# Engineering (ENGR)

## Courses

**ENGR 120. Electrical Circuits I. 3 Credits.**
This course uses theory, laboratory investigation, and circuit simulation software to introduce basic electrical and circuit analysis principles. Emphasis is placed on direct current (DC) circuits containing voltage and current sources and resistor networks in series, parallel, and series-parallel configurations. This course also introduces the concepts of electric and magnetic fields in the context of capacitors and inductors and their transient responses in DC circuits. A section on basic alternating current (AC) resistive circuits with sinusoidal sources is included.
P: MATH 104 with a C or higher, AND declared Electrical Engineering Technology major or Electrical Engineering major or Mechanical Engineering major or Electrical Engineering Principles Certificate
Spring.

**ENGR 121. Electrical Circuits I Lab. 1 Credit.**
This course is a laboratory course based on ENGR 120 Electrical Circuits I. In this course, both simulation and implementation of DC circuits will be conducted.
P: ENGR 120 with a C or higher or concurrent enrollment, AND declared Electrical Engineering Technology major, or Electrical Engineering major, or Mechanical Engineering major, or Electrical Engineering Principles Certificate
Spring.

**ENGR 186. Introduction to Digital Transformation. 3 Credits.**
Currently, the world is passing through a significant level of changes due to unprecedented growth of digital technologies, namely, Artificial Intelligence (AI), Big Data, Clouds, and the Internet of Things (IoT). As these digital technologies are being deployed, current business models and user/consumer experience need to be reimagined through the process of digital transformation, thereby making digital transformation not only just an option to move forward but also an urge to act upon for successful survival of contemporary businesses, enterprises, and organizations. While digital transformation is not just applying advanced digital technologies to businesses, it must also adopt a holistic approach that addresses consumer experience and accepts transformational leadership roles to take on challenges and opportunities offered by digital economy. This course attempts to provide an introduction to digital transformation framework, practices, and case studies for the emerging society.
FSS.

**ENGR 198. First Year Seminar. 3 Credits.**
First Year Seminar, topics vary.
Reserved for New Incoming Freshman.

**ENGR 202. An Introduction to Smart Cities. 3 Credits.**
It is anticipated that in the near future a significant portion of world population will live in cities. Cities of the future need to be smart, sustainable, and efficient. This course introduces students to the concept of Smart Cities and explains the technologies, infrastructure, transportation, healthcare systems, and security that must be considered in economic and sustainable development policies. Case studies of a diverse selection of present day smart cities are included to demonstrate the aspects of smart cities in the present and future.
Spring.

**ENGR 210. Electrical Circuits II. 3 Credits.**
This course deals with the fundamentals of alternating current (AC) circuits including theories, analyses, and design of AC circuits and their applications. This course should be useful in building the knowledge foundation for several future courses on electrical and electronic engineering.
P: ENGR 120 with a C or higher, ENGR 121 with a C or higher, and declared major in Electrical Engineering Technology or Electrical Engineering.
Fall Only.

**ENGR 211. Electrical Circuits II Lab. 1 Credit.**
This course is a laboratory course based on ENGR 210 Electrical Circuits 2. In this course, both simulation and implementation of alternating current (AC) circuits will be conducted.
P: ENGR 121 with a C or higher, ENGR 210 with a C or higher or concurrent enrollment, and declared major in Electrical Engineering Technology or Electrical Engineering.
Fall Only.

**ENGR 222. Electronic Devices. 3 Credits.**
This course introduces semiconductor materials and manipulation to create several types of basic electronic devices such as diodes, bipolar junction transistors, field effect transistors, operational amplifiers and their circuit models for the design and analysis of electronic circuits.
P: ENGR 210 with a C or higher, and ENGR 211 with a C or higher
Spring.

**ENGR 223. Electronic Devices Lab. 1 Credit.**
In this course students will perform experiments to verify practically the theories and concepts learned in the Electronic Devices course.
P: ENGR 222 with a C or higher OR concurrent enrollment
Spring.

