forms of chromatography for the separations of biomolecules, especially proteins, will be introduced. Some emphasis will be placed on preparative methods on a scale applicable to the present developments. 2 lec.

483 Biomedical Engineering (3)
Prereq: jsr in engineering, chem, physics, biol. Biomedical engineering with an emphasis on cell and tissue engineering.

492 Special Investigations (1-3, max 9)
Prereq: perm. Individual or small-group work, under staff guidance, in research or advanced study in particular field of chemical engineering. (Only three hours of special investigations in any one area can be counted towards the CHE technical elective requirement.)

493 Intercollegiate Design Competition (1-3, max 9)
Individual or small group participation, under faculty guidance, in regional or national student design competition. (A maximum of three credit hours may be applied toward the CHE technical elective requirement.)

499 Chemical Engineering Senior Assessment (1)
Prereq: 443. Assessment of skills, behaviors, and attitudes of students graduating in chemical engineering. Examination of retention from prerequisite courses. Readings and discussion of professional responsibilities, the impact of engineering solutions in a global and societal context, the need for lifelong learning, and knowledge of contemporary issues. 1 rec.

Engineering, Civil (CE)

200 Civil Engineering Fundamentals (1)
Prereq: Coreq. of civil engineering profession and specialization areas, value of professional organizations and lifelong learning, introduction to departments and facilities, description of curriculum, and advising responsibilities. 1 rec.

201 Civil Engineering Computational Techniques (3)
Prereq: MATH 263A or concurrent. (spring) Introduction to methods of problem solving, use of computers for calculations, applications or problem solving to civil engineering. 3 lec.

210 Plane Surveying (4)
Prereq: MATH 163 or MATH 263A, or perm. (fall, spring) Basic theory and field practice in measurement of distance, elevation, and angle; introduction to data reduction methods. 3 lec, 1 lab.

220 Statics (4)
Prereq: MATH 263C, PHYS 251. (fall, winter, spring) Laws of equilibrium of forces, friction, centroids, and moment of inertia. 4 lec.

222 Strength of Materials (4)
Prereq: grade of C or better in 220. (fall, winter, spring) Simple stresses and strains, bending theory, beam deflection, columns, and combined stresses. 4 lec.

223 Strength of Materials Laboratory (1)
Prereq: 222 or with 222. (fall, winter, spring) Testing of various materials under axial compression, tension, flexure, torsion, impact, and fatigue. Use of electrical, mechanical, and photoelastic strain measuring equipment. 2 lab.

311 Route Engineering (3)
Prereq: 210. (winter) Horizontal and vertical curves; geometric design of highways; earth-work distribution. 3 lec.

316 Construction Engineering and Management (3)
Prereq: Jr, (fall) Overview of civil engineering and management, project funding, bidding and selection process, design and construction of complex and negotiated contracts, planning and scheduling, estimation, equipment productivity and safety. 3 lec.

330 Structural Theory I (5)
Prereq: 221. (fall) Determinacy requirements; analysis of statically determinate structures; influence lines; deflections; introduction to analysis of statically indeterminate structures. 5 lec.

331 Structural Theory II (3)
Prereq: C or better in 330. (winter) Indeterminate conditions for structures; slope deflection method; moment distribution method; influence lines; introduction to computer methods. 3 lec.

340 Fluid Mechanics (4)
Prereq: C or better in ME 224. (fall, winter, spring) Statics and dynamics of various types of non-viscous, Newtonian fluids, dimensional analysis and similitude, pipe flow, principles of lift and drag, introduction to boundary layer flow. 4 lec.

341 Fluid Mechanics Laboratory (1)
Prereq: 340 or with 340. (fall, winter, spring) Lab techniques, calibration principles, fluid and flow measurements, and design of laboratory equipment. 1 lab.

342 Applied Hydraulics (3)
Prereq: C or better in 340. (spring) Flow and pressure distribution in multiple networks, dynam- ics of flow in pumps and turbines, uniform and nonuniform flow in open channels, culvert hydraulics, hydraulic transients. 3 lec.

343 Hydrology (3)
Prereq: 340, ISE 304 or with ISE 304. (spring) Hydrologic cycle. Precipitation and runoff data; groundwater hydraulics; infiltration; peak runoff calculations. Application to water resource problems. 3 lec.

353 Basics of Environmental Engineering (3)
Prereq: jr. (spring) Introduction to civil engineering with emphasis on transportation planning concepts and multi-modal design elements. 3 lec.

370 Geotechnical Engineering (4)
Prereq: 222, 340, GEOL 283, or concurrent with 340. (winter) Soil compositions, physical and chemical properties, and classification; stress movement and seepage problems; consolidation and shear strength; applications to earth structures, retaining walls, slope stability, bearing capacity, and settlement. May be taken as 570 for grad credit except by civil engineers. 4 lec.

371 Soil Engineering Laboratory (1)
Prereq: 370 or concurrent with 370. (winter) Classification of soils and determination of their properties through tests; grain size analysis, Atterberg limits, relative density, Proctor testing, permeability, direct shear, and consolidation. 2 lab.

380 Civil Engineering Materials (3)
Prereq: 222. (spring) Engineering properties of materials used in construction, including applications including metals, concrete, timber, and composites. 3 lec.

400 Societal Concerns in Civil Engineering (3)
Prereq: senior. (fall) Engineering economy, codes, variances, alternative designs, and public meetings. 2 lec.

410 Applied Property Surveying (3)
Prereq: 210. (spring) Triangulation, astronomical observations, land surveying, instrument adjustments, special topics. 2 lec, 3 lab.

415 Geodetic Surveying (3)
Prereq: 210 or perm. (winter) Astronomical observations and methods used in GPS and photogrammetry to establish horizontal and vertical control for objects. 3 lec.

416 Construction Estimating (3)
Prereq: 316. (winter) Methods used to elaborate construction estimates, techniques to prepare and understand the components of a bid, and conduct manual and computer-aided take-off and pricing. 3 lec.

417 Construction Planning and Scheduling (3)
Prereq: 316. (spring) Techniques and applications of all aspects of the construction scheduling process, including computer modeling on scheduling construction projects, development of work breakdown structures, selection of elements of the construction project schedule, linear scheduling methods for heavy construction, use of real-world examples in civil engineering and applications using Primavera Project Planner. 3 lec.

418 Construction Administration (3)
Prereq: 316. (winter). Aspects of construction administration, including project funding, contractor cash disbursements, contract provisions, construction economics, borrowing practices, concepts and explanations of financial documents and reporting requirements, overview of fundamentals and construction marketing practices. 3 lec.

423 Continuum Mechanics (4)
Prereq: perm. (demand) Matrix methods in mechanics and structures; laws of dynamics; mechanical properties of solids and fluids; basic theories of continuum mechanics. Grad course open to selected undergrads. 4 lec.

424 Strength of Materials II (3)
Prereq: C or better in 222. (fall) Unsymmetrical bending, shear centers, columns, and bending and buckling. Continuation of basic topics usually taught in Strength of Materials I. 3 lec.

431 Experimental Methods in Soil Dynamics (3)
Prereq: perm. Modal analysis of structural models to identify their vibration characteristics. Frequency response functions using dual-channel signal analyzers. Modulation measurement techniques. Modal parameter extraction techniques. Computer-aided structural dynamics. Grad course open to selected undergrads. 2 lec, 3 lab.

432 Structural Design in Concrete (4)
Prereq: C or better in 330. (winter) Materials and properties of concrete; design methods; strength of rectangular sections subject to bending moments, axial loads, and shear forces either separately or in combination; continuity in concrete construction; design of one-way slabs; design of T-sections in bending; deflection calculations; footing design. 4 lec.

433 Structural Design in Steel (4)
Prereq: C or better in 330. (spring) Materials and properties of steel; design methods; steel design members; structural fasteners; design of compression members, beams, trusses, and frames. 4 lec.

434 Advanced Structural Design (3)
Prereq: 422 or 433, or perm. (fall) Design of complete structures or major components of structures. 3 lec.

437 Timber Design (3)

438 Prestressed Concrete Design (3)
Prereq: 422 or 433, or perm. (fall) Analysis and design of complete structures or major components of reinforced concrete, structural steel, and/or other applicable materials by using computers. Material reports and cost estimation of projects. 1 lec, 4 lab.

445 Flow Routing (3)
Prereq: 342 or perm. (demand) Gradually varied flow computations, use of computer software programs for flow routing, and their engineering applications. 3 lec.

450 Water Treatment (3)
Prereq: 342, 343, CHEM 123. (fall) Sources and collection of public water supplies; principles of treatment processes. 3 lec.

451 Wastewater Treatment (3)
Prereq: 342, 343, CHEM 123. (winter) Quantities and collection of municipal wastewater; principles of treatment processes. 3 lec.

452 Water and Wastewater Analysis (3)
Prereq: CHEM 123, (fall) Lab methods and interpretation of results for chemical and microbiological examination of water and wastewater. 2 lec, 3 lab.

453Solid/Hazardous Waste Management (3)
Prereq: CHEM 123 or 153 and sr. (fall) Application of engineering principles to chemical processing systems to reduce or eliminate discharges which have a negative impact on environmental systems; Investigations into green building practices and sustainability including use of novel or recycled materials, energy management and efficiency, water use/reuse, and indoor air quality. 3 lec.
454 Green Engineering (3)
Prereq: sr. (perm.) Identification, classification, and study of methods of characterization, handling, treating, managing, and disposal of solid/hazardous wastes regulated under federal and state guidelines and legislation. 3 lec.

457 Water Resources Engineering (3)
Prereq: Chem 325 or perm. (fall) Basic engineering course designed to provide integrated treatment of water resources engineering, including hydrological measurements, runoff, groundwater, water law, reservoir design, frequency analysis, planning, flood control. Systems approach to multiple water resource projects emphasized. 3 lec.

458 Water Quality Engineering (3)
Prereq: perm. (winter) Natural and man-made characteristics of water quality, changes in quality resulting from use, criteria for control of stream pollution, methods of improving water quality, also legal, economic, and institutional aspects. Grad course open to undergrads. 3 lec.

462 Traffic Engineering (3)
Prereq: 361; major or perm. (winter) Traffic parameters, traffic data collection, capacity analysis of freeways, signalized intersections. Design 3 lec.

471 Foundation Engineering (3)
Prereq: 370. (fall) Design and construction problems in soil engineering; subsurface investig- ations, determination of foundation and design criteria, principles of design of shallow and deep founda- tions; site improvement. 3 lec.

474 Soil Mechanics Laboratory (1)
Prereq: perm. (spring) Advanced techniques for measurement of soil engineering properties. Grad course open to selected undergrads. 3 lab.

476 Soil Stabilization (4)
Prereq: perm (spring) Engineering, geological, and pedological soil classification systems. Mineralogy of clay minerals and clay-water systems; requirements for and factors affecting soil stability. Methods and mechanics of soil stabilization; designing and testing stabilized soils. 3 lec., 3 lab.

482 Paving Materials and Mixtures (3)
Prereq: 311; perm. (spring) Aggregates, chemical behavior, tests, specifications, and use of bitumino- nuous materials, Portland cements, and aggregates in cements. Design and manufacture of paving mixtures and construction of pavements. Grad course open to selected undergrads. 2 lec, 3 lab.

483 Principles of Pavement Design (3)
Prereq: perm. (spring) Advanced pavement design. Loads and stresses in pavements. Properties in pavement components and design tests. Design methods and evaluations. 3 lec.

490 Special Investigations (1–5)
Prereq: perm. Special investigation or problems not covered in formal courses. Permits well-qualified student to pursue individual study under direction of faculty member.

49A Senior Design—Land Development (4)
Prereq: 210, with 211. (fall, spring) App. An advanced applied engineering course utilizing multiple funda- mental civil engineering courses as applied to land development. CE 491A is a Tier III equivalent course.

49B Senior Design—Environmental/Water Resources (4)
Prereq: 450, with 451. (perm. or. winter) An advanced applied engineering course utilizing combined concepts of water/wastewater treatment and hydraulic/hydrological sciences as applied to society’s needs. CE 491B is a Tier III equivalent course.

49C Senior Design—Structures and Foundations (4)
Prereq: 370 and 432 or 433, or perm. (spring) A civil engineering design elective integrating fundamental concepts from design courses for foundation and structural design, analysis, and drawing. CE 491C is a Tier III equivalent course.

49D Senior Design—Special Project (4)
Prereq: 370 and perm. An advanced applied engi- neering course integrating several major disciplines of civil engineering in a design project. CE 491D is a Tier III equivalent course.

