EGL 450 Field Experience, Grades 7-12
Observation, inquiry, and practice in English education at the secondary level including 50 hours of documented observations and cooperation at documented sites. Field experience writing logs are the basis for group discussion. Satisfactory/Unsatisfactory grading.
3 credits, S/U grading

EGL 451 Supervised Student Teaching—English; Middle Level Grades 7-9
Prerequisites: Enrollment in English Teacher Preparation Program; permission of instructor
Corequisites: Equivalent sections of EGL 452 and 454
6 credits, S/U grading

EGL 452 Supervised Student Teaching—English; High School Grades 10-12
Prerequisites: Enrollment in English Teacher Preparation Program; permission of instructor
Corequisites: equivalent sections of EGL 451 and 454
6 credits, S/U grading

EGL 454 Student Teaching Seminar
Seminar on problems and issues of teaching English at the secondary school level. Analysis of actual responsibilities and issues encountered by the teacher candidate in the student teaching experience.
Prerequisite: C or higher in EGL 441
Corequisites: Equivalent sections of EGL 451 and 452 3 credits

EGL 475 Undergraduate Teaching Practicum I
Work with a faculty member as an assistant in one of the faculty member's regularly scheduled classes. The student is required to attend all the classes, do all the regularly assigned work, and meet with the faculty member at regularly scheduled times to discuss the intellectual and pedagogical matters relating to the course.
Prerequisite: Upper-division standing; 12 credits in English; permission of instructor and director of undergraduate studies
3 credits, S/U grading

EGL 476 Undergraduate Teaching Practicum II
Work with a faculty member as an assistant in one of the faculty member's regularly scheduled classes. Students assume greater responsibility in such areas as leading discussions and analyzing results of tests that have been graded. Students may not serve as teaching assistants in the same course twice.
Prerequisite: EGL 475; permission of instructor and director of undergraduate studies
3 credits, S/U grading

EGL 477 Independent Project
Intensive study of a special topic undertaken with close faculty supervision. Request for project approval of undergraduate studies committee must be submitted no later than the last week of classes of the prior semester. May be repeated.
Prerequisites: Permission of instructor and director of undergraduate studies
0-6 credits

EGL 488 Internship
Participation in local, state, and national public and private organization. The work must involve skills related to the educational goals of the department. Request for approval of the undergraduate studies committee for internships must be submitted no later than the last week of classes of the prior semester.
Prerequisites: 12 credits of English; 2.50 g.p.a.; permission of instructor and department
0-6 credits, S/U grading

EGL 490 Honors Seminar
Advanced work in periods, genres, and authors of English and American literature is offered in small classes. Credit is given only with the permission of the director of undergraduate studies as the topic changes.
Prerequisite: Permission of instructor
3 credits

EGL 496 Senior Honors Project
Prerequisites: EGL 490; permission of department
3 credits

ENS Environmental Studies

ENS 101-E Prospects for Planet Earth
An introduction for non-science majors to global environmental change. Exploration of the natural science of Earth's environment; the scientific, socioeconomic, and political issues that influence human impact on the global environment and responses to environmental changes; the strategies for humans to live in greater harmony with planet Earth. Global issues are related to the particular interests of the United States, the Northeast, and the greater metropolitan New York City-Long Island area.
3 credits

ENS 119-E Physics for Environmental Studies
The principles of physics as they apply to environmental issues. A review of mathematics is followed by a discussion of Newton's laws, conservation principles, topics in fluids and wave motion, optical instruments, and radioactivity. Three lectures and one laboratory session per week. This course is offered as both ENS 119 and PHY 119.
Prerequisites: MAT 123; CHE 131
3 credits

ENS 301-H Contemporary Environmental Issues and Policies
The scientific, socioeconomic, legal and legislative aspects of current environmental issues and policies. Invited experts address current environmental issues and policies of local, regional and global significance. Topics may include: land use practices and reforestation; farmland and open space preservation; soil and water conservation; wetlands protection and rehabilitation; waste management and reduction, recycling and composting; air pollution, global warming and sea level rise; and marine wilderness areas.
Prerequisite: One of the following: GEO 101, MAR 104, ATM 102, or ENS 101
3 credits