**ENGR 224. Electrical Codes, Safety, and Standards. 2 Credits.**
This course provides an interpretive survey of various codes, safety procedures, and standards as applied to the electrical construction industry. These include discussions on the National Electrical Code (NEC) and related safety organizations and standards guidelines, for instance, OSHA, IEEE, IEC, ISA, ANSI, and UL. Topics also include an overview of electrical wiring, switches and receptacles, metallic and non-metallic sheathed cables, light fixtures, equipment wiring, and conduits. This course also emphasizes electrical safety procedures and up-to-date electrical codes. The National Electrical Safety Code (NESC) would also be introduced.
P: ENGR 120 with a C or higher, ENGR 121 with a C or higher, AND declared Electrical Engineering Technology major or Electrical Engineering major
Spring.

**ENGR 236. Technical Writing and Information Literacy. 3 Credits.**
This course will prepare students to be competent technical writers, both for the scientific community and the general public. Students will learn how to construct well researched and organized papers, lab reports, and technical instructions that meet formal English grammar guidelines. This will include appropriate use of figures and tables in technical communications. Throughout all activities, students will practice information literacy by learning to navigate the information landscape, locating bias in media and other resources, and performing lateral reading to fact check information. This course meets the graduation requirement for WF 105 for Engineering, Engineering Technology, and Computer Science majors and the General Education requirement for Information Literacy.
P: WF 100 or WF 164 with a C or better or ACT English score of 25 or above, or SAT Reading Test score of 32 or above
Fall and Spring.

**ENGR 260. Introduction to Engineering Ethics. 3 Credits.**
This course presents a philosophical examination of the nature of engineering practice and applied technology. The fundamental philosophy of ethics will be covered with application specific to engineering practice. The course will consider how the societal functions of engineers and applications of technology relate to basic ethical and intellectual values, what ethical obligations are implied by the uses and creation of technology, and what ethical duties engineers have in the practice of their careers. Case studies will be used to illustrate concepts.

**ENGR 298. Independent Study. 1-4 Credits.**
Independent study is offered on an individual basis at the student's request and consists of a program of learning activities planned in consultation with a faculty member. A student wishing to study or conduct research in an area not represented in available scheduled courses should develop a preliminary proposal and seek the sponsorship of a faculty member. The student's advisor can direct him or her to instructors with appropriate interests. A written report or equivalent is required for evaluation, and a short title describing the program must be sent early inthe semester to the registrar for entry on the student's transcript.
P: fr or so st with cum gpa > or = 2.50; or jr or sr st with cum gpa > or = 2.00.
Fall and Spring.

**ENGR 310. Digital Logic Design. 3 Credits.**
This course introduces digital electronics, the operation of logic gates, and the theory of combination logic circuits, programmable logic devices, Karnaugh mapping, encoders, decoders, multiplexers, register and counter, A/D and D/A converters and timer circuits. Introduction to transistor level design of digital circuits.
P: ENGR 222 with a C or higher, and ENGR 223 with a C or higher
Fall Only.

**ENGR 311. Digital Logic Design Lab. 1 Credit.**
In this course students will perform experiments to verify practically the theories and concepts learned in the Digital Logic Design course.
P: ENGR 310 with a C or higher OR concurrent enrollment
Fall Only.

**ENGR 320. Energy Conversion. 3 Credits.**
Electromechanical energy conversion and operating principles of electric machines such as induction machines, synchronous machines, direct current machines, and special machines.
P: ENGR 210 with a C or higher, and ENGR 211 with a C or higher
Spring.

**ENGR 321. Energy Conversion Lab. 1 Credit.**
In this course students will perform experiments to verify practically the theories and concepts learned in the Energy Conversion course.
P: ENGR 320 with a C or higher OR concurrent enrollment
Spring.

**ENGR 328. Microcontrollers and Programmable Logic Controllers. 3 Credits.**
This course introduces embedded computer systems and mid-range micro-controller peripherals, including electric motor control components, using assembly and C programming. PLC topics such as troubleshooting, timers, counters, sequencers, data move, math, and analog input and output are covered. Ladder logic programming is also introduced.
P: ET 142 with a C or higher, and ENGR 310 with a C or higher
Spring.

