ECE Course Prerequisite Changes – Effective Fall 2015

Prerequisites that have been removed have a red background: ECE 1331.

Prerequisites that have been added are in boxed red text: ENGI 1100.

- **ECE 1100 - Introduction to Electrical and Computer Engineering** **Credit Hours: 1.0** (0-3) *Prerequisite:* credit for or concurrent enrollment in MATH 1431. An overview of electrical and computer engineering and the professional opportunities available. **Note: Should be taken by Electrical and Computer Engineering students in the first semester in which the prerequisite is satisfied.**
- **ECE 1121 - Electrical Engineering Workshop** **Credit Hours: 1.0** (0-3) *Prerequisite:* consent of instructor. Principles of laboratory-based design using basic digital logic. Boolean algebra; truth tables; logic circuit design. Credit may not be applied toward a degree in engineering.
- **ECE 1331 - Computers and Problems Solving** **Credit Hours: 3.0** (3-0) *Prerequisite:* MATH 1431 and credit for or concurrent enrollment in ECE 1100 and ENGI 1100. Introduction to personal computers and engineering workstations; techniques and standards for networked computers; computer-based tools for engineering problem-solving; programming constructs, algorithms, and applications.
- **ECE 2100 - Circuit Analysis Laboratory** **Credit Hours: 1.0** (0-3) *Prerequisite:* credit for or concurrent enrollment in ECE 2300. Introduction to the electronics laboratory equipment. Introductory experiments in circuit analysis. Formal report writing. This laboratory course is a prerequisite for all other ECE laboratory courses.
- **ECE 2300 - Circuit Analysis** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 1100, ECE 1331, ENGL 1304, MATH 1432, PHYS 1321, and credit for or concurrent enrollment in MATH 2433, MATH 3321, PHYS 1322, and PHYS 1122. Electric circuit analysis techniques. Inductors, capacitors, first order circuits. Sinusoidal analysis.
- **ECE 2317 3318 - Applied Electricity and Magnetism** **Credit Hours: 3.0** (3-0) *Prerequisite:* CHEM 1117 and CHEM 1372, ECE 1100 and ECE 1331, MATH 2433, MATH 3321, PHYS 1322, and credit for or concurrent enrollment in MATH 3321. Fundamentals of electricity and magnetism, vector calculus, Maxwell's equations, Kirchhoff's laws, static electric and magnetic fields, resistance, capacitance, inductance, magnetic circuits, and transformers.

