ELECTRICAL ENGINEERING

College of Engineering

Electrical Engineering EE

300. Electric Circuits I
Fall, Winter. 4(4-0) MTH 113.

301. Electric Circuits II
Winter, Spring. 3(3-0) E E 300, MTH 214.

302. Basic Electronic Circuits
Fall, Spring. 4(4-0) E E 301, MTH 215.
Volt-ampere characteristics of diodes and transistors. Voltage, current, and power amplification. Stability, transient, and high-frequency effects. Feedback, oscillators, and operational amplifiers.

303. Electronics Laboratory I
Winter, Spring. 1(0-3) E E 300; E E 301 concurrently.
Electronic design equipment and measurement fundamentals. Experimental verification of topics covered in E E 300 and E E 301. Computer-aided circuit analysis and design.

304. Electronics Laboratory II
Fall. 1(0-3) E E 302.

305. Electromagnetic Fields and Waves I
Fall, Winter. 3(3-0) MTH 310, PHY 298.

306. Electromagnetic Fields and Waves II
Winter, Spring. 3(3-0) E E 305.
Electromagnetic fields: EM sources, vector potential, magnetic media, inductance; energy storage time varying fields, and Maxwell's equations; potential theory and boundary value problems.

307. Electromagnetic Fields and Waves III
Spring, Summer. 3(3-0) E E 306.

308. Fields and Waves Laboratory
Fall, Spring. 1(0-3) E E 307 or concurrently.
Experimental investigation of charged particle motion in EM fields, dielectric and magnetic properties and materials, probing of currents and charges, and propagation of transient and steady-state waves. Digital computer solutions for EM field and wave problems.

311. Machine Organization and Assembly Language Programming
Fall, Winter. Spring. 4(3-3) MTH 214; CPS 252 or CPS 301 or CPS 304. Interdepartmental with and administered by the Department of Computer Science.

315. Discrete-Time Systems
(SYS A 3111) Fall, Winter. 3(3-0) MTH 215.
Discrete-time system modeling, discrete-time signals, difference equations, convolution summations, z-transform, transfer functions, stability analysis, digital filters.

320. Electromechanical Energy Conversion
Fall, Spring. 3(3-0) E E 301, E E 306.
Review of electromagnetics, three phase power, transformers, electromechanical energy conversion, basic concepts of rotating machines, alternating current machines.

330. Digital Logic Fundamentals
(E E 230) Fall, Winter, Spring, Summer. 4(4-0) CPS 252. Interdepartmental with the Department of Computer Science. Boolean algebra, combinational logic and minimization, sequential system fundamentals and components, arithmetic operations and devices; memory devices and ensembles; digital integrated circuits; practical engineering design problems.

345. Introduction to Electronic Instrumentation Systems
Fall, Winter. 4(3-3) PHY 285.
Basic electronic concepts: passive and active components; operational amplifiers; switching devices, equivalent circuits; transducers; signal conditioning; recording; data management; basic elements of control.

355. Deterministic Communication Systems
Fall, Spring. 3(3-0) E E 301, MTH 214.
Communication systems. Representation of signals in time and frequency domain. Processing of signals by linear, simple nonlinear and time-variant systems. Linear and nonlinear, analog and digital modulation and demodulation, for example, AM, FM, PCM.

410. Digital Circuit Design I
Fall, Winter, Spring. 4(3-3) E E 330, E E 302.
MOS and BJT transistor models; SPICE models and simulation, logic family characteristics; latches, flip-flops, timers; memory circuits; timing diagrams; gate arrays: standard cells, microprocessors, PLAs.

411. Digital Design Automation
Winter, Spring. 4(3-3) E E 410.
Computer-aided engineering of digital circuits; application-specific integrated circuits; design hierarchy; schematic capture; functional specifications; behavioral models; hardware description language; design verification; testability; sequential circuit design.