49E Undergraduate Research Experience (3)
Prereq: perm. (fall, winter, spring) Students participate in an independent and original laboratory research project under the close supervision of a faculty advisor. This entails familiarizing with relevant civil engineering literature, laboratory work, preparation of a report, and presentation of a departmental seminar.

Engineering, Electrical (EE)

101 Introduction to Electrical Engineering (4) (2A)
Prereq: MATH 113 or placement level 2. (fall, winter) The goal of this course is to introduce students to the profession of electrical engineering. Students will develop a knowledge of key technical aspects of electricity: voltage, current, resistance, and power. In addition, students will study the fundamentals of Boolean algebra, professional values, and methods of electrical engineering. Lab work provides hands-on experience with electrical systems. 3 lec, 2 lab.

102 Introduction to Computer Engineering (4)
Prereq: MATH 113 or placement level 2. (fall, winter) The goal of this course is to introduce students to the field of computer engineering. Students will develop a knowledge of the fundamentals of computer architecture, binary arithmetic, characteristics of logic gates, and flip-flops. Lab work provides hands-on experience with digital systems. 3 lec, 2 lab.

103 Introduction to Electrical and Computer Engineering Design (4)
Prereq: EE 101, 102, and CS 210, or 220A, or ET 181. (fall, winter) The goal of this course is to introduce students to design in electrical engineering. Students will develop an understanding of the design process, circuit design principles. Students will also develop a knowledge of computer organization and an ability to perform assembly language programming. Lab work provides students an opportunity to apply design principles on a major project. 3 lec, 1 lab.

210 Foundations of Electrical and Computer Engineering I (4)
Prereq: 101 and MATH 263A. (fall, winter) Basic concepts and definitions, units, DC circuit analysis, Kirchoff’s laws, mesh analysis, nodal analysis, network theorems, inductance and capacitance, and simple RC and RL circuits with an emphasis on developing problem-solving skills. Students will be expected to have, and be able to demonstrate, a firm “understanding” of these topics as well as a mastery of basic problem-solving skills. In addition, there will be an emphasis on being able to make an effective technical presentation.

211 Foundations of Electrical and Computer Engineering II (4)
Prereq: 210 and MATH 263B. (spring) Continuation of 210. RC and RL circuits, Laplace Transforms, State-Variables, Fourier Analysis, AC circuit analysis, electromagnetic waves, Fourier transforms, and problem-solving skills. Lab work provides students an opportunity to apply design principles on a major project. 3 lec, 2 lab.

212 Foundations of Electrical and Computer Engineering III (4)
Prereq: 211 and MATH 263C. (spring) Advanced DC circuits, polyphase circuits, magnetically coupled circuits, frequency domain, filters, Fourier transforms, and problem-solving skills. Lab work provides students an opportunity to apply design principles on a major project. 3 lec, 2 lab.

321 Electromagnetics and Materials I (4)
Prereq: 321, 343, or 361. (fall) Designed to develop in students an understanding of Maxwell’s equations through an overview of properties of materials, metamaterials, magnetostrictics, and magnetostatics and electrodynamics.

322 Electromagnetics and Materials II (5)
Prereq: 321. (fall) Continuation of previous course. Discussion of time-varying, electromagnetic fields. Application of field theory to solution of problems from various branches of electrical engineering with emphasis upon physical interpretation. Included are relation of field theory to circuit theory, Poynting’s theorem, stored energy and power flow, complex fields and power, TEM waves, uniform plane wave, wave reflection and refraction. Theory and applications of transmission lines.

333 Intermediate Electrical Engineering I (4)
Prereq: 221. (fall) Develop an understanding of the relationship between signals and systems. Includes a continuation of the Laplace and Fourier analysis, state modeling of high-order electrical and mechanical systems. Frequency response, Bode plots, and systems design using poles and zeros will be addressed, as well as state equations representation and analysis. Students will also develop an awareness of discrete time systems, difference equations, Z transforms, sampling, and digital filters.

334 Intermediate Electrical Engineering II (4)
Prereq: 233. (fall) Develop an understanding of digital electronics including diodes, bipolar transistors, and FETs. Students will also develop an awareness of semiconductor properties and operations, and use this knowledge to design analog circuits. Course includes computer-aided design and analysis.

335 Energy Conversion (5)

351 Intermediate Computer Engineering (4)
Prereq: 224. (fall, winter) Fundamental knowledge and skills for the study and practice of computer engineering. Utilize assembly language, loops, tables, lists, and interrupts as well as microprocessor I/O with the PIC microprocessor.
Discrete-time signals and systems including convolution, Z-transforms and frequency response.

352 Intermediate Computer Engineering II (4)
Prep: 351. (Spring) Theoretical framework for information processing technology concentration, and transmitting discrete and continuous-time signals and data by digital systems and computers. A continuation of EE 351.

371 Applied Probability and Statistics for Electrical Engineers (4)
Prep: MAC 2311 or MAC 2311H and CS 365. (Fall, spring) Fundamentals of statistics and probability and the ability to apply them to problems in electrical engineering.

395A Intermediate Electrical and Computer Engineering Design Experience (4)
Prep: 102 and CS 240A and junior standing. Enhancement of the laboratory skills of students to reinforce and augment the understanding of the fundamentals necessary for the execution of successful experimentation. Students will develop a greater awareness of specific topics in electronics, energy conversion devices, power distribution, communications, and electromagnetics. 2 lec, 4 lab.

395B Intermediate Electrical and Computer Engineering Design Experience (4)
Prep: 395A. Continuation of EE 395A. 1lec, 6 lab.

395C Intermediate Electrical and Computer Engineering Design Experience (4)
Prep: 395B. Continuation of EE 395B. 8 lab.

401 Advanced Laboratory I (1)
Prep: perm. (Fall, winter, spring) Advanced lab format for those of intermediate lab. Student-proposed projects are design- or research-oriented and directed by faculty member specializing in an area of investigation. Portion of this lab required in conjunction with certain electrical engineering 400-level lecture courses.

402 Advanced Laboratory II (1)
Prep: perm. (Fall, winter, spring) See 401 for description.

403 Library Research (1)
Prep: perm. (Fall, winter, spring) Library research under the supervision of a faculty member. Prior approval required. See departmental office for regulations.

405 Physical Electronics (3)

415 VLSI Design (3)
Prep: 334. (Winter) Introduction to very large scale integration (VLSI) technology and design of CMOS integrated circuit design. Fabrication process design rules, logic design, performance estimation, chip engineering, and computer aids to VLSI design. Student participation in 2 hours of senior lab (401, 402) credit for the VLSI lab work. 3lec, 2 lab.

416 VLSI Design II (4)
Prep: 415. Sequential system design, clock generation and sequencing disciplines, design validation, sequential testing, standard cell layout, adders, ALUs, and pipelines, memory design, PLA design, floorplanning, fiber architecture, register transfer design, data-path control, high-level synthesis. 3lec, 2lab.

425 Control Theory I (3)

426 Control Theory II (3)
Prep: 425. (Fall, on demand) Basic state variable concepts, writing state equations, time-domain solution of the state equation and the matrix exponential, relative stabilization methods, controllability and observability, stability, state variable methods of design including state feedback and state observers. Detailed discussion of various types of lasers and their characterization.

427 Control Theory III (3)
Prep: 426. Sampling and data reconstruction, discrete-time systems, z-transforms, sampled data systems, frequency response of test functions, root locus, bilinear transformation, analytical design of lead, lag, lead-lag and PID compensators.

429 Mechanics and Control of Robotic Manipulators (4)
Prep: sr. (Spring) Classification and applications for mechanical manipulator systems. Manipulator motion description, forward kinematics transformations, and solution of inverse kinematics equations. Velocity kinematics and manipulator dynamics equations. Trajectory generation and control schemes including sensors feedforward. Lab exercises to augment lecture material. Co-listed with ME 429.

431 Optoelectronics and Photonics I (3)
Prep: 321. (Fall) Introduction to important modern optical technologies and devices used in the applications. Emphasizes basic physical theory needed to understand lasers, their construction, and their applications. Emphasizes basic theoretical material discussed, stability, Routh-Hurwitz criterion, root locus construction, specifications and design via root locus.

432 Optoelectronics and Photonics II (3)

433 Optoelectronic Materials and Devices (3)

434 Optoelectronic Materials and Devices (3)

445 Microwave Theory and Devices (3)
Prep: 322. (Offered every spring other year.) Wave propagation, transmission lines, Smith chart, impedance matching techniques, antennas, and survey of devices (microwave generators, semiconductor devices, etc.)

446 Antennas (3)
Prep: 395C. (Winter) Fundamental concepts and definitions, radiation integrals and potential functions, line wire antennas, loops, arrays, and personal computer applications.

447 Electromagnetics I (3)
Prep: 322. (Offered every winter other year.) Mathematical review of vector operations in Cartesian and curvilinear coordinates. Solution of wave equation in Cartesian coordinates and application to wave reflection from interfaces between general materials. Decomposition of wave solutions into TE, TM, and TEM waves, with application to waveguides and transmission lines; solution of wave equations in cylindrical coordinates, with application to circular waveguide, radiation from line sources, and scattering from cylindrical objects.

454 Power Electronics (3)
Prep: 334. (Winter) Introduces senior to power electronics. Covers most uses of semiconductor devices for the conversion and control of electric power: AC to DC, AC to AC, DC to DC, AC to AC conversions, and DC and AC motor drives. Semiconductor device characteristics (particularly those characteristics not stressed in 340 and 341) and device protection conclude the offering.

455 Introduction to Electric Power System Engineering and Analysis I (3)
Prep: 335. (Fall) Includes power system representa- tion, computer methods, symmetrical components, protection methods, and stability.

456 Introduction to Electric Power System Engineering and Analysis II (3)
Prep: 455. (Winter) Continuation of 455. See 455 for description.

463 Digital Systems I (3)
Prep: 352. (Winter) Postulates and fundamental theorems of Boolean algebra; algebraic and map methods for design of combinational and sequential simple sequential circuits; logic minimization methods; introduction to system design using shift registers and counters.

464 Digital Systems II (3)
Prep: 461. (Spring) Basic concepts from theory of finite-state machines, analysis and synthesis of sequential circuits, study of state assignment, synchronous and asynchronous machines, and system design using integrated circuits.

465 Digital Systems III (3)
Prep: 462. (Spring) Synthesis of sequential circuits using ROMs and RAMs for control logic. Introduction to computer organization and design including selection of micro architectures, registers and bus organization and implementation of control logic with microprogrammed control.

467 Advanced Microprocessors (3)
Prep: 395A. (Winter or spring) Operation of 16- and 32-bit microprocessors. Particular attention given to a specific microprocessor family (such as the Motorola 68000 or Intel 8086) regarding instruction set architecture, networks of microcontrollers and embedded microprocessors (e.g. CAN, I2C, TTP SP, Ethernet), motor and actuator control. Computer projects emphasize the design and implementation of microcontroller-based systems.

470 Communication Engineering (3)
Prep: 333. (Fall) Unified approach to communications stressing principles common to all transmission systems. Review of Fourier series, Fourier integral and complex frequency techniques with emphasis on communication networks, time response and convolution, measurement of information, amplitude modulation (double sideband and single sideband), frequency modulation, sampling theory, pulse modulation and digital communications systems, fundamentals of signal theory and its application to communication systems, noise and its effect on conventional modulation systems; noise figure, noise suppression techniques, and other related topics.

471 Stochastic Processes in Electrical Engineering (3)
Prep: 371. (Winter) Brief review of probability concepts, including densities, moments, etc.
Industrial Engineers are responsible for in practice, stationarity concepts, 2nd-order
Gaussian processes, random signal through linear systems, Markov chains.

472 Introduction to Digital Communications (3)  Prereq: 470, 471. (Spring) Summary review of deterministic and stochastic system and signal characterizations, sampling quantization, Baseband pulse signaling and the matching filter. Introduction to digital signals and discrete time concepts. Bandpass modulation and their performance in AWGN. Link budget analysis, synchronization overview.

478 Introduction to Digital Signal Processing (3)  Prereq: 333, 371. (On demand) Discrete time signals and systems review, convolution, discrete-time Fourier transform, z-transform, canonical filter representations, windowing, and FFT.

481 Professional Experience in Electrical Engineering (1)  Prereq: Sr. and perm. Supervised work-study program in an electrical engineering profession, in established industrial environment. Credit dependent on advance registration and mutual agreement between faculty supervisor and participating company. May be repeated; however, hours applied toward graduation limited by department.


