

Department of Electrical and Computer Engineering

The department offers undergraduate degrees in electrical and computer engineering. Both curricula are designed to provide students with the foundation necessary to enter either professional engineering employment or an engineering graduate program immediately after graduation. Students are prepared for life-long practice by stressing the application of scientific engineering and mathematical principles in generating, distributing, controlling and processing of electrical energy and signals. The art of engineering design is integrated throughout the curriculum from the Freshman Design Course to the culminating capstone Senior Design course in the senior year.

Electrical engineering is at the forefront of technology development for global communications, the expanding use of computers, the ever-growing demand for electrical energy, and the rapidly increasing spread of electronics in health care, transportation, manufacturing, recreation, and many other areas of human need. The electrical engineering curriculum emphasizes on a good mix of analysis, design and hands-on laboratory experience, utilization of computer systems and software, oral and written communications, and a broad study in humanities, social sciences, economics, and ethics.

Growth in the computer field has been spectacular with machines ranging from single-chip microcomputers in any number of electrical appliances to supercomputers with literally billions of transistors. Computer engineering today is concerned with all aspects of the computing system including the development and utilization of hardware, the software algorithm and applications. The computer-engineering curriculum is based on a good mix of analysis, design and hands-on laboratory experience, use of computer systems and software, oral and written communications, and a broad study in humanities, social sciences, economics, and ethics.

Mission

The primary mission of the department for undergraduate education is to produce technically competent and well-rounded graduates with the ability to adapt to the dynamic electrical and computer industry and/or pursue a post-graduate degree program.

Undergraduate Majors

Bachelor of Science in Computer Engineering
Bachelor of Science in Electrical Engineering

Computer Engineering Program

Program Objectives

- To prepare graduates for the life-long practice of computer engineering, and
- To provide graduates with solid academic preparation for graduate study.

Program Educational Outcomes

Each Computer Engineering graduate will demonstrate the following before graduation:

1. Knowledge of scientific principles that are fundamental to the following application areas: digital design, computer networks and software engineering.
2. An ability to design and conduct experiments, analyze and interpret data, design a system, component or process using the techniques, skills, and modern engineering tools, incorporating the use of design standards and realistic constraints that include most of the following considerations: economic, environmental, sustainability, manufacturability, ethical, health and safety, social and political.
3. An ability to function on multi-disciplinary teams with a commitment to succeed and to assure employer success.
4. An ability to identify, formulate and solve engineering problems.
5. An ability to communicate effectively and possess knowledge of contemporary issues and a commitment to continue developing knowledge and skills after graduation.

Electrical Engineering Program

Accreditation

Northwest Commission on Colleges and Universities
ABET (Accreditation Board for Engineering and Technology)
B.S.E. in Electrical Engineering

Program Objectives

- To prepare graduates for the life-long practice of electrical engineering, and
- To provide graduates with solid academic preparation for graduate study.

Program Educational Outcomes

Each Electrical Engineering graduate will demonstrate the following before graduation:

1. Knowledge of scientific principles that are fundamental to the following application areas: Circuits, Communications, Computers, Controls, Digital Signal Processing, Electronics, Electromagnetics, Power and Solid State.
2. An ability to design and conduct experiments, analyze and interpret data, design a system, component, or process using the techniques, skills, and modern engineering tools, incorporating the use of design standards and realistic constraints that include most of the following considerations: economic, environmental, sustainability, manufacturability, ethical, health and safety, social and political.
3. An ability to function on multi-disciplinary teams with a commitment to succeed and to assure employer success
4. An ability to identify, formulate and solve engineering problems
5. An ability to communicate effectively and possess knowledge of contemporary issues and a commitment to continue developing knowledge and skills after graduation.

Admission to the Major

Minimum GPA: 2.5

Admission and transfer policies are described in the College of Engineering section.

