

Engineering (ENGR)

Courses

ENGR 1A. General Chemistry for Engineers. 4 Units.

Emphasis on solid-state chemistry. Quantum theory, atomic structure, periodic trends, chemical bonding, molecular orbitals, electronic band structure, gases, liquids, intermolecular forces, unit cells, crystal lattices, phase transformations, and electrochemistry.

(Design units: 0)

Prerequisite: AP Chemistry or SAT Subject Chemistry or SAT Mathematics or ACT Mathematics. AP Chemistry with a minimum score of 3. SAT Subject Chemistry with a minimum score of 600. SAT Mathematics with a minimum score of 600. ACT Mathematics with a minimum score of 27. A score of 85 or higher on the Engineering Chemistry Placement Exam (fee required) is also accepted.

Overlaps with CHEM 1A.

Restriction: Electrical Engineering Majors have first consideration for enrollment. Mechanical Engineering Majors have first consideration for enrollment. Aerospace Engineering Majors have first consideration for enrollment. Civil Engineering Majors have first consideration for enrollment. Materials Science Engineering Majors have first consideration for enrollment. Environmental Engineering Majors have first consideration for enrollment.

(II)

ENGR 7A. Introduction to Engineering I. 2 Units.

Introduction to engineering disciplines and the design process. Students enrolled in the online lecture also attend a three-hour lab on campus. Materials fee.

(Design units: 1)

Grading Option: In Progress (Letter Grade with P/NP).

Restriction: Lower-division students only. School of Engineering students have first consideration for enrollment.

ENGR 7B. Introduction to Engineering II. 2 Units.

Introduction to engineering disciplines and the design process. Students enrolled in the online lecture also attend a three-hour lab on campus. Materials fee.

(Design units: 2)

Prerequisite: ENGR 7A

Restriction: Lower-division students only. School of Engineering students have first consideration for enrollment.

ENGR 30. Statics. 4 Units.

Addition and resolution of forces, distributed forces, equivalent system of forces centroids, first moments, moments and products on inertia, equilibrium of rigid bodies, trusses, beams, cables. Course may be offered online.

(Design units: 0)

Corequisite: MATH 2D

Prerequisite: MATH 2D and PHYSICS 7C

Same as ENGRCEE 30, ENGRMAE 30.

Restriction: School of Engineering students have first consideration for enrollment.

ENGR 54. Principles of Materials Science and Engineering. 4 Units.

Superconductors to biodegradable polymers. Structure and properties of materials, including metal, ceramics, polymers, semiconductors, composites, traditional materials. Atomic structure, bonding, defects, phase equilibria, mechanical properties, electrical, optical and magnetic properties. Introduction to materials processing and synthesis. Materials fee.

(Design units: 0)

Prerequisite: (ENGR 1A or CHEM 1A or CHEM H2A) and PHYSICS 7C

Restriction: School of Engineering students have first consideration for enrollment.

ENGR 80. Dynamics. 4 Units.

Introduction to the kinematics and dynamics of particles and rigid bodies. The Newton-Euler, Work/Energy, and Impulse/Momentum methods are explored for ascertaining the dynamics of particles and rigid bodies. An engineering design problem using these fundamental principles is also undertaken.

(Design units: 0.5)

Prerequisite: MATH 2D and PHYSICS 7C

Same as ENGRCEE 80, ENGRMAE 80.

Restriction: Mechanical Engineering Majors have first consideration for enrollment. Aerospace Engineering Majors have first consideration for enrollment. Civil Engineering Majors have first consideration for enrollment. Materials Science and Engr Majors have first consideration for enrollment. Environmental Engineering Majors have first consideration for enrollment.

ENGR 92. Engineering and Computer Educational Laboratory. 1-4 Workload Units.

Comprehensive academic support designed primarily for underrepresented or underprepared students in Engineering, ICS, or selected areas of the physical sciences. Typical program activities: tutoring, study skills, career planning, self-esteem enhancement, library research techniques.

(Design units: 0)

Grading Option: Workload Credit P/NP Only.

Repeatability: May be taken for credit for 12 units.

ENGR 93. Public and Professional Service in Engineering. 1-2 Workload Units.