487 Electronic Navigation Systems III (3)  Prereq: 486. Continuation of 485 and 486 with emphasis on mathematical modeling of navigation and landing systems, fault tolerant avionics system design and architectures, and flight testing and current developments.

490 Selected Topics (1–6)  Prereq: perm. Selected topics of current interest in electrical engineering.

495A Electrical and Computer Engineering Capstone Design I (4)  Prereq: 44 hours of EE. The goal of this course is to give students the opportunity to refine and demonstrate their ability in engineering design. Students work on a major design project as part of a team to design a system. Topics include problem definition and specification. They will conduct a preliminary design review. In addition, students will study the systems design process, mathematical modeling, decision-making, ethics, evaluation, and the elements of scheduling and planning. 3 lec, 2 lab.

495B Electrical and Computer Engineering Capstone Design II (4)  Prereq: 495A. Continuation of EE 495A. Students are expected to continue the design begun in EE 495A with an emphasis on construction, pre-testing, and redesign. They will conduct a critical design review. In addition, students will study and develop skills necessary for a successful engineering career. 1 lec, 6 lab.

495C Electrical and Computer Engineering Capstone Design III (4)  Prereq: 495B. Continuation of EE 495B. Students are expected to complete the design developed in EE 495B with an emphasis on final assembly, testing, and analysis of outcomes. They will conduct a formal design review. In addition, the students will be exposed to a variety of career options available to graduates. This is a Tier III equivalent course. 1 lec, 6 lab.

Engineering, Industrial and Systems (ISE)

200 Introduction to Computers and Industrial Engineering (4)  (Winter) Introduces the major skills that Industrial Engineers are responsible for in practice, including engineering economy, methods of analysis, and system design. The applications and important features of office software, especially spreadsheets, are explained, with examples related to the IE skills that are discussed.

201 Data Display and Management (4)  Prereq: MATH 263A (Winter, Summer) How data—primarily numeric—can represent systems. Focuses on the display of the data and common formats for data in structured problem solving. Course introduces software used for data management that are discussed.

304 Applied Engineering Statistics (3)  Prereq: MATH 163B or MATH 263B. (Fall, Winter) Introduction to efficient methods for data collection and analysis. Applications of basic statistical tests, techniques, and experimental design concepts to engineering and science data problem areas. Not for ISE majors.

305 Engineering Statistics I (4)  Prereq: MATH 263C. (Winter, Spring) Introduction to probability, concept of random variables, discrete and continuous probability distributions, and expectation.

306 Engineering Statistics II (4)  Prereq: 305. Math 211 or concurrent. (Fall, Spring) Functions of random variables, sampling distributions, estimation theory, hypotheses testing, and statistical prediction.

330 Engineering Economy (3)  Prereq: 200, 305; IT 101. (Spring) Principles of the economic consequences of engineering design decisions, and methods for evaluation of engineering design alternatives in view of costs and benefits. Topics include time equivalence of money, annual cost method, present worth method, rate of return method, depreciation, benefit/cost, break-even analysis, income taxes, equipment replacement and risk.

333 Work Design (5)  Prereq: 305; IT 101. (Spring, Summer) Design of work systems and measurement of work. Topics include job methods, operation analysis, charting techniques and standard data, sampling data, work sampling, predetermined time systems, standard data, time study, wage systems, and learning curves. 4 lec, 2 lab.

336 Project Management (3)  Prereq: 400 or 403, IT 101. (Fall, Spring) Project management and planning of time and cost. Project scheduling, control methods, project cost analysis, and risk analysis. Lab projects using computer programs that generate project schedules. 3 lec.

381 Internship in Industrial and Systems Engineering (1–3)  Prereq: Jr. Supervised work-study program, in industrial and systems engineering profession, in established industrial environment. Credit dependent upon advance registration and mutual agreement between faculty supervisor and participating company. Course may be repeated; however, hours applied for graduation limited by department.

402 Manufacturing Systems (4)  Prereq: in ISE. (Winter) Applications of manufacturing engineering principles, policies, and methodologies as they relate to the production, operation, management, planning, and design of manufacturing systems.

403 Material Handling Systems Engineering (4)  Prereq: 333 or in EN. (Winter) Provides a broad understanding of materials handling engineering from a system design and application engineering point of view. Instruction in the engineering principles, design criteria, operating parameters, performance requirements, equipment resources, and applications of engineering practices involved in the planning, design, and operation of materials handling systems for manufacturing, physical distribution, and government operations. A materials handling system design project is a required part of the course.

407 Introduction to Designed Experiments (3)  Prereq: 304 or 306 or equiv. (spring) Design and analysis of experiments. Analysis of variance, and design introduction to response surface methodology. Software for statistical analysis is utilized.

412 Principles of Six Sigma (4)  Prereq: 306 (winter) Introduction to the Six Sigma DMAIC problem-solving method. Covers include the tools and techniques for product and process improvement and the application of basic and advanced statistics for problem solving.

415 Introduction to Systems Engineering (3)  Prereq: 305, MATH 340. ET 181. Introduction to systems engineering concepts and systems theory. Emphasis on mathematical modeling of open-loop and closed-loop systems, positive and negative feedback. State and transition equations. Applications to modeling in manufacturing, production and inventory systems, service industries, physical and biological systems.


432 Inventory and Manufacturing Control (4)  Prereq: 305, (winter) Spring) Design of inventory and manufacturing control systems. Forecasting, decision making, and inventory control. Inventory models, classical models, economic order quantities, and continuous and discrete time models. Relationship between production schedules and inventory. MRP. Production scheduling systems, sequencing models, etc.


435 Quality Control and Reliability (3)  Prereq: 304 or 306. (Fall) Design and implementation of statistics to control quality and reliability in products and services. Design of acceptance sampling and process control systems, including statistical process control and test designs. Design and implementation of quality assurance programs, including nonstatistical dimension of quality systems. 3 lec.

440 Facility Planning and Design (4)  Prereq: 333, IT 110 or 117 or IT 101. (Fall) The process of designing and laying out a facility, with an emphasis on manufacturing and service. Topics addressed include selecting the type and quantity of production and handling equipment, alternatives for material handling and other technologies, and building and quantitative methods for developing the facility layout; determining the appropriate size for the departments and the facility overall. A computer program is appropriate for determining the facility design.

441 Introduction to Operations Research (4)  Prereq: 305. (Fall) Basic methods of operations research. Modeling methods, linear programming, Simplex method, integer programming. Random processes, queueing theory.


445A Systems Design I (3)  Prereq: 330, 333, 342, ENG 305. (Winter) Design methodology and principles of design and definition of design project. This is a Tier III equivalent course.
445B Systems Design II (3)  
Prereq: 445A. (spring) Individual or small-group system design project continued from 445A. This is a Tier 1 elective.  

448 Human-Machine Systems (3)  
Prereq: with 407; ET 181, ENG 305J. Role of operator as subsystem in human-machine systems. Design principles for information displays, equipment controls, workplace environments, and life support systems. Design project required. 3 lec.  

455 Information Systems Engineering (4)  
(winter) Introduction to applications of information systems industry and the design and implementation of these systems. Students will also learn IDEF0 modeling systems and database development.  

456 Database Information Systems (4)  
Prereq: ISE 200 or ET 181. Introduction to application and development of database systems in industrial engineering. In addition, students will learn IDEF1x modeling and SQL.  

489 Special Investigations (1–6)  
Prereq: course intrdoucy another student in industrial and systems engineering under the guidance of a faculty member.  

490 Advanced Problems in Computer Applications (1–6)  
Prereq: perm. Special investigations of advanced industrial and systems engineering problems involving use of digital computers.  

Engineering, Mechanical (ME)  

100 Introduction to Mechanical Engineering (4) (2A)  
(fall, winter, spring) Open to students of all majors. Introduction to the history, professional values, and methods of mechanical engineering. Lab work provides hands-on experience with engineering systems and introduces engineering design, graphical, and computer techniques of problem solving. Discussion of current areas of interest for engineering research and future prospects for technology. No specific mathematics background required.  

101 Mechanical Engineering–Gateway Course (4)  
Gateway course introduces engineering students to the culture and problem solving methods of the mechanical engineering profession. Student teams will work cooperatively with teams of senior ME students on projects of interest to both. Introduction to use of numerical modeling and graphical representation of engineering problem solving. Introduction to professional ethics.  

224 Dynamics (4)  
Prereq: PHYS 251. C or better in CE 220. (fall, winter, spring) Open to students of all majors. Introduction to the history, professional values, and methods of mechanical engineering. Lab work provides hands-on experience with engineering systems and introduces engineering design, graphical, and computer techniques of problem solving. Discussion of current areas of interest for engineering research and future prospects for technology. No specific mathematics background required.  

288 Data Analysis Lab II (2)  
Prereq: ME103, ET181. An introduction to statistics and a detailed study of its application in the analysis of experimental data. Includes weekly laboratory experiments, and data analysis and curve fitting using computerized methods. Lab experiments and exercises will introduce interpretation of engineering drawings and an introduction to geometric dimensioning and tolerancing (GD&T).  

301 Kinematics and Dynamics of Machines (4)  
Prereq: C or better in 224. (winter) Analytical and graphical solutions of motion problems involving mechanical elements: linkages, gears, cam mechanisms, and planar mechanisms.  

303 Machine Design Analysis (4)  
Prereq: 301, 314 concurrent. Comprehensive study of the stress and deflection analysis of machine elements. Special emphasis on the design characteristics of materials and on the theories of failure for static, impact and cyclic loads.  

304 Machine Elements (4)  
Prereq: 303, 351 concurrent. A detailed study of the design and use of machine elements, including screws and fasteners, shafts and associated parts, bearings, gears and other power transmission components. Team design project.  

313 Metal Processing (3)  
Prereq: CE 222, CHE 331. (winter, spring) Structure of metals, mechanics of metal forming and metal cutting. Analysis and design requirements, and temperature effects. Interrelationship between metal processing and mechanical properties.  

314 Introduction to Manufacturing Processes (4)  
Prereq: CE 222, CHE331, 303 concurrent. Introduction to applied statistics in manufacturing. Interrelationship between process, design, materials and mechanical properties. Introduction to major metal manufacturing processes: casting, forging, forming, machining, powder metallurgy and heat treating. Analysis of forces, energy requirements, and temperatures. Polymers and plastic processing.  

321 Introduction to Thermodynamics (4)  
Prereq: PHYS 252, MATH 263C. (fall, winter, spring) Basic engineering thermodynamics. Definitions, first law, second law, availability, and applications to engineering problems.  

328 Applied Thermodynamics (4)  
Prereq: C or better in 321, 412 concurrent. An introduction to applications of thermodynamics in the analysis of experimental data. Includes discussions of current areas of interest for engineering research and future prospects for technology. No specific mathematics background required.  

351 Computer-Aided Design I (3)  
Prereq: IT101, 304 concurrent. A detailed study of the use of computer-aided design tools in the engineering design process with a focus on solid modeling and finite element analysis. Team design project that emphasizes proper use of CAD tools.  

388 Applied Instrumentation Lab (4)  
Prereq: ME288 or ISE 304, EE313, CE340 or concurrent. Students will be instructed on the use of basic lab equipment while constructing and testing their own measurement systems. This will comprise the use and construction of various transducers, signal conditioning circuits and data acquisition systems. The importance of error analysis and its application to their own experiments will also be covered. The final part of the course will require the completion of lab experiments using more advanced instrumentation systems.  

398 Junior Laboratory (3)  
Prereq: EE 304. (fall, winter, spring) Introduction to measurement of basic phenomena frequently encountered in mechanical engineering, e.g., strain, temperature, pressure, flow rate, displacement, and acceleration. Emphasis given to interpretation of data and preparation of laboratory reports.  

400 Heating, Ventilation, Air Conditioning, and Refrigeration (3)  
Prereq: Jr. (on demand) Description and evaluation of heating, air conditioning, and total energy systems employed to provide thermal environments for buildings ranging in scope from residences to integrated commercial, apartment, or industrial complexes. Covers human comfort, psychrometry, load analysis, techniques, equipment, and controls.  

401 System Analysis and Control (4)  
Prereq: MATH 340. (spring) Modeling and formulation of physical systems. Transient and steady-state dynamic responses, and other fundamental theory of automatic controls and applications. 3 lec, 1 lab.  

403 Machine Design I (4)  
Prereq: CHE 331, 412 or better in CE 222, (spring) Applications of mechanics, mechanisms, materials, and mechanical processes to design and selection of machine members and units of power transmission.  

