Engineering (ENGN) Courses

ENGN1001 Digital Logic Design I
This course is an introduction to analysis and design of digital circuits. Topics include numbering systems, logic gates, Boolean algebra, MSI devices, and analysis and design of combinational circuits. This course includes the use of software tools for design, minimization, simulation, and schematic capture of digital systems. A hands-on laboratory including PLD/FPGA is integrated in which students work in teams.
Offered at Providence
4.5 Quarter Credit Hours

ENGN1015 Introduction to Engineering
This first-year engineering course is designed as an introduction to engineering and the techniques and tools used in solving engineering problems. The engineering design process is utilized in the development of solutions to problems. Data analysis, formula construction and graphing techniques are developed through the use of software applications. Programming in MATLAB and simulation of electronic circuits are included. Individual as well as team problem-solving activities are required with written technical documentation. The nature of engineering ethics and professional responsibility are discussed and the impact of engineering solutions in a global, economic, environmental and societal context are addressed.
Offered at Providence
4.5 Quarter Credit Hours

ENGN2000 Robotics
This course introduces students to the basic concept and applications of robotics. The study of robotics includes the supporting disciplines of mechanics, motors, microprocessors, various sensors and artificial intelligence. The course covers the concepts of work envelope, real-time programming, and the theory of electrical, pneumatic and hydraulic servo control systems. Also, the theory and application of various sensors including temperature, proximity, ultrasonic and vision sensors, the use of microprocessors, microprocessor interfacing, and artificial intelligence in robotic systems is covered. Industrial applications in the areas of automotive and semiconductor manufacturing as well as medical and aerospace applications are described. The course includes a lab session on robotic work cell.
Prerequisite(s): CSIS1020 or CSIS1101.
Offered at Providence
4.5 Quarter Credit Hours

ENGN2002 Digital Logic Design II
The focus of this course is the analysis and design of sequential logic circuits. Topics include asynchronous and synchronous sequential circuit analysis and design, state machine analysis and design, and ASM design methodologies utilizing PLD and FPGA implementations. This course includes the use of software tools for design, minimization, simulation, and schematic capture of digital systems. A hands-on PLD/FPGA based laboratory is included.
Prerequisite(s): ENGN1001.
Offered at Providence
4.5 Quarter Credit Hours

ENGN2003 Circuit Theory I
This course provides a firm foundation in DC circuit analysis. The goals of this course include developing an ability to solve engineering problems to design, implement and test circuits to meet design specifications. Emphasis is upon the understanding and application of Ohm's law and Kirchhoff's Voltage and Current Laws in resistive networks. Methods of linear systems analysis are introduced including Thevenin's and Norton's theorems and the superposition principle.
Prerequisite(s): MATH1040 (or concurrent), Corequisite: ENGN2004.
Offered at Providence
4.5 Quarter Credit Hours

ENGN2004 Circuit Theory I Lab
Laboratory project activities requiring design, simulation, implementation, measurement and testing of circuits to meet design specifications. Labs are designed to reinforce concepts discussed in Circuit Theory I, ENGN2003.
Prerequisite(s): MATH1040 (or concurrent), Corequisite: ENGN2003.
Offered at Providence
1 Quarter Credit Hour

ENGN2005 Circuit Theory II
This course focuses on the principles and applications of alternating current (AC) circuit fundamentals essential to the study of RL, RC and RLC circuit. The use of complex numbers and phasor analysis are used to analyze AC passive network circuits. The concepts of maximum power transfer, resonance and passive filters are also covered.
Prerequisite(s): ENGN2003, ENGN2004, MATH1040 (or concurrent), Corequisite: ENGN2006.
Offered at Providence
4.5 Quarter Credit Hours

ENGN2006 Circuit Theory II Lab
Laboratory project activities requiring design, simulation, implementation, measurement and testing of circuits to meet design specifications. Labs are designed to reinforce concepts discussed in Circuit Theory II, ENGN2005.
Prerequisite(s): ENGN2003, ENGN2004, MATH1040 (or concurrent), Corequisite: ENGN2006.
Offered at Providence
1 Quarter Credit Hour

ENGN2007 Circuit Theory III
This course focuses on the characteristics and application of semiconductor devices in circuit design. The terminology, symbols, and applications of switching and rectifier diodes, Zener diodes, Bipolar (BJT) and Field Effect (FET) transistors are examined. Circuit applications of power supplies, voltage regulation, small-signal amplifiers and power amplifiers are included.
Prerequisite(s): ENGN2005, ENGN2006, MATH1040 (or concurrent), Corequisite: ENGN2008.
Offered at Providence
4.5 Quarter Credit Hours

