How to establish a personal library for life-long journey of spiritual development.
CSPH 5225. Meditation: Integrating Body and Mind. (2 cr. Prereq.–Jr or sr or grad student or #) Meditation as a mental, emotional, intellectual, and spiritual inquiry. Students examine a variety of texts and develop ability to enter a state of calm, meditative awareness.

CSPH 5226. Advanced Meditation: Body, Brain, Mind, and Universe. (1 cr. Prereq.–5225, [Jr or sr or grad student] or #) Students work to integrate meditation practice into daily life, cultivating awareness of the fundamental oneness of body, brain, mind, and universe. Mind-body interactions in “Hard problem” of consciousness in brain science. Emergence of compassion, wisdom, and healing in non-discursive awareness.

CSPH 5301. Cultures, Faith Traditions, and Health Care. (2 cr. A-F only. Prereq.–Jr or sr or grad student or #) Culturally/spiritually based health care practices of selected native/immigrant populations in Minnesota. Clinical implications. Personal/ professional conflicts for delivery of competent care to culturally diverse groups by those trained in Western health care.

CSPH 5311. Introduction to Traditional Chinese Medicine. (2 cr. A-F only. Prereq.–Jr or sr or grad student or #) Philosophical roots of Shamanism, Confucianism, Taoism, and Buddhism. Influence of these philosophies on Chinese medicine. Evolution of concepts of the tao, Yin-Yang, microcosm, macrocosm. Development of herbal medicine, Tui Na, Qi Gong, acupuncture, moxibustion. Traditional Chinese medicine etiology of disease, physiology, diagnosis, therapy, disease prevention, ethics, psychology, cosmolgy.

CSPH 5315. Traditional Tibetan Medicine: Ethics, Spirituality, and Healing. (2 cr. Prereq.–Jr or sr or grad student or #) Ethics, spirituality, and healing from perspective of traditional Tibetan medicine. Belief that illness results from imbalance and that treating illness requires correcting underlying imbalance. How to apply these principles, integrate them into clinical practice, and consult with a traditional Tibetan doctor.

CSPH 5317. Yoga: Ethics, Spirituality, and Healing. (2 cr. Prereq.–5101, 5115 or #) Ethics, spirituality, and healing from perspective of yoga, an ancient Indian discipline. Students test the claim that systematic yoga practice leads to optimal health. Evaluating yoga’s philosophy, scientific evidence, practical application. Students propose research-based programs for integrating yoga into personal/professional life.

CSPH 5321. Public Health Priorities in the Developing World. (2 cr. SJMD 7567. Prereq.–Jr or sr or grad student or #) Primary public health problems, priorities, and interventions in developing countries. Issues related to culture/indigenous health systems and of concern to health care providers who work abroad or with refugee communities in countries of resettlement.

CSPH 5325. Latinos: Culture and Health. (3 cr. Prereq.–Jr or sr or grad student or #) How Latino world view (cosmovision) affects health and coping. Students from U.S. perspective. Differences in perception of time, family involvement, community “belonging,” gender roles, and communication styles. Folkloric beliefs. Specific issues such as AIDS, pregnancy/women’s issues, pharmacy, and nutrition. Health issues of workers. Cultural competency.

CSPH 5331. Foundations of Shamanism and Shamanic Healing. (2 cr. S-N only. Prereq.–Jr or sr or grad student or #) 3-7 day retreat intensive. Shamanic philosophies, ritual etiquette, Core beliefs common to all shamanic healing practices. Cross-cultural healing belief/practices, unique psychology for understanding them, their use with contemporary healing practices and for personal growth.

CSPH 5332. Global Healing Traditions: Amazonia Plant Spirit Medicine. (2 cr. Prereq.–Jr or sr or grad student or #) Principles of therapeutic design for specific population requirements. Therapeutic landscape design. Incorporates interdisciplinary interaction between landscape architecture, and health science departments.

CSPH 5333. Introduction to Energy Healing. (2 cr. Prereq.–Jr or sr or grad student or #) Healing techniques (Therapeutic Touch, Reiki, acupuncture, reflexology, magnets, homopathy) that use energetic systems in the body to enhance the body’s ability to heal. Scientific theories. Students interact with practitioners and have the opportunity to experience feeling “energy.”

CSPH 5335. Reiki Healing. (1 cr. Prereq.–Jr or sr or grad student or #) History, principles, precepts, and practical application of Reiki energy healing. Alternative energy healing modalities, current research findings. Activation of the Reiki energy, hand positions to perform a treatment. Students provide Reiki treatments, discuss findings.

CSPH 5336. Advanced Reiki Healing: Level II. (1 cr. Prereq.–5335, #) Principles/application of Reiki energy healing. Four levels of healing. Emphasizes healing at spiritual level. Activation of Reiki energy. Symbols that allow for energy transfer through space/time. Using second level Reiki energy for both distance healing and standard Reiki treatment. Students provide Reiki treatments, discuss findings. Current literature, research findings.


CSPH 5431. Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health. (2 cr. Prereq.–Jr or sr or grad student) in Health Sciences or #) Principles of nutrition related to metabolic function. Model attempts to reduce chronic disease by looking for underlying causes/trigger and to intervene to restore function and achieve optimal health. Emphasizes importance of nutrition as a component of self-care.

CSPH 5501. Therapeutic Use of Plant Essential Oils. (3 cr. Prereq.–Jr or sr or grad student or #) intended for students in health sciences or practicing health professionals; [basic science, health science knowledge, computer skills, internet skills] recommended). Fundamentals of essential oil therapy for licensed health professionals. History, scientific basis, practice issues, use of 30 essential oils in clinical practice. Controlled use of essential plant oils for specific, measurable physiological/psychological therapeutic outcomes. Topical application, inhalation.

CSPH 5511. Interdisciplinary Palliative Care: An Experiential Course in a Community Setting. (2 cr) Multidisciplinary student teams partner with interdisciplinary community hospice teams in delivery of care to patients in a variety of settings. Series of seminars employs self-analysis/case studies.

CSPH 5521. Therapeutic Landscapes. (3 cr. Prereq.–Jr or sr or grad student) in [health sciences or therapeutic recreation or horticulture or landscape architecture] or health professional or #) Principles of therapeutic design for specific population requirements. Therapeutic landscape design. Incorporates interdisciplinary interaction between horticulture, landscape architecture, and health science departments.

CSPH 5555. Introduction to Body and Movement-based Therapies. (2 cr. Prereq.–Jr or sr or grad student or #) Theories/approaches of selected somatic therapies, including dance, movement, and body-based therapies. Historic/theoretical perspectives on use of movement, dance, and somatic re-patternning. Demonstrations of techniques. Application of techniques to specific populations/settings.


CSPH 5611. Healthy Humor. (1 cr. Prereq.–Jr or sr or grad student or #) Use of humor to enhance communication, treatment, and relationships with patients. How to create a positive work environment and outlook. Physiologic effects/benefits of humor/laughter. Humor and spirituality. Connection between positive outlook and health.
Central Asian Studies (CAS)
Institute of Linguistics, ESL, and Slavic Languages and Literatures

Course Descriptions

College of Liberal Arts

CAS 3511. Ancient Iran. (3 cr, §MELC 3511) Development of ancient Iranian culture under the Achaemenians and Sassanians; the impact of the Zoroastrian religion on Iranians and of Hellenism on the east, especially on domains such as Bactria; Iran’s contribution to the flourishing cultures of the Silk Road.

CAS 3512. Modern Iran. (3 cr, §MELC 3512) The development of medieval Iranian culture under the Arab, Turkish, and Mongol rules. Study two major trends: Islamization beginning after the Arab conquest to A.D. 1500; Westernization from the Safavids to the Islamic Republic in 1979.

CAS 3526. Islam and Communism. (3 cr, §CAS 5526, MELC 3526, MELC 5526) Development of medieval Islamic culture in Transoxiana; formation of Sufi orders; rise and development of Communist ideology; introduction of socialist principles into Central Asia; clash of Islamic principles with Communist dicta; Pan-Islamism; Pan-Turkism.

CAS 3532. Russia and Central Asia. (3 cr, §CAS 3532, MELC 3532, MELC 5532) Rise and fall of the Mongol Empire, formation of the Chaghatai Khanate and the Golden Horde. Russian expansion into Central Asia and rivalry with Britain. Russia and the Central Asian republics during and after the Soviet period.

CAS 5601. Persian Fiction in Translation. (3 cr, §CAS 5601, MELC 3601, MELC 5601) Impact of westernization on Iran, from 1920s to the fall of the Timurids (A.D. 1500). Ibn Sina (Avicenna), al-Biruni, al-Ghaznavi, Rumi, Sa’di, and Firdowsi are among the sages whose lives are examined.

CAS 5526. Islam and Communism. (3 cr, §CAS 3526, MELC 3526, MELC 5526) Development of medieval Islamic culture in Transoxiana; formation of Sufi orders; rise and development of Communist ideology; introduction of socialist principles into Central Asia; clash of Islamic principles with Communist dicta; Pan-Islamism; Pan-Turkism.

CAS 5532. Russia and Central Asia. (3 cr, §CAS 3532, MELC 3532, MELC 5532) Rise and fall of the Mongol Empire, formation of the Chaghatai Khanate and the Golden Horde. Russian expansion into Central Asia and rivalry with Britain. Russia and the Central Asian republics during and after the Soviet period.

CAS 5601. Persian Fiction in Translation. (3 cr, §CAS 3501, MELC 3501, MELC 5601) Major poetic works of Iran dealing with life at the medieval courts. Sufic poetry, and “new” poetry are studied. Rudaki, Khayyam, Rumi, Hafiz, Yushij, and Farrukhzad are among the poets whose works are examined.

CAS 5994. Directed Research. (1-10 cr, max 10 cr) Prereq-P, A, J. Directed Research

Chemical Engineering (CHEN)

Department of Chemical Engineering and Materials Science

Institute of Technology

CHEN 3041. Industrial Assignment I. (2 cr, A-F only. §MATS 3041. Prereq—CHEN upper div; completion of required courses in CHEN prog through fall sem of 3rd yr; GPA of at least 2.80, registered in co-op prog) Industrial work assignment in engineering co-op program. Formal written report.

CHEN 3045. Chemical Engineering Industrial Internship. (1-2 cr, max 2 cr) Prereq—Proposed plan approved by FACC, report signed by industrial supervisor describing engineering work completed. Industrial internship, three to eight months.

CHEN 3701. Introduction to Biomolecular Engineering I. (3 cr, A-F only. Prereq—[4001 or equiv], [CHEN 2302 or CHEN 2302], [Math 2373 or equiv]; high school biology recommended) Fundamentals of biological systems, from biomolecules to interplay of biomolecules that give rise to “processes” of life. Students apply chemical engineering principles to analysis of living systems.

CHEN 4001. Material and Energy Balances. (4 cr, A-F only. Prereq—[CHEN 2302 or CHEN 2302], [CHEN 3501 or CHEN 3501 or equiv], [Math 2373 or Math 2373 or equiv], [Math 2374 or Math 2374 or equiv], PHYS 1302) Description/analysis of chemical engineering systems: units/dimensions, materials balances on systems with/without chemical reactions, elementary phase equilibria/diagrams, energy balances. Elementary treatment of multistage steady-state equilibrium operations.


CHEN 4006. Mass Transport and Separation Processes. (4 cr, A-F only. Prereq—[4001 or A], 4005, 4101, [upper div CHEN major or A]) Introduction to principles of mass transfer. Mass transfer operations used in separation processes, unit operations.

CHEN 4041. Industrial Assignment II. (2 cr, A-F only. §MATS 4041. Prereq—3041, completion of required courses in CHEN prog through fall sem of 4th yr, GPA of at least 2.80, registration in co-op prog) Industrial assignment in engineering co-op program. Application of chemical engineering principles to engineering design problems in an industrial work environment. Formal written report.

CHEN 4101. Chemical Engineering Thermodynamics. (4 cr, A-F only. Prereq—[4001 or transfer student, A], CHEN 3501, [upper div CHEN major or A]) Applications of concepts of thermodynamics and chemical equilibrium to problems in chemical engineering.

CHEN 4102. Reaction Kinetics and Reactor Engineering. (4 cr, A-F only. Prereq—[4001 or 4010, 1 upper div CHEN major or A]) Chemical equilibrium and chemical kinetics applied to chemical engineering systems. Behavior/design of chemical reactors, interaction between chemical and physical rate processes. Mathematical modeling, design of reactors.

CHEN 4201. Numerical methods in CHEN applications. (3 cr, A-F only. Prereq—[4001 or A], [4005 or equiv], [4006 or 4006 or equiv], [upper div CHEN major or A]) Numerical methods and applications in heat/mass transfer and advanced chemical engineering applications.

CHEN 4214. Polymers. (3 cr, Prereq—Grade of at least C in MATH 3011, CHEN major upper division or #) Polymer structure–property relations: structure/morphology of crystalline/amorphous states, Crystallization kinetics. Vitrification and the glass transition. Mechanical properties, failure, permeability, optical/electrical properties, polymer composites, effect of processing on properties.