404 Machine Design II (4)  
Prereq: 403. (on demand) Morphology of design decisions using design criteria and probability and techniques of optimization to design. Team design project.  

406 Analysis and Design of Mechanisms (4)  
Prereq: 301, 412. (on demand) Analysis and synthesis of planar and spatial mechanisms using design criteria and modern analytical approaches. Structural synthesis of mechanisms, dimensional synthesis of linkages for function generation, design generation, and for rigid-body guidance. Applications of matrix methods, optimization techniques, and computer solutions.  

407 Fundamentals of Nuclear Engineering (2)  
(on demand) Nuclear engineering, including nuclear reactions, radiation detection and measurement, reactor criticality, principles of reactor control, radiation shielding, effects of radiation of materials, use of radioactive materials.  

408 Nonlinear Vibrations (3)  
(on demand) Qualitative and numerical study of nonlinear systems.  

412 Mechanical Engineering Dynamics (3)  
Prereq: 324. (on demand) Advanced solutions of dynamical aspects and problems of machines and systems.  

413 Conduction and Radiation Heat Transfer (4)  
Prereq: 412. (on demand) Advanced analytical treatment of conduction and radiation heat transfer. Boundary value problems, orthogonal expansions, moving heat sources, multidimensional problems with time varying boundary conditions, finite difference analysis. Design project and report required.  

417 Design of Thermal Systems (4)  
Prereq: 328, 412. (on demand) Design of systems in which thermodynamics, transport behavior, and optimization techniques are the major considerations. Emphasis on total design approach including factors such as cost and reliability. Typical systems include power, propulsion, environmental, and energy. Design project and report required.  

418 Mechanical Engineering Experimentation (1)  
Prereq: ME or grad. (on demand) Instruction in experimental procedure and experience in designing and executing lab experiments. Students plan and execute their own experiments to acquire answers to assigned problems. Variety of areas covered including control systems, energy conversion, fluid flow, heat transfer, motion measurements, stress-strain, instructional guidance provided by entire mechanical engineering staff. Provides familiarity with variety of instrumentation and procedures. Three-quarter sequence with experimental subjects phased with prerequisites.  

419 Mechanical Engineering Experimentation (1)  
Prereq: ME or grad. (on demand) Continuation of 418. See 418 for description.  

420 Mechanical Engineering Experimentation (1)  
Prereq: ME or grad. Continuation of 419. See 418 for description.
181 Computer Methods in Engineering I (4)
Prereq: MATH 263A or 163A. Preference given to ET or pre-engineering majors. Introduces students to application of digital computer for solution of engineering problems, with emphasis on methodology and organization. Problem formulation and solution in terms of an object oriented programming approach using the C++ language in an interactive work environment.

190 Cooperative Education Field Experience I (1)
Prereq: perm. Required of, and limited to, students approved for co-op work assignments. Prior approval required before a student registers. Credit earned is not applicable toward specific degree requirements, but will accumulate in the student's academic credit total. In addition to continual monitoring of student's progress by the cooperative education coordinator and the faculty advisor, participating students are required to submit a final report on their activities.

280 Engineering and Technology—Overview (3) (2A)
Intended for students of all majors; non-engineering technology students are encouraged. Provides an overview of engineering and technology, to place the profession in a historical context, to examine the views of supporters and detractors, to examine moral and ethical issues associated with the profession in society, and to develop an appreciation of the manner in which engineering and technological work is conducted. Emphasizes a “problem-solving” approach to questions of all kinds, but particularly technological ones.

290 Cooperative Education Field Experience II (1)
Prereq: perm. See 190.

320 History of Western Technology (3)
Survey of significant technological innovations of Western civilization from Greco-Roman period into 20th century, with emphasis on the interaction between technology and society. Background in technology or science not required.

322 Introduction to Materials Behavior (3)
Introductory materials science course covering behavior of metals, polymers, and ceramics for non-technical majors.

325 Pollution Solutions I (3)
Understanding current air pollution problems, their causes, effects, and possible solutions and impact of those solutions on society.

326 Pollution Solutions II (3)
Same course description as 325 covering different aspects and topics. Not a continuation of 325.

331 Fluid Dynamics for Nonengineers (3)
Prereq: jr or sr engineering students. Physical, not mathematical, introduction to principles controlling fluid motions in our environment. Study of weather, flood circulation, aerodynamics, river hydraulics, and rocketry through design of golf balls and plumbing systems included. Introduction to mechanics, fluid properties, fluids at rest and in motion. Lectures and reading assignments supplemented with films.

334 Water Pollution Control (3)
Prereq: other non-engineering students. Designed for student with limited technical background but who is interested in problems of water pollution. Deals with nature of water, source and character of pollutants, technology of wastewater renovation, ecology of bodies of water, urban, agricultural, and legal, economic, and administrative constraints.

337 Transportation Today (3)
Prereq: jr or perm, not open to civil engineering majors. Designed for student with limited technical background who is interested in gaining knowledge in area of highway and transportation planning and design. Major topics include geometric factors, traffic studies, modes of transportation, human equation, and planning strategies.

350 Engineering and the Technological Society (3) (2A)
Prereq: jr or sr. Technical inventions and social inventions, impact and social consequences of engineering, political issues, ethical considerations, and some exploration of alternative futures. Discussion and lecture format used.

390 Cooperative Education Field Experience III (1)
Prereq: perm. See 190.

400 Professional Engineering Fundamentals Review (2)
Prereq: sr. Review of basic engineering principles. Provides a compact review of basic engineering principles and illustrated by practical solutions.

445 Advanced Numerical Methods (4)
Prereq: ME 497 or equiv. (winter) Numerical methods for solution of ordinary and partial differential equations, stability considerations and error estimates, application to variety of engineering problems, numerical method of lines and integration procedures for stiff ODE systems.

470 Energy and the Environment (3) (2A)
(On demand) Technical, economic, political, and environmental factors in energy production. Conventional, gasification, syntechs, fission, fusion, solar, wind, and possible future conversion techniques. Course designed to provide understanding needed for intelligent participation in societal decisions related to energy issues. (Equiv to MATH 445.)

490 Cooperative Education Field Experience IV (1)
Prereq: perm. See 190.

495 Leadership Seminar (4)
Prereq: ET major, perm. Through selected readings, class presentations, case studies, students will seek an understanding of leadership and its importance and effectiveness in achieving goals with successful leaders in engineering and other fields will visit the class and share their knowledge of leadership. Several written reports and oral presentations on leadership case studies will be required during the term.

475 Business and Technology (3)
Prereq: jr or sr, ET or pre-engineering majors. Introduction to technology and society. Background in technology or science not required.

English (ENG)

150 Developmental Writing Skills (4)
Prereq: placement. Credit for 150 will not be given to any student who has already passed any other English course. Develops skills through attention to coherence, mechanics, syntax, and writing conventions. Does not satisfy Tier I or Arts and Sciences humanities requirement. (Nonnative speakers take 150A.)

151 Writing and Rhetoric I (5) (1E)
Prereq: fr or soph only, 150, or 151 placement into required or earlier quarter or into 152/3. Practice in composing and revising expository essays which are well organized, logically coherent, and effective for their purpose and audience. Topics from personal experience or nonfiction reading. (Nonnative speakers take 151A.)

152 Writing and Reading (5) (1E)
Prereq: fr and soph only. Same as 151, except that topics are developed from reading and discussion of fiction, poetry, and literary nonfiction.

153 Writing and Reading: Special Topics (5) (1E)
Prereq: fr and soph only. Similar in structure, genres, and purposes to 152, but each section uses readings and/or clips focused on a specific theme chosen by the instructor. Recent themes include the environment, the Viet-Nam war, the social outsider, The Brothers Karamazov, and popular culture.

153A Writing and Reading: Gender (5) (1E)
Prereq: fr and soph only. Same as 152 except that topics are developed from readings depicting women and men in literature. Students examine and write about how, in literature and life, women and men see themselves and each other, how people learn what society expects of them, how people learn what society expects of them, how, and write about how, in literature and life, women and men see themselves and each other, how people learn what society expects of them, and about such topics as sexuality, marriage, friendship, and rebellion against culturally imposed sexual roles.

153B Writing and Reading: Tradition (5) (1E)
Prereq: fr and soph only. Same as 152 except that topics are developed from readings depicting women and men in literature. Students examine and write about how, in literature and life, women and men see themselves and each other, how people learn what society expects of them, and about such topics as sexuality, marriage, friendship, and rebellion against culturally imposed sexual roles.

153C Writing and Reading: African American Experience (5) (1E)
Prereq: fr and soph only. Same as 152 except that topics are developed from readings examining various experiences of African Americans in America, from earlier writings up to and emphasizing contemporary literature, including fiction, poems, essays, and autobiographies.

200 Introduction to Literature (4) (2H)
Prereq: 151 or 152 or 153 or 153A/B. Close textual analysis of poetry, development of critical vocabulary, and introduction to the variety of current methods of responding to literature. Intended for nonmajors.

201 Critical Approaches to Fiction (4)
Close textual analysis of fiction, development of critical vocabulary, and introduction to the variety of current methods of responding to literature. Intended for nonmajors.

202 Critical Approaches to Poetry (4)
Close textual analysis of poetry, development of critical vocabulary, and introduction to the variety of current methods of responding to literature. Intended for nonmajors.

209 Critical Approaches to Drama (4)
Close textual analysis of drama, development of critical vocabulary, and introduction to the variety of current methods of responding to literature. Intended for nonmajors.

209A Interpretation of Drama (Film) (4)
Prereq: 151 or 152 or 153 or 153A/B. Critical study of film and literature, e.g., film versions of literary classics, films made by literary authors, etc. May not be taken to fulfill major requirement of two courses 201, 202, 209.

204 Introduction to International Literature I: The Classical Tradition (4) (2H)
Prereq: course above 199. Texts which exemplify the classical sensibility in Western literature.

205 Introduction to International Literature II: Romantic Tradition (4) (2H)
Prereq: one course above 199. British, American, and Continental texts which exemplify the Romantic tradition in Western literature.

206 Introduction to International Literature III: The Modern Tradition (4) (2H)
Prereq: one course above 199. Texts which express the modern sensibility in Western literature.

210 Critical Approaches to Popular Literature (4)
Prereq: one course above 150. Introduction to techniques and criticism in works of various and popular literature meet, e.g., mysteries, science fiction, westerns.

225 Principles of Textual Analysis (4)
Offers undergraduate majors and those of current methods of responding to literature rather than investigation of a particular topic.

251 English Lit. to 1688 (5)
Prereq: 250 or concurrent. This course will survey some of the major authors, genres, and movements of the early British period, from the Anglo-Saxons to the Glorious Revolution in the 17th century. The course will include some of the most influential literary figures of the period, but will also give attention to less canonical writers who have attracted increasing scholarly attention in recent years.

252 English Lit. 1689—Present (5)
Prereq: 250 or concurrent. This course will survey some of the major authors, genres, and movements of the modern British period, from the Glorious Revolution to the 20th century. The course will include some of the most influential literary figures of the period, and will also give attention to less canonical writers who have attracted increasing scholarly attention in recent years.

253 Survey of American Lit. (5)
Prereq: 250 or concurrent. This course will survey some of the major authors, genres, and movements in American Literature from the early colonial period to the 20th century. The course will include some of the most influential literary figures of the period, but will also give attention to less canonical writers who have attracted increasing scholarly attention in recent years.

254 Research and Writing in English Studies (4)
Prereq: 151-2-3; 250 or concur; not 307I. This course prepares students to use scholarly resources to write critical analyses of texts in English Studies. Students are required to master research methods, library resources, the integration of primary and secondary texts, MLA/Chicago documentation, and the conventions of critical writing. Readings for the course vary, and may include a single long text or several short ones. Students do extensive outside research on the readings, write at least 20 pages
of critical prose based on this research, revise this writing, and make presentations to the class about their work.

270 Special Studies: Individual or Comparative Authors (2–3)
Prereq: one course above 150. Intensive study of individual or comparative authors: (A) Medieval, (B) Renaissance, (C) Restoration and 18th-century, (D) 19th-century American, (E) 19th-century British, (F) 20th-century American, (G) 20th-century British, (H) Continental.

271 Special Studies: Selected Themes or Topics in Literature (2–3)
Prereq: one course above 150. Intensive study of selected theme or topic: (A) poetry, (B) fiction, (C) drama, (D) comparative genres, (E) language, (F) stylistics and rhetoric, (G) literature and film, (H) gay and lesbian, (I) man and books.