ENGN2007 Circuit Theory III Lab
This course includes laboratory project activities requiring design, simulation, implementation, measurement and testing of circuits to meet design specifications. Labs are designed to reinforce concepts discussed in ENGN2007 Circuit Theory III.
Prerequisite(s): ENGN2005, ENGN2006, MATH1040 (or concurrent), Corequisite: ENGN2007.
Offered at Providence
1 Quarter Credit Hour

ENGN2014 Computer Architecture I
This course is a study of the evolution of computer architecture and the factors influencing the design of hardware and software elements of computer systems. Topics include instruction set design; processor microarchitecture and pipe-lining; cache and virtual memory organizations; scheduling, standard hardware performance metrics (e.g., processor speed, number of bits per processor, address capacity, number of interrupt vectors, etc.), protection and sharing; I/O and interrupts; VLIW machines; multi-threaded architectures; symmetric multiprocessors; and parallel computers.
Prerequisite(s): CSIS1112. (OL)
Offered at North Miami, Online, Providence
4.5 Quarter Credit Hours

ENGN2020 Transform Methods for Engineering
This course covers the time and frequency analysis of linear systems involving Fourier series, the Fourier and Laplace transforms. Transfer function analysis and synthesis principles are developed and placed into application settings. The role of the Laplace transform in network analysis including steady-state AC analysis is addressed. Equivalent state space models are developed.
Prerequisite(s): MATH2040.
Offered at Providence
4.5 Quarter Credit Hours

ENGN2025 Applied Mechanics I: Statics
Introduction to the fundamental concepts of engineering mechanics. Topics include terminology, two and three dimensional force systems, determination of the resultant force of force systems, analysis of coplanar systems in equilibrium, centroids, and moments of inertia and friction.
Prerequisite(s): MATH1040 (or concurrent), PHY1011, PHY1015.
Offered at Providence
4.5 Quarter Credit Hours
ENGN2030 Electronic Communications
This course introduces students to the theory and applications of electronic communications. Topics include review of electromagnetic theory and the principle of modulation and demodulation including amplitude, frequency and phase modulation. Principles of signal transmission and reception including DSB and SSB communication and description of basic hardware are covered. Computer simulations are used to illustrate various concepts regarding transmission and reception of signals, modulation and demodulation, and spectrum analysis of signals. Prerequisite(s): ENGN2007, ENGN2008. Offered at Providence 4.5 Quarter Credit Hours

ENGN2032 Industrial Robotics
This course includes an introduction to industrial robots, work cell integration, and manufacturing concepts and control. Students will explore how robots integrate into industrial production and control and how communications among Computer Numerical Control (CNC) machines, sensors, and robots combine to make work cells. Laboratory exercises, both hands-on and simulation are integrated to reinforce the theory presented in lecture with practical applications. Prerequisite(s): ENGN2000, ENGN2005, ENGN2006. Offered at Providence 4.5 Quarter Credit Hours

ENGN2035 Programmable Logic Controllers
This course is an introduction to programmable logic controllers (PLCs). It focuses on how PLC’s perform process control and motor control functions. Topics include PLC architecture, working principles, programming techniques, ladder logic programming, data manipulation, data highway, and various input/output modules and their interface for actuation signal control. Prerequisite(s): ENGN2005, ENGN2006. Offered at Providence 4.5 Quarter Credit Hours

ENGN2045 Computer Vision
This course provides an introduction to the basic elements of computer vision to all majors. Emphasis is placed on intuitive and practical aspects of computer vision with very limited theory and math. The course involves intensive computer lab work and may include a project using the vision system of the “Mentor” robot that is used in the robotic course. The computer lab includes some applications in image processing. Prerequisite(s): CSIS1020 or CSIS1101. Offered at Providence 4.5 Quarter Credit Hours

ENGN2062 Artificial Intelligence
This course introduces students to the basic concepts of artificial intelligence, including some applications. The course first introduces the different methods of representing knowledge and inference methods. It is then followed by the study of rule based expert system, fuzzy expert systems and artificial neural networks. There is also a brief introduction to the area of evolutionary computation and genetic programming. Basic method of shape recognition and classifiers may be discussed. Some probability theory and Bayesian analysis are also covered in the course. Prerequisite(s): CSIS1020 or CSIS1101, MATH1030. Offered at Providence 4.5 Quarter Credit Hours

ENGN2075 Microcontrollers I
This is an introductory course in microcontrollers. Topics covered include microcontroller architecture, instruction set, assembly language programming, subroutines, basic microcontroller peripherals, the interdependence of hardware and software, input/output subsystems, and microcontroller application development tools and platforms. Prerequisite(s): ENGN1001, ENGN2002. Offered at Providence 4.5 Quarter Credit Hours

ENGN2080 Microcontrollers II
This is an advanced course in microcontrollers. Topics covered include interrupts, high-level language programming, advanced microcontroller peripherals, interfacing concepts, and performance optimization. Prerequisite(s): ENGN2075. Offered at Providence 4.5 Quarter Credit Hours