**ENGR 329. Microcontrollers and Programmable Logic Controllers Lab. 1 Credit.**
In this course students will perform experiments to verify practically the theories and concepts learned in the Microcontrollers and PLCs course.
P: ENGR 328 with a C or higher OR concurrent enrollment
Spring.

**ENGR 342. Signals and Systems. 3 Credits.**
This course provides an introduction to analysis techniques for continuous-time and discrete-time signals and typical model systems. Topics include signals and systems definitions and properties as well as signal processing techniques and applications. Signals and systems representations and applications to circuit analysis will also be performed using MATLAB software package.
P: MATH 203 with a C or higher, ENGR 210 with a C or higher, and declared major in Electrical Engineering
Fall Only.

**ENGR 343. Signals and Systems Lab. 1 Credit.**
This course provides a laboratory session for the analysis techniques for continuous-time and discrete-time signals and typical model systems.
P: ENGR 342 with a C or higher OR concurrent enrollment
Fall Only.

**ENGR 346. Electrical Power Systems. 3 Credits.**
This course covers characteristics of three phase power configurations and utility systems' interconnections from power generation through distribution systems, including renewable energy sources, transmission lines, utility grid, device coordination, metering, protective relays, fuses, breakers, and fault circuit interrupting.
P: ENGR 320 with a C or higher
Spring.

**ENGR 348. Electromagnetic Fields and Applications. 3 Credits.**
This course introduces electromagnetic vector quantities and vector operations in different coordinate systems; electric field concepts; potential, dielectrics, magnetic fields, magnetic properties; Maxwell's equations and electromagnetic waves.
P: MATH 203 with a C or higher, ENGR 210 with a C or higher, and ENGR 211 with a C or higher
Fall Only.

**ENGR 402. Smart Cities: Engineering the Future. 3 Credits.**
Cities are now a major hub of human populations and in the near future a majority of the world's population will live in cities. To meet growth needs, future cities must be engineering to be smart, sustainable, and efficient. This course characterizes features of smart cities, particularly the role of engineering and technology in the design of infrastructure, transportation, health care, and the security and privacy required in smart systems. Case studies will be used to assess and analyze the economics, policy making, and sustainability of smart city design.
P: MATH 104 or higher with at least a C or graduate standing. REC: ENV SCI 102 or ENV SCI 260 or ET 101 or ENGR 198
Fall and Spring.

**ENGR 412. Communications Systems. 3 Credits.**
This course presents the major concepts necessary to understand the data communications field. The principles of data communication technologies, transmission media, interfaces, channel capacity, error control, flow control, multiplexing, synchronization, circuit switching, and packet switching are the main focus of this course. The course presents the communication systems in terms of their physical and data link layers and then touches upon some selected topics on communications systems and standards. Finally, it is anticipated that introductions to a few selected and special topics in the emerging fields of data communication and networking would also be presented in this course.
P: ENGR 342 with a C or higher
Fall Only.

**ENGR 414. Power System Analysis and Protection. 3 Credits.**
Electrical power flow analysis, short-circuit analysis, symmetrical and unsymmetrical fault analysis, transient stability analysis, economic load dispatch, and general technical problems of electric power systems.
P: ENGR 346 with a C or higher
Fall Only.

**ENGR 426. Wireless Communications. 3 Credits.**
This course presents the main concepts to understand the principles of wireless communications systems. The introductory concepts of wireless communications systems, radio wave propagation, channel models and capacity analysis, as well as the performance of wireless communications systems are the main focus of this course. This course should build upon the backgrounds on communications systems and further the knowledge towards wireless communications fields. This course would also include some emerging topics in the field of wireless communications. Therefore, this course should be useful to students who are or would be pursuing careers in the wireless communications and networking fields.
P: ET 350 with a C or higher OR ENGR 412 with a C or higher
Spring Even.