CHEN 4401W. Chemical Engineering Lab I. (3 cr, A-F only. Prereq—[4002 or 4002, 4101, 4102, 4001, 4201, CHEN 3511, CHEN 4121, English composition requirement, upper div CHEN major or A]) Principles/techniques of efficient design, measurement, planning, analysis, and presentation of experiments and experimental results. Problems in energy balances, fluid flow, heat transfer, and mass transfer. Design of new systems using experimental data obtained in lab. Oral/written presentations.
CHEN 4402W. Chemical Engineering Lab II. (2 cr. Prereq—4006, 4101, 4407W, upper div CHEN major) Principles/techniques of efficient design, structure, measurement, planning, analysis, and presentation of experimental and experimental results. Experimental problems in energy balances, fluid flow, heat transfer, and mass transfer. Design of new systems using data obtained in lab. Open to CHEN major upper division.

CHEN 4501W. Chemical Engineering Process Design. (3 cr. Prereq—4105, 4006, 4107, 4002, 4101, CHEM 3311, CHEN 4121, tr writing requirement. upper div CHEN major) or Δ Engineering economics of process evaluation, including time/bases for cost estimation. Engineering design through group projects. Case studies.

CHEN 4502W. Chemical Engineering Process Design II. (2 cr. A-F only. Prereq—4501W, upper div CHEN major or Δ) Continue review from 4501 of unit processes/operations, introducing detail for design, cost analysis, control, operability, modifications, and alternatives. Case studies, special topics.

CHEN 4593. Directed study. (1-4 cr. [max 4 cr.] Prereq—CHEN major upper division, Δ) Directed study under faculty supervision.

CHEN 4594. Directed Research. (1-4 cr. [max 4 cr.]) Independent lab research under faculty supervision.

CHEN 4601. Process Control. (3 cr; A-F only. Prereq—4102, upper div CHEN major or Δ) Analysis of dynamic behavior/design of linear control systems for chemical processes. Dynamic response and stability of linear ODE systems, tuning of PID controllers, synthesis of feedback, feedforward/feedback controller.

CHEN 4701. Advanced Undergraduate Applied Math I: Linear Analysis. (3 cr; A-F only. Prereq—4102, CHEN major upper division) Integrated approach to solving linear mathematical problems (linear algebraic equations, linear ordinary/partial differential equations) using theoretical/numerical analysis based on linear operator theory. Undergraduate version of 8201.


CHEN 4703. Advanced Undergraduate Applied Math II: Nonlinear Analysis. (3 cr; A-F only. Prereq—CHEN 4002, CHEN major upper division; grad-level course in linear analysis recommended) Nonlinear mathematical problems (nonlinear ordinary/partial differential equations) using theoretical/numerical analysis. Undergraduate version of 8202.


CHEN 4706. Advanced Undergraduate Physical and Chemical Thermodynamics. (3 cr; A-F only. Prereq—CHEM 3302, 4101, 4002; CHEN major upper division; recommended background in undergraduate engineering or chemistry courses in thermodynamics) Principles of classical thermodynamics, introduction to nonequilibrium thermodynamics. Applications in chemical engineering, materials science. Undergraduate version of 8401.

CHEN 4707. Advanced Undergraduate Statistical Thermodynamics and Kinetics. (3 cr; A-F only. Prereq—4102, 4107, CHEM 3302; CHEN major upper division) Introduction to statistical mechanical description of equilibrium/non-equilibrium properties of matter. Emphasizes fluids, classical statistical mechanics. Undergraduate version of 8402.


CHEN 5221. Introduction to Polymer Chemistry. (3 cr; A-F only. §CHEM 4221, CHEM 8221, MATS 5221, MATS 8221. Prereq—CHEM 2302, CHEM 3501) or Δ) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.


CHEN 5595. Special Topics. (1-4 cr. [max 4 cr]) New or experimental special topics.

CHEN 5751. Biochemical Engineering. (3 cr; A-F only. Prereq—CHEM 5501, CHEM 5502, CHEN major upper division) Chemical engineering principles applied to analysis/design of complex cellular/enzyme processes. Quantitative framework for design of cells for production of proteins. Synthesis of antibodies with mammalian cells, or degradation of toxic compounds in contaminated soil.


CHEN 5754. Food Processing Technology. (3 cr; A-F only. Prereq—4002) Introduction to food processing as it interfaces with engineering. Case studies. Engineering economics and practical design problems in food processing. Heat transfer; freezing, conduction (unsteady state); thermal processing; extruder design; protein processing; order-of-magnitude estimating; and economic concepts such as ROI, discounted cash flow, and capital estimating.

CHEN 5759. Principles of Mass Transfer in Engineering and Biological Engineering. (2 cr; A-F only. Prereq—4002) Principles of mass transfer in gases, liquids, biological and macromolecular solutions, gels, solids, membranes, and capillaries. Porous solids interaction between mass transfer and chemical reaction. Applications in biological, environmental, mineral, and chemical engineering systems.

CHEN 5771. Colloids and Dispersions. (3 cr; A-F only. Prereq—Physical chemistry) Preparation, stability, coagulation kinetics or colloidal solutions. DLVO theory, electrokinetic phenomena. Properties of micelles, other microstructures.

Chemistry (CHEM)

Department of Chemistry

CHEM 1011. Introductory Chemistry: Lecture and Laboratory. (4 cr; Prereq—[high school chemistry or equiv]) two yrs high school math, not passed CHEN placement exam; high school physics recommended) Elementary organic chemistry. Matter/energy, atoms, compounds, solutions, chemical reactions, molecular/macro-nuclear calculations, gases, liquids, solids, chemical bonding, atomic/molecular structure, acids, bases, equilibria. Physical/chemical properties of hydrocarbons and organic compounds containing halogens, nitrogen, or oxygen. Emphasizes problem solving.

CHEM 1015. Introductory Chemistry: Lecture. (3 cr; Prereq—[high school chemistry or equiv]) two yrs high school math, not passed CHEM placement exam; high school physics recommended) Broad survey of chemical concepts. Matter and energy, atoms, compounds, solutions, chemical reactions, molecule/macro-nuclear calculations, gases, liquids, solids, chemical bonding, atomic and molecular structure, acids, bases, equilibria. Physical and chemical properties of hydrocarbons and organic compounds containing halogens, nitrogen, or oxygen. Problem solving emphasized.

CHEM 1017. Introductory Chemistry: Laboratory. (1 cr; Prereq—1015, Δ) Same curricular content as lab component of 1011.


CHEM 1022. Chemical Principles II. (4 cr. §CHEM 1032H. Prereq—1021 or equiv) Chemical kinetics; radioactive decay; chemical equilibrium; solutions; acids and bases; solubility; second law of thermodynamics; electrochemistry and corrosion; descriptive chemistry of the elements; coordination chemistry; biochemical; applications of chemical principles to environmental problems.
Course Descriptions

CHEM 1031H. Honors Chemistry L (4 cr; A-F only. §CHEM 1021. Prereq–IT honors student or permission from IT honors office)


CHEM 1032H. Honors Chemistry II (4 cr; A-F only. §CHEM 1022. Prereq–[1031 or equiv]. IT honors student or consent of IT honors office)

Advanced introduction. Chemical kinetics/reaction mechanisms, chemical/physical equilibria, acids/bases, entropy/second law of thermodynamics, electrochemistry/corrosion; descriptive chemistry of the inorganic/coordination chemistry; biochemistry; applications of chemical principles to environmental problems. Lab emphasizes writing for scientific journals.

CHEM 1905, Freshman Seminar. (1-3 cr [max 3 cr]; A-F only. Prereq–Freshman)

Topics vary. See freshman seminar topics.

CHEM 1910W, Freshman Seminar: Writing Intensive. (1-3 cr [max 3 cr]; A-F only. Prereq–Freshman)

Topics vary. See freshman seminar topics.

CHEM 2094, Directed Research. (1-3 cr [max 3 cr]. Prereq–4th.

Learning experience in areas not covered by regular courses. Individually arranged with faculty member.

CHEM 2101, Introductory Analytical Chemistry Lecture. (3 cr. Prereq–1022 or equiv)

Primarily for chemistry majors. Methods/concepts of measurement by chemical/instrumental analysis, including titrimetry, quantitative spectrophotometric analysis, chromatographic separations, equilibrium/rate methods.

CHEM 2111, Introductory Analytical Chemistry Lab. (2 cr. Prereq–1011 or 2101)

Lab for 2101. High precision methods, acidimetry and complexometry, single and multicomponent analysis by spectrophotometry, analysis of mixtures by ion exchange and gas chromatography, enzymatic and rate methods.

CHEM 2301, Organic Chemistry I. (3 cr. Prereq–Grade of at least C in [1022 or 1032H or equiv])

Important classes of organic compounds, their constitutions, configurations, conformations, and reactions. Relationships between molecular structure and chemical reactivity/properties. Spectroscopic characterization of organic molecules.

CHEM 2302, Organic Chemistry II. (3 cr. Prereq–2301)

Reactions, synthesis, and spectroscopic characterization of organic compounds, organic polymers, and biologically important classes of organic compounds such as lipids, carbohydrates, amino acids, peptides, proteins, and nucleic acids.

CHEM 2311, Organic Lab. (4 cr. Prereq–2302 or 2302H)

Lab techniques in synthesis, purification, and characterization of typical organic compounds.

CHEM 2312, Honors Organic Lab. (5 cr; A-F only. Prereq–[2301 or 2301H, CHEM or ChemE or BioC] major or equiv. §CHEM 8221, CHEN 5221, MATS 5221. Honors organic chemistry lab)

CHEM 2910, Special Topics in Chemistry. (1 cr [max 6 cr]; S-N only. Prereq–1 sem 1xx chemistry or #)

Topics in chemistry. Opportunities and current research.

CHEM 2920, Special Topics In Chemistry. (1 cr [max 6 cr]; S-N only. Prereq–1 sem 1xx chemistry or #)

Topics in chemistry. Opportunities and current research.

CHEM 3001, Chemical Literature and Information Retrieval. (1 cr; S-N only. Prereq–2302)

Forms of chemical literature, relationships among them. Major information sources in chemistry. Basic search techniques for print/electronic sources, choosing sources most appropriate for various information needs.

CHEM 3501, Introduction to Thermodynamics, Kinetics, and Statistical Mechanics. (3 cr. Prereq–1022 or 1032H, [NATH 2263 or PHYS 320 or PHYS 3400])


CHEM 3502, Introduction to Quantum Mechanics and Spectroscopy. (3 cr. Prereq–One yr college chemistry, one yr college physics, one yr college calculus)

Introduction to microscopic descriptions of chemical systems. Elementary quantum mechanics. Applications to atomic/molecular structure. Molecular spectroscopy. Quantum statistical mechanics. While a course in differential equations is not required, solutions to several such equations are discussed.

CHEM 4001, Chemistry of Plant Materials. (4 cr; A-F only. Prereq–2302, [jr or sr or #])

Chemical principles underlying structure, properties, processing, and performance of plant materials.

CHEM 4011, Mechanisms of Chemical Reactions. (3 cr. Prereq–3502 or equiv)


CHEM 4021, Computational Chemistry. (3 cr. Prereq–3502 or equiv)


CHEM 4066, Chemistry of Industry. (3 cr. Prereq–CHEM sr or grad student or #)

Industrial and polymer chemistry technology. Relation of basic properties to industrial utility. Economics, social problems, industrial environment.

CHEM 4094W, Directed Research. (1-5 cr [max 75 cr]. Prereq–Any 3xx or 4xx CHEM course, [jr or sr or #])

Learning experience in areas not covered by regular courses. Individually arranged with faculty member.

CHEM 4101, Intermediate Analytical Chemistry Lecture. (3 cr. A-F only. Prereq–2101, 2311, 2311, §CHEM 53501)

Basic electronic, optical, computer technologies employed in design of chemical instrumentation. Advanced topics in spectroscopy (e.g., FT-nmr, FT-IR, atomic absorption/emission). Electrochemistry. Mass spectrometry.

CHEM 4111W, Intermediate Analytical Chemistry Lab. (2 cr. A-F only. Prereq–4101, chemistry major)

Instrumental techniques, including spectroscopic methods, electrochemical methods, and analysis based on separation. Emphasizes use of computers in data collection and reduction.

CHEM 4121, Process Analytical Chemistry. (3 cr. A-F only. Prereq–[2302, 2311, 3501, chemical engineering major])

Strategies and techniques for analysis. Use of modern instrumentation, including spectrophotometry, chromatography and electrochemistry.

CHEM 4201, Materials Chemistry. (3 cr. §CHEM 8201. Prereq–[3502 or equiv, 4701] or #)

Crystal systems/unit cells, phase diagrams, defects/interfaces, optical/ dielectric properties, electrical/thermal conductivity, X-ray diffraction, thin film analysis, electronic structure, polaron/phonons, solid state chemistry, liquid/molecular crystals, polymers, magnetic/optical materials, porous materials, ceramics, piezoelectric materials, biomaterials and catalysts.

