Engineering (ENGR)

Courses

ENGR 100. Introduction to Engineering. 1 Credit.
This course has been developed to provide undecided freshman in engineering with an introduction to the different engineering disciplines offered at the College of Engineering and Mines. The goal of this course is to enable undecided freshmen to make a more informed choice when choosing an engineering degree program. The course covers challenges and opportunities for emerging engineers. The overview is followed by discipline specific presentations and activities. Information about advising, career planning and placement, and information on student organizations will also be presented. S/U grading. F.

ENGR 102. Professional Assessment and Evaluation. 1 Credit.
This course is designed for students with industrial experience. Students complete a portfolio documenting educational and work experiences for evaluation, and individualized curriculum plans are developed. Various academic programs in engineering are also introduced. Based on the assessment and evaluation, some engineering requirements may be waived. Prerequisite: Work experience and/or technician school training plus completion of Chemistry I, Physics I and II, and Calculus I, II, and III (see dept for approval). S/U grading.

ENGR 105. Project Lead the Way in CEM. 1-6 Credits.
This course awards credits to students that have completed High School level Project Lead The Way (PLTW) courses that may not be equivalent to other credits in the College of Engineering Mines. PLTW Engineering teaches students that real-world problems often have multiple solutions with many pathways to achieve success. With engaging courses like environmental sustainability, civil engineering and architecture, digital electronics, and aerospace engineering, you can empower your students to explore possibilities, experiment, learn from failure, and turn ideas into reality. PLTW Engineering encourages students to adopt a problem-solving mindset, engaging them in compelling, real-world challenges that help them become better collaborators and thinkers. Prerequisite: Consent of Instructor. F.

ENGR 200. Computer Applications in Engineering. 2 Credits.
The fundamentals of computer programming are presented, with special emphasis on learning a high-level language. The languages are used as tools in solving engineering problems. Python 3 MATLAB skills are taught at the beginner level to prepare students for utilization in later engineering courses. Prerequisite: CEM major or permission of instructor. Prerequisite or Corequisite: MATH 107 or MATH 165. F,S,SS.

ENGR 201. Statics. 3 Credits.
Vector approach to the principles of Statics. Analysis of resultants and equilibrium in 2-D and 3-D force systems: free body diagrams, analysis of equilibrium at a point, rigid bodies, trusses, frames and machines; shear and bending moments in beams, friction, wedges, screws, belts, pulleys and bearings, centroids and center of mass, area and mass moments of intertia. Prerequisite: CEM major or permission of instructor; MATH 165 with a grade of C or better. F,S,SS.

ENGR 202. Dynamics. 3 Credits.
Plane motion particle and rigid body kinematics/kinetics: Vector approach to the principles of dynamics, curvilinear coordinate systems, Newton's laws of motion, work-energy, and impulse-momentum for particles, systems of particles, elastic collisions. Kinetics and kinematics rigid bodies and mechanical systems, work energy and impulse momentum, and vibrations. Prerequisite: CEM major or permission of instructor, ENGR 201, MATH 166, and PHYS 251 or PHYS 251C and PHYS 251CL; all pre-requisites with a grade of C or better. F,S,SS.

ENGR 203. Mechanics of Materials. 3 Credits.
Plane stress, plane strain, stress-strain and deflection-deformation relationships: elements of material behavior, mechanical and thermal properties of materials, axial loading, torsion, shear and bending moments, flexure and shear stresses and deflection in beams, combined loading, stress and strain transformation and measurement, generalized Hooke's Law, stress concentrations and factors of safety, statically indeterminate loading and column analysis. Prerequisite: CEM major or permission of instructor, ENGR 201, MATH 166, and PHYS 251 or PHYS 251C and PHYS 251CL; all pre-requisites with a grade of C or better. F,S,SS.

ENGR 206. Fundamentals of Electrical Engineering. 3 Credits.
The course introduces fundamental electrical engineering concepts, such as passive and active components (resistor, capacitor, inductor, operational amplifier, digital gates), circuit analysis (Ohm's Law, KCL, KVL, phasors), energy, power and three-phase systems. The course includes laboratory experiments and computer simulations. Prerequisite: CEM major (except for EE) or permission of instructor; MATH 165. F,S,SS.

ENGR 301. Technology and Innovation Case Studies. 3 Credits.
The qualities and attributes that lead to the successful development of new and innovative technologies will be presented in the form of case studies. This course will provide a basic understanding of the entrepreneurial process of innovation and technology-based venture creation. Effective leadership and entrepreneurial skills will be demonstrated. F.

ENGR 340. Professional Integrity in Engineering. 3 Credits.
This course emphasizes the need for technical professionals to develop personal integrity and moral character in order to benefit society. Students will develop an appreciation for the global context of their decisions, the ability to make sound ethical decisions, and communicate their ideas effectively. This course also explores the impact of engineering and applied science on society. Prerequisite: CEM majors and junior standing, or permission of instructor. Prerequisite or Corequisite: ENGL 130. F,S,SS.

