Department of Electrical and Computer Engineering

Interim Chair: J. Iwan Alexander, PhD

Associate Chair: Leon Jololian, PhD

Degree Offered: Bachelor of Science in Electrical Engineering

Accreditation: The Bachelor of Science in Electrical Engineering degree program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Website: https://www.uab.edu/engineering/ece/undergrad

Program Director: Leon Jololian, PhD

Email: leon@uab.edu

Phone: 205 934-8440

The Department of Electrical and Computer Engineering offers a bachelor’s degree in electrical engineering (BSEE), which provides the foundation for students to succeed in any of the areas of electrical engineering, including biomedical instrumentation, digital computer systems, software systems, electric utility power systems, digital control, signal processing, and data analysis. In addition to courses in mathematics; calculus-based physics; chemistry; the humanities and fine arts; and history, social, and behavioral sciences, students take a core of fundamental engineering coursework outside of electrical engineering, a core of courses in the breadth of electrical engineering, and electrical engineering elective courses.

Each student must complete a senior design team project that comprises six semester hours of coursework (EE 498 Team Design Project I and EE 499 Team Design Project II).

Student Outcomes

Upon completion of the BSEE degree program, our graduates will have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Bachelor of Science in Electrical Engineering

Requirements

<table>
<thead>
<tr>
<th>Core Curriculum as Specified for Engineering Majors</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Area I: Written Composition (6 hrs)</td>
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<tr>
<td>Area II: Humanities and Fine Arts (9 hrs)</td>
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<tr>
<td>Area III: Natural Sciences and Mathematics (12 hrs)</td>
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| Area IV: History, Social, and Behavioral Sciences (9 hrs) |

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<tr>
<th>Other Required Courses</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CE 210 Statics</td>
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<tr>
<td>CH 115 General Chemistry I &amp; 115R and General Chemistry I Recitation &amp; CH 116 and General Chemistry I Laboratory</td>
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<tr>
<td>EE 210 Digital Logic</td>
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<tr>
<td>EE 233 Engineering Programming Methods</td>
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<tr>
<td>EE 254 Applied Numerical Methods</td>
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<tr>
<td>EE 300 Engineering Problem Solving II</td>
<td></td>
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<tr>
<td>EE 314 Electrical Circuits &amp; 314R and Electrical Circuits Recitation</td>
<td></td>
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<tr>
<td>EE 316 Electrical Networks &amp; 316L and Electrical Networks Laboratory</td>
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<tr>
<td>EE 318 Signals and Systems</td>
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<tr>
<td>EE 333 Engineering Programming Using Objects</td>
<td></td>
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<tr>
<td>EE 337 Introduction to Microprocessors &amp; 337L and Introduction to Microprocessors Laboratory</td>
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<tr>
<td>EE 341 Electromagnetics</td>
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</table>

Vision

To be a nationally recognized Department of Electrical and Computer Engineering: a first choice for undergraduate and graduate education

Mission

To prepare graduates to be immediately productive and able to adapt to a rapidly changing environment while also creating and applying knowledge for the benefit of Birmingham, the state, and beyond

Program Educational Objectives

The Electrical Engineering undergraduate program prepares graduates to:

• Succeed in a career or graduate studies in electrical engineering
• Approach problem solving with an engineering mindset
• Grow professionally
### Department of Electrical and Computer Engineering Residency Requirement

Students are required to take the following at UAB:

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Hours</th>
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<tbody>
<tr>
<td>EE 421 Communication Systems</td>
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<tr>
<td>EE 426 Control Systems</td>
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</tr>
<tr>
<td>EE 431 Analog Integrated Electronics</td>
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</tr>
<tr>
<td>EE 498 Team Design Project I</td>
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</tr>
<tr>
<td>EE 499 Team Design Project II</td>
<td>3</td>
</tr>
<tr>
<td>Nine hours of EE 400-level electives</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td><strong>25</strong></td>
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</tbody>
</table>

### Curriculum for the Bachelor of Science in Electrical Engineering (BSEE)

#### Freshman

<table>
<thead>
<tr>
<th>First Term</th>
<th>Hours Second Term</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CH 115</td>
<td>4 EE 210</td>
<td>3</td>
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<tr>
<td>&amp; 115R &amp; CH 116</td>
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<tr>
<td>EH 101</td>
<td>3 EGR 111 &amp; EGR 111</td>
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<tr>
<td>EGR 265</td>
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<tr>
<td>MA 126</td>
<td>4 MA 126</td>
<td>4</td>
</tr>
<tr>
<td>ME 102</td>
<td>2 PH 221 &amp; EGR 150</td>
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<td><strong>Total</strong></td>
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<td><strong>18</strong></td>
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#### Sophomore