CHEM 4221, Introduction to Polymer Chemistry. (3 cr. §CHEM 8221, CHEM 5221, MATS 5221, MATS 8221. Prereq–2302, [5011 or 3501 or CHEM 4214 or #])

Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

CHEM 4223W, Polymer Laboratory. (2 cr. §MATS 5223W. Prereq–[MATS 5223, 5221 or 8221 or CHEM 4214 or #])


CHEM 4301, Surface and Colloid Science in Bio-based Products Manufacturing. (3 cr. Prereq–3501, [jr or sr or #])

Principles of surface/colloid science, their application to understanding manufacturing/ performance of bio-based products.

CHEM 4311W, Advanced Organic Chemistry Lab. (2 cr. Prereq–2311)

Reactions, techniques, and instrumental methods in synthetic organic chemistry.

CHEM 4321, Organic Synthesis. (3 cr. Prereq–[2302 or equiv, #])

Fundamental concepts, reactions, reagents, structural/stereochemical issues, and mechanistic skills for organic chemistry.

CHEM 4322, Advanced Organic Chemistry. (3 cr. Prereq–[2302 or equiv, #])

Topics vary by instructor. Examples: natural products, heterocycles, asymmetric synthesis, organometallic chemistry, polymer chemistry.

CHEM 4352, Physical Organic Chemistry. (3 cr. Prereq–2302, [jr or sr or #])

Fundamental concepts and mechanistic tools for analysis of organic reaction mechanisms. Solvation, reactive intermediates, gas phase chemistry, photochemistry or strained-ring chemistry or both.

CHEM 4361, Interpretation of Organic Spectra. (3 cr. Prereq–[2302 or equiv, #])

Application of nuclear magnetic resonance, mass, ultraviolet, and infrared spectral analyses to organic structural problems.

CHEM 4411, Introduction to Chemical Biology. (3 cr. Prereq–[2302 or equiv])

Chemistry of amino acids, peptides, proteins, lipids, carbohydrates, and nucleic acids. Structure, nomenclature, synthesis, and reactivity. Techniques to characterize biomolecules.

CHEM 4412, Chemical Biology of Enzymes. (3 cr. Prereq–[2302 or equiv])

Enzyme classification with examples from current literature; strategies to decipher enzyme mechanisms; chemical approaches to control enzyme catalysis.

CHEM 4413, Nucleic Acids. (3 cr. Prereq–[2302 or equiv])

Chemistry and biology of nucleic acids. Structure, thermodynamics, reactivity, DNA repair, chemical oligonucleotide synthesis, antisense approaches, ribozymes, techniques for nucleic acid research, interactions with small molecules and proteins.

CHEM 4511W, Advanced Physical Chemistry Lab. (2 cr. Prereq–[53501 or 3502 or #])

Experiments illustrating principles and methods of thermodynamics, reaction kinetics, and quantum mechanics.

CHEM 4701, Inorganic Chemistry. (3 cr. Prereq–[2311 or §CHEM 53501 or 53502 or #])

Advanced introduction to inorganic chemistry. Periodic trends. Structure and bonding in compounds where s and p electrons are important. Descriptive chemistry of solids and transition metal compounds. Emphasizes transition metal chemistry. Advanced topics in main group and materials chemistry.
CHIC 1102. Latinos in the United States: Culture and Citizenship. (3 cr) Historical/cultural knowledge on the complex/multi-layered relationship that Latinos have to the U.S., their country of origin. Influence of social, cultural, and political dynamics on Latino identity, politics, and sense of belonging in the U.S. Cultural citizenship.

CHIC 1102H. Latinos in the United States: Culture and Citizenship. (3 cr) Historical/cultural knowledge on the complex/multi-layered relationship that Latinos have to the U.S., their country of origin. Influence of social, cultural, and political dynamics on Latino identity, politics, and sense of belonging in the U.S. Cultural citizenship.

CHIC 1112. Introduction to Chicana/o Studies: Critical Paradigms. (3 cr) Prevailing paradigms of analysis, methodologies of research, and guiding theoretical concepts that have shaped Chicano Studies. Chicano history, culture, and meanings, including (im)migration, repatriation, community formation, Chicano two movements. Contemporary trends in art and culture.

CHIC 1275. Service Learning in the Chicano/Latino Community. (3 cr) (CHIC 3275) Hands-on, minds-on engagement in service learning. Integration of community service and related academic study. Students work as tutors/mentors in a Chicano/Latino-based K-12 educational setting (school or after school program).

CHIC 1901. Freshman Seminar. (3 cr; A-F only; Prereq—Freshman) Topics specified in Class Schedule.

CHIC 1902. Freshman Seminar. (3 cr) Topics specified in Class Schedule.

CHIC 1907W. Freshman Seminar. (3 cr; Prereq—Freshman) Topic specified in Class Schedule.

CHIC 2121. La Chicana. (2 cr; WGST 3410) This class centers on Chicanas or politically defined women of the Mexican American community. Our method is interdisciplinary. It emphasizes the importance of historical context and cultural process to any discussion on Chicana experience.

CHIC 3213. Chicano Music and Art. (3 cr; A-F only) Survey of diverse forms of cultural expression in Mexican American music/art. History of various types of artistic production and musical forms in their regional specificity. Social/economic implications of several genres, styles, and traditions.

CHIC 3221. Introduction to Chicana/o Cultural Studies: Barrio Culture and the Aesthetics of Everyday Life. (3 cr) Cultural studies approach to investigating aesthetic dimensions of experience that inform and are informed by dynamic relationship between culture, class, ethnicity, and power.

CHIC 3223. Chicana/o and Latina/o Representation in Film. (3 cr) Introduction to Chicana/o and Latina/o visual representation. Depiction of Latina/o experience, history, and culture in film. Analyzing independent/commercial films as texts that illuminate deeply held beliefs around race, class, ethnicity, gender, and national origin.

CHIC 3275. Service Learning in the Chicano/Latino Community. (3 cr; CHIC 1275) Hands-on, minds-on engagement in practice/theory of service learning. Integration of community service and related academic study. Students work as tutors/mentors in a Chicano/Latino-based K-12 educational setting (school or after school program).


CHIC 3374. Migrant Farmworkers in the U.S.: Families, Work, and Advocacy. (3 cr) Social, economic, and legal realities of migrant workers. Demographic shifts, laws, and policies. Farmworker movements and other responses to conditions facing migrants in contemporary economy. Gendered nature of work. Way in which commodities are produced and resistance expressed within structures/traditions of an increasingly globalized system.

CHIC 3375. Folklore of Greater Mexico. (3 cr) Scholarly survey and exploration of the sociocultural function of various types of folklore in Greater Mexico. Students analyze the ways in which folklore constructs and maintains community, as well as resists and engenders cultural shifts.


CHIC 3446. Chicana/o History II: WWII, El Movimiento, and the New Millennium. (3 cr) Experiences of people of Mexican descent in the U.S. Notions of citizenship from WWII Chicano civil rights movement. Impact of immigration patterns/lawmaking. Cultural wars, changing demographics. Social, economic, and political changes that influenced day-to-day life of Mexican Americans. Meaning of racialized Mexican identity. How different groups of Mexicans have understood their relationships to other Americans and other Latino groups.

CHIC 3452. Xicana/Indigena Studies: History, Culture, and Politics. (3 cr) Historical, cultural, and political processes that have impacted Chicana/os and their understanding of being indigenous to North American continent and Southwestern U.S. History as dynamic process intimately related to present/future constructions of Mexican American identities and sociopolitical perspectives.
CHIC 3507W. Introduction to Chicana/o Literature. (3 cr) Cultural, intellectual, and socio-political traditions of Mexican Americans as they are represented in creative literature. Various genres/forms of creative cultural expression and their significance as representations of social, cultural, and political life in the United States. Novels, short stories, drama, poetry.

CHIC 3672. Chicana/o Experience in the Midwest. (3 cr) Lived experience of Chicana/o in Midwest. Art, music, and spoken word as media for how Chicano/as convey that experience. How/why groups, affiliations, and organizations form in alliance/competition. How living in Midwest impacts those relationships.

CHIC 3712. Chicanas/os: Psychological Perspectives. (3 cr) Textual analysis of Chicana/Latina writings with special emphasis on the psychological motivations of the subjects pertaining to race, class, and gender relationships.

CHIC 3752. Chicanas and Chicanos in Contemporary Society. (3 cr) Introduction to sociological analysis of theoretical/methodological approaches to Chicanas/o and Latino/a communities. Socioeconomic conditions, education, cultural change, the family, gender relations, political experiences. Theories, issues, methods of sociological research. Debates regarding qualitative/quantitative research methods.

CHIC 3852. Chicanas/o Politics. (3 cr) [SPOL 3752] Foundations/contradictions of contemporary Chicano politics. Policy issues that concern Latinos, successes/failures of Latino empowerment strategies, electoral impact of Latino votes. Question of whether there is a Latino political/community.

CHIC 3900. Topics in Chicana/o Studies. (3 cr) Topics vary by section of course.

CHIC 3993. Directed Studies. (1-9 cr max 16 cr) Prereq–§4900) General reading, research, and study. Students often do preliminary readings and research in conjunct with plans for education abroad programs.

CHIC 4231. The Color of Public Policy: African Americans, American Indians, and Chicanos in the United States. (3 cr) Examination of the structural or institutional conditions through which people of color have been marginalized in public policy. Critical evaluation of social theory in addressing the problem of contemporary communities of color in the United States.

CHIC 4232. Chicana/o - Latina/o Gender and Sexuality Studies. (3 cr) Critical thinking of Chicanas/os and Latinas/os around construction of gender. Politics of sexual identity. How the self is gendered in relationship to sexual, racial, class, and national identities under different social structural conditions. Way in which the “boundaries” that define/confine sexual norms shift over time.


CHIC 4401. Chicana/Latina Cultural Studies. (3 cr) [SWST 446] Diversity of cultures that are called “Hispanic”; women in these cultures; Chicanas and Latinas living in the United States or migrating from their home nations to the United States.

CHIC 4900W. Proseminar: Senior Project. (1 cr) Students work closely with a faculty member to complete their senior project.

CHIC 4901W. Senior Paper. (2 cr; Prereq–¶4000) Capstone experience. Students produce original research papers or creative projects on topics determined in consultation with a faculty adviser.

CHIC 5374. Migrant Farmworkers in the U.S.: Families, Work, and Advocacy. (3 cr) Social, economic, and legal realities of migrant workers. Demographic shifts, laws, and policies. Farmworker movements and other responses to conditions facing migrants in contemporary economy. Gendered nature of work. Way in which commodities are produced and resistance expressed within structures/traditions of an increasingly globalized system.


CHIC 5993. Directed Studies. (1-3 cr max 16 cr) Prereq–§4900) General reading, research, and study for completion of the requirements for a senior paper or honors thesis.

Child Psychology (CPSY)

Institute of Child Development

College of Education and Human Development


CPSY 2301. Introductory Child Psychology. (4 cr; Prereq–4 cr intro psych) Introduction to the science of child behavior; review of theory and research.


CPSY 3308. Introduction to Research Methods in Child Psychology. (4 cr; A-F only. Prereq–2301, PSY 1001) Techniques used in the study of child development; emphasis on collection, organization, and analysis of data.

CPSY 3360. Child Psychology Honors Seminar. (2 cr; A-F only. Prereq–CPsy 3731) Acquaints students with the various research projects and activities in the Institute for Child Development and in related departments. Faculty are invited to discuss their research projects with seminar participants.

CPSY 4302. Infant Development. (4 cr; A-F only. Prereq–2301 or ¶) Perceptual, motor, emotional, social, and cognitive development during the first two years of life; the developing infant in his or her social and physical environment.


CPSY 4310. Special Topics in Child Development. (1-4 cr max 12 cr. Prereq–2301) Topics/credits vary.

CPSY 4311. Behavioral and Emotional Problems of Children. (4 cr; A-F only. Prereq–Intro psych) Behavioral and emotional problems of children and adolescents; psychopathology contrasted to normal development; symptoms, causes, course, and prevention of common disorders, excluding physical and sensory handicaps.


CPSY 4329. Biological Foundations of Development. (4 cr. A-F only. Prereq–2301 or equiv) Evolutionary theory and behavioral genetics applied to understanding of development of human behavior; formation of species-specific adaptive behavior and individual differences in infancy, childhood, and adolescence. This course is only offered Fall semesters.

CPSY 4331. Social and Personality Development. (4 cr; A-F only. Prereq–2301, PSY 1001) Development of social relations and personality; research, methodology, and contrasting theoretical perspectives. Survey of findings on interpersonal relationships, the concept of self, prosocial and antisocial behavior, and acquisition of social roles.

CPSY 4334W. Children, Youth in Society. (4 cr; A-F only. Prereq–2301) Child development principles relative to social policy decision making. Issues in applying theories, findings to problems (e.g., media influence, day care, child abuse, effects of peers).

CPSY 4336W. Development and Interpersonal Relations. (4 cr; A-F only. Prereq–2301 or equiv. 4331) Processes and functions of interactions with parents and peers; analysis of theory and research on developmental changes and influences.


CPSY 4345. Language Development and Communication. (4 cr; A-F only. Prereq–2301) Structure and function of language; factors influencing development; methodological problems, language scales, theories.

CPSY 4347W. Senior Project. (2 cr; A-F only. Prereq–CPsy 4352) Current literature on self-selected developmental topic. Students write a literature review.

