Engineering (ENGR)

Courses

ENGR 104. Engineering Graphics. 1 Credit.
This course introduces students to the creation of 2D engineering drawings using AutoCAD software. Topics covered include line types, drawing sheet layouts, sketching, orthographic projections, section views, isometric drawing, dimensioning, tolerances, and threads and fasteners.
P: MATH 101 with a C or higher OR WPT-MFND score >465 and WPT-AALG score >525, and declared major in Mechanical Engineering.
Fall and Spring.

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 198. First Year Seminar. 3 Credits.
First Year Seminar, topics vary.
Reserved for New Incoming Freshman
Fall Only.

ENGR 201. Engineering Materials. 2 Credits.
This course covers the basic behavior and processing of engineering materials, including metals, ceramics, plastics, and alloys. Phase behavior of alloys, response to applied loads, crystalline and noncrystalline behavior are included.
P: ET 206 with a C or higher, OR CHEM 211 and CHEM 212 and CHEM 213 and CHEM 214 all with a C or higher.
Fall and Spring.

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 204. Programming for Engineers. 2 Credits.
This course introduces students to the fundamental principles of programming for solving engineering problems and familiarizes students with the process of computational thinking and translation of real life engineering to computational problems. Programming languages covered include MATLAB and Python.
P: MATH 202 with a C or higher, and declared Mechanical Engineering major or Mechanical Engineering Technology major.
Fall and 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 213. Mechanics I. 3 Credits.
Elementary vector operations, resultant of two- and three-dimensional force systems, centroid, hydrostatic forces, equilibrium of trusses and frames, laws of friction and impending motion, moments of inertia, virtual work, stability.
P: MATH 202 with a C or higher and declared major in either Mechanical Engineering or Mechanical Engineering Technology
Fall and Spring.

ENGR 214. Mechanics II. 3 Credits.
Displacement, velocity and acceleration components, kinematics of particles using rectilinear and curvilinear coordinates, relative motion, solution and plane motion of rigid bodies, work and potential energy of particles and rigid bodies, linear and angular impulse and momentum, central force motion.
P: ENGR 213 with a C or higher
Fall and Spring.

ENGR 216. Basic Manufacturing Processes. 3 Credits.
This course introduces machining, stamping, casting, forming, and joining of materials. It covers basic machine processes use to form materials to desired specifications and includes manufacturing of materials, heat treatment, foundry work, and shaping processes.
P: ENGR 201 with a C or higher, and declared Mechanical Engineering Technology major or Mechanical Engineering major
Fall and Spring.

ENGR 220. Mechanics of Materials. 3 Credits.
This course teaches how to design and analyze simple structures for predetermined strength and deformation requirements. Topics include theory of stress-strain; Hooke's law; analysis of stresses and deformations in bodies loaded by axial, torsional, bending, and combined loads; and analysis of statically indeterminate systems.
P: ENGR 213 with a C or higher; Major in Mechanical Engineering Technology or Mechanical Engineering
Spring.

ENGR 221. Mechanics of Materials Lab. 1 Credit.
This lab teaches students an applied analysis of the distribution of forces in static structures; analysis of axial, torsional, and bending stresses; and loading analysis of systems.
P: ENGR 220 or concurrent enrollment
Spring.

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. 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 and lab reports that meet proper grammar guidelines. This will include appropriate use of figures and tables in technical communications. Students will also learn how to write technical directions for assembly and use of equipment. This course meets the graduation requirement for WF 105 for Engineering, Engineering Technology, and Computer Science majors.
P: Declared major in Engineering or Engineering Technology or Computer Science AND 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 308. Electrical and Electronic Circuits. 3 Credits.
This course provides an introduction to DC and AC electrical circuit analysis, electronic devices and circuits, transducers, electric machines, and power transmission. This course includes both lecture and lab.
P: PHYSICS 202 with a C or higher OR Concurrent enrollment, AND declared Mechanical Engineering Technology major OR declared Mechanical Engineering major.
Fall Only.

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 312. Engineering Measurements. 2 Credits.
This course teaches students instrumentation and techniques for measurement of mechanical phenomena. It includes generalized measurement systems, characteristics of dynamic signals, calibration, recording systems, error and statistical analysis.
P: ENGR 308 with a C or higher OR concurrent enrollment, and ENGR 326 with a C or higher
Spring.

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 322. Engineering Measurements Lab. 1 Credit.
This course introduces students to the laboratory analysis of Engineering Measurements including instrumentation and measurement systems, calibration, error and statistical methods applied to engineering processes.
P: ENGR 312 with at least a C or concurrent enrollment
Spring.

ENGR 324. Engineering Thermodynamics. 3 Credits.
This course teaches student engineering applications of thermodynamics including the first and second laws, behavior of condensable and non-condensable substances, analysis of open and closed systems, equations of state, and power and refrigeration cycles.
P: PHYSICS 202 with a C or higher, ET 206 or CHEM 211, CHEM 212, CHEM 213, and CHEM 214 with a C or higher; declared major in Mechanical Engineering or Mechanical Engineering Technology
Spring.