Department Policies

1. Regardless of catalog of graduation students must satisfy prerequisite and corequisite course requirements as specified in the current catalog.
2. Grades of C (2.00) or higher are required in all immediate prerequisites of all engineering, mathematics, science, and computer science courses, and in ENG 101, 102 and (231 or 232).
3. All Electrical and Computer engineering majors must take the Fundamentals of Engineering Discipline-Specific Electrical Engineering examination within one year prior to anticipated date of graduation. A good faith effort on the exam is required.
4. Students must complete all pre-major courses before promotion to Advanced Standing.

5. Electrical and Computer Engineering students should register for ECG 497 Senior Design I in their last semester prior to anticipated date of graduation. To verify eligibility and permit registration for Senior Design 1, students must submit a completed graduation application prior to the start of instruction in their next-to-last semester.

Degree Requirements

Computer Engineering

Pre-Engineering

- 1) English Composition.....6 credits (ENG 101 and 102)
- 2) Constitutions.....4-6 credits
- 3) Mathematics.....8 credits (MAT 181 and 182)
- 4) Distribution Requirement (Life & Physical Sciences & Analytical Thinking)
 - Humanities and Fine Arts.....9 credits
 - Social Science.....9 credits
- 5) Multicultural.....(see notes 5 below)
 - International..... (see notes 5 below)
- 6) Degree Requirements
 1. Sciences.....12 credits (CHE 115; PHY 180, 180L, 181, and 181L)
 2. Engineering.....7 credits (ECG 100, ECG 190, and ECG 220)
 3. Computer Science.....6 credits (CS 135, 136)

Other Required Courses (can be taken as Pre-Major or Advanced Standing student):

Advanced Standing

- 1) English literature.....3 credits (ENG 231 or 232)
- 2) Mathematics9 credits (MAT 251, MAT 429, STA 463)
- 3) Computer Science9 credits (CS 218, 269, 370)
- 4) Required Department Courses ...25 credits (ECG 200, 200L 221, 221 L, 300, 300L, 320, 320L, 402, 410, 497,498)
- 5) Computer Engineering Concentrations.....13 credits

Students must select and complete at least 2 concentration areas out of the following three areas:

	Digital Design	Credits
ECG 415		3
ECG 421		1
ECG 421L		3
	Computer Networks	

CS 465		3
ECG 400		3
	Software Engineering	
CS 319		3
CS 472		3

CE Labs: Those who do not opt for the digital design concentration must complete at least one of the laboratories. (1 credit)

		Cred.
ECG 420L		1
ECG 421L		1
ECG 433		1
ECG 440L		1
ECG 450L		1
ECG 470L		1
ECG 480L		1

- 6) Professional Electives (see notes 3 below).....9 credits

Total.....128/129 credits

Notes

1. If the Constitutions requirement is satisfied with six credits, only three humanities credits are required.
2. Please see department-approved lists, available through the department office or Advising Center for courses in social science, humanities, and fine arts. In addition, EGG 307 and PHI 242 are required.
3. Professional Electives: Six of these credits must be electrical or computer engineering courses and three credits must be from our approved list of mathematics or science courses, available through the department office or Advising Center. Students are encouraged to select sequences of at least two courses in electrical/computer engineering. Please see the ECG department office or Advising Center for approved elective lists.
4. All required and all professional elective courses must be completed with a grade of C or better.
5. Every student must complete a three-credit multicultural course and a three-credit international course. Courses satisfying other requirements may simultaneously satisfy the multicultural and international requirements except one course cannot satisfy both the multicultural and the international requirements.