Student participation in public and professional service activities related to engineering.

(Design units: 0)

Grading Option: Workload Credit P/NP Only.

Repeatability: May be repeated for credit unlimited times.

ENGR 98. Group Study . 1-4 Units.

Group study of selected topics in engineering.

(Design units: 1-4)

Repeatability: Unlimited as topics vary.

ENGR 100. Special Topics in Fabrication Safety. 1 Workload Unit.

Hands on training in the safe use of item fabrication: metalworking, woodworking, electronics fabrication, composites, welding, adhesives, water disposal, and others. Safety certification will be granted from this course and is required for access to Engineering School fabrication facilities.

(Design units: 0)

Grading Option: Workload Credit Letter Grade with P/NP.

Repeatability: Unlimited as topics vary.

Restriction: School of Engineering students have first consideration for enrollment.

ENGR 113. Introduction to STEM Education Research. 4 Units.

Introduces students to education research and topics studied in STEM education. Enables students to develop research questions, participate in research projects, design and utilize research tools, and contribute to STEM education research products.

Same as BIO SCI 105.

Restriction: Upper-division students only. School of Engineering students have first consideration for enrollment.

ENGR 150. Mechanics of Structures. 4 Units.

Introduction to mechanics of materials. Topics include stresses and strains, axial and torsional loading, bending, shear, combined loading, stress and strain transformation, failure theories, beam deflection, and buckling.

(Design units: 2)

Prerequisite: (ENGRCEE 30 or ENGR 30 or ENGRMAE 30) and MATH 3A

Same as ENGRMAE 150.

Overlaps with ENGRCEE 150.

Restriction: Mechanical Engineering Majors have first consideration for enrollment. Aerospace Engineering Majors have first consideration for enrollment. Chemical Engineering Majors have first consideration for enrollment. Materials Science and Engr Majors have first consideration for enrollment.

ENGR 165. Advanced Manufacturing. 4 Units.

Principles in manufacturing processes. All machining requires energy: mechanical (cutting and shaping), heat energy (laser cutting), photochemical (photolithography), chemical energy (electro chemical machining and chemical vapor deposition). These methods and their fundamentals are examined. Materials fee.

(Design units: 2)

Restriction: Seniors only. School of Engineering students only.

Concurrent with ENGR 265.

ENGR 180. Entrepreneurship for Scientists and Engineers. 4 Units.

Learn the theory and practice of entrepreneurship and intrapreneurship. Covers positioning an idea, establishing the value propositions and benefits case, going to market strategy, creating an execution plan, and raising funds. Concepts are applied to a real-world venture project.

(Design units: 0)

Restriction: Upper-division students only. School of Engineering students have first consideration for enrollment.

Concurrent with ENGR 280.

ENGR 189. Senior Project - Topics Vary. 1-4 Units.

Multidisciplinary group senior project of theoretical or applied nature involving design.

(Design units: 1-4)

Repeatability: May be taken for credit for 12 units as topics vary.

Restriction: Seniors only.

ENGR 190W. Communications in the Professional World. 4 Units.

Upper-division technical writing course including the development of presentation skills. Effective communication with a range of audiences. Recognition of ethical and professional responsibilities for engineers.

(Design units: 0)

Prerequisite: Satisfactory completion of the Lower-Division Writing requirement.

Restriction: School of Engineering students only. Graduating seniors with an application on file have first consideration.

(Ib)

ENGR 191. Curricular Practical Training. 1 Unit.

Practical training under an industry mentor in a technical field corresponding to students' area of interest.

Grading Option: Pass/no pass only.

Repeatability: May be repeated for credit unlimited times.

ENGR 195. Special Topics in Engineering. 1-4 Units.

Studies in selected areas of Engineering. Topics addressed vary each quarter.

(Design units: 1-4)

Prerequisite: Prerequisites vary.

Repeatability: Unlimited as topics vary.

ENGR 196W. Engineering Thesis. 4 Units.

Preparation of final presentation and paper describing individual research in Engineering completed in one or more quarters of individual study (i.e., ENGR 199).

(Design units: 0)

Prerequisite: Completion of at least 4 units of Individual Research in Engineering. Satisfactory completion of the Lower-Division Writing requirement.