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<tr>
<th>First Term</th>
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<tbody>
<tr>
<td>EE 314</td>
<td>3 EE 233</td>
<td>3</td>
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<tr>
<td>&amp; 314R &amp; EGR 265</td>
<td>4 EE 316 &amp; 316L</td>
<td>4</td>
</tr>
<tr>
<td>CE 210</td>
<td>3 EE 300</td>
<td>3</td>
</tr>
<tr>
<td>PH 222</td>
<td>4 ME 251</td>
<td>2</td>
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<td><strong>Total</strong></td>
<td><strong>17</strong></td>
<td><strong>15</strong></td>
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#### Junior

<table>
<thead>
<tr>
<th>First Term</th>
<th>Hours Second Term</th>
<th>Hours</th>
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<tbody>
<tr>
<td>EE 318</td>
<td>3 EE 254</td>
<td>3</td>
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<tr>
<td>EE 333</td>
<td>3 EE 337</td>
<td>4</td>
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<tr>
<td></td>
<td>&amp; 337L</td>
<td></td>
</tr>
<tr>
<td>EE 351</td>
<td>4 EE 361</td>
<td>4</td>
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<tr>
<td></td>
<td>&amp; 361L</td>
<td></td>
</tr>
<tr>
<td>EE 485</td>
<td>3 EE 341</td>
<td>3</td>
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<tr>
<td></td>
<td>3 Core Curriculum Area II or IV</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
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#### Senior

<table>
<thead>
<tr>
<th>First Term</th>
<th>Hours Second Term</th>
<th>Hours</th>
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<tbody>
<tr>
<td>EE 426</td>
<td>3 EE 421</td>
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<tr>
<td>EE 498</td>
<td>3 EE 431</td>
<td>4</td>
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<tr>
<td>Electrical Engineering Elective</td>
<td>3 EE 499 &amp; 6 EE 499</td>
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<tr>
<td>Core Curriculum Area II or IV</td>
<td>3 Electrical Engineering Elective</td>
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<td></td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
<td><strong>16</strong></td>
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</tbody>
</table>

**Total credit hours: 128**
Courses

EE 011. Coop/Internship in EE. 0 Hours.
Engineering workplace experience in preparation for the student's intended career.

EE 210. Digital Logic. 3 Hours.
Number systems and codes. Boolean algebra and combinational logic. Arithmetic and logic circuits. Memory elements. Synchronous sequential logic. Lecture and computer laboratory.
Prerequisites: MA 106 [Min Grade: C] or MA 107 [Min Grade: C] or MA 125 [Min Grade: C] (Can be taken Concurrently) or MA 225 [Min Grade: C] (Can be taken Concurrently)

EE 233. Engineering Programming Methods. 3 Hours.
Program design techniques, data structures, coding and documentation standards. File I/O. Product design and life cycles. Testing and software tools. Lecture and computer laboratory.
Prerequisites: (MA 106 [Min Grade: C] or MA 107 [Min Grade: C] or MA 125 [Min Grade: C] (Can be taken Concurrently)) or MA 225 [Min Grade: C] (Can be taken Concurrently) and (BME 150 [Min Grade: C] or EGR 150 [Min Grade: C])

EE 254. Applied Numerical Methods. 3 Hours.
Selected mathematical and computational topics appropriate to the numerical solution of engineering problems.
Prerequisites: EGR 265 [Min Grade: C] or (MA 227 [Min Grade: C] and MA 252 [Min Grade: D]) and (MA 125 [Min Grade: C] or MA 225 [Min Grade: C]) and (MA 126 [Min Grade: C] or MA 226 [Min Grade: C]) and (BME 150 [Min Grade: C] or EGR 150 [Min Grade: C])

EE 300. Engineering Problem Solving II. 3 Hours.
Selected mathematical and computational topics appropriate to the solution of engineering problems, including probability and statistics.
Prerequisites: EGR 265 [Min Grade: C] or (MA 227 [Min Grade: C] and MA 252 [Min Grade: D]) and (MA 125 [Min Grade: C] or MA 225 [Min Grade: C]) and (MA 126 [Min Grade: C] or MA 226 [Min Grade: C]) and (BME 150 [Min Grade: C] or EGR 150 [Min Grade: C])

EE 305. Fundamentals of Electrical Engineering. 3 Hours.
Survey of topics fundamental to field of electrical engineering. For non-engineering majors. Not available for credit toward engineering major.
Prerequisites: MA 109 [Min Grade: C]