Electrical Engineering

(Pre-Engineering)

- 1) English Composition6 credits (ENG 101 and 102)
- 2) Constitutions.....4-6 credits

- 3) Mathematics8 credits (MAT 181 and 182)
- 4) Distribution Requirement (Life & Physical Sciences & Analytical Thinking) Humanities and Fine Arts.....9 credits Social Science.....9 credits
- 5) Multicultural.....(see notes 5 below) International.....(see notes 5 below)
- 6) Degree Requirements
 1. Sciences.....12 credits (CHE 115, PHY 180, 180L, 181, and 181L)
 2. Engineering.....7 credits (ECG 100, ECG 190, and ECG 220)
 3. Computer Science.....6 credits (CS 117 or 119 and CS 218)

Other Required Courses (can be taken as Pre-Major or Advanced Standing student):

Advanced Standing:

- 1) English literature.....3 credits (ENG 231 or 232)
- 2) Mathematics9 credits (MAT 283, MAT 429, MAT 459)
- 3) Required Department Courses23 credits (ECG 221, 221L, 320, 320L, 360, 361, 330, 497,498 and MEG 311 or MEG 314)
- 4) Area of Interest Requirements18 credits

Students must select and complete one course in six areas:

- Communications:.....ECG 460
- Computers:ECG 300, ECG 140
- Controls:.....ECG 470
- Digital Signal Processing:ECG 480
- Electronics:.....ECG 415, 420, or 421
- Power:ECG 440
- Electromagnetics: ECG 430, 431, 432, or 433
- Solid State:.....ECG 450, 451, or 452

- 5) Laboratory Requirements5 credits

Students must select and complete five laboratory courses from: ECG 300L, 420L, 421L, 440L, 450L, 470L, or 480L

- 6) Professional Electives (see notes 3 below).....9 credits

Total:128/129 credits

Notes

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2. Please see department-approved lists, available through the department office or Advising Center for courses in social science,

humanities, and fine arts. In addition, EGG 307 and PHI 242 are required.

3. Professional Electives: Six of these credits must be electrical or computer engineering courses and three credits must be from our approved list of mathematics or science courses, available through the department office or Advising Center. Students are encouraged to select sequences of at least two courses in electrical/computer engineering. Please see the ECG department office or Advising Center for approved elective lists.
4. All required and all professional elective courses must be completed with a grade of C or better.
5. Every student must complete a three-credit multicultural course and a three-credit international course. Courses satisfying other requirements may simultaneously satisfy the multicultural and international requirements except one course cannot satisfy both the multicultural and the international requirements.

ECG 100 (Formerly EEG 114)

Computer Logic Design I

Digital design concepts and fundamentals. Combinational circuits. MSI and LSI circuits. Sequential machine fundamentals Sequential circuit analysis and design. Modern developments. Prerequisites: MAT 126 and MAT 127 or MAT 128. 3 credits.

ECG 100L (Formerly EEG 191)

Digital Logic Laboratory

Logic gates, simplification of Boolean functions, design and testing of combinational and sequential circuits including code converters, multiplexers, adders, and synchronous counters. Not for electrical engineering and computer engineering majors. Corequisites: ECG 100 (Formerly EEG 114). 1 credit.

ECG 190

ECE Freshman Design

The course will introduce students to safety, ethics, and various branches of electrical and computer engineering through 1-hour weekly lectures by various professors and practitioners. Students will be introduced to design principles in electrical and computer engineering and will design, build, and test an electrical and/or computer system. 1 credit.

ECG 200 (Formerly EEG 314)

Computer Logic Design II

Sequential logic, synchronous and asynchronous circuits, hazards, PAL/PLA based implementation, computer-aided design of digital systems, introduction to computers. Prerequisites: ECG 100 (Formerly EEG 114). 3 credits.

ECG 200L (Formerly EEG 314L)

Computer Logic Design Laboratory

Design and testing of combinational and sequential logic circuits. Includes synchronous and asynchronous circuits, races, cycles, hazards, timing considerations and design with programmable logic devices (PLD). Corequisite: ECG 200 (Formerly EEG 314). 1 credit.

ECG 220 (Formerly EEG 208)

Circuits I

Introduction to linear circuit analysis. Kirchhoff's laws, operational amplifiers, node and loop analysis. Thevenin, Norton, and other network theorems, first order RL and RC circuits. Prerequisites: MAT 182. 3 credits.