(Ib)

ENGR H196W. Honors Thesis. 4 Units.

Preparation of final presentation and paper describing individual research in Engineering. For participants in the Campuswide Honors Program.

(Design units: 1-4)

Prerequisite: ENGR H199. Satisfactory completion of the Lower-Division Writing requirement.

Restriction: Campuswide Honors Collegium students only.

(Ib)

ENGR 199. Individual Study. 1-4 Units.

Supervised independent reading, research, or design for undergraduate Engineering majors. Students taking individual study for design credit are to submit a written paper to the instructor and to the Undergraduate Student Affairs Office in the School of Engineering.

(Design units: 1-4)

Repeatability: May be taken for credit for 8 units.

Restriction: School of Engineering students only.

ENGR 199P. Individual Study. 1-4 Units.

Supervised independent reading, research, or design for undergraduate Engineering majors. Students taking individual study for design credit are to submit a written paper to the instructor and to the Undergraduate Student Affairs Office in the School of Engineering.

(Design units: 1-4)

Grading Option: Pass/no pass only.

Repeatability: May be repeated for credit unlimited times.

ENGR H199. Individual Study for Honors Students. 1-5 Units.

Supervised research in Engineering for participants in the Campuswide Honors Program. Students taking individual study for design credit are to submit a written paper to the instructor and to the Undergraduate Student Affairs Office in the School of Engineering.

(Design units: 1-5)

Repeatability: May be repeated for credit unlimited times.

Restriction: Campuswide Honors Collegium students only.

ENGR 201P. Engineering Leadership and Entrepreneurship: Innovation. 4 Units.

Teaches concepts on how to develop innovate/disruptive ideas through actual delivery and adoption. Focuses on the critical thinking skills, the process of developing an idea into a product/service, and teaching a framework to foster adoption of the idea and product.

Restriction: Graduate students only. Master of Engineering students only.

ENGR 202P. Engineering Leadership and Entrepreneurship: Build. 4 Units.

Learn how to build an executable plan to transform an idea into a product. Learn how to construct a go-to market plan, raise funds for building the product, and leverage ecosystem resources to fill in resource gaps.

Restriction: Graduate students only. Master of Engineering students only.

ENGR 203P. Engineering Leadership and Entrepreneurship: Launch. 4 Units.

Understand how to build an actual product. Learn about prototyping and basic project management skills. Learn a framework on when to pivot for course corrections. Identify how to define outcome metrics and measure progress as the product is launched.

Restriction: Graduate students only. Master of Engineering students only.

ENGR 205P. Technical Project Management. 4 Units.

Project management is the most effective method of delivering products within cost, schedule, and resource constraints. Students gain a strong working knowledge of the basics of technical project management, particularly, managing scope, planning, budgeting, resourcing, and risk management.

Restriction: Master of Engineering students only.

ENGR 206P. Innovation and Entrepreneurial Thinking. 4 Units.

Unlock innovation by learning the techniques, models, and tools to create unique products and solve complex problems. Uses real-world projects to provide hands-on experience from ideation to product go live to apply the course concepts.

Restriction: Master of Engineering students only.

ENGR 207P. People Management and Communication. 4 Units.

Students gain knowledge on the strategies to effectively manage people. This includes improving recruitment and retention, training, managing conflicts, motivating people, giving feedback, and effective communication to manage each direct report.

Restriction: Master of Engineering students only.

ENGR 210P. Capstone Project . 4 Units.

Students are required to complete a project that deals with a specific emphasis of their Master of Engineering concentration/specialization.

Repeatability: May be taken for credit 4 times.

Restriction: Master of Engineering students only. Graduate students only.

ENGR 211P. M.Eng Proseminar.

Provides students in the Master of Engineering program with information and.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be taken for credit 3 times.

Restriction: Master of Engineering students only. Graduate students only.

ENGR 230P. Introduction to Machine Learning. 4 Units.

Introduces fundamental concepts in programming and machine learning. The goal is to provide an accessible introduction to the field of machine learning and related techniques for students with a wide variety of engineering degrees.