412. Computer Communications
Fall, Winter. Spring. 3(3-0) CPS 311; STT 351 or STT 441. Interdepartmental with and administered by the Department of Computer Science.
Computer networks: analysis by queueing theory; network design algorithms, routing and flow.
413. Analysis of Control Systems
(SYS 413) Fall. 4(4-0) E E 301, E E 355.
Control system characteristics, performance criteria, transient and steady-state responses, error analysis, stability, root locus and frequency response techniques. Controller design using root locus and frequency response methods.

414. Control Systems Laboratory
Winter, Spring. 1(0-3) CPS 311, E E 304, E E 413.
Experimental investigations of feedback systems. Study of solid state controllers. Properties and applications of phase lock loops. Introduction to digital control.

415. Digital Control Systems
Winter. 3(3-0) CPS 311, E E 315, E E 413.
Organization of digital control systems, classical and modern control systems. Hardware and software considerations with emphasis on microprocessor implementation.

416. Computers in Robotics
Spring. 3(2-3) E E 415.
Topics include overview of robots, sensors, homogeneous transforms, kinematics, trajectory planning, control and introduction to vision.

417. State Models, Analysis, and Simulation
(SYS 418) Spring. 3(3-0) E E 315, MTH 310, MTH 334.
Vector-matrix state-space models of dynamic systems, exponential matrix, transform solutions, convolution, stability, controllability, observability, simulation, computational techniques, extensions to nonlinear systems.

418. Introduction to Computer-Aided Circuit Design
Fall. 3(3-0) CPS 301, E E 302.
Introduces the techniques used for automatic formulation, analysis and optimization of linear and nonlinear electronic circuits. Students will write a modest but useful analysis program package.

419. Physical Phenomena and Electronic Instrumentation I
Winter. 4(3-3) PHY 259, PHY 258 or approval of department, MTH 215. Interdepartmental with and administered by Physics.
Concepts of electronics relative to uses in investigations of physical phenomena and their subsequent applications to provide reliable instrumentation. Nuclear radiation detectors, photometers and magnetometers are examples of specific topics covered.

421. Power System Analysis
Spring. 3(3-0) E E 329 or concurrently.
Model of power system components, analysis and planning techniques including load flow, short circuit, transient stability, voltage and frequency control, economic operation of power systems.

422. Power Electronics
Winter. 3(3-0) E E 302, E E 320.
Thyristor characteristics, commutation, AC voltage controllers, single-phase and three-phase rectifier and inverter circuits, DC-to-DC converters, cycloconverters, AC and DC motor drives.

423. Electrical Machines Laboratory
Spring. 1(0-3) E E 320.
Transformers, torque, power and speed characteristcs of induction, synchronous and d-c machines, steady state and transient operation of machines, machine control.

424. Computer Architecture I
Fall, Winter, Spring. 4(3-3) CPS 411, E E 336. Interdepartmental with and administered by the Department of Computer Science.
Computer organization, control unit implementation, input-output, interrupt, and interface design; digital system simulation.

425. Computer Architecture II
Winter, Spring, Summer. 4(2-6) CPS 424.
Interdepartmental with and administered by the Department of Computer Science.
Microprogrammed control; pipelining; multiprocessors and parallel processing; fault tolerant computing. Implementation of a digital system combining simulation and hardware.

430. Computer Interfacing
Fall, Winter, Spring. 4(3-3) CPS 411, E E 410.
Case study of a small computer system; I/O controller design; bus interface requirements, interrupt structure, and data transfer. Digital system design.

435. Microwave Circuits and Systems
Fall. 3(3-0) E E 307.

436. Radiation and Reception of Electromagnetic Waves
Winter. 3(3-0) E E 307.
Radiation, propagation, scattering and reception of electromagnetic waves; circuit and radiation characteristics of wire and microwave and antennas; radiation fields, self and mutual impedances of antennas and arrays; microwave aperture antennas.