ENS 311-H Ecosystem Ecology and the Global Environment
Ecosystem ecology with an emphasis on biogeochemical cycling in oceans and on land, as well as on biosphere-atmosphere interactions. Topics include earth system processes such as climate and atmospheric composition, the hydrological cycle, cycling of chemicals such as nutrients and metals in the oceans, the soil cycle, and the fate and transport of materials in the atmosphere. Natural and perturbed systems are discussed. This course is offered as both BIO 386 and ENS 311.
Prerequisites: BIO 201; CHE 131
Advisory Prerequisite: MAR 104
3 credits

ENS 312-H Population, Technology, and the Environment
A study of the biological, social, and economic factors that influence population growth. The development of new technologies and their influence on resource use and the effects that increasing population and changing technologies have on the environment are explored.
Prerequisites: BIO 113; MAR 340
3 credits

ENS 333 Environmental Law
Survey of the origins of environmental law and the major legislation enacted by Congress and the state of New York. Special emphasis is placed on the application of environmental law to the problem of solid waste management on Long Island. This course is offered as both ENS 333 and POL 333.
Prerequisites: ECO 108; POL 102
3 credits

ENS 395 Topics in Environmental Sciences
Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for credit as the topic changes.
Prerequisite: One upper-division ENS course
3 credits

ENS 443 Environmental Problem Solving
The integration of information and skills from the natural sciences, social sciences, engineering and the humanities to address important environmental problems. An environmental problem of current interest is presented. Working in small groups, students develop a proposal to solve the problem, collect and analyze data, and present results. Data collection may include field and laboratory work outside of scheduled class meetings.
Prerequisites: U3 or U4 standing; ENS major or minor
2 credits

ENS 487 Independent Research in Environmental Studies
An independent project, developed out of advanced coursework in environmental studies, designed in consultation with and supervised by a faculty member. The project should be formulated before the start of the semester in which the research will be done and should culminate in a substantial written paper. May be repeated.
Prerequisites: Permission of a supervising faculty member and MSRC Undergraduate Programs Director
3 credits

ENS 488 Internship in Environmental Studies
Internships provide students with an opportunity of gaining experience working in the community at government agencies, environmental groups, aquaria, summer camps, field studies, etc. A suitable proposal must be presented by the student and approved by the Director of Undergraduate Studies before the internship begins. May be repeated for a maximum of 6 credits for the ENS major, 3 credits for the ENS minor.
Prerequisite: Permission of the MSRC Undergraduate Programs Director
0-6 credits, S/U grading

ESE Electrical Engineering

ESE 123 Introduction to Electrical and Computer Engineering
Introduces basic electrical and computer engineering concepts in a dual approach that includes: laboratories for hands-on wired and computer simulation experiments in analog and logic circuits, and lectures providing concepts and theory relevant to the laboratories. Emphasizes physical insight and applications rather than theory.
Pre- or Corequisites: AMS 151 or MAT 125 or 131 or 141; PHY 125 or 151 or 141
3 credits
ESE 124 Computer Techniques for Electronic Design I
An extensive introduction to problem solving in electrical engineering using the ANSI C language. Topics covered include data types, operations, control flow, functions, data files, numerical techniques, pointers, structures, and bit operations. Students gain experience in applying the C language to the solution of a variety of electrical engineering problems, based on concepts developed in ESE 123. Knowledge of C at the level presented in this course is expected of all electrical engineering students in subsequent courses in the major.
Pre-or Corequisites: AMS 151 or MAT 125 or 131 or 141; ESE 123 or equivalent
3 credits

ESE 211 Electronics Laboratory A
Introduction to the measurement of electrical quantities; instrumentation; basic circuits, their operation and applications, electronic devices, amplifiers, oscillators, power supplies, wave-shaping circuits, and basic switching circuits.
Prerequisite: ESE 271
Corequisite for ESE and ECE majors: ESE 372
2 credits

ESE 218 Digital Systems Design
Develops methods of analysis and design of both combinatorial and sequential systems regarding digital circuits as functional blocks. Utilizes demonstrations and laboratory projects consisting of building hardware on breadboards and simulation of design using CAD tools. Topics include: number systems and codes; switching algebra and switching functions; standard combinational modules and arithmetic circuits; realization of switching functions; latches and flip-flops; standard sequential modules; memory, combinational, and sequential PLDs and their applications; design of system controllers.
Prerequisite for engineering majors: PHY 127 or 132/134 or 142 or ESE 124
Prerequisite for computer science majors: CSE 220
4 credits