ECG 221 (Formerly EEG 209)

Circuits II

Second order RLC circuits, sinusoidal steady state analysis using phasors, sinusoidal steady state power, the Laplace transform and its application to circuit analysis, network functions, frequency response, magnetically coupled circuits and transformers. Prerequisites: ECG 220 (Formerly EEG 208) and CS 117, CS 119, or CS 135. 3 credits.

ECG 221L (Formerly EEG 209L)

Circuits II Laboratory

Basic measurements and instrumentation. Principles of experimentation. Corequisite: ECG 221 (Formerly EEG 209). 1 credit.

ECG 290 (Formerly EEG 291)

Fundamentals of Engineering

Introduction to electric circuit analysis, electronic devices and circuits, transducers, electric machines and power transmission. Not for electrical engineering and computer engineering majors. Prerequisites: MAT 182 and PHY 180. 3 credits

ECG 300 (Formerly EEG 416)

Digital Systems Design

Digital systems, hardware organization and design. Basic computer organization. Control unit implementation. Interface design. Corequisite: ECG

320 (Formerly EEG 308). Prerequisites: ECG 100 (Formerly EEG 114), and CS 218. 3 credits.

ECG 300L (Formerly EEG 417)

Digital Systems Design Laboratory

Digital logic laboratory. Implementation of combinational and sequential logic design. Introduction to large systems. Prerequisites: ECG 320L (Formerly EEG 308L) and ECG 300 (Formerly EEG 416). 1 credit.

ECG 320 (Formerly EEG 308)

Engineering Electronics I

Introduction to electronic devices, electronic circuits and electronic signal processing. Design and analysis of diode circuits including rectifiers and power supplies. Design and analysis of single stage amplifiers and digital circuits. Prerequisites: CHE 115, ECG 221 (Formerly EEG 209), MAT 429, PHY 181, and PHY 181L. 3 credits.

ECG 320L (Formerly EEG 308L)

Engineering Electronics I Laboratory

Laboratory-based analysis and design of electrical and electronic systems. Corequisite: EEG 308. Prerequisite: ECG 221L (Formerly EEG 209L). 1 credit.

ECG 330 (Formerly EEG 430)

Engineering Electromagnetics I

Static electric and magnetic fields. Dielectric and ferromagnetic materials. Laplace's equation. Time-varying electric and magnetic fields. Maxwell's equations. Engineering applications. Corequisite: MAT 459. Prerequisites: PHY 181, MAT 429 and ECG 221 (Formerly EEG 209). 3 credits.

ECG 360 (Formerly EEG 310)

Signals and Systems I

Deterministic signals and linear systems. Time domain analysis of analog and discrete linear systems. Analysis of linear systems using the Laplace transform and the z-transforms, Signal spaces and the generalized Fourier Series. Corequisite: MAT 459. Prerequisites: ECG 221 (Formerly EEG 209) and MAT 429. 3 credits.

ECG 361 (Formerly EEG 311)

Signals and Systems II

Stochastic and deterministic signals and linear systems. Analog and discrete Fourier Series, analog and discrete Fourier transforms, basic probability theory, stochastic processes, stochastic signals and linear systems.

Prerequisites: ECG 360 (Formerly EEG 310) and MAT 459. 3 credits

ECG 400 (Formerly EEG 470)

Computer Communication Networks

Computer network architecture; OSI Model; network protocols; local area networks; fiber optics communication; ISDN; elements of Queuing Theory, with emphasis on hardware design issues. Prerequisites: ECG 300 (Formerly EEG 416), CS 370, and STA 463. 3 credits.

ECG 402 (Formerly EEG 419)

Microprocessor Systems Design

Advanced study of the microprocessor and its application to a broad range of engineering problems. Micro-controllers. Modern trends in both computer and non-computer systems. Processor design, architecture characteristics and performance, case studies. Prerequisites: ECG 300 (Formerly EEG 416). 3 credits.