438. Transmission and Radiation Laboratory
Winter. 1(0-3) E E 435; E E 436 concurrently.
Microwave transmission and radiation laboratory. Measurement of frequency, wavelength, standing waves, impedance, and power. Experiments on transmission lines, waveguides, cavity resonators, microwave circuits, and circuit and radiation properties of antennas.

450. Applied Probability in Communication Theory
Fall, Winter. 3(3-0) E E 355.

455. Digital Filter Design
Winter. 3(3-0) E E 456. E E 457.
Design of digital filter algorithms and their implementation; software and hardware considerations. Applications and application driven design.

456. Communications Laboratory
Spring. 1(0-3) E E 456; E E 445 concurrently.
Experimental investigations on communication theory and information transmission topics from E E 415, E E 456, and E E 445.

457. Physical Principles of Electronic Devices
Fall. 4(4-0) E E 302; E E 305.
Energy levels in atoms and crystals; density of states; Fermi-Dirac and Maxwell-Boltzmann statistics; transport properties of bulk materials; metal-semiconductor contacts; the p-n junction and BJTs.

458. Electronic Devices and Circuits
Winter. 3(3-0) E E 474.
Fabrication technology; models and characteristics of BJTs, JFETs, and MOS devices; application to linear and digital circuits.

459. Applications of Electronic Devices
Spring. 3(3-0) E E 474.
Power devices and applications; transistors, diodes, triacs, and SCR's; high frequency devices and applications; transistors; impact, Gunn and vacuum devices; photo-devices; solar cells and LED's.

460. Electro-optic Devices
Spring of odd-numbered years. 3(3-0) E E 306.
Atomic origin and the operational characteristics of light sources and detectors. Basic design considerations for gas and solid state lasers. Methods of optical detection, applications.

461. Integrated Circuit Fabrication Laboratory
Winter, Spring, Summer. 2(1-3) E E 474.
Integrated circuit design and fabrication. Laboratory fabrication of resistors, diodes, capacitors, and simple MOS or bipolar integrated circuits. Yield, testing, and economic considerations.

465. Integrated Circuits Operational Amplifiers
Fall, Winter. 3(3-0) E E 392.

466. Independent Study
Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 6 credits. May be enrolled for a maximum of 3 credits in E E 445 and E E 448 combined. Approval of department.
Independent study of a topic in electrical engineering of particular interest to the student.

467. Undergraduate Research
Fall, Winter, Spring. 1 to 3 credits. May reenroll for a maximum of 6 credits. Approval of department.
Independent undergraduate research in contemporary areas of electrical engineering such as: alternative energy, monitoring and control, bioengineering, power systems, integrated electronics, electromagnetic systems.
801. Special Problems
Fall, Winter, Spring, Summer. 1 to 4 credits. Approval of department.
Investigation of a topic in electrical engineering compatible with the student's prerequisites, interest, and ability.

809. Computer Arithmetic Algorithm Design
Fall. 4(4-0) E E 433 or CPS 424. Interdepartmental with the Department of Computer Science.
Number systems; fast two-operand and multiple-operand addition/subtraction; standard, reencoded and cellular array multipliers; high-performance dividers; floating-point arithmetic; error control; pipelining.

812. Computer Networks
Spring. 3(3-0) CPS 412, CPS 415, CPS 424. Interdepartmental with and administered by the Department of Computer Science.
Data communication, baseband and broadband local area networks, logical link control, internetworking, transport protocol, naming and addressing, interprocess communication, reliable broadcast protocol, distributed processing.

813. Logic Design Methodologies
Spring. 3(3-0) CPS 424 or E E 431. Interdepartmental with the Department of Computer Science.
Modeling and simulation of logic circuits; hardware description languages; design methodologies for logic arrays and bit-slice processors; fault tolerance, testability, computer-aided design of logic circuits; automated routing algorithms.