ESE 224 Computer Techniques for Electronic Design II
Introduces C++ programming language for problem solving in electrical and computer engineering. Topics include C++ structures, classes, abstract data types, and code reuse. Basic object-oriented programming concepts, as well as fundamental topics of discrete mathematics and algorithms are introduced.
Prerequisite: ESE 124
3 credits

ESE 231 Introduction to Semiconductor Devices
The principles of semiconductor devices. Energy bands, transport properties and generation recombination phenomena in bulk semiconductors are covered first, followed by junctions between semiconductors and metal-semiconductor. The principles of operation of diodes, transistors, light detectors, and light emitting devices based on an understanding of the character of physical phenomena in semiconductors. Provides background for subsequent courses in electronics.
Prerequisites: AMS 161 or MAT 127 or 132 or 142 or 171; PHY 127 or 132/134 or 142
3 credits

ESE 271 Electrical Circuit Analysis I
Kirchhoff’s Laws, Ohm’s Law, nodal and mesh analysis for electric circuits, capacitors, inductors, and steady-state AC; transient analysis using Laplace Transform. Fundamentals of AC power, coupled inductors, and two-ports.
Prerequisites: AMS 161 or MAT 127 or 132 or 142 or 171; PHY 127 or 132/134 or 142
4 credits

ESE 290 Transitional Study
A vehicle used for transfer students to remedy discrepancies between a Stony Brook course and a course taken at another institution. For example, it allows the student to take the laboratory portion of a course for which he or she has had the theoretical portion elsewhere. Open elective credit only.
Prerequisite: Permission of department
1-3 credits

ESE 300 Technical Communication for Electrical and Computer Engineers
Topics include how technical writing differs from other forms of writing, the components of technical writing, technical style, report writing, technical definitions, proposal writing, writing by group or team, instructions and manuals, transmittal letters, memoranda, abstracts and summaries, proper methods of documentation, presentations and briefings, and analysis of published engineering writing. Also covered are the writing of resumes and cover letters.
Prerequisite: WRT 102/ ESE or ECE major, U3 standing
Pre-or Corequisite: ESE 314 or 324 or 380 or 382
3 credits

ESE 304 Applications of Operational Amplifiers
Design of electronic instrumentation: structure of basic measurement systems, transducers, analysis and characteristics of operational amplifiers, signal conditioning and operational amplifiers, signal and noise, instrumentation amplifiers, circuit performing, multichannel, A/D and D/A conversion; signal conditioning, data input and display, and automated measurement systems. Application of measurement systems to pollution and to biomedical and industrial monitoring is considered.
Prerequisite: ESE 372
3 credits

ESE 305 Deterministic Signals and Systems
Pre-or Corequisite: ESE 271
3 credits

ESE 306 Random Signals and Systems
Random experiments and events; random variables, probability distribution and density functions, continuous and discrete random processes; Binomial, Bernoulli, Poisson, and Gaussian processes; system reliability; Markov chains; elements of queuing theory; detection of signals in noise; estimation of signal parameters; properties and application of auto-correlation and cross-correlation functions; power spectral density; response of linear systems to random inputs.
Prerequisite: ESE 305
3 credits

ESE 307 Analog Filter Design
Introduces basic concepts of analog filter theory and implementation. Topics include: filter types; transfer functions; Bode plots; implementation of first- and second-order filters using op amps, maximally flat, and equal-ripple filters; frequency transformations; LC filters; transconductance-C realizations; switched capacitor circuits; and filter sensitivity.
Prerequisites: ESE 305 and 372
3 credits

ESE 310 Electrical Circuit Analysis II
Network elements, graph theory, linear network analysis; fundamental loops and cutsets, matrix solutions, nonlinear network analysis; state variables, small and large signal analysis, numerical methods.
Prerequisite: ESE 271
3 credits

ESE 311 Analog Integrated Circuits
Engineering design concepts applied to electronic circuits. Basic network concepts, computational analysis and design techniques: models of electronic devices; biasing and compensation methods; amplifiers and filters designed by conventional and computer-aided design techniques.
Prerequisite: ESE 372
3 credits

ESE 312 Microwave Electronics
Fundamentals of microwave and RF electronics. Includes S-parameter theory, Smith charts, amplifier and oscillator design, matching network synthesis, large-signal and broadband methods, and power combiners. Computer-aided design packages are used throughout the course.
Prerequisite: ESE 211 and 372
3 credits