ECG 403

Embedded System

Design of hardware and software for embedded systems. SBC/microcontroller architecture, A/D and D/A conversion, signal conditioning, interfacing, controlling electronic/electromechanical systems. Assembly language, high-level language programming, efficient use of computational/physical resources, considerations for speed, robustness, debugging methods, use of simulators and in-circuit emulators. Project-based, requiring design/construction an embedded system. Prerequisites: ECG 402. 3 credits.

ECG 404

Modern Processor Architecture

Instruction level parallel processing. Processor performance evaluation and optimization. Scalar and superscalar pipelines. Instruction, register data and memory data flow techniques. Cache organization and performance analysis. Comparison of RISC, CISC and VLIW architecture. Survey of modern processors. Introduction to multithreading. Prerequisites: ECG 300. 3 credits.

ECG 405

Data Compression Systems

Source modeling. Foundations of lossy and lossless compression, Code properties, Huffman and arithmetic coding, Predictive coding, Dictionary

techniques, Compression techniques and standards for facsimile, audio, video and still image coding, Hardware design specifics, Coding and watermarking. Prerequisites: MAT 429, ECG 220 . 3 credits.

ECG 410 (Formerly EEG 418)

Digital System Design using Hardware Description Languages: HDL

Modern methodologies in design and test of digital/computer systems. Primary focus on Very High Speed Integrated circuit Hardware description languages, in particular, VHDL. Verilog and other hardware programming languages will be explored. Behavior level simulation, debugging. Introduction to synthesis, placement and routing. Prerequisites: ECG 200 (Formerly EEG 314) and CS 269. 3 credits.

ECG 415 (Formerly EEG 460)

Introduction to VLSI System Design

Introduction to theory, design and implementation of digital VLSI systems including MOS transistor theory and integrated circuit fabrication technology, digital system design, layout and design rules and use of CAD tools. Prerequisites: ECG 320 (Formerly EEG 308) and ECG 300 (Formerly EEG 416). 3 credits.

ECG 416

VLSI Physical Design

Physical design of VLSI systems is the process of transforming structural representation into layout representation. This transformation creates an efficient layout representation satisfying-topological, geometric, timing and power-consumption design constraints. Also covers various optimization techniques, such as network flow, Steiner tree, scheduling, simulated annealing, generic algorithm, and linear/convex programming. Prerequisites: ECG 300, CSC 119 or CSC 135. 3 credits.

ECG 420 (Formerly EEG 420)

Engineering Electronics II

Analysis, synthesis and design techniques of modern electronic analog and digital circuits. Prerequisites: ECG 320 (Formerly EEG 308) and MAT 429. 3 credits.

ECG 420L (Formerly EEG 421)

Engineering Electronics II Laboratory

Applications and study of modern electronic analog and digital circuits. Advanced instrumentation. Corequisite: ECG 420 (Formerly EEG 420). Prerequisite: ECG 320L (Formerly EEG 308L). 1 credit.

ECG 421 (Formerly EEG 414)

Digital Electronics

Digital circuit analysis. Discrete and integrated circuit technology, logic families, A/D-D/A circuits, comparators, Schmitt triggers. Prerequisites: ECG 100 (Formerly EEG 114) and ECG 320 (Formerly EEG 308). 3 credits.

ECG 421L (Formerly EEG 415)

Computer Electronics Laboratory

Laboratory-based analysis and design of digital and computer electronic systems. Corequisite: ECG 421 (Formerly EEG 414), Prerequisite: ECG 320L (Formerly EEG 308L). 1 credit.

ECG 422

Introduction to Analog Integrated Circuit Design

The design of CMOS, BiCMOS and bipolar analog integrated circuits. Topics include device models, current mirror design, single stage amplifier design, differential amplifier design, frequency response analysis and noise analysis. Prerequisite: ECG 320. 3 credits.