815. Advanced Computer Architecture
Fall. Winter. 3(3-0) CPS 413, CPS 424. Interdepartmental with and administered by the Department of Computer Science.
Classification of computer systems, memory organizations, cache memories, look-ahead processors, stack processors, pipeline processors, vector processors, associative processors, supercomputer architectures, parallel processing, performance issues, case studies.

816. Fault-Tolerant Computing
Winter. 3(3-0) E E 813. Interdepartmental with the Department of Computer Science.
Reliability evaluation; fault models and test pattern generation; design for testability; fault-tolerant design techniques; self-checking circuits and systems; system diagnosis and reconfiguration, case studies.

818. Introduction to Robotics
Spring. 3(3-0) E E 415 or M E 455 or approval of department. Interdepartmental with the Department of Computer Science.
Robot configuration and geometry, Robot drive systems, kinematics, controller design, sensors, sensor-based robots. Economic, political and social implications. Industrial application.

820. Electric Power Transmission System
Fall. Spring of odd-numbered years. 4(4-0) E E 421 or approval of instructor.
Symmetrical components, calculation of short circuit currents for symmetrical and unsymmetrical faults; methods and devices used in protection; pilot wire and carrier systems, circuit interruption, grounding.

823. Power System Stability and Control
Fall of even-numbered years. 3(3-0) E E 826.
Analysis and simulation of small and large disturbance stability of power systems; generator, exciter, voltage regulator models; control system analysis and design of excitation systems and power system stabilizers.

824. Power System Operation and Control
Fall of odd-numbered years. 3(3-0) E E 421, E E 455 or STT 441.
Operation planning of power systems including load flow, unit commitment, and production cost methods; on-line operation and control including automatic generation control, economic dispatch, security assessment, and state estimations.

825. Alternating Current Electrical Machines
Spring of even-numbered years. 3(3-0) MTH 424; E E 480 or approval of instructor.
Analysis and modeling and design aspects of synchronous, inductive, and switched reluctance machines for use in power systems stability and control, and in motion control.

826. Advanced Linear Systems Analysis
(Spring 826.) Fall. 4(4-0) MTH 310, MTH 334, approval of instructor.
Analysis of linear continuous time and discrete time systems for both time invariant and time varying models; state space and transfer function models; transition matrices; controllability; observability; minimal realizations; stability.

827. Nonlinear Systems Analysis
(Spring 827.) Spring. 4(4-0) E E 826, MTH 424.
Existence, uniqueness and stability in nonlinear systems; autonomous systems and the phase space; linearization, perturbation, describing functions and harmonic balance procedures; numerical solutions.

829. Linear Multivariable Control Systems
(Spring 829.) Winter. 4(4-0) E E 826, STT 441, E E 835.
Linear continuous time and discrete time multivariable control systems; state and output feedback; observers; eigenstructure placement; asymptotic tracking; optimal linear control; stochastic processes; Kalman filter; LQG optimal control.

831. Active Network Synthesis
Winter. 3(3-0) Approval of department.

832. Switched Capacitor Circuits
Spring of odd-numbered years. 3(3-0) E E 475.
Switched capacitor analog circuit analysis and design. Analog sampled data concepts; implementation of signal processing operations; switched capacitor filters; nonlinear effects; linear and nonlinear applications.

835. Electromagnetic Waves
Fall. 3(3-0) Approval of department.

836. Electromagnetic Waves I
Winter. 3(3-0) E E 836.

837. Electromagnetic Waves II
Spring. 3(3-0) E E 837.

841. Fourier Optics
Spring of even-numbered years. 3(3-0) E E 455 or E E 430 or E E 835.
Electromagnetic (Fourier) optics and optical information processing. Spatial linear systems, EM optics and scalar diffraction; lenses; optical imaging systems; optical information processing; holography.