CPSY 4993. Directed Instruction in Child Psychology. (1-4 cr max 6 cr; S-N only. Prereq–4 cr in CPsy, ¶). Students serve as teaching assistants or peer advisers.

CPSY 4994. Directed Research in Child Psychology. (1-4 cr max 8 cr) Prereq–4 cr in CPsy, ¶, 4352) Individual empirical investigation. Students help plan/implement scientific studies, gain experience/expertise in methodology of research.


CPSY 4996. Field Study in Child Psychology. (1-4 cr max 8 cr) Prereq–4 cr in CPsy, ¶, 4352) Independent reading. Varies depending on student’s specific area of interest. Students receive credit while interning in metropolitan area.

CPSY 5225. Social and Philosophical Foundations of Early Childhood Education. (3 cr. Prereq–MEd student in ECE or ESE2) Surveys imagery, history, philosophy, and psychology of early childhood education. Analyzing/interpreting trends in early education, including diversity, special needs, legislation, public policy, and educationally appropriate practice.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHN 1011</td>
<td>Beginning Modern Chinese</td>
<td>(3 cr. §CHN 4001)</td>
<td>6</td>
<td>Introduction to the sources and approaches of modern Chinese. Focuses on early childhood policy development, research, or evaluation. Students attend an early childhood policy lecture series and participate in small discussion groups and follow-up activities.</td>
</tr>
<tr>
<td>CHN 1012</td>
<td>Beginning Modern Chinese</td>
<td>(3 cr. §CHN 4002)</td>
<td>6</td>
<td>Course designed primarily for students with oral/aural Chinese, 3031. Advanced Modern Chinese. (4 cr. Prereq–3031 or equiv or #) Reading and analysis of 20th-century texts.</td>
</tr>
<tr>
<td>CHN 3021</td>
<td>Intermediate Modern Chinese</td>
<td>(5 cr. §CHN 3022)</td>
<td>3</td>
<td>Study of classical Chinese through reading and analysis of representative texts.</td>
</tr>
<tr>
<td>CHN 3031</td>
<td>Advanced Modern Chinese</td>
<td>(4 cr. Prereq–3032 or equiv or #)</td>
<td>4</td>
<td>Reading and analysis of commercial and business texts.</td>
</tr>
<tr>
<td>CHN 3041</td>
<td>Business Chinese</td>
<td>(4 cr. Prereq–3032 or equiv or #)</td>
<td>3</td>
<td>Study of classical Chinese through reading and analysis of representative texts.</td>
</tr>
<tr>
<td>CHN 3111</td>
<td>Introductory Classical Chinese</td>
<td>(3 cr. Prereq–3032 or equiv or #)</td>
<td>3</td>
<td>Study of classical Chinese through reading and analysis of representative texts.</td>
</tr>
<tr>
<td>CHN 3161</td>
<td>Media Cultures in Modern China</td>
<td>(3 cr. Prereq–Soph or higher; Chinese language not required, background in modern Chinese history recommended)</td>
<td>3</td>
<td>Reading and analysis of commercial and business texts.</td>
</tr>
<tr>
<td>CHN 3201</td>
<td>Chinese Calligraphy</td>
<td>(2 cr)</td>
<td>2</td>
<td>Appreciation and execution of Chinese calligraphy through guided practice.</td>
</tr>
<tr>
<td>CHN 3202</td>
<td>Intermediate Chinese Calligraphy</td>
<td>(2 cr. Prereq–3201 or #)</td>
<td>2</td>
<td>Advanced techniques of composing Chinese characters using regular style of Chinese calligraphy.</td>
</tr>
<tr>
<td>CHN 3203</td>
<td>Chinese Language Teaching Tutorial</td>
<td>(1 cr [max 2 cr] Prereq–Grad)</td>
<td>1</td>
<td>Chinese Calligraphy. (2 cr) Appreciation and execution of Chinese calligraphy through guided practice.</td>
</tr>
<tr>
<td>CHN 4001</td>
<td>Beginning Modern Chinese</td>
<td>(3 cr. §CHN 1011)</td>
<td>3</td>
<td>Analysis of modern Chinese through structured practice. Meets with 1011.</td>
</tr>
<tr>
<td>CHN 4002</td>
<td>Beginning Modern Chinese</td>
<td>(3 cr. §CHN 1012)</td>
<td>3</td>
<td>Chinese Calligraphy. (2 cr) Appreciation and execution of Chinese calligraphy through guided practice.</td>
</tr>
<tr>
<td>CHN 4003</td>
<td>Intermediate Modern Chinese</td>
<td>(5 cr. §CHN 3021)</td>
<td>3</td>
<td>Modern standard Chinese skills developed through conversations, writing, and reading. Meets with 3021.</td>
</tr>
<tr>
<td>CHN 4004</td>
<td>Intermediate Modern Chinese</td>
<td>(5 cr. §CHN 4003)</td>
<td>3</td>
<td>Modern standard Chinese skills developed through conversations, writing, and reading. Meets with 3021.</td>
</tr>
<tr>
<td>CHN 4005</td>
<td>Accelerated Beginning Modern Chinese</td>
<td>(5 cr. §CHN 3022)</td>
<td>3</td>
<td>Mandarin Chinese course designed primarily for students with oral/aural skills but with little or no exposure to reading and writing. Also for speakers of other Chinese dialects and others with prior experience. Concentration on reading, writing, and standard pronunciation. Equivalent to two semesters, Chinese 3021-3022. Upon completion, student may enter Advanced Modern Chinese, Chinese 3031.</td>
</tr>
<tr>
<td>CHN 5011</td>
<td>Topics in Chinese Linguistics</td>
<td>(4 cr. §CHN 3022)</td>
<td>3</td>
<td>Mandarin Chinese. Reading, writing, standard pronunciation.</td>
</tr>
<tr>
<td>CHN 5040</td>
<td>Readings in Chinese Texts</td>
<td>(2.4 cr [max 12 cr]; A-F only; Prereq–3032 or equiv or #)</td>
<td>2.4</td>
<td>Modern standard Chinese skills developed through conversations, writing, and reading. Meets with 3021.</td>
</tr>
<tr>
<td>CHN 5041</td>
<td>Topics in Chinese Poetry</td>
<td>(4 cr. §CHN 3022)</td>
<td>4</td>
<td>Modern standard Chinese skills developed through conversations, writing, and reading. Meets with 3021.</td>
</tr>
<tr>
<td>CHN 5120</td>
<td>Topics in Chinese Linguistics</td>
<td>(4 cr. §CHN 3022)</td>
<td>4</td>
<td>Modern standard Chinese skills developed through conversations, writing, and reading. Meets with 3021.</td>
</tr>
<tr>
<td>CHN 5230</td>
<td>Topics in 20th-Century Chinese Literature</td>
<td>(4 cr. §CHN 3022)</td>
<td>4</td>
<td>Modern standard Chinese skills developed through conversations, writing, and reading. Meets with 3021.</td>
</tr>
<tr>
<td>CHN 5240</td>
<td>Topics in Chinese Philosophy</td>
<td>(4 cr. §CHN 3022)</td>
<td>4</td>
<td>Modern standard Chinese skills developed through conversations, writing, and reading. Meets with 3021.</td>
</tr>
<tr>
<td>CHN 5250</td>
<td>Topics in Chinese Fiction</td>
<td>(4 cr. §CHN 3022)</td>
<td>4</td>
<td>Modern standard Chinese skills developed through conversations, writing, and reading. Meets with 3021.</td>
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For definitions of course numbers, symbols, and abbreviations, see page 300.
Course Descriptions

Civil Engineering (CE)
Department of Civil Engineering

Institute of Technology

CE 5. Refresher Course for Civil Engineers. (0 cr; N-S only. Prereq – BSC or equivalent degree or completion of HARTS I and II of the State Board Exam) Review of civil engineering fundamentals required to pass the Minnesota Professional Engineering Examination in civil engineering.

CE 1101. Civil Engineering Orientation. (1 cr; S-N only) Introduction to the Civil Engineering Department and civil engineering practice. Presented by faculty members and professional engineers.


CE 3102. Uncertainty and Decision Analysis in Civil Engineering. (3 cr; A-F only. Prereq – MATH 1371, MATH 1372) or equiv) Stochastic models and their usefulness in reasoning about uncertainty in civil engineering. Techniques for identifying, fitting, and validating models using data samples. Testing hypotheses about, and bounding the uncertainty attached to, important engineering parameters. Applications to problems arising in construction, environmental, geotechnical, structural, transportation, and water resources engineering.

CE 3111. CADD for Civil Engineers. (2 cr. Prereq – 3201, IT) Introduction to AutoCAD and land development desktop software. Students complete all tasks to design two-lane roadway using civil engineering design software, including topography, plan/profile contours, cross sections, and quantity calculations.

CE 3201. Transportation Engineering. (3 cr. Prereq – PHYS 1302) Laws of motion to describe vehicle performance and determine constraints for highway designs. Traffic flow principles and their relation to capacity and level of service. Introduction to geometric design, pavement design, and transportation planning.

CE 3202. Surveying and Mapping. (2 cr; A-F only. Prereq – IT or MATH 1271, 1272) Theory of precision measurements of distance, elevation, angle, and direction of points and lines above, on, or beneath the earth’s surface; establishing such points or lines. Elements of coordinate systems, datum planes, and maps.


CE 3401. Linear Structural Analysis. (3 cr; A-F only. Prereq – Grade of at least C- in AEM 3031, IT) Analysis of determine/indeterminate trusses and frames and of deformation by virtual work. Application of energy, slope-deflection, and moment distribution methods to indeterminate structures. Influence lines. Design.

CE 3402. Construction Materials. (3 cr; A-F only. Prereq – Grade of at least C- in AEM 3031, IT) Basic concepts of behavior mechanisms for construction materials such as concrete, metals, asphalt, plastics, and wood. Standard specifications for material properties. Techniques for testing.
CE 441. Steel Design II. (3 cr; A-F only. Prereq—[Grade of at least C- in 4401, upper div IT or grad student] or #; 4411 recommended)
Design of steel and composite steel/concrete structures, including multistory frames and plate-girders bridges. Beam-columns, torsion, connections, frames.

CE 4414. Prestressed Concrete Design. (3 cr; A-F only. Prereq—[Grade of at least C- in 4401, upper div IT or grad student] or #; 4412 recommended)
Design of prestressed concrete structures. Time dependent effects, behavior, flexure, shear, torsion, deflections, continuous systems.

CE 4415. Masonry Structures. (3 cr; A-F only. Prereq—[Grade of at least C- in 3401, upper div IT or grad student] or #; 4401 recommended)


CE 4502. Water and Wastewater Treatment. (3 cr; A-F only. Prereq—3501).

CE 4511. Hydraulic Structures. (4 cr; A-F only. Prereq—4501) Hydraulic design procedures for culverts, dams, spillways, outlet works, and river control works. Drop structures, water intakes, bridge crossings. Offered alt yrs.

CE 4512. Open Channel Hydraulics. (4 cr; A-F only. Prereq—IT or grad, 3502 or #)
Theories of flow in open channels, including gradually varied and rapidly varied flows, steady and unsteady flows. Computational methods for unsteady open channel flows, applications to flood routing. Introduction to moveable bed mechanics.

CE 4531. Environmental Process Engineering. (3 cr; A-F only. Prereq—4531, 4541) Physical principles that influence behavior of engineered and natural environmental systems. Flow behavior through reactors, mass transfer, interfacial effects, stability, kinetics.

CE 4561. Solid Hazardous Wastes. (3 cr. Prereq—IT or grad, CHEM 1022, 3501 or #)
Solid and hazardous waste characterization; regulatory legislation; waste minimization; resource recovery; chemical, physical, and biological treatment; thermal processes; disposal practices. Analysis and design of systems for treatment and disposal.

CE 4562. Environmental Remediation Technology. (3 cr; A-F only. Prereq—3501, 4501 or #) Techniques designed for removal of pollutants from groundwater and soils. Advances in technological design. Emerging technologies such as in situ bioremediation, phytoremediation. Role of environmental biotechnology in pollution abatement.

CE 4591. Environmental Law for Engineers. (3 cr; A-F only. Prereq—Upper div IT or grad or #) Environmental regulatory law relevant to civil and environmental engineering; specific provisions of federal statutory and regulatory laws such as NEPA, CWA, CRCA,CAA, and CERCLA.

CE 5094. Civil Engineering Research. (1-4 cr [max 4 cr]. Prereq—)
Research or independent study in concrete, structural steel, soils, hydraulics, hydrology/minucial, environmental, or transportation problems. Investigations, reports, tests, designs.

CE 5170. Internet Based Study. (1-5 cr [max 15 cr]. A-F only. Prereq—Upper div IT or #) Internet based teaching with bi-weekly exercises on topic of concern.

CE 5180. Special Topics. (1-4 cr [max 4 cr]. Prereq—)
Topics vary depending on faculty and student interests.

CE 5211. Traffic Engineering. (3 cr. Prereq—3201, STAT 3021 or equival.) Principles of vehicle and driver performance as they apply to the safe and efficient operation of highways. Design and use of traffic control devices. Capacity and level of service. Trip generation and traffic impact analysis. Safety and traffic studies.