- **ECE 2331 3340 - Numerical Methods for Electrical and Computer Engineers** **Credit Hours: 3.0** (3-0)*Prerequisite:* ECE 1100, ECE 1331 3331 and MATH 1432 3321. Basic numerical methods with engineering applications. Emphasis on use of computer-based solution techniques.
- **ECE 2355 - Honors Circuits and Electronics** **Credit Hours: 3.0** (3-0)*Prerequisite:* ENGI 1331, MATH 1432, PHYS 1321, credit for or concurrent enrollment in MATH 2433 and PHYS 1322 and membership in the Honors Engineering Program. Electric circuit analysis, inductors, capacitors, first order circuits. Sinusoidal analysis, complex power and frequency response. Transformers, ac power and power distribution. Diodes and op-amps.
- **ECE 3155 - Electronics Laboratory** **Credit Hours: 1.0** (0-4)*Prerequisite:* ECE 2100, ECE 2300, ECE 2317, ECE 3337, ENGI 2304, and credit for or concurrent enrollment in ECE 3355. Corequisite: ECE 3355 Laboratory projects concerning topics studied in ECE 3355.
- **ECE 3317 - Applied Electromagnetic Waves** **Credit Hours: 3.0** (3-0)*Prerequisite:* ECE 2300 ECE 2317, MATH 2433, MATH 3321, PHYS 1322 and credit for or concurrent enrollment in ECE 3337. Maxwell's equations in time and frequency domains, Poynting's theorem, plane wave propagation, reflection and transmission in lossless and lossy media, transmission lines, waveguides, and antennas.
- **ECE 3331 - Programming Applications in Electrical and Computer Engineering** **Credit Hours: 3.0** (3-0)*Prerequisite:* ECE 1331, ECE 2300, MATH 3321, and credit for or concurrent enrollment in ECE 2300. Procedural programming in C and C++, with applications in electrical and computer engineering.
- **ECE 3336 - Introduction to Circuits and Electronics** **Credit Hours: 3.0** (3-0)*Prerequisite:* PHYS 1322 and MATH 2433, and either CIVE 1331 or INDE 1331 or MECE 1331 or CHEE 1331. For BSIE, BSCE, BSME, BSPetE majors only. Electric circuit analysis, ac circuits and frequency response, transformers, power supplies, ac power and power distribution, diodes, op amps and solid state devices.
- **ECE 3337 - Signals and Systems Analysis** **Credit Hours: 3.0** (3-0)**Formerly** ECE 3337 Electrical Engineering Analysis *Prerequisite:* MATH 3321, ECE 1331, ECE 2300, and credit for or concurrent enrollment in ECE 2317. Time and frequency domain techniques for signals and systems analysis. Engineering applications of the convolution integral, Fourier series and transforms, and Laplace transforms.
- **ECE 3355 - Electronics** **Credit Hours: 3.0** (3-0)*Prerequisite:* ECE 2100, ECE 2300, ECE 2317, ECE 3337, ENGI 2304, and credit for or concurrent enrollment in ECE 3155. Signal and amplifier concepts; operational amplifiers; diodes and nonlinear circuits; Bipolar junction transistors; biasing, small and large signal analysis; Transistor amplifiers; two-port networks.

- **ECE 3364 - Circuits and Systems** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 2300, ECE 3337, and credit for or concurrent enrollment in ECE 2317. Three-phase circuits, design of three-phase systems for maximum power to the load, self inductance, mutual inductance, single-phase transformers, three-phase transformers, Laplace transform circuit analysis, analysis and design of frequency-selective circuits, control system characteristics and stability.
- **ECE 3366 - Introduction to Digital Signal Processing** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3337. Credit may not be received for more than one of ECE 3366 and BIOE 3366. Discrete-time signals and systems, discrete Fourier methods, sampling, z-transform, modulation, synthesis of discrete-time filters using digital signal processors. Examples will be taken from bioelectrical signals.
- **ECE 3399 - Senior Honors Thesis** **Credit Hours: 3.0** *Prerequisite:* approval of department chair.
- **ECE 3441 - Digital Logic Design** **Credit Hours: 4.0** (3-3) *Prerequisite:* ECE 2100, ECE 2300, and ECE 2317. Initial course in Boolean algebra, combinational logic, sequential machine analysis and synthesis.
- **ECE 3456 - Analog Electronics** **Credit Hours: 4.0** (3-3) *Prerequisite:* ECE 3155, ECE 3355, and ECE 3337. Bipolar MOS and JFET transistors; Multistage amplifier design; Frequency response and feedback concepts; Operational amplifiers; Analysis and design using discreet and integrated devices.
- **ECE 3457 - Digital Electronics** **Credit Hours: 4.0** (3-3) *Prerequisite:* ECE 3155, ECE 3337, and ECE 3355. Analysis of discrete and integrated digital electronic devices and components and their use in the design and implementation of digital circuits.
- **ECE 4113 - Energy Conversion Laboratory** **Credit Hours: 1.0** (0-3) *Prerequisite:* ECE 2100 and credit for or concurrent enrollment in ECE 4363. Selected experiments in electromechanical energy conversion devices.
- **ECE 4115 - Control Systems Laboratory I** **Credit Hours: 1.0** (0-3) *Prerequisite:* ECE 2100, ECE 3337, and credit for or concurrent enrollment in ECE 4375. Introductory experiments in automatic control systems.
- **ECE 4117 - Telecommunications Laboratory** **Credit Hours: 1.0** (0-1) *Prerequisite:* ECE 2100, credit for or concurrent enrollment in ECE 4371. Selected experiments in telecommunications.
- **ECE 4119 - Solid State Devices Laboratory** **Credit Hours: 1.0** (0-3) *Prerequisite:* credit for or concurrent enrollment in ECE 4339. Introduction to the methods of solid state device characterization and the use of CAD tools in the design of discrete devices.
- **ECE 4198 - Independent Study** **Credit Hours: 1.0** *Prerequisite:* approval of department chair.