ENGR 326. Numerical Methods. 3 Credits.
This courses teaches students applied numerical analysis for linear and non-linear engineering problems; systems of linear equations, non-linear equations, eigen value problems, and optimization techniques; approximate numerical integration and differentiation; developing numerical methods; and solving for initial and boundary value problems. The course includes both a lecture and a lab.
P: MATH 305 with a C or higher OR concurrent enrollment, MATH 209 with a C or higher, and ENGR 204 with a C or higher
Fall Only.

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 334. Industrial Decision Processes. 3 Credits.
Industrial decision processes, or operations research, is an applied science that deals with quantitative decision making, usually involving the allocation and control of limited resources. Its focus is using advanced analytical methods for industrial decision making via mathematical optimization and statistical analysis. This course will provide students with the tools and concepts to analyze real world problems in terms of economics and risk.
P: MATH 104 with a C or better or higher level math placement and junior standing. REC: MATH 260 or other introductory statistics course.

ENGR 336. Fluids. 3 Credits.
This course provides an introduction to fluid properties, fluid statics, and fluid dynamics; potential flow; dimensional analysis; closed conduits and external flow; boundary-layer theory; compressible flows; and turbomachinery.
P:ENGR 214 with a C or higher, MATH 209 with a C or higher, and MATH 305 with a C or higher OR concurrent enrollment
Fall Only.

ENGR 337. Fluids Lab. 1 Credit.
This laboratory course introduces students to the experimental analysis of Fluid Dynamics concepts including measurement of fluid properties, applications of Bernoulli's equation, and fluid power systems.
P: ENGR 336 with a C or higher or concurrent enrollment
Fall Only.

ENGR 340. Analysis of Dynamic Systems. 3 Credits.
This course introduces students to mathematical modeling and analysis of dynamic systems with mechanical, thermal, and fluid elements. Topics include time and frequency domain solutions, linearization techniques, state space modeling and solutions.
P: ENGR 204 with a C or higher, ENGR 214 with a C or higher, MATH 209 with a C or higher, and MATH 305 with a C or higher
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 344. Mechanical Vibration. 3 Credits.
Mechanical structures and systems are susceptible to vibrations, i.e. periodic changes in the physical state. Vibrations can both be a hindrance and a benefit to machines. This course studies about modeling and analyzing single and multiple degrees of freedom systems. Vibrations of machine elements. Design vibration isolation systems. Balance rotating machinery. Random excitation and response of mechanical structures. Students will utilize basic MATLAB skills to solve problems related to vibrations. Students who completes this course should have a clear understanding of vibrations and modeling of mechanical systems. They will analyze free and forced vibrations and will develop mathematical techniques to model and design mechanical systems.
P: MATH 305 with a C or higher or concurrent enrollment, MATH 209 with a C or higher, and ENGR 214 with a C or higher.

ENGR 346. Electrical Power Systems. 3 Credits.
This course covers characteristics of three phase power configurations and utility systemsÂ¿ 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, ENGR 211 with a C or higher, and declared major in Electrical Engineering
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 408. Finite Element Analysis. 3 Credits.
Applying introductory concepts of finite element methods like direct stiffness, energy and/or weighted residual methods in analytically solving linear and nonlinear structural and thermal problems. Introduces common finite element programs used in academia and industry. Formulate 1D, 2D and 3D elements models. Comparison of exact solutions with approximate finite element predictions
P: ET 207 with a C or higher, ENGR 204 with a C or higher, and ENGR 220 with a C or higher
Fall Only.

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 420. Machine Component Design I. 3 Credits.
Detailed design and selection of machine components such as shafts, fasteners, springs, and gears. Analysis of stresses and deformation of the machine components under combined static and dynamic loads, stress concentrations, and fatigue.
P: ENGR 220 with a C or higher
Fall Only.

ENGR 422. Machine Component Design II. 3 Credits.
Design of advanced machine elements such as bearings, gears, brakes, clutches, flywheels, and flexible mechanical elements. Application of mechanics, materials and machine components principles and methods to design mechanical devices and assemblies.
P: ENGR 420 with a C or higher
Spring.

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 430. Heat Transfer. 3 Credits.
This course teaches students fundamental concepts of steady-state and transient conduction, convection, and radiation. It also includes an introduction to heat exchanger principles and applications.
P: ENGR 324 with a C or higher, MATH 209 with a C or higher, and MATH 305 with a C or higher
Spring.

ENGR 431. Thermal Lab. 1 Credit.
This laboratory course includes thermodynamic experiments such as gas laws and internal combustion engines, and heat transfer experiments on conduction, convection and radiation.
P: ENGR 430 with a C or higher or concurrent enrollment
Spring.

ENGR 432. Automatic Controls. 3 Credits.
This combined lecture and lab course gives students an introduction to feedback control system concepts; mathematical modeling of mechanical, hydraulic, electro-mechanical, and servo systems; feedback system characteristics and performance; stability; design; and compensation of control systems.
P: ENGR 340 with a C or higher
Fall Only.

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 310 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 328 with a C or higher
Spring.

ENGR 460. Senior Design. 3 Credits.
Senior design is the mechanical engineering synthesis course in which students complete a senior design process that includes project proposal, design definition, design analysis, design completion, oral presentation, and a written report.
P: Senior standing in Mechanical Engineering major or Mechanical Engineering Technology major
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.