CE 5212. Transportation Policy, Planning, and Deployment. (3 cr. Prereq—3201 or equival) Techniques of analysis and planning for transportation services. Demand-supply interactions. Evaluating transportation alternatives. Travel demand forecasting. Integrated model systems. Citizen participation in decision-making.

CE 5214. Transportation Systems Analysis. (3 cr. Prereq—3201) Systems approach, its application to transportation engineering/planning. Prediction of flows and level of service. Production functions, cost optimization, utility theory, demand modeling, transportation network analysis, equilibrium assignment, decision analysis, multidimensional evaluation of transportation projects.


CE 5232. Advanced Portland Cement Concrete. (3 cr. Prereq—Upper div IT or grad, CE 4232 or #) Advanced topics in cement chemistry and selection of materials for and design of portland cement concrete mixtures. Lab assignments pertaining to mixture design and short-term and long-term behavior. Use of admixtures and fiber reinforcement. Effects of proportioning of standard materials.

CE 5233. Advanced Bituminous Materials. (3 cr. Prereq—Upper div IT or grad, CE 4202 or #) Advanced topics in selection and design of bituminous materials. Asphalt cement, rheology, emulsions, chip seals, hot-mix asphalt design, viscoelastic characterization. Lab assignments pertaining to rheology, mixture design and viscoelastic behavior.

CE 5311. Experimental Geomechanics. (3 cr; A-F only. GEES 5311, Prereq—Upper div IT or grad, 4301, GEES 4301 or #) Machine stiffness, closed-loop testing. Small-strain theory. Measurement of deformation: strain gages, LVDT's, accelerometers, and associated circuits. Direct and indirect testing. Material behavior: experiments on anisotropic, damaged, and fluid-filled solids.


CE 5331. Geomechanics Modeling. (3 cr; A-F only. GEES 5331, Prereq—Upper div IT or grad, 4301 or #) Soil and rock response in triaxial testing; drained and undrained behavior; elastic and plastic properties. Modeling stresses, strains, and failure in geomechanics problems.

CE 5341. Wave Methods for Nondestructive Testing. (4 cr; A-F only. Prereq—[AEM 2021, AEM 3031] or #) Introduction to contemporary methods for nondestructive characterization of objects of civil infrastructure (e.g., highways, bridges, geotechnical sites). Imaging technologies based on propagation of elastic waves such as ultrasonic/resonant frequency methods, seismic surveys, and acoustic emission monitoring. Lecture, lab.

CE 5351. Advanced Mathematics for Civil Engineers. (3 cr; A-F only. Prereq—[Math 2363 or Math 2374 or #]) Emphasizes skills relevant for civil engineers. Mathematical principles explained in an engineering setting. Applications from various areas in civil engineering.

CE 5411. Applied Structural Mechanics. (3 cr; A-F only. Prereq—[Grade of at least C- in 4401, upper div IT or grad student] or #) Principal stresses and failure criteria in 3 dimensions. Introduction to plane elasticity, energy methods, torsion of beams, and bending of unsymmetrical beams.

CE 5541. Environmental Water Chemistry. (3 cr; A-F only. Prereq—3501, CHEM 1021, CHEM 1022) Introduction to water chemistry and emerging environmental chemical principles, geochemical processes controlling chemical composition of waters, behavior of contaminants that affect the suitability of water for beneficial uses.

CE 5542. Experimental Methods in Environmental Engineering. (3 cr; A-F only. Prereq—4501, CHEM 1021, CHEM 1022) Tools necessary to conduct research in environmental engineering and chemistry. Theory of operation of analytical equipment. Sampling and data handling methods, statistical analyses, experimental design, laboratory safety. Lecture, laboratory.

CE 5551. Environmental Microbiology Laboratory. (4 cr; A-F only. Prereq—3501, CHEM 1021, CHEM 1022) Role of microorganisms in environmental bioremediation, pollution control, water/wastewater treatment, biogeochemistry, and human health. Basic microbiological techniques: isolation, identification/ enumeration of bacteria, BOD, biodegradation kinetics, disinfection. Lecture, lab.

CE 5581. Water Resources: Individuals and Institutions. (3 cr; A-F only) Control of water resources by natural system functions, user actions, and influence of social, economic, and political institutions. Water resource policy in the United States. Case studies (e.g., flood/ drought management).

Classical and Near Eastern Studies (CNES)
Department of Classical and Near Eastern Studies
College of Liberal Arts

CNES 1001. World of the Bible: Religions, Empires, and Discourses of Power. (3 cr)

CNES 1002. World of Greece. (3 cr)
Ancient Greek civilization, from second millennium BCE to Roman period. Art/archaeology, philosophy, science, literature, social/political institutions. Focuses on connections with contemporary cultures corresponding to Ancient Near East.
CNES 1003. World of Rome. (3 cr.)
Roman civilization, from Etruscan origins to late antiquity. Focus on literature, history, civilization of Mediterranean civilization. Ways of life, social, and political institutions as evidenced by literature, art, architecture, history, and material culture.

CNES 1042. Greek and Roman Mythology. (4 cr. §CNES 1042H. Prereq—§: CLAS 1042, 1042H)
Introduction to the history, the stories and the study of Greek and Roman mythology.

CNES 104H2H. Honors Course: Greek and Roman Mythology. (4 cr. §CNES 1042. Prereq—Honors or #)
Introduction to stories/study of Greek/Roman mythology.

CNES 1043. Introduction to Greek and Roman Archaeology. (4 cr.)
Role that material culture, including art/architecture, plays in forming our picture of Classical past. Relationship between archaeology and other disciplines dealing with past. Selected sites, motives/methods of research. How results are used by archaeologists and general public.

CNES 1044. Introduction to Near Eastern Archaeology. (3 cr.)
Near Eastern peoples before Greco-Roman times, how archaeology discovered them. Cultural history going back 10,000+ years, including rise of farming, domesticity, life, states, and empires. Art, ideas, and architecture of Egypt, Babylonia, Persia, and other civilizations.

CNES 1046. Technical Terminology for the Health Professions. (3 cr. §CLAS 1148)
Greek and Latin prefixes, suffixes, and roots basic to the vocabulary of health professions; taught through computer-assisted instruction.

CNES 1082. Jesus in History. (3 cr. §REL 1082)
Jesus of Nazareth in his original setting. Modern approaches to the historical Jesus. Perspectives/needs of current society; effects on portrayals of Jesus. Shifting representations of Jesus in new historical-cultural situations. Meets with Class 1082.

CNES 1082H. Honors Course: Jesus in History. (3 cr. §REL 1082H. Prereq—Honors)
Jesus of Nazareth in his original setting. Modern approaches to the historical Jesus. Perspectives/needs of current society; effects on portrayals of Jesus. Shifting representations of Jesus in new historical-cultural situations. Meets with 1082.

CNES 1201. The Bible: Context and Interpretation. (3 cr. §CNES 1201, JWST 1201, JWST 3201)

CNES 202. Prophecy in Ancient Israel. (3 cr. §ANE 1002, RELA 3203. Prereq—Knowledge of Hebrew not required)

CNES 203. The Bible: Wisdom, Poetry, and Apocalyptic. (3 cr. §ANE 1003, RELA 3203. Prereq—Knowledge of Hebrew not required)

CNES 3321. Ships and Seafaring: An Introduction to Nautical Archaeology. (3 cr.)

CNES 3340. Practicum in Archaeological Field and Computer Techniques. (4 cr. §ARTH 3340, ARTH 5340, CLCV 3340, CNES 5340. Prereq—CLCV major or # or 1 course in ancient art and archaeology)
Methods used for excavation of Old and New World sites. Meets at archaeometry/computer lab for part of the semester and at a selected site in Minnesota for day-long sessions for 9 to 10 weeks.

CNES 3502. Ancient Israel: From Conquest to Exile. (3 cr. §CNES 5502, HIST 3502, RELA 3502. Prereq—Knowledge of Hebrew not required, 3501 recommended)
Israelite history in context of what is known from Egyptian, Canaanite, and Mesopotamian sources. Focuses on issues raised by archaeological data related to Israelite conquest of Canaan.

CNES 3503. History and Development of Israelite Religion I. (3 cr. §ANE 3503, ANE 5503, CNES 5503, RELA 3503, RELA 5503)

CNES 3535. Death and the Afterlife in the Ancient World. (3 cr. §CNES 5535, RELA 3535, RELA 5535)
Beliefs, attitudes, and behaviors related to death and the afterlife found in the cultures of the ancient Mediterranean and Near East. Literature, funerary art/epitaphs. Archaeological evidence for burial practices and care of dead.

CNES 395W. Major Project. (4 cr. Prereq—Three 3xxx ANE courses, [major in ANE or CNEA or RelS] or #)
Guided individual reading or study. Research project pertaining to the study of the ancient world, using documents or other primary sources along with secondary sources. Students select project in consultation with a faculty member.

CNES 3993. Directed Studies. (1-6 cr. [max 16 cr])
Guided individual reading or study.

CNES 401. Ancient Near East and Egypt. Neolithic to 1500 BCE. (3 cr. A-F only §HIST 401. Prereq—Previews coursework in ancient history recommended)
Lands of Western Asia and Northeast Africa from Neolithic through Middle Bronze Age. Interdependent technologies and developments such as agriculture, state formation, and writing. Use of literature/art as vehicles for articulating concepts. Changing relationships among cultures/polities of ancient Near East and regions beyond.

CNES 3008. History of Ancient Art. (4 cr. §ARTH 3008)
Architecture, sculpture, and painting of selected early cultures; emphasis on influences on the development of Western art.

CNES 3035. Classical Myth in Western Art. (4 cr. §ARTH 3035)
Study of a specific aspect of religion in Classical and Near Eastern antiquity such as healing cults, magic and divination, Gnosticism, or prophecy and authority. Topics specified in the Class Schedule.

CNES 3071. Greek and Hellenistic Religions. (3 cr. §CNES 3071, RELA 3071, RELA 5071)
Greek religion from the Bronze Age to Hellenistic times. Sources include literature, art, and archaeology. Homer and Olympian deities, ritual performance, prayer/sacrifice, temple architecture, death and the afterlife, mystery cults, philosophical religion, Near Eastern satanic religions.

CNES 3072. The New Testament. (3 cr. §CNES 3072, RELA 3072, RELA 5072. Prereq—§: CLAS 3072)

CNES 3073. Roman Religion and Early Christianity. (3 cr.)

CNES 3081W. Classical Epic in Translation. (3 cr. §CNES 5081)

CNES 3082W. Greek Tragedy in Translation. (3 cr.)

CNES 3104. Ancient Rome: Kings and Consuls. (3 cr.)
Roman Republic, from its origins to Caesar’s death.

CNES 3105. Ancient Rome: The Age of Augustus. (3 cr. Prereq—§: CLAS 1005)

CNES 3107. Age of Constantine the Great. (3 cr.)

CNES 3108. Age of St. Augustine of Hippo. (3 cr. §CLAS 1024. Prereq—§: CLAS 3024)
Cultural diversity (A.D. 363 to circa 500 A.D.). Replacement of paganism in Europe by barbarian kingdoms, consolidation of Constantinople as capital in the East. Literature, art, thought resulting from new prominence of Christianity; particularly Augustine of Hippo. Meets with 1024.

CNES 3142. Art of Egypt. (4 cr. §ARTH 3142)
Arts and architecture of Egypt, from prehistoric times to emergence of modern Egypt. Emphasizes elements of continuity and of change that have shaped Egyptian art.

CNES 3152. Art and Archaeology of Ancient Greece. (4 cr. §ARTH 3152, RELA 3152)
Introduction to civilization of ancient Greece as revealed through art and material culture. Case studies of selected monuments/sites.

CNES 3162. Roman Art and Archaeology. (4 cr. §ARTH 3162, RELA 3162. Prereq—§: CLAS 3162)
Introduction to material culture of Roman world: origin, change, continuity, “Progress” or “decay” in the later Empire, its legacy to modern world.

CNES 3172. Archaeology of Israel. (3 cr.)

CNES 3201. The Bible: Context and Interpretation. (3 cr. §CNES 1201, JWST 1201, JWST 3201, RELA 3201.
Prereq—Knowledge of Hebrew not required)
**Course Descriptions**

**CLCV 3510. Great Books.** (3 cr [max 9 cr]; Prereq—1 cr or cr & #) Intensive study of major works of classical antiquity and later literature in or translated into English), related by kind, theme, style, or perspective. Sometimes including works from non-Western cultures.

**CLCV 3711. Classics of Literary Criticism.** (3 cr; Prereq—1 course in literature, 2nd course in literature or philosophy or #) Principles of criticism as expounded and employed in major critical works by writers such as Plato, Aristotle, Horace, Longinus, Sir Philip Sidney, John Dryden, Samuel Johnson, David Hume, William Wordsworth, Samuel Taylor Coleridge, and T. S. Eliot.

**CLCV 3940. Proseminar: Classical Traditions in Western Culture.** (3-4 cr [max 6 cr]; Prereq—CLCV major or #) The nature of Greek-Roman classical traditions manifested in various cultural spheres: language and literature, fine arts, history, science, philosophy, theology, and other disciplines; the political, social, educational, and religious life of society. The perspective, scope, breadth, and depth of the course will vary.