- **ECE 4298 - Independent Study** **Credit Hours: 2.0** *Prerequisite:* approval of department chair.
- **ECE 4335 - Electrical and Computer Engineering Design I** **Credit Hours: 3.0** (2-3) *Prerequisite:* ECE 3155, ECE 3355, ECE 3436, ECE 3317, ECE 3340, ECE 3441, ENGI 2304, INDE 2333, credit for or concurrent enrollment in ECE 4436 and a core approved economics elective. Propose and begin team projects involving open-ended design problems supplied by industry and faculty. Professionalism, research methodologies, design tools, and technical communication.
- **ECE 4336 - Electrical and Computer Engineering Design II** **Credit Hours: 3.0** (2-3) *Prerequisite:* ECE 4335 and graduating senior standing. Complete, construct, demonstrate, and defend team projects begun in ECE 4335.
- **ECE 4339 - Physical Principles of Solid State Devices** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3155, ECE 3355, and credit for or concurrent enrollment in ECE 4119. Electronics, modern physics, and electromagnetism used to develop fundamental understanding of bipolar, Schottky, and MOS solid state device operation.
- **ECE 4363 - Electromechanical Energy Conversion** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3364 and credit for or concurrent enrollment in ECE 4113. Electromechanical energy conversion principles, transformers, rotating machines, and solid-state motor control.
- **ECE 4371 - Introduction to Telecommunications Engineering** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3337 and INDE 2333. Linear systems, filters, convolution, spectra, random processes, noise, baseband transmission, amplitude modulation and angle modulation, baseband digital communication and digital modulation.
- **ECE 4375 - Automatic Control Systems** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 2300, ECE 3337, and credit for or concurrent enrollment in ECE 4115. Automatic Control System: mathematical modeling, block diagram, transfer function, system response, stability, root-locus, Bode analysis, Nyquist analysis, Nichols analysis, compensator design.
- **ECE 4398 - Independent Study** **Credit Hours: 3.0** *Prerequisite:* approval of department chair.
- **ECE 4399 - Senior Honors Thesis** **Credit Hours: 3.0** *Prerequisite:* approval of department chair.
- **ECE 4436 3436 - Microprocessor Systems** **Credit Hours: 4.0** (3-3) *Prerequisite:* ECE 3331 ECE 2300 and credit for or concurrent enrollment in ECE 3331 ECE 3441. Memory devices, microcomputer architecture, assembly language programming, I/O programming, I/O interface design, data communications, and data acquisition systems. Laboratory exercises in assembly language and C.
- **ECE 4437 - Embedded Microcomputer Systems** **Credit Hours: 4.0** (3-3) *Prerequisite:* ECE 3155, ECE 3355, ECE 3441 and ECE 4436 3436. Hardware and software components of real-time embedded microcomputer systems;

programming and interfacing to real-time external devices.