ESE 314 Electronics Laboratory B
Coordinated with, and illustrates and expands upon, concepts presented in ESE 372. Experiments include diode circuits, class A BJTs, FET and differential amplifiers as well as analog signal processing. Laboratory fee required.
Prerequisites: ESE 211 and 372
3 credits

ESE 315 Control System Design
Prerequisite: ESE 271
3 credits

ESE 316 Digital Devices and Circuits
Switching characteristics of devices: bipolar transistors, MOSFETs, C.C.D.s. Circuit analysis of leading IC gate technologies: TTL, ECL, MOS, CMOS, dynamic MOS. Interfacing logic families. Application of small scale ICs in control and timing circuits. Large scale integrated circuits, organization and characteristics of RAMs, ROMs and PLAs. The use of computer-aided circuit analysis is included.
Prerequisite: ESE 372
3 credits

ESE 319 Introduction to Electromagnetic Fields and Waves
Fundamental experimental results of electromagnetism. Topics include: mathematical formulation of integral laws and derivation and physical interpretation of differential Maxwell equations in free space; interaction of electromagnetic sources and fields; engineering applications; electromagnetic energy and power; generation of electromagnetic fields and waves in unbounded media by known sources; transmission line theory.
Prerequisite: ESE 271
3 credits

ESE 320 Microwave Electronics Laboratory
Introduces microwave measurement techniques as well as the design, fabrication and experimental characterization of various microwave components. Utilizes microwave CAD techniques for the design of microwave components and for experimental charac-
terization, including the measurement of scattering parameters over a band of frequencies, employing a network analyzer. The first half of the course is in the format of lectures that introduce the concepts and theory behind the experiments. The second half is dedicated to performing the experiments on a rotation basis between various student groups of two or three students per group.

Prerequisite: ESE 319
3 credits

ESE 321 Electromagnetic Waves and Wireless Communication
Covers the wireless radio signal environment; electromagnetic wave propagation in free space and in other media; effects of reflection, scattering, diffraction, and multi-path interference on the characteristics and quality of the received signal; cellular wireless network planning; efficient use and reuse of assigned radio frequency spectrum; effects of transmitting and receiving antenna design; introduction of basic wireless communication techniques to achieve reliable communication.

Prerequisite: ESE 319
3 credits

ESE 322 Introduction to Auto ID Technologies
Introduces theory and application of important data-capture techniques namely barcodes, biometrics and RFID. Topics to be covered include: architecture of data-capture / Auto ID systems, barcodes; overview of 1-D and 2-D barcodes and other LOs technologies biometric; fingerprints, iris-scan, voice recognition and smart-cards; radio frequency identification (RFID); fundamentals, near-field vs. far field, UHF read range estimation, reader sensitivity limits, tag singulation and multiple access protocols, standards, privacy and security issues in RFID, real time location systems (RTLS).

Prerequisites: ESE 218, 305, and 372; Corequisite: ESE 319
3 credits

ESE 323 RFID Technology for Automatic Identification
This course covers the analysis and design of RFID technologies for automatic identification. Included are the theory of operation, analysis of RFID systems components, passive and active tags, frequencies used, air interfaces, coding structures, antenna design, and regulatory compliance.

Prerequisite: ESE 319
3 credits

ESE 324 Electronics Laboratory C
Illustrates and expands upon advanced concepts presented in ESE 372. Experiments include multistage amplifiers, class B and class C power amplifiers, speech processing, active RC and switched-capacitor filters, oscillators, and switching power supplies. Laboratory fee required.

Prerequisites: ESE or ECE major; U3 standing; ESE 211 and 372
2 credits

ESE 330 Integrated Electronics
An overview of the design and fabrication of integrated circuits. Topics include gate-level and transistor-level design; fabrication material and processes; layout of circuits; automated design tools. This material is directly applicable to industrial IC design and provides a strong background for more advanced courses.

Prerequisite: ESE 372
3 credits

ESE 332 Semiconductor Device Characterization
Basic experimental experience in characterization of microelectronic and optoelectronic: semiconductor devices including diodes, transistors, light emitting diodes, lasers, and photodetectors. Measurement of I-V and I-L (light-current) device characteristics; practice in the techniques of determining various device parameters; analysis of aggregate experimental data to determine the relationships between device and output characteristics, device band diagrams, and device designs. Includes study of modern methods of silicon and compound semiconductor devices and systems technologies.