ECG 430 (Formerly EEG 431)

Transmission Lines

Telegraphist's equation; transient response--steady state response; reflection diagrams; Smith chart; matching techniques and designs; narrow and broadband impedance; scattering matrix; introduction to stripline and microstrip devices. Prerequisite: ECG 330 (Formerly EEG 430). 3 credits.

ECG 431 (Formerly EEG 435)

Engineering Optics

Engineering applications of optics. Includes aperture and grating antennas, holography, optical image processing, optical waveguides, and tomography. Prerequisite: ECG 330 (Formerly EEG 430) and MAT 459. 3 credits.

ECG 432 (Formerly EEG 434)

Antenna Engineering

Fundamentals of antennas and antenna design; Linear wire, loop and antenna arrays; antenna measurements. Prerequisite: ECG 330 (Formerly EEG 430) and MAT 459. 3 credits.

ECG 433 (Formerly EEG 433): Active and Passive Microwave Engineering

Waveguides, dispersion diagrams, microwave network analysis, broadband impedance matching, open and closed resonators, power dividers, directional couplers, filters, circulators, phase shifters, solid state amplifier, and oscillator design. Prerequisite: EEG 330 and MAT 459 or consent of instructor. 3 credits.

ECG 440 (Formerly EEG 442)

Introduction to Electric Power Engineering

Electric energy sources and energy conversion principles, modeling and analysis of synchronous generators, transmission lines, transformers, AC and DC machines, brief introduction to power system analysis including power flow, fault calculation and economic dispatch. Corequisite: ECG 330 (Formerly EEG 430). Prerequisites: ECG 320 (Formerly EEG 308). 3 credits.

ECG 440L (Formerly EEG 443)

Electric Power Engineering Laboratory

Measurement of different electric powers, measurement of equivalent circuit parameters and characteristics of electric generators, transformers, transmission lines, AC and DC motors, use of software packages for fault calculation and load flow. Corequisite: ECG 440 (Formerly EEG 442). Prerequisites: ECG 320L (Formerly EEG 308L). 1 credit.

ECG 442 (Formerly EEG 445)

Power Electronics

Diode circuits and rectifiers, power semiconductor diodes and transistors, thyristors and static switches, controlled rectifiers, AC voltage controllers, DC choppers, inverters, AC and DC drives, power supplies, protection of devices and circuits. Prerequisites: ECG 320 (Formerly EEG 308) and ECG 440 (Formerly EEG 442). 3 credits.

ECG 450 (Formerly EEG 481)

Solid State Devices

Semiconductor physics, pn diode, bipolar junction transistor, metal semiconductor FET devices, metal oxide semiconductor FET devices. Prerequisites: ECG 320 (Formerly EEG 308), MAT 429. 3 credits.

ECG 450L (Formerly EEG 484)

Solid State Characterization Laboratory

Capacitance and voltage, Hall mobility and carrier concentration, oxidation and etching silicon dioxide processing of silicon. Prerequisite: ECG 450 (Formerly EEG 481). 1 credit.

ECG 451 (Formerly EEG 482)

Electronic and Magnetic Materials and Devices

Semiconductors, dielectrics, ferroelectrics, antiferromagnetics, ferromagnetics, ferrimagnetics, crystal structure, structure-property relations, device applications. Prerequisite: ECG 320 (Formerly EEG 308). 3 credits.

ECG 452 (Formerly EEG 483)

Introduction to Optical Electronics

Optical radiation and detection. Electro-optical sensors, signal processing and application. Prerequisite: ECG 330 (Formerly EEG 430). 3 credits.

ECG 460 (Formerly EEG 428)

Analog and Digital Communications

Review of Fourier transform theory, linear system theory, probability and random processes. Modulation and detection. Noise in modulation systems. Introduction to digital data transmission. Prerequisites: ECG 361 (Formerly EEG 311). 3 credits.