277T English Tutorial (1–10)
Prereq: approval from Department of English tutorial director; arts and sciences major. Fall quarter, first year.

278T English Tutorial (1–10)
Prereq: approval from Department of English tutorial director; arts and sciences major. Winter quarter, first year.

280 Expository Writing and the Research Paper (4)
Prereq: one course above 150. Practice in library research, techniques of documentation, and writing research papers.

297T English Tutorial (1–15)
Prereq: HTC student. Fall quarter, first-year course in two-year tutorial sequence.

298T English Tutorial (1–15)
Prereq: HTC student. Winter quarter, first-year course in two-year tutorial sequence.

299T English Tutorial (1–15)
Prereq: HTC student. Spring quarter, first-year course in two-year tutorial sequence.

301 Shakespeare: The Histories (4)
Prereq: 251 or jr or sr.

302 Shakespeare: The Comedies (4)
Prereq: 251 or jr or sr.

303 Shakespeare: The Tragedies (4)
Prereq: 251 or jr or sr.

304 English Bible (4)
Prereq: one course above 150. Selected prose and poetry of the Hebrew and Christian scriptures.

305J Technical Writing (4) (1J)
Prereq: jr and completion of first-year composition. Preparing clear, functional reports; presenting data for experts and other specialized audiences. Documents include, but are not limited to, proposals, information reports (progress, feasibility, inspection, completion); and descriptions of mechanisms and technical processes.

306J Women and Writing (4) (1J)
Prereq: jr and completion of first-year composition. Practice in developing essays on women and their interests, on women and writing, and on gender issues.

307J Writing and Research in English Studies (4) (1J)
Prereq: jr or sr; two courses from 201, 202, 203. Scholarly writing in English studies: research reports, integration of primary and secondary texts, library resources, and MLA/Chicago documentation.

308J Writing and Rhetoric (4) (1J)
Prereq: jr or sr and completion of first-year composition. Focuses on skills in writing expository prose, with regular practice and evaluation supplemented by attention to published prose and concepts of rhetoric and style.

309J Writing in the Sciences (4)
Prereq: jr or sr; completion of first-year composition; and permission of instructor. The primary purpose of this course is to provide students in the sciences with an opportunity to practice writing within their majors. The course focuses on how to review prior research, how to propose research projects, how to incorporate research results into final reports, and how to write clearly and concisely.

311 English Literature to 1500 (4)
Prereq: 251. Authors, works, and genres of Old and Middle English literature.

312 English Literature: 1500–1660 (4)
Prereq: 251. Authors, works, and genres of Renaissance English literature.

313 English Literature: 1660–1800 (4)
Prereq: 252. Authors, works, and genres of Restoration and 18th-century English literature.

314 English Literature: 1800–1900 (4)
Prereq: 252. Authors, works, and genres of Romantic and Victorian English literature.

315 English Literature: 1900 to Present (4)
Prereq: 252. Authors, works, and genres of British literature from 1900 to the present.

321 American Literature to 1865 (4)
Prereq: 253. Authors, works, and genres of American literature from the colonial period through the Civil War.

322 American Literature: 1865–1918 (4)
Prereq: 253. Authors, works, and genres of American literature from the end of the Civil War to the end of World War I.

323 American Literature: 1918 to Present (4)
Prereq: 253. Authors, works, and genres of American literature from the end of World War I to the present.

325 Women and Literature (4)
Prereq: one course above 199 and jr or sr. Surveys work of significant women writers.

326 Lesbian and Gay Literature (4)
Prereq: one course above English 150. Surveys lesbian, gay, bisexual, and transgendered (LGBT) literature with an emphasis on how LGBT identities and experiences have been represented in post-1900 literary discourse.

327 African American Fiction (4)
Prereq: one course above 150. A selection of major fiction by African American authors.

328 African American Poetry (4)
Prereq: one course above 150. A selection of major poetry by African American authors.

329 African American Drama (4)
Prereq: one course above 150. A chronological survey of major drama by African American authors.

331 Studies in Asian Literature (4) (2C)
( Fall) Introduction to cultural background of Asian literature.

332 Studies in Asian Literature (4) (2C) (winter)
Continuation of 331. Study of classical Asian literature.

333 Studies in Asian Literature (4) (2C) (spring)
Continuation of 332. Study of modern Asian literature.

335 The Ohio University Writers (4)
Faculty writers visit classrooms to read and discuss their works.

336 McGuffey Lectureship in Literature (1–4)
Prereq: one course above 150. Special series of lectures by current McGuffey Visiting Professor of English. Lectures offered determine credit hrs assigned.

342 English and Continental Literature (4)
Prereq: one course above 150. Authors, themes, and genres in English and European literature.

349 History of Books and Printing (4)
Prereq: one course above 150. Introduction to history of the book and its place in development of Western culture from ancient world to present. Approach is primarily historical, cultural, and aesthetic.

350 Traditional Grammar, Mechanics, and Usage (4)
Prereq: one course above 150. Grammatical understanding and awareness of relationships in sentence structure and punctuation.

351 The History of the English Language (4)
Prereq: jr or sr. Course examines changes affecting English; sound patterns, grammatical forms, vocabulary, and semantic values.

352 The Development of American English (4)
Prereq: jr or sr. Regional and social varieties of American English.

353 The Structure of American English (4)
Prereq: jr or sr. Study of English grammar using a linguistic model chosen from contemporary linguistic theories.

356 Young Adult Literature (4)
Prereq: 250. Historical development, and philosophical and aesthetic bases of literature for young adult.

361 Creative Writing: Fiction (4)
Prereq: 200 or 201 or 250. Beginning course in writing short fiction with emphasis on invention, craft, and criticism of student writing and published fiction.

362 Creative Writing: Poetry (4)
Prereq: 200 or 202 or 250. Beginning course in writing poetry with emphasis on invention, craft, and criticism of student writing and published poetry.

363 Creative Writing: Nonfiction (4)
Prereq: 200 or 201 or 250. Beginning course in writing nonfiction with emphasis on invention, craft, and criticism of student writing and published nonfiction.

377T English Tutorial (1–10)
Prereq: approval from Department of English tutorial director; arts and sciences major. Spring quarter, first year.

378T English Tutorial (1–10)
Prereq: approval from Department of English tutorial director; arts and sciences major. Fall quarter, second year.

393 Creative Writing Workshop: Short Story (4)
Prereq: 361. Instruction and practice in fiction writing, concentrating on narrative, characters, and setting.

394 Creative Writing Workshop: Poetry (4)
Prereq: 362. Instruction and practice in poetry writing.

395 Creative Writing Workshop: Nonfiction (4)
Prereq: 363. Instruction and practice in writing nonfiction prose, with attention to fictionalized biography and literary essays.

397T English Tutorial (1–15)
Prereq: HTC student. Fall quarter, second-year course in two-year tutorial sequence.

398T English Tutorial (1–15)
Prereq: HTC student. Winter quarter, second-year course in two-year tutorial sequence.

399 Literature Theories (4)

399T English Tutorial (1–15)
Prereq: HTC student. Spring quarter, second-year course in two-year tutorial sequence.

430 American Literature (3)
Prereq: enrollment in Inst. Amer. Cult. Modern and contemporary American literature as part of the annual summer Institute in American Culture for Austrian Students and Teachers.

441 Colloquium (4)
Prereq: sr. (fall) Specific interdisciplinary problems to be assigned each quarter.

442 Colloquium (4)
Prereq: sr. (winter)

443 Colloquium (4)
Prereq: sr. (spring)

445 Special Studies (4)
Prereq: sr.

447 Studies in Criticism (4)
Prereq: sr. Problems in critical theory.

451 Teaching Language and Composition (3)
Prereq: sr. Advanced standing in professional education. Content and methods of presentation for teaching language and composition in high school. Not applicable to Arts and Sciences 200-level requirement.

451L Field Experience in Secondary English/ Language and Composition (1)
Prereq: sr. Concurrent with 451. Field experience to provide practical applications of materials, methods, and techniques of language and composition instruction as appropriate in various secondary
school settings. Students will observe classroom teachers and carry out various instructional tasks as the cooperating teachers deem appropriate.

452 Teaching Literature (3) Prereq: sr, adhering in professional education. Content and methods of presentation for teaching literature in high school. Not applicable to Arts and Sciences 200-level requirement.

452L Field Experience in Secondary English / Literature (1) Prereq: sr; concurrently with 452. Field experience to provide practical application of materials, methods, and techniques of literature instruction as appropriate in various secondary school settings. Students will observe classroom teachers and carry out various instructional tasks as the cooperating teachers deem appropriate.

453 Studies in World Literature (4) Prereq: 339. A study of current world literature with an emphasis on non-Western texts (e.g., African, Indian, Latin American, Eastern European, etc.) to let students explore various cultural voices. Investigates cultural diversity through close analysis of texts. Addresses current literary discussion related to decolonization, the postcolonial condition, eurocentrism, displacement, and multiethnicism. Intended for students in secondary education program.

455 English Education Workshop (1–5) Prereq: teaching certificate or equiv, or perm. Studies in principles, problems, approaches, and issues related to teaching English from elementary school to post-secondary. Topics vary.

456 Readings in Children's Literature (4) Prereq: one course above 199. Historical development of children's literature; philosophical and aesthetic bases.

457 Readings in English Education (4) Prereq: jr or sr. Recent developments in English education and application to teaching of jr and sr high school English.

460 Literary Topics (4) Prereq: Three courses from 310–323 and sr. Concentrated attention to one literary topic, e.g., a genre, theme, rhetoric, or literary theory. Topics are announced quarterly in the departmental course description booklet available in Ellis Hall.

464 Major English Authors (4) Prereq: Three courses from 310–323 and sr. Authors to be studied vary section to section, quarter to quarter, and are announced quarterly at preregistration in the departmental course description booklet available in Ellis Hall.

465 Major American Authors (4) Prereq: Three courses from 310–323 and sr. Authors to be studied vary section to section, quarter to quarter, and are announced quarterly at preregistration in the departmental course description booklet available in Ellis Hall.

466 Major International Authors (4) Prereq: Three courses from 310–323 and sr. Authors to be studied vary section to section, quarter to quarter, and are announced quarterly at preregistration in the departmental course description booklet available in Ellis Hall.

477 English Tutorial (1–10) Prereq: approval from Department of English tutorial director; arts and sciences major. Winter quarter, second year.

478T English Tutorial (1–10) Prereq: approval from Department of English tutorial director; arts and sciences major. Spring quarter, second year.

481 Form and Theory of Literary Genres: Fiction (4) Prereq: 8 hrs creative writing. Theoretical considerations of fiction.

482 Form and Theory of Literary Genres: Poetry (4) Prereq: 8 hrs creative writing. Theoretical considerations of poetry.


486 Advanced Workshop in Fiction (4) Prereq: 393 and perm in advance.

487 Advanced Workshop in Poetry (4) Prereq: 394 and perm in advance.

488 Advanced Workshop in Nonfiction (4) Prereq: 395. This is the third in the sequence of three nonfiction workshops. Students will be expected to produce at least three essays in workshop, participate in advanced readings in the form, and submit a portfolio.


491 English Internship (1–10) Prereq: sr. and perm. as coordinator. Provides qualified students with opportunity to learn through working at selected sites.


499T Honors Project (5–15) Prereq: perm. Completion of individual writing project for A.B. with honors in English.


Humanities (HUM) 100 Humanities–Great Books (4) (2H) Prereq: fr and soph only. (Fall) Ancient classics of Western civilization (Greek, Roman, Biblical) leading toward understanding of cultural heritage. Guidance in critical thinking, reading, and writing about those works.

101 Humanities–Great Books (4) (2H) Prereq: fr and soph only. (Spring) Modern classics of Western civilization. See 107 for further description.

103 Humanities–Great Books (4) (2H) Prereq: jr and sr only. (Fall) Ancient classics of Western civilization (Greek, Roman, Biblical) leading toward understanding of cultural heritage. Guidance in critical thinking, reading, and writing about those works. (Credit not allowed for both 101 and 307.)

107 Humanities–Great Books (4) (2H) Prereq: fr and soph only. (Spring) Modern classics of Western civilization. See 107 for further description.

110 Humanities–Great Books of the Orient (4) (2H) Prereq: jr and sr only. (Spring) Medieval and Renaissance classics of Western civilization. See 107 for further description.

113 Humanities–Great Books of Western Civilization (4) (2H) Prereq: jr and sr only. (Fall) Ancient classics of Western civilization (Greek, Roman, Biblical) leading toward understanding of cultural heritage. Guidance in critical thinking, reading, and writing about those works. (Credit not allowed for both 107 and 308.)