EE 312. Electrical Systems. 3 Hours.
Introduction to DC circuit analysis, AC steady-state analysis, first-order transient analysis, ideal transformers, and electrical safety. For non-EE majors.
Prerequisites: (MA 125 [Min Grade: C] or MA 225 [Min Grade: C]) and (MA 126 [Min Grade: C] or MA 226 [Min Grade: C]) and PH 221 [Min Grade: C]

EE 314. Electrical Circuits. 3 Hours.
Introduction to DC circuit analysis, AC steady-state analysis, first-order transient analysis, and electrical safety. For EE Majors.
Prerequisites: (MA 125 [Min Grade: C] or MA 225 [Min Grade: C]) and (MA 126 [Min Grade: C] or MA 226 [Min Grade: C]) and PH 221 [Min Grade: C]

EE 314R. Electrical Circuits Recitation. 0 Hours.
An application based course designed to reinforce concepts from EE 314.
Prerequisites: (MA 125 [Min Grade: C] or MA 225 [Min Grade: C]) and (MA 126 [Min Grade: C] or MA 226 [Min Grade: C]) and PH 221 [Min Grade: C]

EE 316. Electrical Networks. 4 Hours.
Analysis of circuits using classical differential/integral techniques, Laplace transforms, and two-port network parameters. Circuit solution using simulation. EE 316L must be taken concurrently. Quantitative Literacy is a significant component of this course.
Prerequisites: EGR 265 [Min Grade: C] or (MA 227 [Min Grade: C] and MA 252 [Min Grade: C]) (Can be taken Concurrently) and EH 101 [Min Grade: C] and PH 222 [Min Grade: C] and EE 314 [Min Grade: C] and (MA 125 [Min Grade: C] or MA 225 [Min Grade: C]) and (MA 126 [Min Grade: C] or MA 226 [Min Grade: C])

EE 316L. Electrical Networks Laboratory. 0 Hours.
Electrical Networks laboratory component. EE 316 must be taken concurrently.

EE 318. Signals and Systems. 3 Hours.
Time-domain and frequency-domain methods for modeling and analyzing continuous and discrete-time signals and systems. Fourier, Laplace, and Z transform methods.
Prerequisites: EE 300 [Min Grade: D] and EE 316 [Min Grade: C]

EE 333. Engineering Programming Using Objects. 3 Hours.
Software development emphasizing object-oriented methods. Design and develop programs using existing classes and newly created classes. A graphical user interface framework will be used as extensive example of Object Oriented System. Develop skills in project management, written and oral communication, teams, and an introduction to ethics and intellectual property issues.
Prerequisites: EE 233 [Min Grade: D]

EE 337. Introduction to Microprocessors. 4 Hours.
Application of microcomputers to engineering problems such as data acquisition and control. Topics include CPU architecture, assembly language, and input/output interfacing. EE 337L must be taken concurrently.
Prerequisites: EE 210 [Min Grade: C] and EE 233 [Min Grade: D]

EE 337L. Introduction to Microprocessors Laboratory. 0 Hours.
Introduction to Microprocessors laboratory component. EE 337 must be taken concurrently.

EE 341. Electromagnetics. 3 Hours.
Mathematical techniques used to solve electromagnetics problems. Fundamental concepts and applications for dynamic and static problems. Electromagnetic wave propagation and transmission. Transmission lines.
Prerequisites: EE 300 [Min Grade: D] (Can be taken Concurrently) and EE 316 [Min Grade: C]

EE 351. Electronics. 4 Hours.
Solid-state electronics, bipolar junction and field-effect transistor (FET) properties, biasing, frequency response, single and multistage amplifier circuits. EE 351L must be taken concurrently.
Prerequisites: EE 210 [Min Grade: C] and EE 316 [Min Grade: C]

EE 351L. Electronics Laboratory. 0 Hours.
Electronics laboratory component. EE 351 must be taken concurrently.

EE 361. Machinery I. 4 Hours.
Fundamentals and applications of polyphase circuits, magnetic circuits, transformers, polyphase synchronous and asynchronous machines. EE 361L must be taken concurrently.
Prerequisites: EE 316 [Min Grade: C] and PH 222 [Min Grade: D]
EE 361L. Machinery I Laboratory. 0 Hours.
Machinery I laboratory component. EE 361 must be taken concurrently.

