COURSE DESCRIPTIONS

and preparing students for lifelong learning. Proficiency in the skill areas required. Credit cannot be earned for both SCED 416 and SCED 316. Fall. Prerequisites: Phase II admission or permission of Department Chair; EDUC 391 recommended concurrently.

SCED 419 Science in the Secondary School 3 cr.
Subject methods course required for secondary certification in teaching science. Modern trends in curriculum and instruction. Not open to students with credit for former SCED 319. Fall. Prerequisites: Phase II admission or permission of Department Chair; EDUC 391 recommended concurrently.

SCED 420 Social Studies in the Secondary School 3 cr.
Subject methods course required for secondary certification in teaching social studies. Modern trends in curriculum and instruction. Not open to students with credit for former SCED 320. Fall. Prerequisites: Phase II admission or permission of Department Chair; EDUC 391 recommended concurrently.

SCED 430 Pedagogical Content Knowledge in the Secondary Disciplines 3 cr.
Secondary content, discipline-specific learning modules in lesson design and teaching methods focused on English Language Arts, Mathematics, Spanish Language & Literature, Science and Social Studies. Comparison of pedagogically appropriate application of content curriculum at the middle and high school levels in all secondary disciplines. Design of model unit plan and other key program assessments. Embedded clinical practice in local 7-12 schools. Required for secondary education majors. Fall. Prerequisite: Phase II admission.

SCED 496 Teaching Internship II: Secondary Education 6-12 cr.
Supervised practicum in teaching at secondary school level. Joint supervision by school system and University personnel. Daily, full day for one semester. Graded P/F. Spring. Prerequisite: Phase III admission or permission of Department Chair.

Special Education

SPED 451 Adapting Instruction in Diverse Classrooms 3 cr.
An understanding of the instructional and social development needs of the disabled and non-disabled students in inclusive classrooms. Special attention to collaboration, technology, legislation, educational programming, instructional strategies, inclusion models and current research related to the students enrolled in secondary school inclusion programs (middle/senior high school) and K-12 programs. Not open to students with credit for former SPED 361. Spring. Prerequisite: appropriate phase admission.

SPED 461 Characteristics of Exceptional Children 3 cr.
Etiology, diagnosis, physical, emotional and social characteristics of exceptional children, including the gifted. Variable.

SPED 462 Intro. to the Education of Exceptional Children 3 cr.
Understanding the educational needs of exceptional children; preventive and remedial education. Variable.

SPED 463 Teaching Children with Special Needs 3 cr.
Observation, identification and management of children with mild to moderate learning problems. Variable. Prerequisite: permission of instructor.

SPED 481 The Gifted Learner 3 cr.
Study of recent research on characteristics, needs and problems of gifted learners; model programs; future possibilities. Variable. Prerequisite: PSYC 150 or EDUC 201 or permission of instructor.

SPED 482 Curriculum for the Gifted Learner 3 cr.
Theoretical and practical approaches to teaching gifted learners; constructing unique plans for each teacher's needs. For those who will deal with gifted learners. Variable. Prerequisite: at least one course in curriculum.

Engineering

Engineering Sciences

ENES 099 Introduction to Workshop and Machine Shop 1 cr.
General knowledge of the available resources required for upper level physics and engineering courses. Hands-on and demonstration activities. Strong emphasis on personal safety and procedures while using the department workshop and machine shop space and equipment. One hr. integrated lecture and lab. Fall. Does not count for credit toward the 120 hours required for graduation.

ENES 100 Introduction to Engineering Design 3 cr.
FSU Course. Introduction to the engineering design process, computer software for word processing, spreadsheet, CAD and communication skills. Students work as teams to design and build a project. Two hrs. lecture and two hrs. recitation per week. Every semester. Tech. Fluency.