- **ECE 4458 - Instrumentation Electronics** **Credit Hours: 4.0** (3-3) *Prerequisite:* ECE 3155, ECE 3337, and ECE 3355. BJT review; FETs; differential amplifiers; op-amp non-ideal characteristics; measurements with low signal-to-noise ratio and high source impedance such as bioelectrical signals; electrical safety; electrodes; transducers.
- **ECE 4498 - Independent Study** **Credit Hours: 4.0** *Prerequisite:* approval of department chair.
- **ECE 4598 - Independent Study** **Credit Hours: 5.0** *Prerequisite:* approval of department chair.
- **ECE 5113 - Microwave Engineering Laboratory** **Credit Hours: 1.0** (0-3) *Prerequisite:* ECE 2100 and credit for or concurrent enrollment in ECE 5317. Selected topics in microwave engineering.
- **ECE 5114 - Antenna Engineering Laboratory** **Credit Hours: 1.0** (0-3) *Prerequisite:* ECE 2100 and credit for or concurrent enrollment in ECE 5318. Selected topics in antenna engineering.
- **ECE 5115 - Control Systems Laboratory II** **Credit Hours: 1.0** (0-3) *Prerequisite:* ECE 2100, ECE 4375, and credit for or concurrent enrollment in ECE 5335. Computer simulations and computer-aided control system design.
- **ECE 5119 - Nanotechnology Laboratory** **Credit Hours: 1.0** (0-2) *Prerequisite:* ECE 2317 3317, credit for or concurrent enrollment in ECE 3337 and ECE 5319. Introduction to nanotechnology, metrology and fabrication methods.
- **ECE 5120 - Nanomaterials Engineering Laboratory** **Credit Hours: 1.0** (0-2) *Prerequisite:* ECE 5119 or CHEE 5119 or MECE 5119, concurrent enrollment in ECE 5320 and instructor permission. Introduction to engineering of nanomaterials with emphasis on structural, optical, photonic, magnetic and electronic materials. Experimental design, synthetic and analytical characterization will be emphasized.
- **ECE 5121 - Nanofabrication Laboratory** **Credit Hours: 1.0** (0-2) *Prerequisite:* ECE 5120 or CHEE 5120 or MECE 5121, enrollment in ECE 5321 and consent of instructor. Design, fabrication, and metrology of nanoscale devices.
- **ECE 5127 - Power Transmission and Distribution Laboratory** **Credit Hours: 1.0** (0-3) *Prerequisite:* ECE 2100 and credit for or concurrent enrollment in ECE 5377. Real and reactive power, power flow and voltage regulation, parallel lines and transformers, series and parallel network compensation, phase shift transformers, protection.
- **ECE 5197 - Selected Topics** **Credit Hours: 1.0** May be repeated for credit when topics vary.
- **ECE 5197:5397:5497 - Selected Topics** **Credit Hours: Cr. 1-4 per semester.** May be repeated for credit when topics vary.

- **ECE 5317 - Microwave Engineering** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3317. Transmission lines, waveguides, microstrip circuits, microwave circuit theory, scattering matrices, impedance transformers, passive microwave devices, resonators, microwave tubes, and solid state active devices.
- **ECE 5318 - Antenna Engineering** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3317. Antenna concepts, linear wire antennas, linear arrays, aperture and horn antennas, printed-circuit radiators, frequency-independent antennas, and measurement techniques.
- **ECE 5319 - Introduction to Nanotechnology** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 2317, credit for or concurrent enrollment in ECE 3337, ECE 3317, and ECE 5119, and instructor permission. Fundamental concepts underlying various nanotechnologies.
- **ECE 5320 - Introduction to Nanomaterials Engineering** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 5319 or CHEE 5319 or MECE 5319, concurrent enrollment in ECE 5120, or consent of instructor. Engineering of nanomaterials with emphasis on structural, optical, photonic, magnetic and electronic materials. Synthetic methods and analytical characterization with design for applications will be emphasized.
- **ECE 5321 - Design and Fabrication of Nanoscale Devices** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 5320 or CHEE 5320 or MECE 5320, concurrent enrollment in ECE 5121 or consent of instructor. Design and fabrication at the nanoscale. Effects of nanoscale phenomena on device scaling: technological advantages and challenges. Design, fabrication, metrology and device integration at nanoscale.
- **ECE 5322 - Nanoengineering Research** **Credit Hours: 3.0** *Prerequisite:* ECE 5119, ECE 5120, ECE 5319, ECE 5320, and instructor permission. Guided research in nanoengineering technology.
- **ECE 5335 - State-Space Control Systems** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 4375. State-space modeling, matrix algebra, system response, coordinate transformation, stability, controllability, observability, realization, state-feedback design and observers, nonlinear systems, Lyapunov functions, and optimal control.
- **ECE 5340 - Introduction to Well-Logging Techniques** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3317 or GEOL 4330 or PHYS 4321 or consent of instructor. Logging tools, including electrical resistivity, induction, acoustic, dielectric, natural gamma ray, neutron density, pulse neutron, NMR, and dipmeter. Production tools, along with well log data transmission, processing, and recording.
- **ECE 5344 - Signal Integrity** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3317, ECE 3355 and instructor permission. Introduction to signal integrity for high-speed digital system.
- **ECE 5346 - VLSI Design** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3456 or ECE 3457. Integrated circuit design using