**CLCV 3950. Topics in Classical Civilization.** (3-4 cr [max 8 cr]; Prereq—Topics specified in the Class Schedule.)

**CLCV 3993. Directed Studies in Classical Civilization.** (1-4 cr [max 4 cr])

**CLCV 3994. Directed Research in Classical Civilization.** (1-4 cr [max 4 cr])

**CLCV 3996. Directed Instruction in Classical Civilization.** (1-4 cr [max 4 cr])

**CLCV 5120. Field Research in Archaeology.** (3 cr; §ARTH 5120, CHES 5120) Field excavation, survey, and research at archaeological sites in Minnesota. Techniques of excavation/exploration. Interpretation of archaeological materials.

**Classics (CLAS)**

**Department of Classical and Near Eastern Studies**

**College of Liberal Arts**


**Clinical Laboratory Science (CLS)**

**Department of Laboratory Medicine and Pathology**

**Medical School**

CLSV 5064. Introduction to Clinical Immunohematology. (2 cr; A-F only; §MEDT 4064, Prereq—#) Principles of blood grouping, antibody identification, compatibility testing, serology, and immunology.

CLSV 5065. Introduction to Clinical Immunohematology: Laboratory. (2 cr; A-F only; §MEDT 4065, Prereq—#) Exercises illustrating techniques in blood grouping, antibody identification, compatibility testing, and detection of antibodies by serological and immunological methods.

CLSV 5090. Special Laboratory Methods. (1-2 cr [max 2 cr]; A-F only; §MEDT 4090, Prereq—#) Assignment on an individual basis to one of a variety of special areas of experience in the clinical lab.

CLSV 5100. Virology, Mycology, and Parasitology for Medical Technologists. (2 cr; A-F only; §MEDT 4100. Prereq—microbiology course with lab, bioCHEM course) Lab diagnosis of viral, fungal, and parasitic infections. Lecture.

CLSV 5104. Principles of Diagnostic Microbiology: Lecture. (2 cr; A-F only; §MEDT 4104. Prereq—One microbiology course with lab, one biochemistry course, #) Current techniques used in lab diagnosis of infectious disease. Isolating/identifying bacteria and yeasts. Antimicrobial susceptibility testing. Lecture.

CLSV 5105. Principles of Diagnostic Microbiology: Laboratory. (2 cr; A-F only; §MEDT 4105. Prereq—One microbiology course with lab, one biochemistry course, #) Current techniques used in lab diagnosis of infectious disease. Isolating/identifying bacteria/ yeasts. Antimicrobial testing. Laboratory.

CLSV 5210. Seminar: Clinical Laboratory Science. (1 cr [max 3 cr]; S-N only, Prereq—#) Current literature. Presentation/discussion of research.

CLSV 5211. Journal Presentations. (1 cr [max 2 cr]; S-N only, Prereq—First year CLSV graduate student) Critical analysis, evaluation, discussion of current journal articles in student’s specialty area.

CLSV 5215. Practicum Teaching. (1-2 cr [max 2 cr]; A-F only, Prereq—#) Supervised teaching experience, develop skills using instructional materials, tests, and measurements.

CLSV 5217. Introduction to Management and Education I. (1 cr; A-F only; §MEDT 4127W, Prereq—#) Elements of Laboratory Administration. (2 cr; A-F only, Prereq—#) Leadership styles, employee selection and evaluation, communications, motivation, morale, discipline, job descriptions, record keeping, budgets, cost accounting, purchasing, product evaluation, lab safety, labor relations, government regulations.

CLSV 5219. Practicum in Laboratory Administration. (2 cr; A-F only, Prereq—#) Supervised experience and assignment of specific problems related to lab service and management in education in health care institutions.

CLSV 5140. Techniques for Teaching. (2 cr; A-F only, Prereq—#) Developing objectives, classroom activities, and evaluation criteria for medical technology education.

CLSV 5155. Advanced Clinical Hematology. (3 cr; A-F only, Prereq—#) Observation, study, and practice in special problems, advanced techniques, and methodology.

CLSV 5165. Advanced Clinical Immunohematology. (3 cr; A-F only, Prereq—#) Observation, study, and practice in special problems, advanced techniques, and methodology.

CLSV 5175. Advanced Clinical Chemistry. (3 cr; A-F only, Prereq—#) Observation, study, and practice in special problems, advanced techniques, and methodology.

CLSV 5251. Hematology I: Basic Techniques. (3 cr; A-F only, §MEDT 4251, Prereq—#) Theory and application of basic principles and techniques in clinical hematology and hemostasis. Lecture and lab.

CLSV 5252. Hematology II: Morphology and Correlation. (2 cr; A-F only; §MEDT 4252, Prereq—5251 or §MEDT 4251) Fundamentals of blood and bone marrow examination emphasizing microscopic identification of immature and abnormal cells. Clinical correlation of lab findings in hematology and hemostasis. Lecture and lab.

CLSV 5253. Hemostasis. (1 cr; A-F only; §MEDT 4253. Prereq—5251 or §MEDT 4251) Theory and application of specific concepts and techniques in hemostasis and coagulation. Lecture and lab.

CLSV 5254. Clinical Chemistry I: Lecture. (2 cr; A-F only; §MEDT 4310. Prereq—organic CHEM course with lab bioCHEM course, #) Principles and theory of clinical chemistry for assessing renal and metabolic disease/dysfunction, electrolyte balance, and acid-base balance. Principles and processes for quality management in the clinical lab.

CLSV 5311. Clinical Chemistry I: Laboratory Applications. (2 cr; A-F only; §MEDT 4311. Prereq—One organic chemistry course with lab, one biochemistry course, #) Application of clinical chemistry principles and laboratory techniques in the analysis of urine, plasma, and body fluids. Emphasis on laboratory tests to evaluate renal function, electrolytes, and acid-base balance. Introduction to principles and processes for managing test quality. Laboratory.

CLSV 5320. Clinical Chemistry II: Lecture. (2 cr; A-F only; §MEDT 4320. Prereq—organic CHEM course with lab, biochem course, §MEDT 4310, #) Topics vary by semester.

CLSV 5321. Clinical Chemistry II: Laboratory Applications. (2 cr; A-F only; §MEDT 4321. Prereq—organic CHEM course with lab, biochem course, §MEDT 4310, #) Application of clinical chemistry principles and lab techniques in analyzing serum, plasma, and urine. Focus on tests to evaluate selected disorders. Developing lab and instrumentation use skills with emphasis on quality control and technique.

CLSV 5768. Advanced Hematology. (6-10 cr [max 30 cr]; A-F only, Prereq—#) Practical experience collecting bone marrow from patients. Diagnosing hematological diseases by evaluating and interpreting cells from clinical specimens of bone marrow, peripheral blood, and, if applicable, lymph nodes.

CLSV 5864. Research Seminar. (1 cr [max 10 cr]; S-N only, Prereq—#) Departmental research seminar series.

CLSV 5865. Departmental Seminar. (1 cr [max 10 cr]; S-N only, Prereq—#) Departmental clinical lab research seminar series.

**College of Food, Agricultural & Natural Resource Sciences (CFAN)**

**CFAN 1000H. Honors Colloquium.** (2 cr [max 8 cr]; Prereq—Admission to honors program or #) Topics vary by semester.

**CFAN 1501. Biotechnology, People, and the Environment.** (3 cr; A-F only) Basic concepts in genetic engineering as a foundation for studying the impact of biotechnology on agriculture, medicine, industry, and the environment. Controversial aspects of biotechnology related to public policy issues are discussed.

**CFAN 1901. Topics: Freshman Seminar.** (1-3 cr [max 3 cr]; A-F only; Prereq—Freshman) Interdisciplinary seminar. Topics specified in Class Schedule.

**CFAN 1902. Topics: Freshman Seminar.** (3 cr; A-F only; Prereq—Freshman) Interdisciplinary seminar. Topics specified in Class Schedule.

**CFAN 1902H. Freshman Seminar.** (3 cr; Prereq—Fr) Topics will vary. See Class Schedule.

**CFAN 1903. Topics: Freshman Seminar.** (1-3 cr [max 3 cr]; A-F only; Prereq—Freshman) Interdisciplinary seminar. Topics specified in Class Schedule.
College of Liberal Arts (CLA)

CLA 1001. Introduction to CLA Student Life. (1 cr; S-N only)

CLA 1002. Topics in First-Year Seminar. (2 cr; Prereq–Freshman)

CLA 1050. Faculty Mentor Freshman Seminar. (2 cr; A-F only. Prereq–Freshman)
Discussions led by faculty mentors on liberal education, nature of University life, major exploration, study skills appropriate to various disciplines.

CLA 1101. SEAM First Year Seminar. (2 cr; A-F only. Prereq–SEAM)
Exploration of issues related to students’ academic/ career interests. Multiculturalism, other skills. Small- group discussions.

CLA 1102. SEAM First-Year Colloquium. (2 cr; A-F only. Prereq–SEAM)
Introduction to resources that enhance academic/ professional interests. Focus on multiculturalism. Small group discussions led by professional staff, guest speakers.

CLA 1103. Topics: Freshman Seminar. (1-4 cr [max 4 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.

CLA 1104. Topics: Freshman Seminar. (1-3 cr [max 3 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.

CLA 1105. Topics: Freshman Seminar. (3 cr; A-F only. Prereq–Freshman)
Freshman seminar. Topics specified in Class Schedule.

CLA 1106W. Topics: Freshman Seminar. (1-4 cr [max 4 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.

CLA 1201. Honors First-Year Seminar. (3 cr; Prereq–Freshman)
Introduction to resources that enhance academic/ professional interests. Focus on multiculturalism. Small group discussions led by professional staff, guest speakers.

CLA 1313. Topics: Freshman Seminar. (1-4 cr [max 4 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.

CLA 1301. SEAM First Year Seminar. (2 cr; A-F only. Prereq–SEAM)
Exploration of issues related to students’ academic/ career interests. Multiculturalism, other skills. Small- group discussions.

CLA 1302. SEAM First-Year Colloquium. (2 cr; A-F only. Prereq–SEAM)
Introduction to resources that enhance academic/ professional interests. Focus on multiculturalism. Small group discussions led by professional staff, guest speakers.

CLA 1303. Topics: Freshman Seminar. (1-4 cr [max 4 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.

CLA 1402. Topics: Freshman Seminar. (1-4 cr [max 4 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.

CLA 1403. Topics: Freshman Seminar. (1-4 cr [max 4 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.

CLA 1404. Topics: Freshman Seminar. (1-3 cr [max 3 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.

CLA 1405. Topics: Freshman Seminar. (3 cr; A-F only. Prereq–Freshman)
Freshman seminar. Topics specified in Class Schedule.

CLA 1406. Topics: Freshman Seminar. (1-4 cr [max 4 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.

CLA 1407. Topics: Freshman Seminar. (1-4 cr [max 4 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.

CLA 1408. Topics: Freshman Seminar. (1-4 cr [max 4 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.

CLA 1409. Topics: Freshman Seminar. (1-4 cr [max 4 cr]; A-F only. Prereq–Freshman)
Interdisciplinary seminar. Topics specified in Class Schedule.
Course Descriptions

COMM 3131. Leadership Theory and Practice. (3 cr; S-N only. Prereq—Student hired for leadership position in New Student Programs.) Preparation for New Student Program leadership position. Attitudes/skills with leadership and student life issues. Building authentic community.

COMM 3190H. Honors Course: Research Seminar in Communication. (3 cr; max [6 cr]; A-F only. Prereq—Honors candidate in comm.) Students conduct original research in rhetoric, communication theory, or media for honors thesis. Theory, methods, research writing.

COMM 3201. Introduction to Electronic Media Production. (4 cr; A-F only) Production/criticism of messages for electronic media. Theory/practice in planning, scripting, production, and criticism in various electronic media. Student productions in lab.

COMM 3204. Advanced Electronic Media Production. (4 cr; A-F only. Prereq—3201 or #) Video production medium integrating visual/audial aesthetics. Creation of broadcast-quality product integrating message creation, audience analysis, argument development, and visual/audio scripting. Utilization of media aesthetics to develop/shape discourse content.


COMM 3401. Introduction to Communication Theory. (3 cr. Prereq—1101) Social scientific theory in communication. Communication history; logic of scientific theories and communication types of theories in interpersonal, small group, organizational, intercultural, and electronically mediated communication.

COMM 3402. Introduction to Interpersonal Communication. (3 cr) Nature and function of communication between individuals in formal and informal relationships. Communicative interactions from theoretical and practical viewpoints.


COMM 3405. Language and Gender. (3 cr. [WOST 3305. Prereq—One women's studies course] Gender/communication. Interdisciplinary theory. Role of communication in creating, maintaining, reinforcing, and changing gender relations in society.

COMM 3406. Language and Sexual Diversity. (3 cr) Language use in lesbian, gay, bi-sexual, and transgender communities. Ways in which sexual diversity affects language use.

COMM 3409. Nonverbal Communication. (3 cr) Nonverbal communication in interpersonal communication process. Nonverbal codes (touch, space, facial expression, and their communicative functions (impression management, flirting, persuading, lying) in relational contexts (intimate relationships, friendships, work relationships). Theories, practices.