ENGR 401. Engineering Leadership Seminar. 1 Credit.
This seminar course is taken by students participating in the CEM Leadership Development Program. Students will meet 4-6 times per semester to take part in workshops and activities conducted by the Jodsaas Center for Engineering Leadership and Entrepreneurship staff and invited speakers from industry. Topics will include leadership, management, business and entrepreneurship presented in an engineering context. Repeatable to 4.00 credits. F,S.

ENGR 410. Technology Ventures. 1-3 Credits.
The primary focus will be on developing techniques to formulate the strategic framework required to develop high-tech ventures. Successful techniques to take technology-intensive opportunities from concept to commercialization will be explored. Prerequisite: Permission of instructor. Repeatable to 6.00 credits. S.

ENGR 460. Engineering Economy. 3 Credits.
Evaluation of the economic merits of alternative solutions in engineering decision making. Evaluations emphasize the time value of money. Cost benefit estimations, depreciation methods, taxes, and different analyses techniques such as present worth analysis, rate of return analysis, benefit-cost ratio analysis, etc. are covered. Prerequisite: CEM majors and junior standing, or permission of instructor. Prerequisite or Corequisite: MATH 165. F,S,SS.

ENGR 490. Topics in Engineering. 1-3 Credits.
This course covers current engineering topics based on student and faculty interest. Student should check with their home department to determine whether it can be used to satisfy specific degree requirements. Prerequisite: Permission of Instructor. Repeatable to 9.00 credits. On demand.

ENGR 502. Alternative Energy Systems. 3 Credits.
Provides an interdisciplinary background in alternative energy systems. Any form of energy production different from traditional fossil fuel combustion falls in this category. Such alternate systems include energy production from biomass, gasification of wood and coal, geothermal energy, solar energy (wind energy, fuel cells, and photovoltaics), etc. Prerequisite: Consent of instructor.

ENGR 550. Fundamentals of Systems Engineering. 3 Credits.
This course is designed to discuss the key skills of systems engineering and provide knowledge essential for successful systems engineering in today's fast-paced environment. The objective is to enhance student's understanding and appreciation for the field of systems engineering. This will be accomplished using a combination of real-life examples, theoretical explanations and demonstrations. The program focuses on practical methods and tools for eliciting user needs and requirements, defining robust system architectures and designs, and effectively verifying and validating the operation of the product. Participants learn current industry best-practices to ensure robust, cost-effective designs that meet stringent functional, performance, and cost requirements. Prerequisite: Admission to the Systems Engineering graduate program or Instructor consent. F.

ENGR 554. Applied Project Management. 3 Credits.
This course is an interdisciplinary project management course utilizing case studies to illustrate project management principles and allow students to practice using real-world examples. Students will have the background and training required for certification through the Project Management Institute. Prerequisite: Consent of Instructor. S.

ENGR 556. System Dynamics I. 3 Credits.
This course provides an introduction to the System Dynamics field of study which is a computer-aided approach to improving system performance through policy analysis and design. The knowledge and critical thinking skills gained from this course will enable students to work either independently or on interdisciplinary teams to effectively deal with problems arising from dynamically complex systems. Topics include: perspective and process; tools for systems thinking; the dynamics of growth; tools for modeling dynamic systems; instability and oscillation; model testing; and challenges for the future. F.

ENGR 558. System Dynamics II. 3 Credits.
This course builds on ENGR 556 System Dynamics I. This course will enable students to effectively plan and manage System Dynamics projects by providing knowledge and skill relating to advanced modeling techniques, software capabilities, and client engagement processes. Topics include: model building, documentation and presentation best practices; use of historical data; model calibration and testing techniques; advanced software features; group model building; and implementation challenges. Prerequisite: ENGR 556. S.

ENGR 562. Seminar in Engineering. 1 Credit.
Conference and reports on current developments in Engineering. Prerequisite: Admission to the Engineering Ph.D program. Repeatable to 3.00 credits. S/U grading.

ENGR 590. Special Topics in Engineering. 1-6 Credits.
Investigations of special topics in energy engineering dictated by students and faculty interests. Repeatable. Prerequisite: Consent of instructor. Repeatable.

ENGR 599. Doctoral Research. 1-15 Credits.
Repeatable to 60 credits. Repeatable.

ENGR 994. Capstone Project. 3 Credits.
This course is intended for students enrolled in a graduate program, who need to complete a semester long project. The class will emphasize applied learning to demonstrate real world problem solving skills. Prerequisite: Consent of Instructor. F,S,SS.

ENGR 996. Continuing Enrollment. 1-12 Credits.
Repeatable. S/U grading.

ENGR 998. Thesis. 1-9 Credits.
Repeatable to 9 credits. Repeatable to 9.00 credits.

ENGR 999. Dissertation. 1-18 Credits.
Repeatable to 18 credits. Repeatable to 18.00 credits.