ENES 102 Statics 3 cr.
FSU Course. The equilibrium of stationary bodies under the influence of various kinds of forces. Forces, moments, couples, equilibrium, trusses, frames and machines, beams and friction. Vector and scalar methods are used to solve problems. Three hrs. lecture and one hr. discussion/recitation per week. Spring. Prerequisite: MATH 236.

ENES 220 Mechanics of Materials 3 cr.
FSU Course. Stress and deformation of solids-rods, beams, shafts, columns, tanks, and other structural, machine and vehicle members. Topics include stress transformation using Mohr's circle; shear and moment diagrams; derivation of elastic curves; and Euler's buckling formula. Design problems related to this material are given in lab. Fall. Prerequisites: ENES 102, MATH 237, PHYS 261.

ENES 221 Dynamics 3 cr.
FSU Course. Systems of heavy particles and rigid bodies at rest and in motion. Force-acceleration, work-energy and impulse-momentum relationships. Motion of one body relative to another in a plane and in space. Two hrs. lecture and two hrs. lab per week. Fall. Prerequisites: PHYS 261, ENES 102, MATH 237.

ENES 304 Computational Techniques 2 cr.
Introduction to and application of the fundamental methods, tools and techniques essential to solve problems in the physical sciences. Regular topics include statistical, mathematical and computational tools; data analysis. LabView software as applied to instrumentation. Additional topics explored will augment student needs and supplement area of current interest in science. One hour lecture, one 2-hr lab integrated. Fall. Also offered as CHEM 304 and PHYS 304. Prerequisites: CHEM 201 and 202 or COSC 240 or ENEE 114 equivalent, or permission of the instructor.

ENES 310 Mechatronic and Robotic Design 3 cr.
Components of mechatronics systems and robotics. Control of electromechanical systems. Material handling systems, numerical controlled tools, flexible manufacturing systems. Sensors, transducers, actuators, data acquisition and computer interfacing. Process control systems. Dynamics of electromechanical systems, design considerations and contemporary practical issues. Two hrs. lecture and two hrs. lab activities per week. Fall. Prerequisite: ENME 350 or ENEE 204 or permission of department chair.

ENES 320 Wind and Solar-Powered Generation System Design 3 cr.
Comparison of wind turbine types. Types of photovoltaic (PV) modules. Grid-connected, backup and off-grid systems. Structure and feasibility of wind and PV generation system. Design considerations related to wind and solar-powered energy generation systems: capacity factor, cost analysis, power quality and environmental issues. Two hrs. lecture and two hrs. lab per week. Spring. Prerequisite: PHYS 264 or permission of department chair.

ENES 401 Fundamentals of Energy Engineering 3 cr.
Principles of thermodynamics; conventional and alternative energy sources and storage systems. Integration of alternative sources of energy and distributed generation. Energy conservation, environmental impacts of energy use, energy sustainability. Spring. Prerequisites: PHYS 263, or permission of the department chair.

ENES 491 Engineering Seminar 3 cr.
Individual reports and group discussions on current topics in engineering and the role of various science fields in engineering. Topics selected jointly by student and instructor. Preparation...
of proposal for a research project. Variable. Repeatable once for credit. Prerequisite: Majors with junior or senior standing. May not be taken at the same time as PHYS 491.

ENES 495 Engineering Internship 1-4 cr.
A field experience to provide the student with an opportunity to explore career paths in a work setting while applying knowledge learned in the classroom. Throughout the internship student develops professional skills consistent with the program educational objectives. Student must enroll in the course before starting the workplace experience. Variable, Up to 4 credits. One course credit for 45-hours of work (37.5 hours of clock time) at the internship location. Can be repeated for up to 4 credits. Prerequisites: Junior standing, approval of the department chair.

Electrical Engineering

** Courses marked UMCP Course are offered only for students completing the previous UMCP/FSU collaborative electrical engineering program. A limited selection of UMCP ENEE courses is offered as needed.