COMM 3411. Introduction to Small Group Communication. (3 cr) Cooperative thinking in task-oriented groups. Planning, preparing for, and participating in small groups in private and public contexts.

COMM 3422. Interviewing and Communication. (3 cr; A-F only. Prereq—1101 or #) Application of communication concepts in information interview process. Practical experience in planning, conducting, and evaluating informational, journalistic/elite, helping, persuasive, appraisal, and employment interviews. Class training and field experience.

COMM 3431. Persuasion Theories. (3 cr. Prereq—Soph recommended) Sociological, psychological, and communication perspectives. Theoretical knowledge applied to persuasion problems.

COMM 3441. Introduction to Organizational Communication. (3 cr. Prereq—1101 or equiv) Functions of communication in work groups, in organizational hierarchies, and between organizations.


COMM 3452W. Communication and the Intercultural Reentry. (3 cr. Prereq—Return from an intercultural experience) Intercultural experience explored through stories and story telling, participant observation, and social scientific theory. Constructs include identity, learning styles, cultural adaptation, values, ethics.

COMM 3601. Introduction to Rhetorical Theory. (3 cr. Prereq—1101) Theoretical systems intended to explain or direct the creation of public discourse. Traditional rhetoric to contemporary perspectives. Using theory to explain the practice of public discourse.

COMM 3605W. Persuasive Speaking and Speech Writing. (G3 cr. Prereq—Soph) Performance and composition with critical inquiry into rhetorical theories. Develops writing, thinking, and speaking skills.


COMM 3625. Communication Ethics. (3 cr; A-F only. Prereq—1101) Applying concepts/theories from philosophy and social science to ethical issues in interpersonal, group, organizational, intercultural, and media communication.

COMM 3631. Freedom of Speech. (3 cr) Communication theories and principles that underlie the concept of freedom of speech in the United States. A variety of contexts and practices are examined in order to understand how communicative interaction should be described and, when necessary, appropriately regulated.

COMM 3970. Directed Study. (1-3 cr; max [6 cr]; Prereq—One COMM course. A—Guided individual reading or study.

COMM 3980. Directed Instruction. (3 cr max [6 cr]; S-N only. Prereq—A) Supervised planning/teaching of undergraduate courses.

COMM 3990. Research Practicum. (1-3 cr; max [6 cr]) How communication research is designed, implemented, published, and evaluated. Focus is on working with senior faculty on their current research projects.

COMM 3995W. Major Project. (1-2 cr; max [2 cr]; S-N only. Prereq—COMM major, #) Individualized instruction leading to completion of senior project.

COMM 4231. Comparing Electronic Media Systems. (3 cr. Prereq—1101 or #) Historical, political, and sociological aspects of electronic media systems throughout the world, including United States, Canada, Great Britain, France, Germany, and Russia. Regulation and impact on political, social, and economic development.

COMM 4235. Electronic Media and Ethnic Minorities—A World View. (3 cr) Representation and involvement of various ethnic groups (e.g., African-Americans, Native Americans in United States and Canada, Maori, Turks in Europe) in radio, TV, cable, Internet. Roles of government, industry, public organizations, and minority groups in regulating, managing, and financing ethnic media activities.

COMM 4291. New Telecommunication Media. (3 cr; A-F only. Prereq—3211 or #) Development and current status of new telecommunication media such as cable TV, satellites, DRS, MDS, and video disk/cassettes. Technology, historical development, regulation, and programming of these media and their influence on individuals, organizations, and society.

COMM 4407. Communication and Conflict. (3 cr; A-F only. Prereq—3401 or #) Aspects of conflict common across types of relationships. Theories as alternative lenses to illuminate aspects of conflict. Communication strategies to manage or resolve conflict.

COMM 4452W. Intercultural Interaction: Theory and Application. (3 cr) Small group interaction across cultures for both international and U.S. students. Discussion, simulations, readings.

COMM 4471. Communication in Marriage and Family. (3 cr. Prereq—3401 or 3402 or #) Contemporary theories of marriage/family communication using life-cycle approach. Role/ function of communication in changing relational contexts. Ways of improving marriage/family relationships.

COMM 4602W. Contemporary Political Persuasion. (3 cr. Prereq—1101, 3431 or #) Contemporary political speech. Ideologies in political persuasion.

COMM 4616. African American Civil Rights Rhetoric. (3 cr. Prereq—Jr) Uses the struggle of African Americans to explore and analyze philosophical concepts, political issues, moral complexities, and discursive characteristics of civil rights rhetoric.

COMM 4621W. Rhetoric of Feminism. (3 cr. Prereq—4615 or #) History and criticism of the rhetoric of feminism from 19th century to the present.

COMM 5110. Special Topics in Communication Theory. (3 cr [max 6 cr]) Advanced theoretical problems. See department office for current offering.


COMM 5233W. Electronic Media and National Development. (3 cr) Use of electronic media to change social, political, economic, and cultural life. Use by developing nations to improve agricultural practices, hygienic standards, literacy, and awareness of civic responsibility.

COMM 5261. Political Economy of Media Culture. (3 cr. Prereq—3211 or #) Organizational practices of media communicators. Media content as link between communicators and audiences. How viewers use/process media content.
Civil War. to power. Speeches and public debates used to examine Discourse: 1630-1865.

Prereq–1101; 3601 recommended) contemporary period; application of theory to public

Survey of rhetorical theory from ancient to


How discourse has been used to establish or maintain power. Speeches and public debates used to examine U.S. public address from the mid 19th century to 1950.

COMM 5970. Directed Study. (1-3 cr [max 6 cr]; S-N only. Prereq–Nnr 3500-5500. Sppcr ch. #, A, O)

Guided individual reading or study.

COMM 5994. Communication Research Practicum. (1-3 cr [max 9 cr]; S-N only. Prereq–

Students participate in research group.

Comparative Literature (CL)

Department of Cultural Studies and Comparative Literature

College of Liberal Arts

CL 5331. Discourse of the Novel. (3 cr. §GSL 5331) Comparative study of the novel (eighteenth century to present): its relation to ordinary language practices, emergent reading publics, technologies of cultural dissemination, problems of subjectivity; its role in articulating international cultural relations.

CL 5555. Introduction to Semiotics. (3 cr. §GSL 5555) Problems of the nature of the sign; sign function; sign production; signifyings systems as articulated in philosophy, linguistics, anthropology, psychoanalysis, and art theory. Applying semiotics to various signifyings practices (e.g., literature, cinema, daily life).


CL 5910. Topics in Comparative Literature. (3 cr [max 24 cr])

Topics specified in Class Schedule.

CL 5982. Directed Reading in Comparative Literature. (1-3 cr [max 9 cr]. Prereq–

Guided individual reading and study.

Comparative Studies in Discourse and Society (CSDS)

Department of Cultural Studies and Comparative Literature

College of Liberal Arts

CSDS 5301. Society, Ideology, and the Production of Art. (3 cr. §GSL 5301) Recent critical theories of relation of art to social/ideological forces. Selected artifices from Western culture (e.g., Renaissance to 20th century; high, popular, mass culture). Music, visual art, literature.

CSDS 5302. Aesthetics and the Valuation of Art. (3 cr. §GSL 5302) Society, ideology, aesthetic value in light of recent critical theories of visual art, music, literature. Mediations of place, social class, gender, ideology on aesthetic judgment in post-renaissance Western culture.

CSDS 5555. Introduction to Semiotics. (3 cr)

Problems of the sign. Sign function/production. Signifying systems as articulated in philosophy, linguistics, anthropology, psychoanalysis, and art theory. Applying semiotics to various signifyings practices (e.g., literature, cinema, daily life).

CSDS 5751. Basic Concepts of Cinema. (4 cr. §GSL 5751, CSDS 5751) Cinema as object of theoretical/historical analysis. Emphasizes concepts that have transformed scope/aim of film analysis since 1960s. Readings of filmic/theoretical texts.

CSDS 5910. Topics in Comparative Studies in Discourse and Society. (3 cr [max 24 cr]) Themes in comparative, sociohistorical analysis of discursive practices. Individually or team taught. Topics specified in Class Schedule.

CSDS 5993. Directed Study. (1-3 cr [max 9 cr]. Prereq–

Guided individual reading and study.

Computer Science (CSCI)

Department of Computer Science

Institute of Technology


CSCI 1107. Introduction to FORTRAN Programming for Scientists and Engineers. (3 cr. Prereq–MATH 1271 or MATH 1371 or #) Algorithm development and principles of computer programming using FORTRAN. Emphasizes numerical methods for science and engineering applications.

CSCI 1109. C# Programming. (1-3 cr [max 3 cr]) Provides credit for transfer students who have taken a freshman or sophomore-level C# class.

CSCI 1113. Introduction to C++ Programming for Scientists and Engineers. (4 cr. Prereq–MATH 1271 or MATH 1371) Programming for scientists/engineers. C/C++ programming constructs, object-oriented programming, software development, fundamental numerical techniques. Exercises/examples from various scientific fields.

CSCI 1121. Introduction to the Internet. (4 cr. A-F only) Concepts of the internet, analog vs digital communication, networking, packet switching, software protocols. E-mail, search engines, file transfer (ftp), remote login (Telnet). Creating Web pages using HTML and Cascading Style Sheets. Advanced programming concepts such as Java, Perl, and CGI.

CSCI 1901. Structure of Computer Programming I. (4 cr. Prereq–MATH 1271 or equiv or #) Principles of programming. Different programming paradigms (message-passing, data-driven, event-driven). Students develop algorithms/data types using language such as Scheme and techniques such as abstraction, procedures, recursion, iteration.

CSCI 1902. Structure of Computer Programming II. (4 cr. Prereq–1901 or #) Object-oriented programming using language such as C++ or Java. Builds on 1901, presenting additional data structures/algorithms. Object-oriented approach to implement data structures/operations as abstract data types.

For definitions of course numbers, symbols, and abbreviations, see page 300.
Course Descriptions


CSCI 2031. Introduction to Numerical Computing. (4 cr. §CSCI 5031. Prereq–Math 2243 or #) Introduction to numerical computing for CSci, mathematics, and science/engineering students. Uses Mathematica or Matlab to cover numerical error, root finding, systems of equations, interpolation, numerical differentiation and integration, least squares, and differential equations.

CSCI 2121. Introduction to the Internet 2. (4 cr.; A-F only; Prereq–1121) Programming for the Internet using HTML, JavaScript, and Perl. CGI, database programming with Perl. Database concepts such as relational vs object-oriented database technologies, querying data using SQL. Interfacing databases to the Web, E-commerce, emerging trends such as XML.

CSCI 2980. Special Topics in Computer Science. (1–4 cr.; A-F only; Prereq–#) Special topics. Lectures, informal discussions.

CSCI 3003. Introduction to Computing in Biology. (3 cr. Prereq–1002H or BIOL 1002 or 100H or BIOL 1003 or equiv or #) Emphasizes computing tasks common in biology. Programming techniques: variables, flow control, input/output, strings, pattern matching, arrays, hash tables, functions, subroutines. Concepts in computing: algorithms, complexity, documentation, regular expressions/grammar, local variables, encapsulation. Students complete lab projects in Perl language.

CSCI 3081W. Program Design and Development. (4 cr. §CSCI 4081W; CSCI 4089. Prereq–[1902, 2021] or #) Principles of programming design/analysis. Concepts in software development. Use of C/C++ language to illustrate key ideas in program design/development, data structures, debugging, files, I/O, state machines, testing, and coding standards.

CSCI 3921W. Social, Legal, and Ethical Issues in Computing. (3 cr. Prereq–at least soph or #) Impact of computers on society. Computer science perspective of ethical, legal, social, philosophical, political, and economic aspects of computing.

CSCI 3970. Industrial Student Co-op Assignment. (2 cr. [max 4 cr.]; S-N only. Prereq–CSCI, in co-op program, #) Industrial work assignment in a co-op program involving advanced computer technology. Reviewed by a faculty member. Grade based on final written report.

CSCI 3980. Undergraduate Colloquium. (1 cr. [max 2 cr.]) Prereq–Upper div CSCI; can be repeated for cr) Current computing trends and hot topics; industrial and career related topics; research topics; research projects and undergraduate research opportunities; graduate school options.


CSCI 4061. Introduction to Operating Systems. (4 cr. Prereq–2021 or EE 2361; no cr or grad in CSCI) Foundations of operating systems. History/evolution of operating systems, shells, tools, memory organization, file-system overview, I/O, concurrent processes, interprocess communication.

CSCI 4107. Introduction to Computer Graphics Programming. (3 cr. §CSCI 5107, Prereq–4041 or #; cannot be taken for grad CSCI cr) Theory/practice of computer graphics programming using C/C++ and OpenGL. Practical concepts in computer graphics modeling, rendering, and animation. Emphasizes effective use of graphics toolkits.


CSCI 4203. Computer Architecture. (4 cr. §EE 4363, EE 5361. Prereq–2021 or #) Introduction to computer architecture. Aspects of computer systems, such as pipelining, memory hierarchy, and input/output systems. Performance metrics. Examines each component of a complicated computer system.