**ENGR 428. Wireless Networks. 3 Credits.**
This course presents the main concepts to understand the principles of wireless networks. The introductory concepts of wireless networks, wireless transmission techniques, wireless network topologies, routing, and advanced topics in the fields of wireless and cellular communication networks are the main focus of this course. This course should build upon the backgrounds on communications systems and further the knowledge towards data and wireless networks fields. This course would also include some advanced topics in the field of emerging wireless networks. Therefore, this course should be useful to students who are or would be pursuing careers in the wireless communications and networking fields.
P: ET 350 with a C or higher OR ENGR 412 with a C or higher
Spring Odd.

**ENGR 434. Power Electronics. 3 Credits.**
This course covers the fundamental concepts of power electronics, characteristics of static power semiconductor devices (BJT, MOSFET, IGBT, Thyristors), AC/DC power converters: uncontrolled and controlled rectifiers (single phase and three phase), dual converter, AC/AC power converters: phase-controlled converters (single phase and three phase), AC switch, cycloconverter. DC/DC converters: choppers (step down and step up), switching regulators (buck, boost, buck-boost), DC/AC converters: single phase and three phase inverters, and various power control applications.
P: ENGR 222 with a C or higher
Spring.

**ENGR 438. Microprocessors and Embedded Systems. 3 Credits.**
This course will provide an introduction to microprocessor and embedded systems. Basic instructions, features, and architecture of a typical microprocessor system will be studied in this course. Topics on microprocessor programming and assembly language programming will be included. Finally, applications of microprocessors and embedded systems will be studied.
P: ENGR 310 with a C or higher
Spring.

**ENGR 462. Senior Design Project. 3 Credits.**
This is the electrical engineering synthesis course in which students complete a capstone design process that includes project proposal, design definition, design analysis, design completion, oral presentation, and a written report.
P: Senior standing in Electrical Engineering
Fall Only.

**ENGR 478. Honors in the Major. 3 Credits.**
Honors in the Major is designed to recognize student excellence within interdisciplinary and disciplinary academic programs.
P: min 3.50 all cses req for major and min gpa 3.75 all UL cses req for major.

**ENGR 493. Special Topics in Electrical Engineering. 3 Credits.**
This course introduces special topics in the field of Electrical Engineering. The topic of the course will be decided by the Electrical Engineering faculty and approved by the Engineering disciplinary Chair prior to being offered.
P: Junior or Senior standing in Electrical Engineering or Electrical Engineering Technology.

**ENGR 494. Co-op. 1-2 Credits.**
Participation in a full-time position at a host organization providing direct, on-the-job experience with professionals already successful in the selected field. The co-op will be in a position closely related to a professional career associated with the major. Students must complete at least two (2) co-op credits during the fall or spring semester and one (1) credit in the summer to be considered full-time status. Course is repeatable for credit. No more than 6 credits may be used to meet requirements for a major and no more than 3 credits may be used to meet requirements for a minor; may vary by academic department.
P: Junior standing and minimum 2.0 GPA in major emphasis (Dept. will monitor GPA req.).

**ENGR 495. Teaching Assistantship. 1-6 Credits.**
The student and supervising teacher must prepare a statement that identifies the course with which the assistantship will happen, objectives for the assistantship, and expectations in order to fulfill the course objectives. Students are not eligible to receive credit in both the course they assist the instructor with and the teaching assistantship in the same semester. Typically student has previously taken the course prior to enrollment in the assistantship. Course is repeatable for credit.
Fall and Spring.

**ENGR 497. Internship. 1-12 Credits.**
Supervised practical experience in an organization or activity appropriate to a student's career and educational interests. Internships are supervised by faculty members and require periodic student/faculty meetings. Course is repeatable for credit.

**ENGR 498. Independent Study. 1-4 Credits.**
Independent study is offered on an individual basis at the student's request and consists of a program of learning activities planned in consultation with a faculty member. A student wishing to study or conduct research in an area not represented in available scheduled courses should develop a preliminary proposal and seek the sponsorship of a faculty member. The student's advisor can direct him or her to instructors with appropriate interests. A written report or equivalent is required for evaluation, and a short title describing the program must be sent early in the semester to the registrar for entry on the student's transcript. Course is repeatable for credit.
P: fr or so st with cum gpa > or = 2.50; or jr or sr st with cum gpa > or = 2.00.
Fall and Spring.