ECG 462 (Formerly EEG 451)

Advanced Digital Communications

Information theory and fundamental limits on performance, digital coding of waveforms, pulse shaping for baseband transmission, digital bandpass modulations, channel coding. Prerequisites: ECG 460 (Formerly EEG 428). 3 credits

ECG 470 (Formerly EEG 412)

Classical Feedback and Control Systems

Introduction to control systems. Feedback control characteristics, performance, stability. Analysis, synthesis and design of feedback control systems including digital techniques. Prerequisites: ECG 360 (Formerly EEG 310). 3 credits.

ECG 470L (Formerly EEG 413)

Feedback and Control Systems Laboratory

Laboratory projects and exercises in feedback control. Corequisite: ECG 470 (Formerly EEG 412), Prerequisite: ECG 221L (Formerly EEG 209L). 1 credit.

ECG 472 (Formerly EEG 429)

Digital Control Systems

An introduction to time domain methods of control. State space representation of linear systems; time domain stability; the concepts of controllability and

observability. Time domain control system design techniques, including pole placement, detector design and an introduction to linear optimal control. Design of digital control systems. Prerequisite: ECG 470 (Formerly EEG 412). 3 credits.

ECG 474 (Formerly EEG 461)

Recent Topics in Control

State variable time domain approach to the analysis and design of control systems. Applications of matrix theory and linear algebra to the characterization of intrinsic system properties of stability, controllability, observability. state feedback, closed loop pole placement. Recent developments in control theory and applications. Prerequisites: ECG 470 (Formerly EEG 412) or consent of instructor. 3 credits.

ECG 480 (Formerly EEG 450)

Digital Signal Processing

Review of discrete linear system theory including the z-transform, the Fourier transform, discrete and fast Fourier transform. Sampling, reconstruction multirate systems and quantization noise. IIR and FIR digital filter design including digital filter structures and finite word length effects. Prerequisites: ECG 361 (Formerly EEG 311). 3 credits.

ECG 480L (Formerly EEG 450L)

Digital Signal Processing Laboratory

Laboratory projects and exercises in digital signal processing including the design and implementation of FIR, IIR, and multirate systems. Corerequisite: ECG 480 (Formerly EEG 450). 1 credit.

ECG 482 (Formerly EEG 456)

Introduction to Biomedical Signals and Systems

Introduction to biomedical signals, transduction devices, bioelectric potentials and sensors. Application of electrical signal and system principles to biosignals such as cardiovascular electric signals, neural electric communication, and diagnostic ultrasound. Includes current biomedical engineering topics. Prerequisite: ECG 360 (Formerly EEG 310) or consent of instructor. 3 credits.

ECG 490 (Formerly EEG 497)

Senior Design Project

Synthesis course to involve students in the design process from analysis and proposal to solution. Prerequisite: ENG 404 and final semester senior standing in Electrical Engineering. 3 credits.

ECG 491 (Formerly EEG 491)

Independent Study

Independent study of a selected engineering topic. Prerequisite: Senior standing in Engineering or Consent of Instructor. May be repeated once for credit. 1-3 credits.

ECG 495 (Formerly EEG 495)

Special Topics

An outlet for experimental and other topics which may be of current interest. Topics and credits to be announced. May have a laboratory. Prerequisite: Upper-division standing in Engineering or consent of instructor. May be repeated once under different topic. 1-4 credits.

ECG 497

Senior Design Project I

Capstone synthesis course to teach students the design process from problem definition, team building, to project planning, paper design, written and oral communications. Prerequisites: Students who are within 30 credits of graduating. 1 credit.

ECG 498

Senior Design Project II

Capstone synthesis course to teach students hardware and software implementation of their projects proposed and paper-designed in ECG 497, testing and recommendations, project presentations. Prerequisite: ECG 497. 2 credits.