CSCI 4211. Introduction to Computer Networks. (3 cr. §CSCI 5211. Prereq–4041 or #; basic knowledge of [computer system.] Programming.) Introduction to computer networks. Layered network architectures, data link protocols, local area networks, routing, transport, network programming interfaces, networked applications. Examples from Ethernet, Token Ring, TCP/IP, HTTP, WWW.

CSCI 4707. Practice of Database Systems. (3 cr. §CSCI 5707, NET 4707. Prereq–4041 or #) Concepts, conceptual data models, case studies, common data manipulation languages, logical data models, database design, facilities for database security/integrity, applications.

CSCI 4921. History of Computing. (3 cr. §HSCI 4321) Development in last 150 years; evolution of hardware and software; growth of computer and semiconductor industries and their relation to other businesses; changing relationships resulting from new data-gathering and analysis techniques; automation; social and ethical issues.

CSCI 4950. Senior Software Project. (3 cr. [max 6 cr.]) Prereq–Upper div CSCI. #) Student teams develop a software system, distribute system to users, and extend/maintain it in response to their needs. Software engineering techniques. Software development, team participation, leadership.

CSCI 4970W. Advanced Project Laboratory. (3 cr. [max 9 cr.]) Prereq–Upper div CSCI, 4061, #; cannot be taken for grad cr) Formulate and solve open-ended project: design, implement, interface, document, test. Team work strongly encouraged. Arranged with CSCI faculty.

CSCI 4980. Special Topics in Computer Science for Undergraduates. (1–3 cr. [max 9 cr.]; A-F only; Prereq–Undergrad; #) No for cr or grad in [CSCI or CompE]. Lectures and informative discussions on current topics in computer science.

CSCI 5103. Operating Systems. (3 cr. Prereq–4061 or #) Conceptual foundation of operating system designs and implementations. Relationships between operating system structures and machine architectures. UNIX implementation mechanisms as examples.

CSCI 5104. System Modeling and Performance Evaluation. (3 cr. Prereq–5103 or #) Techniques for modeling computing systems for performance evaluation through analytical/simulation techniques. How to model computing systems and communications protocols to evaluate their performance under different operating conditions.

CSCI 5106. Foundations of Modern Operating Systems. (3 cr. Prereq–5103 or #) Advanced concepts that build foundations of modern operating systems. Advanced scheduling algorithms, distributed communication/synchronization, consistency/replication models, distributed file systems, security, protection/virtualization, OS architectures.

CSCI 5106. Programming Languages. (3 cr. Prereq–4011 or #; Design and implementation of high-level languages. Course has two parts: (1) language design principles, concepts, constructs; (2) language paradigms, applications. Note: course does not teach how to program in specific languages.


CSCI 5109. Visualization. (3 cr. Prereq–1902, 4041 or equiv or #) Fundamental theory/practice in data visualization. Emphasizes programming applications. Volume visualization, vector field visualization, information visualization, multivariate visualization, visualization of large datasets, visualization in immersive virtual environments, and perceptual issues in effective data representation. Projects are implemented in C++ using VTK or similar visualization API.

CSCI 5115. User Interface Design, Implementation and Evaluation. (3 cr. Prereq–4041 or #) Theory, design, programming, and evaluation of interactive application interfaces. Human capabilities and limitations, interface design and engineering, prototyping and interface construction, interface evaluation, and topics such as data visualization and World Wide Web. Course is built around a group project.

CSCI 5116. GUI Toolkits and Their Implementation. (3 cr. Prereq–5115 or 5107 or #) Structure and design of user interface toolkits and frameworks. Aspects of GUI toolkits (e.g., window system protocols, event processing, geometry management, resource management, data management, constraints). Course is built around implementation assignments and case studies of toolkits.
Course Descriptions


CSCI 5403. Computational Complexity. (3 cr. Prereq–4041 or #) Computational models, complexity measures in each model, and related complexity classes.


CSCI 5425. Introduction to Parallel Computing. (3 cr. Prereq–4041 or #) Parallel architectures design, embeddings, routing, examples of parallel computers, fundamental communication operations, performance metrics, parallel algorithms for sorting, matrix problems, graph problems, dynamic load balancing, types of parallelisms, parallel programming paradigms, message passing programming in MPI, data parallel programming in HFT, shared-address space programming in threads.

CSCI 5426. Introduction to Parallel Computing. (3 cr. Prereq–4041 or #) Parallel architectures design, embeddings, routing, examples of parallel computers, fundamental communication operations, performance metrics, parallel algorithms for sorting, matrix problems, graph problems, dynamic load balancing, types of parallelisms, parallel programming paradigms, message passing programming in MPI, data parallel programming in HFT, shared-address space programming in threads.

CSCI 5471. Computer Vision. (3 cr. Prereq–2011, 4041, [familiarity with number theory or finite fields] or #) Introduction to computer vision. Theoretical foundations, practical applications. Threats, attacks, and countermeasures, including cryptosystems and cryptographic protocols. Secure systems/heterogeneous networks. History of cryptography, encryption (conventional, public key), digital signatures, hash functions, message authentication codes, identification, authentication, applications.


CSCI 5512W. Artificial Intelligence II. (3 cr. §CSCI 5519. Prereq–5511 or #) Advanced topics in AI for solving complex problems. Machine learning (symbolic/neural networks approaches), genetic algorithms, reasoning with uncertainty, utility theory and decision theoretic methods, natural language processing, perception, robotics, introduction to Prolog programming language.

CSCI 5519. Artificial Intelligence II (non-W). (3 cr. §CSCI 5512W. Prereq–5511 or #) Advanced topics in AI for solving complex problems. Machine learning (symbolic and neural networks approaches), genetic algorithms, reasoning with uncertainty, utility theory and decision theoretic methods, natural language processing, perception, robotics, introduction to Prolog programming language.


CSCI 5523. Introduction to Data Mining. (3 cr. Prereq–4041 or #) Data pre-processing techniques, data types, similarity measures, data visualization/exploration. Predictive models (e.g., decision trees, SVM, Bayes, K-nearest neighbors, bagging, boosting). Model evaluation techniques, Clustering (hierarchical, partitional, density-based, association analysis, anomaly detection. Case studies from areas such as earth science, the Web, network intrusion, and genomics. Hands-on projects.

CSCI 5525. Machine Learning. (3 cr. Prereq–Grad student or #) Models of learning. Supervised algorithms such as perceptrons, logistic regression, and large margin methods (SVMs, boosting). Hypothesis evaluation. Learning theory. Online algorithms such as winnow and weighted majority. Unsupervised algorithms, dimensionality reduction, spectral methods, Graphical models.

CSCI 5541. Natural Language Processing. (3 cr. #CSCI 5511 or #) Elements of linguistic analysis for speech and unstructured text. Phonology, syntax, parsing, semantic interpretation, information extraction. Techniques for modeling uncertainty in linguistic analysis: probabilistic models, Hidden Markov Models (HMMs), Dynamic Bayes Nets (DBNs), Probabilistic Context-Free Grammars (PCFGs), Discounting and backoff smoothing, Maximum entropy modeling. Elements of information theory: entropy, perplexity, metrics for comparing models.

CSCI 5551. Introduction to Intelligent Robotic Systems. (3 cr. #CSCI 5511 or #) Transformations, kinematics/inverse kinematics, dynamics, control. Sensing (robot vision, force control, tactile sensing), applications of sensor-based robot control, robot programming, mobile robotics, and micro robotics.


CSCI 5561. Computer Vision. (3 cr. Prereq–5511 or #) Issues in perspective transformations, edge detection, image filtering, image segmentation, and feature tracking. Complex problems in shape recovery, stereo, active vision, autonomous navigation, shadows, and physics-based vision. Applications.

CSCI 5707. Principles of Database Systems. (3 cr. §CSCI 4707, NET 4707, Prereq–4041 or #) Concepts, database architecture, alternative conceptual data models, foundations of data manipulation/analysis, logical data models, database design, models of database security/integrity, current trends.


Course Descriptions

CSCI 5802. Software Engineering II, (3 cr. Prereq–5801 or #) Introduction to software testing, software maturity models, cost estimation models, bug estimation, software reliability models, software complexity, quality control, and experience report. Student groups specify, design, implement, and test partial software systems. Application of general software development methods and principles from 5801.

CSCI 5980. Special Topics in Computer Science, (1-3 cr [max 9 cr], Prereq–#; may be repeated for cr) Lectures and informal discussions on current topics in computer science.

CSCI 5991. Independent Study, (1-3 cr [max 9 cr], Prereq–#; may be repeated for cr) Independent study arranged with CS faculty member.

CSCI 5994. Directed Research, (1-3 cr [max 3 cr], Prereq–#; may be repeated for cr) Directed research arranged with faculty member.

CSCI 5996. Curricular Practical Training, (1 cr [max 3 cr]; S-N only, Prereq–[CSCI or COMP] major, #) Industrial work assignment involving advanced computer technology. Reviewed by faculty mentor. Grade based on final report covering work assignment.

Construction Management (CMGT)

College of Continuing Education

CMGT 2019. AutoCAD for Construction Managers, (2 cr; S-N only, Prereq–Prep 20-30 sem cr) AutoCAD software skills. Techniques of computer-aided design and drafting (CAD) at job entry level. Lecture, lab.


CMGT 3011. Construction Plan Reading, (2 cr) Intro to construction plan reading and construction documents (using architectural, civil, mechanical, electrical drawings and project manual). Read, understand, and interpret commercial construction plans and project manuals, including notes, symbols, and plan layout.


CMGT 4013. Legal and Ethical Issues in Construction, (3 cr, Prereq–4011 or equiv or #) Role of construction management professional in society. Principles of conduct for construction management professional, goals in professional performance/behavior, reviews of mandatory requirements.


CMGT 4018. E-Business in Construction, (2 cr; A-F only) Selection/implementation of Web-based project management tools. Software such as Bicicon, E-builder, Bricnet, Constructware, Frametech. Hands-on work with live building sites. Digital technologies in construction industry. Wire/wireless communication, online plan/bid rooms, mobile computing, video conferencing.


CMGT 4025. Computer-Based Construction Planning and Scheduling, (2 cr; A-F only, Prereq–[4021, upper div] or #) Project planning, scheduling, and control. Considering/understanding alternatives. Industry techniques such as critical path method. Updating/analyzing project schedules.


CMGT 4027. Computer-Based Project Management, (2 cr, Prereq–CE 4101 or equiv or #) Practical application of construction project management using computer software. Students manage one or two real projects through all phases of construction. Planning, scheduling, budgeting, estimating, staffing projections, cost control, communication tools.


CMGT 4041. Specifications and Technical Writing for Construction Professionals, (3 cr, Prereq–4011 or #) Develop/enhance appropriate oral/written communication necessary for use in the construction process from planning phase through contract closeout. Develop construction-specific practical applications to facilitate the process and avoid common pitfalls.

CMGT 4051. Construction Materials for Managers, (3 cr, Prereq–3001, [AEM 2011 or CE 3001 or CE 3101], 45 sem cr) Concepts of physical properties. Behavior mechanisms for construction materials such as concrete, aggregate, steel, and wood. Standard specifications for material properties. Lab techniques for evaluation of each material.

CMGT 4111. Construction Productivity Management, (2 cr, Prereq–4023, 4222, CE major) How to manage/supervise a project to maximize effectiveness/efficiency. Applying theoretical concepts of improving productivity in people, materials, equipment, and processes via on-going case study. Leadership/communication as applied to construction industry.

CMGT 4193. Directed Study, (1-4 cr [max 16 cr], Prereq–CMGT major or minor or certificate student) Topic arranged with BAS construction management academic adviser.

CMGT 4196. Construction Management Internship, (1-4 cr [max 12 cr], Prereq–[CMGT major or minor or certificate student], [jr or sr], A) Hands-on work experiences in a construction company, applying coursework in the work place, contributing knowledge of best practices, and participating in career development and experiences.

CMGT 4201. Construction Accounting, (3 cr, Prereq–3001, ACCT 2050, ABUS 4101) Unique characteristics and dissimilarities crucial for all parties involved to understand/manage the construction process. Unique aspects of construction financial accounting, managerial accounting, tax planning, and auditing.

CMGT 4550. Topics in Construction Management, (3 cr [max 9 cr]; A-F only) Topics in construction management.

CMGT 4572. Structural Frames and Building Design/Construction, (3 cr, A-F only, Prereq–3001, [AEM 2011 or CP 3001 or CP 3101]) Basic contemporary structural systems in masonry, steel, and wood framing systems. Forms/ performance of systems.

CMGT 4901. Communication and the Construction Process, (2 cr, Prereq–45 sem cr) Traces construction project from client’s idea to completion. Interaction skills that construction managers need to deliver a building project through the hoops, hurdles, and pitfalls of its lifecycle. Managerial written/oral communication skills/techniques. Guest speakers, student debates in mock situations.

Coptic (COPT)

Department of Classical and Near Eastern Studies

College of Liberal Arts

COPT 5001. Elementary Coptic, (3 cr) Introduction to Coptic grammar and vocabulary, chiefly in the Sahidic dialect.

COPT 5002. Elementary Coptic, (3 cr, Prereq–5001 or equiv) Reading a variety of Coptic literature, such as Gnostic, martyrological, or monastic texts.