ENEE 114 Programming Concepts for Engineers 4 cr.
Principles of software development, high-level languages, compiling and linking, pseudo-code, input/output, data types and variables, operators and expressions, conditionals and loops, functions, arrays, pointers, structure data types, memory allocation, introduction to algorithms, software projects, debugging, documentation. Programs will use the C language. Three hrs. lecture and two hrs. recitation per week. Spring. Corequisite: ENEE 100.

ENEE 204 Basic Circuit Theory 3 cr.
Basic circuit elements: resistors, capacitors, inductors, sources, mutual inductance and transformers; their I-V relationships. Kirchoff's Laws. DC and AC steady-state analysis. Phasors, node and mesh analysis, superposition, theorems of Thevenin and Norton. Transient analysis for first- and second-order circuits. Three hrs. lecture and one hr. discussion/recitation per week. Spring. Prerequisite: PHYS 262. Corequisite: MATH 432.

ENEE 206 Fundamental Electric & Digital Circuit Laboratory 2 cr.
Introduction to basic measurement techniques and electrical laboratory equipment (power supplies, oscilloscopes, voltmeters, etc.). Design, construction and characterization of circuits containing passive elements, operational amplifiers and digital integrated circuits. Transient and steady-state response. This course is a prerequisite to all upper-level ENEE laboratories. One hr. lecture and three hrs. lab per week. Spring. Prerequisite: ENEE 244. Corequisite: ENEE 204.

ENEE 241 Numerical Techniques in Engineering 3 cr.

ENEE 244 Digital Logic Design 3 cr.
Gates, flip-flops, registers and counters. Karnaugh map simplification of gate networks. Switching algebra. Synchronous sequential systems. PLAs. Elements of binary arithmetic units. Three hours of lecture and one hour of discussion/recitation per week. Fall. Prerequisite: ENEE 114.

ENEE 303 Analog and Digital Electronics 3 cr.
Introduction to the conceptual physical operation of PN-junction diodes, MOSFETs and bipolar transistors (BJTs). Large signal terminal characteristics of PN junction diodes, bipolar and MOSFET transistors. Digital electronics is covered at the transistor level, including the inverter, NAND and NOR gates. Semiconductor memory. Basic transistor circuit configurations, including the BJT common emitter (CE) and common collector (CC) circuits, and the MOSFET common source (CS) and common drain (CD) configurations. DC bias and small-signal analysis of BJTs and MOSFETs. Simple multistage transistor circuits, including the differential-amp and the current mirror. Frequency response of simple amplifiers. Fall. Prerequisites: “C” or better in ENEE 204, 206 and 244. Corequisite: ENEE 307 or permission of department chair.

ENEE 307 Electronics Circuits Design Laboratory 2 cr.
I-V properties of diodes and transistors through simple experiments. Analysis, design and construction of digital and analog electronic circuits at the transistor and integrated circuit levels. Operation and design of relevant multi-transistor circuits. BJT forward active operation by study of CE design, bias and small-signal operation. MOS common source operation, study of invertors, NAND and NOR gates. Simulation and analysis of Random Access Memory (RAM). Study of basic transistor configurations and frequency response by building a high-fidelity audio amplifier. Differential amplifiers, active loads, current mirrors and principles of feedback through the construction of opamps from discrete components. Experiments will be tightly aligned to the ENEE 303 lectures. Not open to students who have credit for former ENEE 306. One hr. lecture, three hrs. lab per week. Fall. Prerequisites: “C” or better in ENEE 204, 206 and 244. Corequisite: ENEE 303 or permission of the department chair.

ENEE 313 Introduction to Device Physics 3 cr.
Basic physics of devices, including crystal structure, fields in solids and properties of electrons, and holes, including diffusion and energy distributions. Current flow in Si by drift and diffusion, equations of motion of particles, p-n junction, depletion, fields and potentials, depletion and diffusion capacitance, and current flow under forward and reverse bias. Operation of bipolar junction and metal-oxide field effect transistors, their physical structure, operation thresholds, current flow, capacitance and current-voltage characteristics. Spring. Prerequisites: “C” or better in ENEE 204, 206, 244.