computer-aided design methods; MOS, GaAs and bipolar techniques; standard cells, digital subcircuit and memory layout and design. Includes project requiring students to design and to have fabricated a functional integrated circuit.

- **ECE 5354 - Digital Video** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3331, ECE 3337 and credit for or concurrent enrollment in ECE 4436. Concepts, theory, and applications of digital video compression. Sampling and quantization, data compression, adaptive coding, BMP and JPEG image standards, H.261 video-conferencing, MPEG codecs, mathematical animation techniques.
- **ECE 5356 - CMOS Analog Integrated Circuits** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3456. Analysis and design of CMOS analog integrated circuits at the transistor level, single-stage and multistage amplifiers, differential pairs, current source biasing circuits, current mirrors, and operational amplifier circuit design.
- **ECE 5358 - Modern Optics and Photonics** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3317. Lightwave fundamentals: geometrical and wave optics, interference, diffraction, scattering, Fourier optics; photonic passive & active devices: waveguides, lasers detectors, modulators, photonic integrated circuits, displays; optical system design and engineering.
- **ECE 5367 - Introduction to Computer Architecture and Design** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3441 and credit for or concurrent enrollment in ECE 4436 3436. Computer organization, computer arithmetic, instruction sets, programming with MIPS assembly language, CPU design, pipelining, and memory hierarchy including caching and virtual memory.
- **ECE 5377 - Power Transmission and Distribution** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3364 and concurrent enrollment in ECE 5127. Power transmission and distribution network architecture and composition; load curves; symmetrical components; parameters and equivalent circuits in symmetrical components for overhead and underground lines, transformers, generators and loads; sub-stations; industrial networks; network steady-state analysis; faults; protection systems; switching equipment; voltage and power static control; surge voltages and protection.
- **ECE 5380 - Power Electronics and Electric Drives** **Credit Hours: 3.0** (3-0) *Prerequisite:* ECE 3155 and ECE 3355. Power electronics; power semiconductor switches; converters and inverters; DC, induction and synchronous motor drives; industrial applications; harmonics and filtering.
- **ECE 5397 - Selected Topics** **Credit Hours: 3.0** May be repeated for credit when topics vary.
- **ECE 5436 - Advanced Microprocessor Systems** **Credit Hours: 4.0** *Prerequisite:* ECE 3441, ECE 4436 3436. Microcomputer assembly language programming, I/O programming, I/O interface design, memory interfacing.
- **ECE 5440 - Advanced Digital Design** **Credit Hours: 4.0** (3-3) *Prerequisite:* ECE 3155, ECE 3355, ECE 3441, and

credit for or concurrent enrollment in ECE 4436 3436. Design fundamentals and techniques using application specific integrated circuit development and synthesis tools and field programmable gate arrays. Design of control units, arithmetic and logic units, memory and I/O subsystems, and cache.

- **ECE 5451 - Principles of Internetworking** **Credit Hours: 4.0** (3-3) *Prerequisite:* credit for ECE 3331 and ECE 3441 and credit for or concurrent enrollment in ECE 4371. Local area networks, IP addressing, routing protocols, TCP flow, congestion and error control, Domain Name System (DNS), Dynamic Host Configuration Protocol (DHCP), and Network Address Translation (NAT). Selected applications.