114 Humanities–Great Books of the Orient (4) (2H) Prereq: jr and sr only. (Spring) Medieval and Renaissance classics of Western civilization. See 107 for further description. (Credit not allowed for both 107 and 308.)

Environmental and Plant Biology (PBIO)

100 The World of Plants (4) (2N) (fall, winter) A. Trese. For nonscience majors. Survey of variety of plants and how they affect and are affected by human activities. (Credit not allowed for both 248 and 307.)

101L The World of Plants with Laboratory (5) (2N) (fall, winter) A. Trese. Same lecture as 100 with additional laboratory to provide practical experience with plants and topics discussed in lecture. 4 lec, 2 lab.

102 Plant Biology (5) (2N) (fall, winter) F. Kolb. Not offered on the Athens campus. Structure of seed plants as related to function. Survey of plants, with emphasis on life histories, reproduction, and relationships of selected plant groups. Credit not allowed for both 102 and 111. 4 lec, 2 lab.

103 Plants and People (4) (2A) Interrelationships of plants and humans from both historical and modern points of view, origins of agriculture and civilization, tropical and temperate food plants, medicinal plants, drug plants, destruction of environment, and its ultimate effect on food plants. 4 lec.

109 Americans and Their Forests: Ecology, Conservation and Policy (4) (2N) (spring) G. Matlack. The course provides understanding of modern forests encompassing both recent and long-term effects arising from natural and human causes. The pattern and character of forest utilization will be interpreted in terms of varied cultural experiences in different regions and times. 4 lec.

114 Foundations of Plant Biology (5) (2N) (fall, spring) S. Wyatt. The course is an introduction to the concepts of plant physiology and molecular biology that are the foundation of all biological processes. Topics include DNA structure and function leading to genes and evolution, theories of the origins of life leading to cell structure and function, and bioenergetics. The lab provides supplemental information and hands-on activities to reinforce the lecture topics. No credit if PBIO 110 or BIOS 170. 3 lec, 4 lab.

115 Plant Structure and Development (4) (2N) (spring) G. Rothwell. For plant biology and other science majors, preprofessional students and science modular students. Introduction to structure, growth, development, and reproductive biology of plants with emphasis on flowering plants. No credit if PBIO 101 or 111. 3 lec, 2 lab.

209 Plant Ecology (4) (2N) (winter) K. Brown. Basic concepts, theory, and applied aspects of plant ecology. Focus on the interactions of plants with their environment (biotic and abiotic) over a range of spatial and temporal scales. No credit if PBIO 425. 4 lec.

210 Plant Physiology (4) Prereq: PBIO 110 or 114 or BIOS 170; PBIO 111 or 115 (winter) A. Paik. The regulation of plant growth and development by internal and external factors, the acquisition of water and nutrients by plants, and the movement of water and solutes through plants. No credit if PBIO 424. 3 lec, 2 lab.

220 Woody Plants (4) (summer) Not intended for plant biology majors, introduction to identification of woody plants, and to the use of keys in plant identification. Credit not allowed if 248 completed. 2 lec, 2 lab.

225 Flowers (4) (summer) Not intended for plant biology majors. Identification of local flowers and discussion of the role of flowers in natural environments. Credit not allowed if 309 completed. 2 lec, 4 lab.

248 Trees and Shrubs (Dendrology) (4) (fall) P. Cantino. Identification, nomenclature, classification, ecological relationships, and importance of native and introduced woody plants. 2 lec, 4 lab, supplementary field trips.

297T Plant Biology Tutorial (1–15) Prereq: Tutorial college. (fall)

298T Plant Biology Tutorial (1–15) Prereq: Tutorial college. (winter)


307 Morphology of Algae and Bryophytes (6) Prereq: 111 or 211. (spring, even years) M. Vix-Chiasson. Comparative studies of structure, evolutionary relationships, life histories, and reproduction of selected representatives of major groups of algae and bryophytes. 3 lec, 1 disc, 4 lab.

308 Morphology of Vascular Plants (6) Prereq: 111 or (115 and 211). (fall, even years) G. Rothwell. Diversity of vascular plants as reflected by structural, developmental, and reproductive features of major groups; emphasis on evolution of diversity through systematically significant adaptations. 3 lec, 6 lab.
Courses / Environmental and Plant Biology

309 Plant Systematics and Ohio Flora (6) Prereq: 111 or 211. (spring) P. Cantino odd years; H. Ballard even years. Principles and methods of systematics; classification, classification, floral biology, and evolution of flowering plants. Lab: identification and classification of spring flora. 3 lec, 2 lab.

310 Biology of Fungi (5) Prereq: 111 or 211. (fall) A. Trese. Morphology and life history studies of selected fungi: major groups; isolation, and growth of selected fungi; fungal activities. 4 lec, 2 lab.

313 Special Topics in Plant Biology (1–6) Current and/or special topics in plant biology.

313B Supervised Study (1–3) Prereq: plant biology majors.

322 Tropical Plant Ecology (4) Prereq: PBIO 209 or 425 or BIOS 375. (fall) G. Mattlack. Tropical rainforest studies around the world, including basic plant ecology, conservation, and management. 4 lec.

331 Plant Genetics (5) Prereq: 110 or 114 or BIOS 170. (spring) H. Ballard and S. Wyatt. Basic principles of genetics as they relate to plants, including transmission, expression and evolution of genetic materials. 5 lec.

353 Plant Developmental Physiology (4) Prereq: 110 or 114 or BIOS 170. (spring, odd years) S. Wyatt Growth and development in flowering plants. Topics include cell growth and differentiation in developing meristems; tissue and organ development in culture, dormancy and germination, flower induction, seed formation, growth regulators, and senescence. 4 lec.

397T Plant Biology Tutorial (1–15) Prereq: Tutorial college. (fall)

398T Plant Biology Tutorial (1–15) Prereq: Tutorial college. (winter)

404 Undergraduate Research (3–6, max 6) Prereq: 17 hrs plant biology and jr standing. Independent research under supervision of faculty member.

406 Undergraduate Research/Written Presentation (3–4) Prereq: 17 hrs plant biology and jr standing. An independent research experience that includes a formal written presentation of the work. All work will be done under the supervision of a faculty member. A credit if PBIO 498R taken.

407 Undergraduate Research/Oral Presentation (3–4) Prereq: 17 hrs plant biology and jr standing. An independent research experience that includes a formal oral presentation of the work. All work will be done under the supervision of a faculty member.

409 Biological Discussions (2) Seminar presentations and discussions on selected plant biology topics. 2 disc.

410 Plants and Soil (4) Prereq: 111 or 211. 2 qtr chemistry. (winter) J. DeForest. Soil as environment for plant growth; interrelationships between plant and soil; role of organisms in cyclic processes; building and maintenance of soil fertility; relationships between soil and health of plants, animals, and humans. 3 lec, 2 lab.

412 Plant Pathology (5) Prereq: 111 or 211. (fall, odd years) A. Trese. Diseases of plants; history, types of pathogens and disease cycles, impact in nature and agriculture, disease control strategies. Isolation and identification of pathogens. 3 lec, 4 lab.

415 Quantitative Methods in Plant Biology (5) Prereq: PSY 221; 24 hrs of PBIO courses. (winter) B. Chiasson. Lecture: biostatistics and applied plant sciences; scientific method, hypothesis testing, and design of experiments; sampling, data collection, regression and correlation, analysis of variance, and parametric and nonparametric statistics. Lab: microcomputer applications in spreadsheet analysis, statistics, and graphics. 4 lec, 2 lab.

418 Writing in the Life Sciences (4) Prereq: Jr, 15 hrs PBIO or BIOS (winter) S. Wyatt. Current research and public controversy dealing with topics in plant research. Students will be provided with students with opportunities to practice and master skills needed for successful written communication in the fields of plant science and biology. No credit toward major. 4 lec.

420 Phycology (5) Prereq: 111 or 211. (spring, odd years) M. Vis-Chisson. Taxonomy and ecology of marine and freshwater algae, with emphasis on identification and distribution of common or representative genera. 3 lec, 4 lab.

424 Plant Physiology (6) Prereq: 210 or 353; organic chemistry recommended. (spring) A. Faik. Basic chemical and physical aspects of processes; photosynthesis, respiration, mineral nutrition, transport, nitrogen metabolism, water relations, and growth. 3 lec, 4 lab.

426 Physiological Plant Ecology (5) Prereq: 209 or 425. (spring, odd years) K. Brown. A survey of the complexity of plant physiological and structural adaptations to the ecological performance. Comparisons of plant characteristics for habitats to different biomes. Emphasis on reading and discussing peer-reviewed literature. Labs feature hands-on learning of microclimate techniques, photosynthesis protocols, synthesis and interpretation of data. 3 lec, 1 lab, 1 Saturday field trip.

427 Molecular Genetics (3) Prereq: 331 or 431 or BIOS 325; organic chemistry (spring) A. Showalter. Genetic fine structure and function at the molecular level; biochemical aspects of heredity in pro-organisms, plants, and animals; recombinant DNA and genetic engineering. 3 lec.

431 Plant Cell Biology (5) Prereq: 110 or 114 or BIOS 170. (fall) A. Faik. Structure and function of cells, organelles, and cellular inclusions. 3 lec, 4 lab.

435 Plant Population Biology (5) Prereq: PBIO 209 or 425 or BIOS 375 (winter, even years) G. Mattlack. Acquaint students with basic demographic processes as experienced by plant populations; 2) explore the demographic implications of a range of plant growth forms and life histories; 3) present the material in the context of a variety of models. The course will take an evolutionary/behavioral approach to plant populations. 3 lec, 4 lab.

436 Plant Community Ecology (5) Prereq: PBIO 209 or 425 or BIOS 375; PSY 221 (fall, even years) B. McCarthy. Advanced concepts and theory of plant community ecology. Emphasis will be placed on the interplay between theory and empirical studies. Classic literature will be reviewed and case studies developed from the modern literature to ideas of theory, approach, and experimentation. Laboratories will emphasize modern field methods of vegetation analysis and environmental assessment. 3 lec, 4 lab.

437 Ecosystem Ecology (4) Prereq: CHEM 122 or 152; PBIO 209 or BIOS 375 (fall) K. Brown. Analysis of the composition, function, and heterogeneity of ecosystems. Topics include: atmospheric, climate and geological controls on ecosystem function, comparison of aquatic and terrestrial ecosystems, ecosystem production, nutrient cycling and trophic dynamics. Synthesis with concepts of human impacts on ecosystems, locally and globally. 4 lec.

442 Experimental Anatomy of Plant Development (6) Prereq: PBIO 210 or 425 (winter) S. Wyatt and G. Rothwell. The concepts of plant development have been integrated with the descriptive assessment of cell, tissue and organ types that are the mainstay of plant anatomy to provide an exciting opportunity for all plant biologists. The course is grounded in experimental design and includes cutting edge methodologies. 3 lec, 6 lab. This is a Tier III equivalent course.

450 Biotechnology and Genomic Instrumentation (4) Prereq: 110 or 114 or BIOS 170. (fall) A. Showalter. For upper level undergraduate students. Introduction to basic molecular biological concepts and techniques in biotechnology and genetic engineering, including discussion of current experiment and progress in these fields. 4 lec.

460 Paleobotany (6) Prereq: 111 or 211. G. Rothwell. Morphology and evolution of representative fossil plant groups. 3 lec, 6 lab.

475 Plant Speciation and Evolution (3) Prereq: Jr or sr majors. (winter, even years) H. Ballard. Principles of evolution of plants and current topics in evolutionary biology. 3 lec.

480 Molecular Approaches in Plant Systematics, Ecology and Evolution (5) Prereq: 111 or 210 or BIOS 170 (winter, odd years) H. Ballard. Overview of computer and molecular approaches used to infer relationships in plants at level of populations, species and lineages. 3 lec, 4 lab.

485 Plant Biology Capstone (6) Prereq: (PBIO 209 and PBIO 211) and (PBIO 322 or PBIO 409). Capstone short-term field course for natural science majors, integrating principles across organismal plant biology and related disciplines, in a selected (often international) region. 4 lec, 4 lab.

490 Internship (max 10) Prereq: 110 or 114; credit for work experience in various applied fields of botany and environmental biology. Overseen by a faculty member and evaluated by the on-the-job supervisor. Report culminates experience.