ENGN2085 Introduction to Embedded Systems
This is an introductory course in embedded systems, which is a project-oriented design course. Topics include embedded system architectures, memory systems and managements, sensors integrations, power management, development tools and platforms, and real-time operating systems. Prerequisite(s): CSIS1020, ENGN2075 or CSIS2023, (ENGN2014 or CYB2010). Offered at North Miami, Providence 4.5 Quarter Credit Hours

ENGN3000 Materials and Process Engineering
This course develops the general properties of materials, defined as plastic, ferrous, nonferrous and ceramics used in product development. Properties of materials are applied to industrial applications to achieve optimum designs. Process engineering concepts are developed from conversion of raw materials into finished products using manufacturing methods to optimize production of parts. Offered at Providence 4.5 Quarter Credit Hours

ENGN3004 Circuit Theory IV
This course focuses on the characteristics and application of field effect transistors (FETs). The terminology and symbols of FETs are examined. Amplifiers and switching circuit applications are included. Laboratory exercises, both hands-on and simulation are integrated to reinforce the theory presented in lecture with practical applications to determine device/component performance and operating conditions. Prerequisite(s): ENGN2007, ENGN2008, MATH2040. Offered at Providence 4.5 Quarter Credit Hours

ENGN3005 Operational Amplifiers and Linear Circuits
This course focuses on the characteristics and application of operational amplifiers (OpAmps). The principles of feedback, open and closed loop operation, and inverting and non-inverting operation of operational amplifiers are explored as is the linear and non-linear operation of the OpAmp. Applications utilizing OpAmps (including its use as an integrator, differentiator, comparator and active filters) are also included. Laboratory projects, both experience-based and simulated, are integrated to reinforce the theory presented in lecture with practical applications to determine device/component performance and operating conditions. Prerequisite(s): MATH2040, ENGN2007 and ENGN2008, or ENGN3004. Offered at Providence 4.5 Quarter Credit Hours

ENGN3010 Mechatronics I
This course is a study of the basic mechanical components and electrical drives in mechatronics systems. Topics covered include basic functions and physical properties of mechanical components and electrical drivers, strategies to identify, localize and correct malfunctions. Prerequisite(s): ENGN2000, ENGN2035, ENGN2080. Offered at Providence 4.5 Quarter Credit Hours

ENGN3015 Mechatronics II
This is a multi-disciplinary project-oriented course with emphasis on mechatronics applications. The course focus is on the integration of the core technologies on innovative mechatronic designs. Topics include, microcontroller technology and interfacing, analog and digital electronics, communication technology, control architectures, real-time programming, sensors, and manufacturing equipment. Prerequisite(s): ENGN3010. Offered at Providence 4.5 Quarter Credit Hours