Prerequisite: ESE 372
3 credits

ESE 333 Real-Time Operating Systems
Introduces basic concepts and principles of real-time operating systems. Topics include structure, multiple processes, interprocess communication, real-time process scheduling, memory management, virtual memory, file system design, security, protection, and programming environments for real-time systems.

Prerequisites: ESE 124; CSE 214; ESE 380 or CSE 220
3 credits

ESE 337 Digital Signal Processing: Theory
Introduces digital signal processing theory sequences, discrete-time convolution, difference equations, sampling and reconstruction of signals, one- and two-sided Z transforms, transfer functions, and frequency response. Design of FIR and IIR filters. Discrete and fast Fourier transforms and applications.

Prerequisite: ESE 305
3 credits

ESE 340 Basic Communication Theory
Basic concepts in both analog and digital data communication; signals, spectra, and linear networks; Fourier transforms, energy and power spectra, and filtering; AM, FM, and PM; time and frequency multiplexing; discussion of problems encountered in practice; noise and bandwidth considerations; pulse modulation schemes.

Prerequisites: ESE 305 and 306
4 credits

ESE 341 Information Theory and Coding
Statistical characteristics of languages, information sources as random processes, measurement of information, noiseless coding; the binary symmetric channel and other digital channels; channel capacity, introduction to algebraic coding, theory for noisy channels, communication with feedback.

Prerequisites: ESE 306 or AMS 311
3 credits

ESE 342 Digital Communications Systems

Prerequisite: ESE 340
3 credits

ESE 343 Modern Electronic Communications Laboratory
Experimental study of communications systems and components. Design, test, and measurement techniques. AM and FM modulators and demodulators. Spectra, bandwidth measurement, analog and digital signaling equipment. Applications in communication and radar systems.

Prerequisite: ESE 340
3 credits

ESE 344 Software Techniques for Engineers
Trains students to use computer systems to solve engineering problems. Includes C/C++ programming languages, UNIX, programming environment, basic data structures and algorithms, and object oriented programming.

Prerequisites: ESE 218; CSE 230 or ESE 224
3 credits

ESE 345 Computer Architecture
Starts with functional components at the level of registers, buses, arithmetic, and memory chips, and then uses a register transfer language to manipulate these in the design of hardware systems up to the level of complete computers. Specific topics included are microprogrammed control, user-level instruction sets, I/O systems and device interfaces, control memories hierarchies, and parallel processing organizations.

Prerequisites for CSE majors: CSE 220 and ESE 218
Prerequisite for ESE and ECE majors: ESE 380
3 credits

ESE 346 Computer Communications
Basic principles of computer communications. Introduction to performance evaluation of protocols. Protocols covered include those for local, metropolitan, and wide area networks. Introduction to routing, high speed packet switching, circuit switching, and optical data transport. Other topics include TCP/IP; Internet, web development, network security, and grid computing. Not for credit in addition to CSE/ISE 310. This course is offered as both CSE 346 and ESE 346.

Prerequisites for CSE majors: CSE 306
Prerequisites for ESE majors: AMS 310 or 311
3 credits

ESE 347 Digital Signal Processing: Implementation
Fundamental techniques for implementing standard signal-processing algorithms on dedicated digital signal-processing chips. Includes a review of discrete-time systems, sampling and reconstruction, FIR and IIR filter design, FFT, architecture and assembly language of a basic signal processing chip, and an introduction to adaptive filtering.

Prerequisites: ESE 357, or ESE 305 and 380
3 credits

ESE 349 Introduction to Fault Diagnosis of Digital Systems
A follow-up to ESE 218 to acquaint students with fault diagnosis of logic circuits. Both combinational and sequential circuits are considered. Concepts of faults and fault models are presented followed by discussion of test generation, test selection, and fault dictionaries. Emphasis is on test generation for fault detection, fault location, fault location within a module, and fault correction. Some basic reliability-enhancing design techniques for digital circuits and systems are also discussed.

Prerequisite: ESE 218
3 credits

ESE 350 Electrical Power Systems
Fundamental engineering theory for the design and operation of an electric power system. Modern aspects of generation, transmission, and distribution are considered with appropriate inspection trips to examine examples of these facilities. The relationship between the utilities and their influence on our environment is reviewed. Topics include power system fundamentals, characteristics of transmission lines, generalized circuit constants, transformers, controller of power flow and of voltage, per unit system of computation, system stability, and extra-high voltage AC and DC transmission.