EE 412. Practical Computer Vision. 3 Hours.
Fundamentals and applications of computer vision: image preprocessing, detection, segmentation, registration, classification and recognition, texture and color, visual tracking.
Prerequisites: EGR 150 [Min Grade: C] and EE 318 [Min Grade: D]

EE 418. Wireless Communications. 3 Hours.
Wireless communication system topics such as propagation, modulation techniques, multiple access techniques, channel coding, speech and video coding, and wireless computer networks.
Prerequisites: EE 316 [Min Grade: D]

EE 421. Communication Systems. 3 Hours.
Prerequisites: EE 318 [Min Grade: D]

EE 423. Digital Signal Processing. 3 Hours.
Digital filter analysis and design. FFT algorithms. Applications of digital signal processing in engineering problems such as data acquisition and control. Lecture and computer laboratory.
Prerequisites: EE 318 [Min Grade: D]

EE 426. Control Systems. 3 Hours.
Prerequisites: EE 318 [Min Grade: D]

EE 427. Controls and Automation. 3 Hours.
Power control devices and applications. Relay logic and translation to other forms. Programmable logic controllers. Proportional-integral-derivative and other methods for process control. Modern laboratory instrumentation and man-machine interface software. Lecture and laboratory.
Prerequisites: EE 233 [Min Grade: D] and (EE 312 [Min Grade: C] or EE 314 [Min Grade: C]) and EE 316 [Min Grade: C] and EE 318 [Min Grade: D] and EE 351 [Min Grade: D] and (EGR 150 [Min Grade: C] or EE 130 [Min Grade: C] or ME 130 [Min Grade: C]) and EE 210 [Min Grade: C] and EE 233 [Min Grade: D] and EE 337 [Min Grade: D]

EE 431. Analog Integrated Electronics. 4 Hours.
Advanced analysis and design using op-amps, with emphasis on error analysis and compensation. Applications include signal conditioning for instrumentation, instrumentation amplifiers, nonlinear and computational circuits, Butterworth and Chebyshev filter design, power amplifier design, voltage regulator design, and oscillators. A-to-D and D-to-A conversion methods. Laboratory exercises emphasize design techniques. Lecture and laboratory.
Prerequisites: EE 210 [Min Grade: C] and EE 318 [Min Grade: D] [Can be taken Concurrently] and EE 351 [Min Grade: D]

EE 432. Introduction to Computer Networking. 3 Hours.
Computer networking and engineering standards related to networking. Networking hardware, software, and protocols including TCP/IP protocol suite. Internetworking, LANS, and typical applications.
Prerequisites: EE 233 [Min Grade: D]

EE 433. Engineering Software Solutions. 3 Hours.
Project planning, specification, design, implementation, and testing of software solutions for engineers. Waterfall model of development and agile development methods. Lecture and computer laboratory.
Prerequisites: EE 233 [Min Grade: D] and EE 333 [Min Grade: D] and (BME 150 [Min Grade: C] or EGR 150 [Min Grade: C] or EE 130 [Min Grade: C] or EE 134 [Min Grade: D])

EE 434. Power Semiconductor Electronics. 3 Hours.
Fundamentals of integrated circuit design for radio-frequency and power converter circuits. Course contents include basics of RF circuit theory, matching networks, high frequency MOS model, low-noise-amplifier, voltage controlled oscillator, fundamentals of power electronics, power semiconductor switches, steady-state equivalent circuit modeling, DC transformer model, basic AC equivalent circuit modeling, linearization and perturbation, etc. Students will require accomplishing a computer aided design, simulation and chip layout of an integrated circuit design project.
Prerequisites: EE 316 [Min Grade: C] and EE 318 [Min Grade: D] and EE 351 [Min Grade: D]

EE 437. Introduction to Embedded Systems. 3 Hours.
Applications of microprocessors in engineering problems such as data acquisition, control, and real-time input/output. Lecture and laboratory.
Prerequisites: (BME 150 [Min Grade: C] or EGR 150 [Min Grade: C] or EE 130 [Min Grade: C] or ME 130 [Min Grade: C]) and EE 210 [Min Grade: C] and EE 233 [Min Grade: D] and EE 337 [Min Grade: D]

EE 438. Computer Architecture. 3 Hours.
Advanced microprocessor topics including cache design, pipelining, superscalar architecture, design of control units, microcoding, and parallel processors. Comparison of advanced, contemporary microprocessors from Intel and IBM. EE 337 (Introduction to Microprocessors) is a recommended prerequisite for this course.
Prerequisites: EE 210 [Min Grade: C] and EE 233 [Min Grade: D] and EE 337 [Min Grade: D]

EE 444. Real-Time Process & Protocols. 3 Hours.
Hands-on laboratory course covering topics in real-time computer systems such as algorithms, state-machine implementations, communication protocols, instrumentation, and hardware interfaces.
Prerequisites: EE 233 [Min Grade: D] and EE 337 [Min Grade: D]