497 Plant Biology Tutorial (1–15) Prereq: Tutorial college. (fall)

498T Plant Biology Tutorial (1–15) Prereq: Tutorial college. (fall)

499T Plant Biology Tutorial (1–15) Prereq: Tutorial college. (spring)

499H Thesis (3–6) Prereq: PBIO 404 or 407, g.p.a. of at least 3.5. Preparation of an honors thesis based on original research. No credit if PBIO 406 taken.

Environmental Engineering Technology (EVT)

The following courses for the A.A.S. in Environmental Engineering Technology are available only on the Chillicothe campus:

100 Introduction to Environmental Engineering Technology (3) Topics include toxicology, air pollution, groundwater contamination, transportation of hazardous materials, waste characterization, waste management, and waste treatment and disposal, with discussion of how regulations affect each.

110 Computational Methods in Environmental Engineering Technology (3) Emphasizes the principles of computational methods, including experimental error recognition, statistical analysis, and graphical data techniques using up-to-date computer software. Computer and programmable calculators will be required for writing lab reports. 3 lec, 2 lab.

115 Legal Aspects of Environmental Engineering (2) Introduction to legal aspects of the rights and duties of the individual, business, and society with regard to the environment, and the consequences of future environmental legislation. Investigates environmental legislation and regulations and environmental case studies highlighting the existing laws.

120 Introduction to Environmental Chemistry (3) Prereq: CHEM 121 or 151. Environmental chemistry as applied to aquatic, atmospheric, soil, and hazardous waste systems. Topics include: environmental chemical cycles; aquatic, atmospheric, and soil chemistry; environmental chemistry of hazardous wastes; and toxicology. 2 lec, 2 lab.

125 HAZWOPER Training (3) Provides certification required to work on a majority of environmental cleanup sites. Covers regulatory obligations, handling hazardous materials, personal protective equipment, monitoring instrumentation, emergency response, site control, medical assessment, confined space entry, and respiratory protection. 3 lec, 2 lab.
125L HAZWOPER Training Laboratory (1)
Emphasizes handling hazardous materials with use of personal protective equipment, instrumentation, and equipment. Includes simulations and demonstrations included. 3 lab.

140 Introduction to Air Pollution (3)
Prereq: 110; CHEM 121 or 151. Principal types; sources; dispersion; effects; and physical, economic, and legal aspects of controlling atmospheric pollutants. Emphasizes atmospheric chemical reactions due to pollution emissions.

150 Instrumentation in Environmental Analysis (3)
Prereq: 110; CHEM 121 or 151. Provides foundation of understanding principles behind instrumentation used for environmental analysis. Gas chromatographs, mass spectrometers, infrared spectrophotometers, FID's, and PID's are studied. 3 lec, 3 lab.

190 Internship/PRACTICUM/Cooperative Education (1, max 20)
Required for students on approved work assignments. Must submit final report on work activities. Credit is not applicable toward specific degree requirements but will accumulate in academic credit total.

198A-Z Special Topics (1–5, max 20)
Provides an opportunity to complete individual projects that involve special programs in the following areas: marketing, research, engineering, environmental engineering technology problems.

200 Site Investigation, Sampling, and Monitoring Laboratory (1)
Prereq: 110. Field-oriented course involving hazardous materials site investigation, characterization, and cleanup. Topics are planning and organization of field study, sampling plan development, sampling and monitoring, site control, hazardous materials handling, and emergency response. 3 lab.

210 Introduction to Health Physics (3)
Addresses fundamental principles of health physics and radiation protection. Topics include atomic structure, types of radiation, radioactive decay, methods of radiation detection, dosimetry, biological effects, and radiation protection.

210L Health Physics Laboratory (1)
Emphasizes health physics instrumentation including rate meters, scintillation cells, radon detection, and gamma spectrometry as they apply to nuclear and industrial monitoring. 3 lab.

220 Fluid Mechanics (3)
Prereq: 110. Fundamentals of fluid mechanics as applied to surface and groundwater, wastewater, and air emissions management. Topics include basic hydraulics, friction loss, pressure, flow measurement, pump types and characteristics, and schematic interpretation.

240 Air Sampling and Analysis (3)
Prereq: 110, 140. Provides practical field experience in ambient air and indoor sampling. Instrumentation is used to provide real time data collection and analysis. Emphasis on methods that determine the concentration of commonly encountered air pollutants.

240L Air Sampling and Analysis Laboratory (1)
Prereq: 110, 140. Emphasizes air flow measurements using devices that demonstrate volumetric displacement, velocity, pressure, and pressure. Provides techniques for determining accuracy, precision or repeatability, and calibration. 3 lab.

245 Wastewater Treatment (3)
Prereq: 110, 120. Introduction to wastewater treatment technologies. Covers regulations and phases of treatment for wastewater treatment systems, liquid-solid waste streams, and basic system process control.

250 Analysis of Environmental Pollutants (3)
Prereq: CHEM 121 and 122, or 151 and 152. Covers important techniques necessary for analyzing environmental samples. Methods established by EPA are used to analyze samples for heavy metals, volatiles, and semi-volatiles. Utilizes lab instrumentation such as GC/MS, AA, and IR spectrophotometer. Lab reports required from the analysis of soil and water samples. 3 lab.

250L Analysis of Environmental Pollutants Laboratory (1)
Prereq: CHEM 121 and 122, or 151 and 152. Emphasizes lab instrumentation such as GC/MS, AA, and IR spectrophotometer. Lab reports required from the analysis of soil and water samples. 3 lab.

260 Environmental Risk Assessment (3)
Analyzes risk assessment process applied to environmental problems. Uncertainty factors, risk analysis, and exposure characterization, fate, and transport models will be addressed.

290 Internship/PRACTICUM/Cooperative Education (1, max 20)
Required for students on approved work assignments. Must submit final report on work activities. Credit is not applicable toward specific degree requirements but will accumulate in academic credit total.

298A–Z Special Topics (1–5, max 20)
Provides an opportunity to complete individual projects that involve special programs in the following areas: marketing, research, engineering, environmental engineering technology problems.

Equine Studies (EQU)
The following courses for the A.A.S. in equine studies are available only on the Southern campus: 101 Introduction to Equine Studies (4) Overview of the history of the horse, evaluation, selection, training, equipment, nutritional requirements, sale and handling of horses, shoeing, equine reproduction, and career and leadership opportunities in the horse industry.

110 Equine Nutrition (4) Study of the equine digestive system, nutrient requirements of horses at various levels of performance, and problems associated with feeding and feeding practices.

120 Equine Anatomy and Physiology (4) Prereq: BIOL 101. Study of the structure and functions of the horse through the various anatomical systems.

125 Equine First Aid and Preventive Medicine (5) First aid and emergency procedures, preventive medicine, diseases, and parasitism in horses.

130 Equine Evaluation and Selection (3) Prereq: 101. Study of the types, evaluation, and selectivity of horses in accordance to their intended use.

200 Equine Reproduction (4) Prereq: 101. Comprehensive study of equine reproduction stressing the anatomy and physiology of the stallion and mare and methods of breeding, including artificial insemination, and foaling.

215 Equine Business Management (4) Prereq: CS 120. Study and practice of basic concepts, techniques, procedures of accounting involved in keeping and evaluating equine records from the management viewpoint. Designed to integrate general marketing concepts with common practices in the horse industry. Topics include general business laws, equine law, public relations, insurance, bookkeeping, contracts, taxes, and starting and maintaining a horse operation.

220 Farm and Stable Management (4) Study of the management of a working horse farm. Topics include scheduling, budgeting, equipment use and maintenance, land management, facilities management, site selection and design, and safety.

225 Equestrian Teaching Techniques (3) Study of the methods of teaching riding. Emphasis on the abilities and skills and how instructor must possess to teach riding as well as the safety, care, and evaluation of school horses. Students will develop and implement teaching plans for riders at the beginning level.

230 Comprehensive and Competitive Horse Judging (3) Prereq: 130. Continuation of 130. Activity through which students can put accumulated knowledge to practical application and assess knowledge competing on the OU Horse Judging Team. Travel and meal fees may be required.

235 Horse Show and Event Management (3) Designed to provide students with the necessary tools to organize any show, event, or clinic related to the equine industry. Major topics include organizing, fund raising, financing, insurance, record keeping, and advertising. Utilizes principles to plan and operate a horse show and/or clinic for OU-Southern or associated organization.

240 Basic Horse Shoing (3) Shoing and balancing of feet, corrective trimming, hoof health, anatomy of the leg and foot, and blacksmithing as a business.

250 Harnessing and Driving (1) Knowledge and fundamental skills used in line driving, lunging, harnessing, and pleasure driving.

280 Fundamentals of Starting the Young Horse (1) Prereq: PED 168, 172, 173, 176, 177, or 180. Development of advanced riding skills including handling, lunging, saddling, and riding a green-broke horse applying basic horsemanship skills.

281 Fundamentals of Starting the Young Horse II (2) Prereq: 280. Continuing to develop advanced riding skills necessary to train a green broke horse by understanding and implementing specific standard training procedures. Student will have responsibility for an assigned young horse, teaching that horse to walk, trot, lope, back, and turn around.

282 Therapeutic Riding (3) Study of the fundamental knowledge and skills related to the therapeutic riding concept. Topics include evaluating and training a horse for therapeutic riding activities, basic horse laws addressing people with disabilities, and behavioral concerns with identification of alternative approaches. A supervised experience in therapeutic riding techniques is part of the course.

283 Therapeutic Facility Design and Management (3) This course focuses on the design and planning of therapeutic riding programs. Topics include facility and building design, and program development.

284 Techniques for Teaching the Therapeutic Rider (4) This course encourages students to understand and work with riders with disabilities and challenges. It is essential for instructors to research and know the issues these riders face and formulate lesson plans according to individual needs and goals.

285 Preparation for Therapeutic Riding Instructor Certification (3) Designed to prepare students for the Registered Level Therapeutic Riding Instructor offered by the North American Riding for the Handicapped Association. The course covers all components of the test and provides lecture and active experience with immediate evaluation and feedback.

286 Administrative Aspects of Therapeutic Riding (3) Provides information on administrative issues and aspects of therapeutic riding, the riding center, and overall management. The course includes goal setting, strategic planning, legal issues, and working with boards.

287 Evaluation and Training of the Horse (2) The Horse (2)
This course rounds out the therapeutic riding student’s education to include evaluation and training of horses brought into the program. This knowledge and awareness increases the safety and therapeutic value of the sessions for the therapeutic riding client.

290 Equine Field Experience (1–6)
Field experience which might include trips to horse farms, race tracks, veterinary clinics, museums, horse shows or events, or seminars offered through recognized organizations or individuals.
251 Equine Internship (1–6)
Prereq: 201 or 202. Internship experience that provides on-site exposure to general business operations and procedures. Intended for experiences following the freshman year.

Prereq: 301 or 302. Principles of financial management, including the economic, strategic, and financial management of business enterprises.

Prereq: two from among 486, 487, 488, and 489.

Prereq: FIN 301. The study of group life insurance, health insurance, and annuities. This course will survey the topics of working capital and income; raising funds to finance growth of business enterprises.

Prereq: FIN 301. Study of corporate financial planning; financial analysis; internal management of working capital and income; raising funds to finance growth of business enterprises.

Prereq: FIN 301. The study of the financial markets, their behavior, and the role of financial institutions.

Prereq: FIN 301. The study of the financial markets, trading, and institutions. This course is supplemented by current readings and derivatives trading simulations.
Foreign Languages and Literatures

includes: International Literatures in English and Modern Languages (Introductory Culture and Civilization; Professional Courses)

Chinese (Asian) (CHIN)

111 Elementary Chinese (4)
Prereq: 111 or equiv. (fall) Beginning course of 3-qt 1st-year sequence.

112 Elementary Chinese (4)
Prereq: 112 or equiv. (spring) Continuation of 112.

169A Spoken Business Chinese (4)
A task-oriented introduction to the basic communicative functions and business terminologies of the Chinese language. Chinese culture and alphabetic Chinese writing will also be introduced; the Chinese character writing system will not be used. Does not satisfy the foreign language requirement.

111 Intermediate Chinese (4) (2C)
Prereq: 113 or equiv. (fall) 1st course of 3-qt intermediate-level sequence.

121 Intermediate Chinese (4) (2C)
Prereq: 211 or equiv. (winter) Continuation of 211.

123 Intermediate Chinese (4) (2C)
Prereq: 212 or equiv. (spring) Continuation of 212.

311 Advanced Chinese (4)
Prereq: 213 or equiv. (fall) Beginning of advanced-level sequence.

312 Advanced Chinese (4)
Prereq: 311 or equiv. (winter) Continuation of 311.

313 Advanced Chinese (4)
Prereq: 312 or equiv. (spring) Continuation of 312.

399 Special Studies in Chinese (1-3)
Prereq: perm. Reading and discussion of assigned assignments in books, periodicals, and tapes on specific topics related to Chinese language and culture.