ENGN3025 Applied Mechanics II: Dynamics
This course introduces the fundamental concepts in kinematics and dynamics that are necessary to understand and analyze mechanisms and machines. Newtonian mechanics including kinematics and kinetics principles of rigid-body dynamics are introduced. Emphasis is on the analysis of bodies in plane motion. Prerequisite(s): ENGN2025, MATH1040 (or concurrent), (PHY1011, PHY1015) or (SCI1011, SCI1041). Offered at Providence 4.5 Quarter Credit Hours
**ENGN3035 Microelectronics Design**  
This is a project-oriented design course. Topics covered include contemporary design methodologies, prototyping platforms, programmable devices, hardware description language, and design, verification, and realizations of digital systems and their building blocks.  
Prerequisite(s): ENGN2080, ENGN2085.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN3045 Electricity & Magnetism**  
This course is a study of the laws of electromagnetism including electrostatics, magnetostatics and electrodynamics. Maxwell's equations and the mathematical foundations of vector analysis are presented.  
Prerequisite(s): ENGN2005, ENGN2006, MATH2043, (PHY2022, PHY2025) or (SCI2012, SCI2042).  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN3053 Strength of Materials**  
Introduction to the fundamental principles of strength, stiffness, and stability as they apply to mechanical components.  
Prerequisite(s): ENGN2025, MATH1040.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN3055 Electronics Engineering Design and Prototyping**  
This is a course in electronics engineering development process. This is a project-oriented design course. Topics covered include the process of development and prototyping of various types of electronic systems starting from problem statement to final fabrication at system and board level.  
Prerequisite(s): ENGN3005 (or concurrent).  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN3075 Applied Fluid Mechanics**  
This is a course in the study of compressible and incompressible fluid statics and dynamics as applied to hydraulic and pneumatic pumps, motors, transmissions and controls.  
Prerequisite(s): ENGN2035 (or concurrent), ENGN3025, PHY1011, PHY1015.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN3085 Principles of Systems Engineering**  
This introductory course addresses the application of scientific and engineering efforts in order to translate specific operational requirements into a system configuration. The course emphasizes a goal-and-team-oriented approach to representative system projects. The goal of this total engineering effort is the creation of an effective and efficient product within specified cost, time and performance envelopes.  
Prerequisite(s): MATH1030 or higher.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN3090 Systems Performance and Measurement**  
This course addresses the critical role of performance in the modeling, design, assessment, operation and management of a system. Emphasis is placed on the identification and development of both qualitative performance criteria and quantitative performance criteria. Data-acquisition and processing requirements for these criteria are also considered both for online and offline system assessment.  
Prerequisite(s): ENGN3085.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN3130 Design II: Iteration and Design Development**  
This course is a continuation of the design process from a fundamental principles of design course. Concepts of schematic design, iteration and documentation is coordinated with a design for manufacturability and assembly focus. Students learn how to develop designs that satisfy programmatic needs through examination of the whole concept down to the detail, tested through drawings, computer modeling, physical models and prototypes. Students learn how to apply design requirements in order to identify best solutions. Design is documented with a thorough exploration of form, function and mechanism.  
Prerequisite(s): CAD2030.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN4000 Standards/Codes and Ergonomics**  
This course is an introduction to standards and regulatory codes governing products and manufacturing procedures. Standards for procedures and processes as related to design and manufacturing are defined and case studies are used to develop relevant concepts. Codes and ergonomic concepts are presented and developed as the driving forces behind standards applied to products and manufacturing procedures.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN4005 Quality Control/Professional Practice**  
This course is an introduction to quality control and professional practice as related to design and configuration management, with the concept of QC as the techniques and activities to achieve, sustain and improve the quality of products, services and the project development. Quality control becomes the responsibility of everyone involved in the design of products or project management. Professional practices covers the general application of regulations, restrictions, record keeping, and ethics related to engineering design and project management.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN4010 Configuration Management**  
This course is an introduction to Configuration Management (CM) as a solution to engineering problems. Students are introduced to project management, change orders, documentation revision, product and project flow processes. Applications of CM are applied to the private corporate sector as well as to government agencies.  
Prerequisite(s): Junior or senior status.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN4030 Digital Signal Processing**  
This course involves the study of Fourier analysis for discrete-time and continuous-time signals and systems, difference equation, Z-transforms, digital filter structures and transfer functions. Analysis of sampling and aliasing effects are also presented with design algorithms for IIR and FIR Digital filters. Digital signal processing functions are also discussed.  
Prerequisite(s): MATH2043.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN4060 Embedded Systems Design I**  
This is the first course in embedded systems design. This is a project-oriented course in which classroom topics are explored through in-depth experiences in substantial design projects. Topics covered include hardware and software co-development, reuse, verification, and realization of digital intellectual property.  
Prerequisite(s): ENGN3035.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN4065 Embedded Systems Design II**  
This is the second course in embedded systems design. This is an advanced project-oriented course, which involves extensive design projects. Topics covered include design of digital intellectual property for embedded systems, design of memory systems, and software hardware design tradeoffs.  
Prerequisite(s): ENGN4060.  
Offered at Providence  
4.5 Quarter Credit Hours

**ENGN4075 Robotics & Automation I**  
This course introduces students to the concepts and applications of robotics and automation. The study of robotics includes the supporting disciplines of mechanics, motors, microcontrollers, various sensors and artificial intelligence. The course covers the concepts of work envelope, real-time programming, and the theory of electrical, pneumatic and hydraulic servo control systems. Also the theory and application of various sensors including temperature, proximity, ultrasonic and vision sensors, the use of microcontrollers, microcontroller interfacing, and artificial intelligence in robotic systems is covered. Concepts in automation will be covered, including manufacturing systems and elements in work cell.  
Prerequisite(s): ENGN3015.  
Offered at Providence  
4.5 Quarter Credit Hours
**ENGN4080 Robotics & Automation II**

This is a design course incorporating the material studied in the areas of mechatronics, artificial intelligence and computer vision. The course integrates areas of knowledge in microcontroller interface for data acquisition of discrete, digital and analog data, robot kinematics, sensor design and sensor interfacing, communication, basic concepts in navigation and real-time programming.

Prerequisite(s): ENGN4075.

Offered at Providence

4.5 Quarter Credit Hours

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**ENGN4130 Design III: Project Resolution and Detailing**

This course is the final design course in a three-course sequence. Concepts of the design process are applied to industrial design problems and project development techniques. Configuration management techniques are developed to support design analysis and product/project development through the life cycle of the product/project. Students develop research and presentation skills related to the design process, cost estimating and project development centered on industrial and urban problem-solving techniques.

Prerequisite(s): ENGN3130.

Offered at Providence

4.5 Quarter Credit Hours