Prerequisite: ESE 271
3 credits

ESE 351 Energy Conversion
Natural and secondary energy sources; methods of energy conversion including thermionic, thermoelectric, and magneto-hydrodynamic converters, fuel cells, and solar cells.

Prerequisites: ESE 271; MEC 301 or ESG 302
3 credits

ESE 352 Electromechanical Energy Converters
Basic principles of energy conversion; DC, induction, and synchronous rotary converters; the three-phase system and symmetrical components; the relation-
ships between voltage, current, flux, and m.m.f.; equivalent circuits and operating characteristics of rotary converters; and analysis of saturation effects. Prerequisite: ESE 372
3 credits

ESE 355 VLSI System Design
Introduces techniques and tools for scalable VLSI design and analysis. Emphasis is on physical design and on performance analysis. Includes extensive laboratory experiments and hands-on use of CAD tools. Prerequisite: ESE 218
3 credits

ESE 356 Digital System Specification and Modeling
Introduces concepts of specification and modeling for design at various levels of abstraction. High level specification language is used for executable models creation, representing possible architecture implementations. Topics include design space exploration through fast simulation and re-use of models and implementation. Prerequisites: ESE 124 (or ESG 111 or MEC 111 or ESE 271 and 380) or CSE 214 and 220
3 credits

ESE 357 Digital Image Processing
Covers digital fundamentals, image transforms, image enhancement, image restoration, image compression, segmentation, recognition and description, recognition and interpretation. Prerequisites for ESE and ECE majors: ESE 305; ESE 224 or CSE 230
Prerequisites for CSE majors: CSE 214 and 220
3 credits

ESE 358 Computer Vision
Introduces fundamental concepts, algorithms, and computational techniques in visual information processing. Covers image formation, image sensing, binary image analysis, image segmentation, Fourier image analysis, edge detection, reflectance map, photometric stereo, basic photogrammetry, stereo, pattern classification, extended Gaussian images, and the study of human visual system from an information processing point of view. Prerequisites for ESE and ECE majors: ESE 305; ESE 224 or CSE 230
Prerequisites for CSE majors: CSE 214 and 220
3 credits

ESE 362 Optoelectronic Devices and Optical Imaging Techniques
A thorough introduction to the field of optoelectronics including a firm basis of fundamental physics, optical imaging, and optical communication systems. A detailed coverage of laser and semiconductor devices along with a study of the commonly used optical radiation detectors. The definition of optoelectronics is extended to include a discussion on the behavior of light in crystals. Prerequisite: ESE 372
3 credits

ESE 363 Fiber Optic Communications
Design of single and multi-wavelength fiber optic communications systems. Topics include analysis of optical fibers, optical transmitters and receiver design, optical link design, single-wavelength fiber optic networks with analysis of FDDI and SONET/SDH, and wavelength division multiplexing. Prerequisite: ESE 372
3 credits

ESE 366 Design using Programmable Mixed-Signal Systems-on-Chip
This course focuses on development of mixed-signal embedded applications that utilize systems on chip (SoC) technology. The course discusses design issues such as: implementation of functionality; realizing new interfacing capabilities; and improving performance through programming the embedded microcontroller and customizing the reconfigurable analog and digital hardware of SoC. Prerequisites: ESE 380 and 372; ESE 224 or CSE 230
3 credits

ESE 371 Computer Graphics
Input and output devices for human-computer communication, bitmap displays and their use. Picture and graphics editor. Curve fitting with emphasis onBezier splines. Scan conversion. Geometric transformations, projections, hidden line problems. Anti-aliasing. Prerequisite: ESE 344 or CSE 214
3 credits

ESE 372 Electronics
The pertinent elements of solid-state physics and circuit theory are reviewed and applied to the study of electronic devices and circuits, including junction diodes, transistors, and gate and electronic switches; large- and small-signal analysis of amplifiers; amplifier frequency response; and rectifiers and wave-shaping circuits. Prerequisite: ESE 271
Prerequisites for ESE and ECE majors: ESE 211
3 credits

ESE 373 RF Electronics for Wireless Communications
Introduces basic concepts and key circuits of radio-frequency systems. Taught within the design and construction of a transceiver for wireless communications, the course covers fundamental principles which apply to all radio devices. Essential theoretical background, with additional emphasis on practical implementation using commercially-available integrated circuits for double-balanced mixers, oscillators, and audio power amplifiers. Basic components and circuits; key elements of radio electronics, including filters, matching networks, amplifiers, oscillators, mixers, modulators, detectors, and antennae. Computer simulation using Pspice and Puff is emphasized as an integral part of the design process. Prerequisite: ESE 372
3 credits