EE 447. Internet/Intranet Application Development. 3 Hours.
Development of models and applications using Internet/Intranet technologies such as JavaScript, Dynamic HTML, server side scripting, multi-tier models, and XML. Lecture and computer laboratory.
Prerequisites: EE 233 [Min Grade: D]

EE 448. Software Engineering Projects. 3 Hours.
Object-oriented concepts and design. Unified Modeling Language and design patterns. Provides a project environment for implementation of systems using object-oriented techniques. Lecture and computer laboratory.
Prerequisites: EE 233 [Min Grade: D] and EE 333 [Min Grade: D]

EE 452. Digital Systems Design. 3 Hours.
Digital system design, verification, and simulation using VHDL. Lecture and laboratory.
Prerequisites: EE 337 [Min Grade: D]

EE 458. Medical Instrumentation. 3 Hours.
Fundamental operating principles, applications, and design of electronic instrumentation used in measurement of physiological parameters.
Prerequisites: EE 351 [Min Grade: D]
EE 461. Machinery II. 3 Hours.
Physical principles of DC machines. Mathematical analysis of generator designs using equivalent circuits and magnetization curves. Calculation of motor speed, torque, power, efficiency, and starting requirements. Solid-state speed control systems.
Prerequisites: EE 361 [Min Grade: D]

EE 471. Power Systems I. 3 Hours.
Components of power systems. Performance of modern interconnected power systems under normal and abnormal conditions. Calculation of inductive and capacitive reactances of three-phase transmission lines in steady state.
Prerequisites: EE 361 [Min Grade: D]

EE 472. Power Systems II. 3 Hours.
Prerequisites: EE 471 [Min Grade: D]

EE 473. Protective Relaying of Power Systems. 3 Hours.
Operating principles of protective relays. Protection of transmission lines, generators, motors, transformers, and buses.
Prerequisites: EE 361 [Min Grade: D]

EE 485. Engineering Operations. 3 Hours.
Economic, procedural, planning, and control aspects of engineering projects. Ethics and Civic Responsibility are significant components of this course.
Prerequisites: (EGR 111 [Min Grade: C] or EGR 200 [Min Grade: C]) and EE 210 [Min Grade: C] and (EE 314 [Min Grade: C] or EE 312 [Min Grade: C])

EE 489. Undergraduate Engineering Research. 0 Hours.
Undergraduate research experiences in electrical engineering.
Prerequisites: PH 221 [Min Grade: C] (Can be taken Concurrently) or (EGR 110 [Min Grade: C] and EGR 111 [Min Grade: C]) or EGR 200 [Min Grade: C] or EGR 100 [Min Grade: C] or HC 111 [Min Grade: C]

EE 490. Special Topics in Electrical Engineering. 1-3 Hour.
Special Topic in Electrical Engineering.

EE 491. Individual Study in Electrical Engineering. 1-6 Hour.
Special Topic in Electrical Engineering.

EE 492. Honors Research I. 4 Hours.
Departmental honors students work closely with faculty to develop research skills.
Prerequisites: EGR 301 [Min Grade: C] (Can be taken Concurrently)

EE 493. Honors Research II. 4 Hours.
Departmental honors students work closely with faculty to develop research skills.
Prerequisites: EGR 301 [Min Grade: C]

EE 498. Team Design Project I. 3 Hours.
Senior Design Team Project Course Part I. Analysis and design of assigned team project, including design review, demonstration, and documentation. Must have an approved Application for Degree on file and must be in final year of his/her program.
Prerequisites: EE 318 [Min Grade: D] and EE 337 [Min Grade: D] and EE 485 [Min Grade: D] (Can be taken Concurrently) and EE 351 [Min Grade: D] (Can be taken Concurrently)

EE 499. Team Design Project II. 3 Hours.
Senior Design Team Project Course Part II. Capstone design project: design and implementation of assigned team project, including design review, demonstration, and documentation. Must have an approved Application for Degree on file and must be in final year of his/her program.
Prerequisites: EE 498 [Min Grade: D] and EE 333 [Min Grade: D] (Can be taken Concurrently) and EE 341 [Min Grade: D] (Can be taken Concurrently) and EE 361 [Min Grade: D] (Can be taken Concurrently) and EE 421 [Min Grade: D] (Can be taken Concurrently) and EE 426 [Min Grade: D] (Can be taken Concurrently) and EE 431 [Min Grade: D] (Can be taken Concurrently)