845. Detection and Estimation Theory
Spring of odd-numbered years. 3(3-0) E E 863.
Classical detection theory, hypothesis testing, decision criteria, multiple hypotheses, colored noise; detection of signals with unknown parameters, Bayes estimates, MAP, ML, LMSE, Wiener and Kalman filters, nonlinear estimation, application to communications and radar systems.

846. Information Theory and Coding
Spring of even-numbered years. 3(3-0) E E 863 or approval of instructor.
Discrete and continuous channels. Channel capacity, Shannon's source coding and channel coding theorems. Rate distortion theory. Linear codes, Hamming, BCH, Cyclic codes. Convolutional codes. Viterbi algorithm, sequential decoding.

847. Communication Engineering
Fall. 4(4-0) E E 457.

848. Communication Theory
Spring. 3(3-0) E E 863.
Hypothesis testing, decision theory and parameter estimation in communications and signal processing. Optimal filtering techniques. Communication in non-white noise. Quantum detection theory.

849. Microwave Electronics
Spring of odd-numbered years. 3(3-0) E E 835, E E 875.
Microwave gaseous, solid-state and vacuum devices, active microwave integrated circuits and systems, waves in solid-state plasmas and their applications, parametric amplifiers. Design of microwave amplifiers, oscillators and communication systems.

850. Electrodynamics of Plasma I
Fall. 3(3-0) E E 835 or PHY 448; E E 874 Interdepartmental with the Department of Physics and Astronomy.
Boltzmann equation; moment equations; two-fluid theory of plasma, waves in cold, warm and anisotropic infinite plasma; waves in bounded plasma structure, energy flow in anisotropic plasmas.
857. Microprocessor-based System Design
Spring, 4(2-0) E E 431 or CPS 424.
Microprocessor-based system design methodology; performance measures; single-chip computer organization; alternatives; local area networks of processors; applications in signal processing and control.

863. Analysis of Stochastic Systems
(SYS 863.) Winter, 3(3-0) E E 826, STT 441, MTH 424.
Analysis and modeling of stochastic signals and systems. Topics include stochastic processes, description of processes, ergodicity, correlation and power spectrum, linear stochastic systems, harmonic analysis, Markov processes, Poisson processes.

871. Integrated Circuit Engineering
Winter, 3(3-0) E E 474.
Fabrication and design of integrated circuits. Physics and chemistry of processing. Comparison of current bipolar and MOS technologies, and their limitations. VLSI design methodology and layout examples.

874. Physical Electronics
Fall, 4(4-0) Approval of department.
Application of quantum mechanics in solids, band theory of semiconductors, electrical transport phenomena, induced current concept, charged particles, and electron optics.

875. High Speed Solid-State Devices
Winter, 3(3-0) E E 474.
Formulation of operating properties and appropriate models of devices formed with semiconductors and solid state materials. Emphasis is on performance limitations of high speed integrated circuit unipolar and bipolar devices.

876. Semiconductor Power Devices
Spring of even-numbered years, 3(3-0) E E 474.
Formulation of operating properties and appropriate models of devices formed with semiconductors and solid state materials. Performance limitations of semiconductor power devices due to voltage, temperature and power considerations.

880. Digital Signal Processing
Winter, 3(3-0) E E 450 or STT 441.
Discrete time signals and systems, random discrete time signals. Basic principles of estimation theory, spectral estimation, digital filter design techniques.

899. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

911. General Automata Theory I
Fall of odd-numbered years, 3(3-0) CPS 423 or E E 827 or approval of department. Interdepartmental with and administered by the Department of Computer Science.
Characterization of machines and programs as automata; mathematical decomposition of finite automata.

920. Advanced Topics on Power
Winter, 3(3-0) E E 823 or E E 824.
Current research topics in power system planning, operation and control. Topics may include AC/DC systems, computational methods for balanced and unbalanced systems, stability, and security.

921. Multiprocessors and Parallel Processing
Fall, 3(3-0) CPS 812, CPS 815. Interdepartmental with and administered by the Department of Computer Science.
Massively parallel processor, parallel memory, interconnection network, tightly and loosely coupled multiprocessors, message-passing model, shared-memory model, operating systems, performance, parallel languages and algorithms.