ESE 380 Embedded Microprocessor Systems Design I
Fundamental concepts and techniques for designing electronic systems that contain a microprocessor or microcontroller as a key component. Topics include system level architecture, microprocessors, ROM, RAM, I/O subsystems, address decoding, PLDs and programmable peripheral ICs, assembly language programming and debugging. Hardware-software trade-offs in implementation of functions are considered. Hardware and software design are emphasized equally. Laboratory work involves design, implementation, and testing of microprocessor controlled circuits. Prerequisite: ESE 218
3 credits

ESE 381 Embedded Microprocessor Systems Design II
A continuation of ESE 380. The entire system design cycle, including requirements definition and system specifications, is covered. Topics include real-time requirements, timing, interrupt driven systems, analog data conversion, multi-module and multi-language systems. The interface between high-level language and assembly language is covered. A complete system is designed and prototyped in the laboratory. Prerequisites: ESE 271 and 380
3 credits

ESE 382 Digital Design Using VHDL and PLDs
Digital system design using the hardware description language VHDL and system implementation using complex programmable logic devices (CPLDs) and field programmable gate arrays (FPGAs). Topics include design methodology, VHDL syntax, entities, architectures, testbenches, subprograms, packages, and libraries. Architecture and characteristics of PLDs and FPGAs in which the student will develop material; permission of department. Prerequisites: ESE or ECE major, U3 or U4 standing; 3.00 g.p.a. minimum in all engineering courses; permission of department
3 credits

ESE 390 Special Topics in Digital Systems
A vehicle for new course material of current interest in the area of digital systems. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for different topics but only three credits may be counted as technical electives. Prerequisite: Permission of department
1-6 credits

ESE 440 Engineering Design I
Lectures by faculty and visitors on typical design problems encountered in engineering practice. During this semester each student will choose a senior design project for Engineering Design II. A preliminary design report is required. Not counted as a technical elective. Laboratory fee required. Prerequisites: ESE or ECE major, U4 standing; two ESE technical electives (excluding ESE 390 and 499); ESE 300. Students may need additional prerequisites depending on the design project undertaken.
3 credits

ESE 441 Engineering Design II
Student groups carry out the detailed design of the senior projects chosen during the first semester. A comprehensive technical report of the project and an oral presentation are required. Not counted as a technical elective. Laboratory fee required. Prerequisite: ESE 440
3 credits

ESE 475 Undergraduate Teaching Practicum
Students assist the faculty in teaching by conducting recitation or laboratory sections that supplement a lecture course. The student receives regularly scheduled supervision from the faculty instructor. May be used as an open elective only and repeated once. Prerequisites: U4 standing; a minimum g.p.a. of 3.00 in all Stony Brook courses, and a grade of B or better in the course in which the student is to assist; permission of department.
3 credits

ESE 476 Instructional Laboratory Development Practicum
Students work closely with a faculty advisor and staff in developing new laboratory experiments for scheduled laboratory courses in electrical and computer engineering. A comprehensive technical report and the instructional materials developed must be submitted at the end of the course. May be used as a technical elective for electrical and computer engineering majors. May be repeated as an open elective. Prerequisites: U4 standing; minimum cumulative g.p.a. of 3.0 and minimum grade of A in the laboratory course for which the students will develop material; permission of department and instructor
3 credits