ENEE 322 Signal and System Theory 3 cr.
Concept of linear systems, state space equations for continuous systems, time and frequency domain analysis of signals and linear systems. Fourier, Laplace and Z transforms. Application of theory to problems in electrical engineering. Fall. Prerequisites: ENEE 204 and MATH 432.

ENEE 324 Engineering Probability 3 cr.
Axioms of probability, conditional probability and Bayes’ rules, random variables, probability distribution and densities, functions of random variables, weak law of large numbers and central limit theorem. Introduction to random processes, correlation functions, spectral densities and linear systems. Applications to noise in electrical systems, filtering of signals from noise, estimation and digital communications. Spring. Prerequisite: ENEE 322.

ENEE 345 Computer Organization 3 cr.
Structure and organization of digital computers. Registers, memory, control and I/O. Data and instruction formats, addressing modes, assembly language programming. Elements of system software, subroutines and their linkages. Three hrs. lecture and one hr. discussion per week. Fall. Prerequisites: "C" or better in ENEE 204, 206 and 244.

ENEE 380 Electromagnetic Theory 3 cr.
Study of electromagnetic fields, Coulomb's law, Gauss's law, electrical potential, method of images, boundary value problems, multipole expansion, Biot-Savart law, Ampere's law, Lorentz force equation, Faraday's law and Maxwell's equations. Fall. Prerequisites: PHYS263 and junior standing. Corequisite(s) MATH 432.

ENEE 381 Electromagnetic Wave Propagation 3 cr.
The electromagnetic spectrum: Review of Maxwell's equations; the wave equation potentials, Poynting's theorem, relationship between circuit theory and fields; propagation of electromagnetic waves in homogeneous media and at interfaces; transmission line theory, wave-guides, radiation and antennas. Spring. Prerequisite: PHYS 312.

ENEE 408 Capstone Design Project for Electrical Engineers 3 cr.
Culmination of prior course work in electrical engineering. Utilization of modern design tools and methodologies for the design of components or systems under realistic constraints, with particular emphasis on teamwork and oral/written communication. Design problems in contemporary and emerging areas of electrical engineering are assigned to project teams. Spring. Prerequisite: permission of department chair. May not be taken at the same time as ENME 410 and PHYS 492.

ENEE 417 Microelectronics Design Laboratory 2 cr.
Senior class capstone project laboratory. The design and building of sophisticated circuits, mainly composed of discrete transistors and integrated circuits. Project-based synthesis of knowledge from varied disciplines within electrical engineering. One hour of lecture and
ENME 272 Introduction to Computer-Aided Design 2 cr.
Fundamentals of CAD, using solid modeling packages (Pro/E, SolidWorks and Autodesk Inventor). Two- and three-dimensional drawing. Dimensioning and specifications. Introduction of CAD-based analysis tools. Students will complete a design project. Prerequisites: ENES 100, Math 237 or equivalent, and permission of the department chair.

ENME 320 Thermodynamics 3 cr.

ENME 331 Fluid Mechanics 3 cr.

ENME 332 Transfer Processes 3 cr.

ENME 350 Electronics and Instrumentation I 3 cr.
FSU Course. Modern instrumentation. Basic circuit design, standard microelectronic circuits. Digital data acquisition and control. Signal conditioning. Instrumentation interfacing. Designing and testing of analog circuits. Laboratory experiments. Two hrs. lecture and two hrs. lab per week. Fall. Prerequisites: A "C" or better in PHYS 262 and MATH 237; co-requisite PHYS 263.

ENME 351 Electronics and Instrumentation II 3 cr.
FSU Course. Continuation of ENME 350. Modern instrumentation. Basic circuit design, standard microelectronic circuits. Digital data acquisition and control. Signal conditioning. Instrumentation interfacing. Designing and testing of analog circuits. Laboratory experiments. Two hours lecture and two hours lab per week. Spring. Prerequisites: A "C" or better in ENME 350 and PHYS 263.