922. Advanced Computer Systems
Winter, 3(3-0) CPS 821, E E 813. Interdepartmental with and administered by the Department of Computer Science.
VLSI and WSI architectures, mapping algorithms to architectures, functional programming, datalflow computer, concurrent symbolic processing and logical programming, computer architecture for artificial intelligence, recent advances in computer systems.

925. Control of Electrical Drives
Fall of even-numbered years, 3(3-0) E E 813, E E 422, E E 829.
Current and voltage source inverter, converter and cycloconverter circuits. Pulse width modulation techniques. Models of electrical machines used in industrial drives, derivation of control algorithms. Microprocessor based control systems.

926. Antenna Theory I
Winter of even-numbered years, 3(3-0) E E 826.
Wire antennas as radiating, receiving and scattering elements; analytical and numerical integral equation methods; coupled antennas and arrays, transient phenomena.

927. Antenna Theory II
Spring of even-numbered years, 3(3-0) E E 826.
Radiation by equivalent aperture fields; aperture antennas, slot antennas, horn and reflector antennas, resonant and dipole antennas; pattern theory; scattering from various objects.

931. Electronic Properties of Semiconductors
Winter of odd-numbered years, 3(3-0) E E 874.
Advanced treatment of phenomena basic to semiconductors and devices. Electronic transport, high field effects, recombination theory, electro-optical phenomena, experimental characterization techniques.

932. Topics in Solid State Device Research
Spring of odd-numbered years, 3(3-0) E E 874.
Relationship of solid state theory and material properties to device performance. Topics selected from current device research areas and vary with year. Examples are photovoltaic, amorphous semiconductor, and piezoelectric devices.

960. Nonlinear Control
Fall of even-numbered years, 3(3-0) E E 827, M E 849 or E E 413. Interdepartmental with and administered by the Department of Mechanical Engineering.
Input-output stability of feedback systems; describing function methods; relay control, stabilizing controllers; design techniques selected from variable structure, high-gain, geometric, Lyapunov-based, vibration, feedback linearization and tracking controls.

961. Optimal Control Theory
(SYS 861.) Fall of odd-numbered years, 3(3-0) E E 829, MTH 424.
Optimal control, performance measures, principles of optimality, dynamic programming, Hamilton-Jacobi-Bellman equation, variational approach, constrained extrema, Pontryagin principle, necessary conditions, solution techniques, singular cases.

963. Dynamic System Identification
(SYS 863.) Winter of odd-numbered years, 3(3-0) E E 863.
Review of stochastic system modeling; identifiability; canonical forms; spectral factorization; least squares and maximum likelihood identification methods and their properties, consistent estimators; closed-loop system identification, recursive algorithms; experiment design.

964. Large Scale Dynamic Systems
(SYS 864.) Spring of even-numbered years, 3(3-0) E E 827, E E 829.
Topics will be drawn from: model reduction and aggregation; stability of interconnected systems; multiple time scale decomposition; decentralized control; hierarchical control.

965. Adaptive Control
(SYS 865.) Spring of odd-numbered years, 3(3-0) E E 827, E E 828, E E 863.
Model reference adaptive control in continuous time and discrete time; Lyapunov and hyperstability approaches; adaptive observers; self tuning regulators; design using pole-zero assignments, minimum variance control and LQG control.

969. Electrodynamics of Plasmas II
Winter of odd-numbered years, 3(3-0) E E 850. Interdepartmental with the Department of Physics and Astronomy.
One fluid plasma model, magnetohydrodynamics, Maxwell’s stress tensor, low frequency waves, transport phenomena, Landau damping, collision and rate coefficients. Diagrams in a magnetic field; investigation of de, dl and microwave discharges.

999. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Systems Science
SYS
410. Systems Methodology
Winter, Spring, 3(3-3) C E 370, CPS 115 or CPS 112.
Systems analysis and design. Needs analysis. Assignment of input, state and output variables. Graphical and programable models of systems and components. Completion of team project including verbal briefings and written final report.
442. Systems Concepts for Biologists
Winter. 3(3-0) Approval of department.
Basic concepts of systems science important to
formal analysis and control of biological com-
munities, with emphasis on modeling and
analysis of behavior through numerical solu-
tions.

810. Introduction to Linear System
Theory
Fall. 3(3-0)
A first course in system theory for students
from a range of disciplines. Mathematical repre-
sentation of system variables, transformation
and simulation of systems described by differen-
tial equations. Generation of random variables,
simulation of discrete and continuous systems,
simulation languages, applications to physical,
economic and social systems.

811. System Methodology and
Simulation
Winter. 3(3-0) SYS 810, STT 441.
Problem definition, design of abstract models for
system, design variables, transformation and state
space methods of simulation, introduction to control
theory, applications to physical, economic and social
systems.

814. Advanced System Methodology and
Simulation
Spring. 3(3-0) SYS 811.
Simulation of a class of time-varying discrete
distribution processes; organization and design
of large simulation models; optimization and
parameter estimation to large simulation mod-
els; applications to economic, social and bi-
oneological systems; other topics of current interest.

835. Static Optimization Methods
Summer. 4(4-0) MTH 424.
Linear and nonlinear optimization: examples and
applications; Kuhn-Tucker theory; saddle point
optimality conditions; algorithms for problems
with constraints; unconstrained optimization;
introduction to search methods.

494. English for Foreign
Students—Roadblocks
Fall. Winter, Spring, Summer. Zero
credits. See page A-1 item 3.1 English
language proficiency examination.
Intensive and extensive reading in small
groups (determined by proficiency). Beginners empha-
sizes vocabulary development and practice in
basic structures. Advanced classes include read-
ing skills, wider reading, and specialized vocab-
ulary.

101. Responses Through Writing
Fall. 4(4-0) Arts and Letters Freshmen
only. Students must enroll in and complete ENG
101 satisfactorily to make a substitution for the
American Thought and Language requirement.
A writing workshop that concentrates on the stu-
dents' personal writing voice and on their
responses to the things, people, and institu-
tions central to their experience.

102. Writing and Composing
Winter. 3(3-0) ENG 101; Arts and
Letters Freshmen only.
A continuation of ENG 101 that develops the
emphases of ENG 101 and encourages students
to write in more public and objective forms—
narrative, critical analysis, and issue-oriented
effectively.

104. Writing for Science Majors
Fall. 3(3-0) Satisfactory grade in En-
glish proficiency exam; College of Natural Sci-
ence majors. Interdepartmental with the
Department of American Thought and Lan-
guage.
Writing workshop for science students that
develops and refines composition ability.

105. The Scientist as Writer
Winter. 3(3-0) ENG 104. Interdepa-
rtmental with the Department of American
Thought and Language.
Study of various types of writing by scientists—
fiction, poetry, and autobiography as well as
professional papers and books. Students will
write frequently about the readings.

106. Introductory Scientific Writing
Spring. 3(3-0) ENG 105. Interdepa-
rntal with the Department of American
Thought and Language.
Writing of popular essays, scientific papers and
reports, and other papers related to science.

2001. Honors Work
Fall, Winter, Spring. 1 to 10 credits.
Approval of department.

201. Nature of Language
Fall, Winter, Spring, Summer. 3(3-0)
Varied aspects of language—phonology
and orthography; morphology, semantics, and the
lexicon; syntax; and dialects—with special refer-
ce to American English.

205. Introduction to Shakespeare
Fall, Winter, Spring. 3(3-0) Not appli-
cable to major or minor requirements.
A study of selected plays illustrating the powers
of England's greatest writer.