ESE 488 Internship in Electrical/Computer Engineering
An independent off-campus engineering project with faculty supervision. May be repeated but only three credits of internship electives may be counted toward the non-ESE technical elective requirement. Prerequisites: ECE or ECE major; U3 or U4 standing; 3.00 g.p.a. minimum in all engineering courses; permission of department
3 credits
ESE 499 Research in Electrical Sciences
An independent research project with faculty supervi-
sion. Permission to register requires a 3.00 g.p.a. in all courses and approval of the agreement by a faculty member to supervise the research. May be repeated but only three credits of research electives (AMS 487, BME 499, ESE 487, MEC 499, ESM 499, EST 499, ESE 457) may be counted toward non-ESE technical elect-
ive requirements.
Requirements: U4 standing, 3.00 g.p.a. minimum in all engineering courses, permission of department
ESG 201-H Engineering Responses to Society
The roles that engineers and engineering scientists play in supporting the societal infrastructure of urban and rural populations throughout the world. Focuses on relating examples of engineering achievement so that students may expand their perspective with regard to the increasingly scientific and technological mode of current culture. Includes the relationship between engineering and aesthetics, the engineering design process, forensic engineering, and biology-related engineering.
Prerequisite: One D.E.C. category E course
ESG 217 Engineering Science Design I
An introduction to the philosophy of engineering design, emphasizing the integration of problem-solv-
ing techniques with choices of available technology and materials in order to respond to a particular human need. Engineering ethics are also examined from both historical and decision-making perspec-
tives. Basic science of design, including system viabil-
ity and project management, is discussed through examples, flowcharts, and optimization techniques with an emphasis on design for manufacturing and reliability.
ESG 281 Engineering Introduction to the Solid State
A discussion of relativity followed by review of the atom and its constituents. Lectures treat the quantiza-
tion of light and of atomic energy levels, matter waves, and introduce the Schrodinger equation, first in one dimension, then in three dimensions. Electron spin and magnetic effects are discussed, followed by multi-
electron atoms and the periodic table. Radiation and lasers, molecules and solids, including conductors, semiconductors, and insulators.
Prerequisite: PHY 132/134 or 142 or 126/127
ESG 301-H Sustainability of the Long Island Pine Barrens
The ecologically diverse Long Island Pine Barrens region provides a habitat for a large number of rare and endangered species, but faces challenges associ-
ated with protection of a natural ecosystem that lies in close proximity to an economically vibrant urban area that exerts intense development pressure. In this course we will consider the interaction of the ecologi-
cal, developmental and economic factors that impact the Pine Barrens and the effectiveness of decision sup-
port systems in promoting sustainability of the Pine Barrens. This course is offered as BIO 301, GEO 301, ECO 301, and ESG 301.
Prerequisites: BIO 201 or ECO 108 or GEO 101 or 102 or ESG 100 or ESG 198 or CHE 131; and upper division status
ESG 302 Thermodynamics of Materials
The basic laws and concepts of thermodynamics are developed quantitatively via the Kronig-Penney ap-
plication to the quantitative treatment of a number of systems are developed. These principles are applied to the control of the properties of semiconductors, commercial plastics, and engineering alloys by thermo-
chemical treatment. Corrosion, oxidation, and other deterioration processes are interpreted through the interaction of materials with their envi-
ronment.
Prerequisites: ESG 198 or CHE 131 or 141 or 198
ESG 303 Materials Science I: Structure and Properties of Materials
A study of the relationship between the structure and properties of engineering materials and the prin-
ciples by which materials’ properties are controlled. The structure and structural imperfections in simple crystalline materials and the role that these factors play in defining electrical conductivity, chemical reactivity, strength, and ductility are considered. The molecular structure of polymers is discussed and related to the behavior of plastics, rubbers, and synthetic fibers. The principles of phase equilibria and phase transformation in multicomponent sys-
tems are discussed. These principles are applied to the control of the properties of semiconductors, commercial plastics, and engineering alloys by thermoch-
ical treatment. Corrosion, oxidation, and other deterioration processes are interpreted through the interaction of materials with their envi-
ronment.
Prerequisites: ESG 198 or CHE 131 or 141 or 198
ESG 333 Materials Science II: Electronic Properties
After a review of quantum mechanics and atomic physics, the binding energy and electronic energy levels in molecules and solids are discussed. The free-electron theory of metals is introduced and applied to the quantitative treatment of a number of electron emission effects. The band theory of solids is developed quantitatively via the Kronig-Penney model, and the transport properties of metals and semiconductors are discussed in detail. The physical principle of pn junctions, transistors, tunnel diodes, etc. is explained. Fundamentals and applications of photoconductors, lasers, magnetic materials, and superconductors are also discussed. (ESG 332 is not a prerequisite.)
Prerequisite: ESG 281 or PHY 251
ESG 339 Thin Film Processing of Advanced Materials
Fundamental aspects of thin film materials design, fabric-
arization, and characterization. Overviews of semicon-
ductor fabrication, surface analysis, and vacuum sys-
tem design. This course includes a design content of one credit, achieved through a design exercise related to thin film fabrication.
Prerequisite: ESG 332, or ESE 331 for ESE majors