ENME 361 Vibration, Controls and Optimization I 3 cr.

ENME 371 Product Engineering and Manufacturing 3 cr.

ENME 373 Advanced Computer-Aided Design 3 cr.
Advanced and three dimensional drawing by using computer-aided design (CAD) software systems. Dimensioning; specifications, and tolerances; introduction of basic CAD analysis tools and applications in engineering; students will complete a design project. Prerequisites: PHYS 262 and MATH 432. Junior standing and approval of the department chair.

ENME 382 Engineering Materials & Manufacturing Processes 3 cr.
FSU Course. Basic material structures and properties. Mechanical behavior of materials. Manufacturing processes theory. Materials processing. Quality assurance. Laboratory experiments. Two hours lecture and two hours lab per week. Spring. Prerequisite: A "C" or better in ENES 220.

ENME 391 Statistical Methods for Product & Process Development 3 cr.
FSU course. Integrated statistical methodology for the improvement of products and processes in terms of performance, quality and cost. Designed experimentation. Statistical process control. Software application. Laboratory activities. Fall. Prerequisites: MATH 238 and permission of the department. Credit cannot be earned for ENME 391 and 392.
ENME 392 Statistical Methods for Product & Process Development 3 cr.
UMCP Course. Integrated statistical methodology for the improvement of products and processes in terms of performance, quality and cost. Designed experimentation. Statistical process control. Software application. Laboratory activities. Fall. Prerequisite: MATH 238.

ENME 400 Machine Design 3 cr.
Calculate working stresses, stress concentration, mechanical failure analysis under static and repeated loadings. Design of machine elements such as bearings, springs, gears, cams, and mechanisms. Kinematics of mechanisms. Fall. Prerequisites: ENME 361 and ENME 382.

ENME 405 Fundamentals of Materials Engineering 4 cr.
Structure of crystalline solids and imperfections in materials. Electrical, thermal, magnetic, and optical properties of materials. Characterization of materials by X-ray diffraction and scanning electron microscopy. Fall. Prerequisite: ENME 382.

ENME 410 Capstone Design Project for Materials Engineering 3 cr.
Culmination of prior course work in materials engineering. Utilization of modern design tools and methodologies to evaluate a society or industry based problems in Materials Science and Engineering to come up with a strategy to address the problem, with a particular emphasis on teamwork and oral/written communication. Spring. Prerequisites: Completion of ENES 491 and permission of department chair. May not be taken at the same time as ENEE 408 and PHYS 492.

ENME 425 Microfabrication 3 cr.
Overview of microfabrication technologies and the science of miniaturization. Microsensors, nanotechnology. Photolithography, dry etching, wet etching, chemical vapor deposition, and physical vapor deposition. Three hrs. integrated lecture and lab. Spring. Prerequisites: Senior standing in physics or engineering or permission of department chair.

ENME 462 Vibration, Controls and Optimization II 3 cr.

ENME 472 Integrated Product and Process Development 3 cr.

ENME 488 Special Problems in Mechanical Engineering 3 cr.
Advanced problems in mechanical engineering with special emphasis on mathematical and experimental methods. Repeatable for maximum of 6 credits if topics are substantially different. Variable. Prerequisite: permission of department.

English

Writing

ENGL 100 Publication Practicum 1-2 cr.
Writing for and editing the campus literary magazine. Open to all students. (1-2 credits per semester; repeatable to 4 credits). Spring.

ENGL 101 Freshman Composition 3 cr.
Addresses the processes of composition and develops intermediate skills in writing essays with an argumentative edge. Based on readings for diverse audiences, it prepares students for writing documented essays. Every semester. Students may not withdraw unless withdrawing from the University. Core Skill 1.