Same as BME 230P, ENGRCEE 230P, EECS 230P, ENGRMAE 230P.

Restriction: Master of Engineering students only.

ENGR 231P. Robotics and Controls. 4 Units.

Covers basic aspects of robotic and mechatronic design, including motor and sensor selection, control strategies, finite state machines, and implementation of advanced feedback control laws.

Same as ENGRMAE 231P.

Restriction: Master of Engineering students only.

ENGR 233P. Additive Manufacturing. 4 Units.

Covers the key concepts of Additive Manufacturing (AM, aka 3D printing), including historical perspectives, the general AM process chain, an overview of available AM technologies, materials for AM, and design strategies for AM.

Restriction: Master of Engineering students only.

ENGR 234P. Advanced Manufacturing and Design. 4 Units.

An in-depth knowledge of manufacturing processes with focus on the fundamentals of materials processing (heat flow, mass flow, fluid flow, etc.). Processing fundamentals that apply to the three main classes of engineering materials: metals, ceramics, and polymers.

Restriction: Master of Engineering students only.

ENGR 235P. Engineering Design and Simulation: Tools and Process. 4 Units.

Practical techniques and use of industry tools that improve the engineering design process by simulating the performance of design options prior to the costly steps of prototyping and manufacturing are covered. Applicable to a wide variety of engineering disciplines.

Same as ENGRMAE 235P.

Restriction: Graduate students only. Master of Engineering students only.

ENGR 252P. Fundamentals of Microfabrication. 4 Units.

Introduces engineering and science students to the science of miniaturization. Different options to make very small machines (micro and nano size) are reviewed, materials choices are discussed, scaling laws are analyzed, and many practical applications are listed.

Same as ENGRMAE 252P.

Restriction: Graduate students only. Master of Engineering students only.

ENGR 265. Advanced Manufacturing. 4 Units.

Principles in manufacturing processes. All machining requires energy: mechanical (cutting and shaping), heat energy (laser cutting), photochemical (photolithography), chemical energy (electro chemical machining and chemical vapor deposition). These methods and their fundamentals are examined. Materials fee.

Restriction: Graduate students only. School of Engineering students only.

Concurrent with ENGR 165.

ENGR 280. Entrepreneurship for Scientists and Engineers. 4 Units.

Learn the theory and practice of entrepreneurship and intrapreneurship. Covers positioning an idea, establishing the value propositions and benefits case, going to market strategy, creating an execution plan, and raising funds. Concepts are applied to a real-world venture project.

Restriction: School of Engineering students have first consideration for enrollment. Graduate students only.

Concurrent with ENGR 180.

ENGR 290. Developing Teaching Excellence. 4 Units.

Introduces the Scholarship of Teaching and Learning (SoTL) as it applies to Engineering Education. Focuses on how teaching practice can be guided by the research literature on teaching and learning.

Restriction: Graduate students only.

ENGR 290P. M.Eng Internship. 1-4 Units.

Students go through practical training under an industry mentor in a technical field corresponding to their area of interest.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Restriction: Master of Engineering students only. Graduate students only.

ENGR 291. Internship. 1 Unit.

Practical training under an industry mentor in a technical field corresponding to the student's area of interest.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.

ENGR 295. Special Topics in Engineering. 1-4 Units.

Studies in selected areas of Engineering. Topics addressed vary each quarter.

Prerequisite: Prerequisites vary.

Repeatability: Unlimited as topics vary.

Restriction: Graduate students only.

ENGR 295P. Special Topics in Master of Engineering. 4 Units.

Studies in selected areas of Master of Engineering. Topics addressed vary each quarter.

Repeatability: Unlimited as topics vary.

Restriction: Master of Engineering students only. Graduate students only.

ENGR 298P. M.Eng Individual Project. 1-8 Units.

Supervised independent project for Master of Engineering students under the direction of the selected faculty member.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Restriction: Master of Engineering students only. Graduate students only.

ENGR 299. Individual Research. 1-16 Units.

Individual research or investigation under the direction of an individual faculty.

Repeatability: May be repeated for credit unlimited times.

ENGR 399. University Teaching. 4 Units.

University teaching with Engineering faculty.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Restriction: Teaching assistants only.