French (Romance) (FR)

111 Elementary French (4)
Beginning course of 3-qt intermediate-level sequence. Basic grammatical concepts and patterns. Emphasis on development of reading, listening comprehension, speaking, and writing skills. Basic text and workbook used. Lab required. No credit if 199.

112 Elementary French (4)
Prereq: 111. Continuation of 111. Basic text, workbook, and readings used. Lab required. No credit if 199.

113 Elementary French (4)
Prereq: 112. Continuation of 112. Basic text, workbook, and readings used. Lab required. No credit if 199.

199 French for Review (4)
No CR if 111, 112, or 113. (fall) Preparation for FR 211 for students with some high school French. Review of grammar and vocabulary with intensive practice adapted to college-level expectations and instructional techniques. Emphasis on speaking, listening, reading, and writing. Does not satisfy language or humanities requirements in Arts and Sciences.

211 Intermediate French (4) (2C)
Prereq: 113 or 2 or 3 yrs h.s. French. 1st course of 3-qt intermediate-level sequence. Intensive review of grammar. Additional readings with discussion in French. Supplemental cultural material.

212 Intermediate French (4) (2C)
Prereq: 211 or perm. Continuation of 211.

213 Intermediate French (4) (2C)
Prereq: 212 or 4-5 yrs h.s. French. Reading and discussion of selected modern works. Completion of 213 fulfills foreign language requirement of College of Arts and Sciences.

298 Independent Study in French (1-2, max 6)
Prereq: 213 or perm. Reading and discussion of assigned assignments in books, periodicals, films, tapes on specific topics involving French language. Does not count toward major or minor. Does not satisfy language requirement.

341 Advanced Conversation and Composition (4)
Prereq: 213 or perm. Speaking and writing based on readings and standard Grammar review.

342 Advanced Conversation and Composition (4)
Prereq: 341 or perm. Continuation of 341.

343 Advanced Conversation and Composition (4)
Prereq: 342 or perm. Continuation of 342.

345 French for Business (4)
Prereq: 343. Profession-oriented language and culture training in French. Reading, writing, listening, and speaking skills are emphasized in a business context.

348 French Civilization and Culture (4)
Prereq: 341 or 342 or 343. Sociopolitical, and cultural history of France from Middle Ages to Revolutio, Readings, discussions, class reports, and short papers.

349 French Civilization and Culture (4)
Prereq: 341 or 342 or 343. (spring) Continuation of 348, covering 1799 to present. France in the modern world.

354 Introduction to Reading French Literature (4)
Prereq: 341 or 342 or 343. Designed to prepare students to meet the challenges of advanced literature courses. Close reading techniques will enable students to read modern French works with speed and comprehension. Basic aspects of literary analysis and theory will be emphasized.

355 Introduction to Prose (4)
Prereq: 344. Reading and discussion of French novels, short stories, and other narrative genres representing various literary traditions.

356 Introduction to Drama and Poetry (4)
Prereq: 345. Reading and discussion of French drama, as literary text and theatrical performance, and lyric poetry from several historical periods.

396 Internship in French (1-5)
Prereq: perm of internship director. Practice using the language in a work environment. Does not count for major.

415 French Literature of the Renaissance (4)
Prereq: 354, 355 or 356. Major 16th-century poets, including Du Bellay and Ronsard.

416 French Literature of the Renaissance (4)
Prereq: 354, 355 or 356. Major 16th-century prose writers, including Rabelais and Montaigne.

418 17th-Century French Literature (4)
Prereq: 354 or 355 or 356. Works by numerous authors, including at least some of following: Descartes, Pascal, La Fayette, La Rochefoucauld, La Bruyère, La Fontaine, and Boileau.

419 17th-Century French Literature (4)
Prereq: 354, 355 or 356. Major plays of Corneille, Racine, and Molière.

423 18th Century (4)
Prereq: 354, 355 or 356. French literature and thought in Age of Enlightenment.

424 18th Century (4)
Prereq: 354, 355 or 356. Continuation of 423.

425 Romanticism (4)
Prereq: 354, 355 or 356. Romanticism in drama, poetry, and fiction of first half of 19th century.

426 Realism and Naturalism (4)
Prereq: 354, 355 or 356. Major fictional works of 19th century.

427 French Poetry in the Second Half of the 19th Century (4)
Prereq: 354, 355 or 356. Poetry of Baudelaire, Verlaine, Rimbaud, Mallarmé, and others.

429 20th-Century French Literature I (4)
Prereq: 354, 355 or 356. French prose fiction before WWII.

431 20th-Century French Literature II (4)
Prereq: 354, 355 or 356. French prose fiction since WWII.

433 20th-Century French Literature III (4)

434 French Through Film (4)
Prereq: 342. Early development of the French cinema and its more recent filmmakers, actors, and actresses. Films are studied in their cultural and historical contexts. Students increase their French proficiency through listening, speaking, reading, and writing.

435 Proseminar (1-4, max 12)
Prereq: 354, 355 or 356. Subject will vary. May be repeated when subject changes.

437 Applied Phonetics (4)
Prereq: 343 or perm. (fall) Systematic study of segmental and prosodic elements of French pronunciation including reading extensive oral practice.

439 Modern French Usage (4)
Prereq: 343 or perm. (winter) Fine points of grammar. Practice in composition and analysis of texts.

440 Teaching French: Theory and Practice (4)
Prereq: 343. Provides an introduction to current theories about learning and teaching modern foreign languages, with a focus on
### Courses / Foreign Languages and Literatures

The particularities of teaching French language and cultures; opportunities to apply that theoretical knowledge to classroom teaching; and opportunities to develop a deeper knowledge of and more proficiency in French language and cultures. Does not count for major.

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<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Description</th>
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<tbody>
<tr>
<td>454</td>
<td>Francophone Literature of Sub-Saharan Africa, Maghreb, and the Caribbean (4)</td>
<td>Prereq: 355 or 356. Representative works by 20th-century Francophone Sub-Saharan, Maghrebian, and Caribbean writers, including at least, but not limited to, Malika Mokkadem, Leopold Senghor, Fernand Oyono, Lydie Baradez, and Simone Schwartz-Bart. Works are studied in their historical and cultural contexts. Readings, lectures, films, and discussions.</td>
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<tr>
<td>464</td>
<td>Francophone Literature of Quebec (4)</td>
<td>Prereq: 355 or 356. Representative works by 20th-century writers of Quebec including at least, but not limited to, Anne Hebert, Roch Côté, Michel Tremblay, Marie-Claire Blais, and Yves Beauchemin. Works are studied in their historical and cultural contexts. Readings, lectures, films, and discussions.</td>
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#### German (Germanic) (GER)

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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>111</td>
<td>Elementary German (4)</td>
<td></td>
<td>Introduction to pronunciation and basic grammar. Development of comprehension and speaking skills. Beginning course of 3-qt 1st-year sequence.</td>
</tr>
<tr>
<td>112</td>
<td>Elementary German (4)</td>
<td>Prereq: 111. Continuation of 111.</td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>Elementary German (4)</td>
<td>Prereq: 112. Continuation of 112.</td>
<td>Continued development of skills of oral and written production and comprehension.</td>
</tr>
<tr>
<td>211</td>
<td>Intermediate German (4) (2C)</td>
<td>Prereq: 113 or 2 or 3 yrs h.s. German.</td>
<td>Continued development of listening comprehension, reading, writing, and speaking skills. Grammar review. Lab required. 1st course of 3-qt intermediate-level sequence.</td>
</tr>
<tr>
<td>212</td>
<td>Intermediate German (4) (2C)</td>
<td>Prereq: 211 or perm. Continuation of 211.</td>
<td>Emphasis on discussion of modern texts. Continued development of listening comprehension and speaking and writing skills. Lab required.</td>
</tr>
<tr>
<td>213</td>
<td>Intermediate German (4) (2C)</td>
<td>Prereq: 212 or 4-5 yrs h.s. German.</td>
<td>Modern German texts are read and form basis for oral and written assignments. Completion of 213 fulfills foreign language requirement of College of Arts and Sciences.</td>
</tr>
<tr>
<td>235</td>
<td>German Drama on Stage (1–4)</td>
<td>(winter) Presentation of German drama on stage.</td>
<td>Private coaching in pronunciation and inflection of German. Some credit is given toward major or minor. Does not count as an intermediate-level sequence.</td>
</tr>
<tr>
<td>298</td>
<td>Independent Study in German (1–2, max 6)</td>
<td>Prereq: 235 or perm. Reading and discussion of assigned materials (books, periodicals, films, tapes) on specific topics involving German language. Does not count toward major or minor. Does not satisfy language requirement.</td>
<td></td>
</tr>
<tr>
<td>341</td>
<td>Advanced Conversation and Composition (4)</td>
<td>Prereq: 213 or perm.</td>
<td></td>
</tr>
<tr>
<td>342</td>
<td>Advanced Conversation and Composition (4)</td>
<td>Prereq: 341 or perm.</td>
<td></td>
</tr>
<tr>
<td>343</td>
<td>Advanced Conversation and Composition (4)</td>
<td>Prereq: 342 or perm.</td>
<td></td>
</tr>
<tr>
<td>345</td>
<td>Business German (4)</td>
<td>Prereq: 342. Development of the student's linguistic abilities in German in a business context.</td>
<td></td>
</tr>
<tr>
<td>251X</td>
<td>Demotic Greek (4)</td>
<td>Beginning demotic (modern) Greek.</td>
<td></td>
</tr>
<tr>
<td>252X</td>
<td>Demotic Greek (4)</td>
<td>Prereq: 251X. Continuation of demotic (modern) Greek.</td>
<td></td>
</tr>
<tr>
<td>253X</td>
<td>Demotic Greek (4)</td>
<td>Prereq: 252X. Continuation of demotic (modern) Greek.</td>
<td></td>
</tr>
</tbody>
</table>

### Indonesian/Malaysian (Asian) (INDO)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>111</td>
<td>Elementary Indonesian/Malaysian (4) (fall)</td>
<td>Beginning course of 3-qt 1st-year sequence.</td>
<td></td>
</tr>
<tr>
<td>112</td>
<td>Elementary Indonesian/Malaysian (4)</td>
<td>Prereq: 111 or equiv. (winter) Continuation of 111.</td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>Elementary Indonesian/Malaysian (4)</td>
<td>Prereq: 112 or equiv. (spring) Continuation of 112.</td>
<td></td>
</tr>
<tr>
<td>211</td>
<td>Intermediate Indonesian/Malaysian (4)</td>
<td>Prereq: 113 or equiv. (fall) 1st course of 3-qt intermediate-level sequence.</td>
<td></td>
</tr>
<tr>
<td>212</td>
<td>Intermediate Indonesian/Malaysian</td>
<td>Prereq: 211 or equiv. (winter) Continuation of 211.</td>
<td></td>
</tr>
<tr>
<td>213</td>
<td>Intermediate Indonesian/Malaysian (4) (2C)</td>
<td>Prereq: 212 or equiv. (spring) Continuation of 212.</td>
<td></td>
</tr>
<tr>
<td>311</td>
<td>Advanced Indonesian/Malaysian (4)</td>
<td>Prereq: 213 or equiv. (fall) Beginning of advanced-level sequence.</td>
<td></td>
</tr>
<tr>
<td>312</td>
<td>Advanced Indonesian/Malaysian (4)</td>
<td>Prereq: 311 or equiv. (winter) Continuation of 311.</td>
<td></td>
</tr>
<tr>
<td>313</td>
<td>Advanced Indonesian/Malaysian (4)</td>
<td>Prereq: 312 or equiv. (spring) Continuation of 312.</td>
<td></td>
</tr>
<tr>
<td>399</td>
<td>Special Studies (1–3, max 9)</td>
<td>Prereq: perm. Independent study of topic of interest in Indonesian/Malaysian language or literature.</td>
<td></td>
</tr>
</tbody>
</table>

### International Literatures in English (ILL/ILML)

The lectures and readings for these courses are in English and are aimed at the entire University community. While they do not fulfill requirements toward any of the majors in foreign language, these courses will count toward the humanities area requirements of the College of Arts and Sciences. No credit is counted toward the foreign language requirement.