ENGL 107 English Praxis 1-3 cr.
Practical application of writing skills and/or literary analysis. Every semester. Departmental approval. Repeatable for a maximum of 3 credits if topics are substantially different.

ENGL 111 Honors: Freshman Composition 3 cr.
Development of intermediate skills in writing based on readings for general audiences. Preparation for honors-level courses. Credit cannot be earned for both ENGL 101 and ENGL 111. Every semester. Prerequisite: enrollment in the Honors Program. Core Skill 1.

ENGL 197 Career Paths in English 1 cr.
Introduction to career paths in English. Explanation of what it means to be an English major or minor at FSU. Discussion of opportunities for involvement within the department, university and community for internships, independent studies, publications, advising, related minors, employment and student organizations. Every fall.

ENGL 215 Grammar for Writing 3 cr.
Systematic study of English grammar, including parts of speech, components of sentences, phrases, clauses, sentence patterns and punctuation. Emphasis on application of grammatical principles to student writing. Variable, but normally offered during Intersession and Summer sessions only. Does not fulfill Core Skill 1 or 2, although the credits may be used to fulfill the 120 hr. minimum toward graduation. MAY NOT BE USED TO SATISFY THE REQUIREMENTS FOR THE MAJOR OR MINOR IN ENGLISH.

ENGL 300 Critical Writing About Literature 3 cr.
Introduction to literary theory to develop critical perspectives on literary works and provide flexible writing strategies. Advanced writing about literature. Required of English majors and minors. Readings involve literary analysis and criticism. Every semester. Prerequisites: C or better in ENGL 101 or 111. Prior literature course at the 200-level required. Core Skill 2.

ENGL 308 Social Sciences Advanced Composition 3 cr.
Development of advanced skills in writing based on reading for social science audiences. Preparation of extended papers; attention to research tools and documentation. Students may receive credit for only one of the following: 308, 309, 310 or 312. Every semester. Prerequisites: C or better in ENGL 101 or 111; and at least 42 credits or permission of Chair. Core Skill 2.

ENGL 309 Advanced Composition: Humanities 3 cr.
A special advanced composition course which fulfills all of the reading and writing requirements of English 308 and 310, but centers research on topics appropriate to the humanities. Development of advanced writing skills. Extensive and research-based papers; attention to research tools and documentation. Students must receive credit for only one of the following: 308, 309, 310 or 312. Fall. Prerequisites: C or better in English 101 or 111; and at least 42 credits or permission of instructor. Core Skill 2.

ENGL 310 General Advanced Composition 3 cr.
Development of advanced skills in writing. Students may receive credit for only one of the following: ENGL 308, 309, 310 or 312. Every semester. Prerequisites: C or better in ENGL 101 or 111; and at least 42 credits or permission of Chair. Core Skill 2.

ENGL 312 Honors: Advanced Composition 3 cr.
Development of advanced skills in writing. Both reading and writing assignments more challenging than those in other Advanced Composition courses (ENGL 308, 310). Credit cannot be earned for more than one of the following: ENGL 308, 309, 310 or 312. Variable. Prerequisites: C or better in ENGL 101 or ENGL 111, at least 42 credits, and enrollment in Honors Program. Core Skill 2.

ENGL 330 Business Writing 3 cr.
Basic writing for business and para-professional occupations. Writing resumes, job applications, memos and reports, and other kinds of business writing. Every semester. Prerequisites: C or better in ENGL 101 or 111; and at least 42 credits or permission of Chair. Core Skill 2.

ENGL 334 Creative Writing: Fiction 3 cr.
Major elements of fiction writing: style, characterization, point of view, structure, pacing, conflict. Class critiques of student work. Every semester. Prerequisite: C or better in ENGL 101 or 111.

ENGL 335 Creative Writing: Poetry 3 cr.
Major elements of poetry: imagery, metaphor, theme, form. Both lyric and narrative poetry. Class critiques of student work. Every semester. Prerequisite: C or better in ENGL 101 or 111.