ENGINEERING-ENGR (ENGR)

Courses

ENGR 101 Grand Challenges in Engineering Credits: 3 (3-0-0)
Course Description: National Academy of Engineering's Grand Challenges in Engineering: overview, roles of engineering disciplines, engineering and societal challenges.
Prerequisite: None.
Registration Information: Credit allowed for only one of the following: ENGR 101, ENGR 111, or ENGR 123.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 102 Problem Solving for Engineers Credits: 3 (3-0-0)
Course Description: Engineering problem solving: dimensional analysis; precision, accuracy, repeatability; problems from all major engineering disciplines.
Prerequisite: MATH 160, may be taken concurrently.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 111 Fundamentals of Engineering Credits: 3 (3-0-0)
Course Description: Overview of engineering disciplines, societal challenges related to the field of engineering, and basic software and mathematical concepts employed in engineering.
Prerequisite: None.
Restrictions: Must not be a: Senior. Must be a: Undergraduate.
Registration Information: Enrollment in a specific Engineering major, Engineering Open Option, or Exploratory Studies: Engineering Interest. Credit not allowed for both CBE 101A and ENGR 111. Credit not allowed for both CBE 101B and ENGR 111. Credit not allowed for both CBE 104A and ENGR 111. Credit not allowed for both CBE 160 and ENGR 111. Credit not allowed for both CIVE 102 and ENGR 111. Credit not allowed for both CIVE 182A and ENGR 111. Credit not allowed for both ENGR 101 and ENGR 111. Credit not allowed for both ENGR 111 and ENGR 123. Credit not allowed for both ENGR 111 and MECH 103. Credit not allowed for both ENGR 111 and MECH 104A.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

ENGR 114 Engineering for Grand Challenges Credits: 3 (3-0-0)
Course Description: Focuses on addressing the National Academy of Engineering's Grand Challenges through experiential design projects and interdisciplinary collaboration. Students will learn about the engineering grand challenges, develop essential design skills, problem-solving abilities, and teamwork capabilities while being exposed to fundamental engineering concepts.
Prerequisite: CBE 104A or CIVE 102 or CIVE 182A or ENGR 111 or MECH 103 or MECH 104A.
Restrictions: Must not be a: Senior. Must be a: Undergraduate.
Registration Information: Enrollment in a specific Engineering major, Engineering Open Option, or Exploratory Studies: Engineering Interest. Sections may be offered: online. Credit not allowed for both CBE 101A and ENGR 114. Credit not allowed for both CBE 101B and ENGR 114. Credit not allowed for both CBE 160 and ENGR 114. Credit not allowed for both CIVE 103 and ENGR 114. Credit not allowed for both ENGR 114 and ENGR 123. Credit not allowed for both ENGR 114 and MECH 202.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

ENGR 120 Scott Scholars Freshman Seminar Credit: 1 (1-0-0)
Course Description: Provides each incoming cohort of Scott Scholars the tools and opportunity to build a sense of community, create a strong network, develop leadership and professionalism skills, connect with the continuing Scott Scholar cohorts, and learn the importance of giving back to the Colorado State University community and every community in which they participate.
Prerequisite: None.
Restriction: Must be a: Undergraduate.
Registration Information: Scott Scholars only. Written consent of instructor. Credit not allowed for both ENGR 120 and ENGR 181A2.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 123 Accelerated Engineering Essentials Credits: 3 (3-0-0)
Course Description: Accelerated course to equip transfer students with foundational knowledge and design skills required for engineering problem-solving, including programming, sensors, circuits, and computer-aided design.
Prerequisite: None.
Restrictions: Must not be a: Senior. Must be a: Undergraduate.
Registration Information: Written consent of instructor. Enrollment in a specific Engineering major, Engineering Open Option, or Exploratory Studies: Engineering Interest. Sections may be offered: Online. Credit not allowed for both CBE 101A and ENGR 123. Credit not allowed for both CBE 101B and ENGR 123. Credit not allowed for both CBE 104A and ENGR 123. Credit not allowed for both CBE 160 and ENGR 123. Credit not allowed for both CIVE 102 and ENGR 123. Credit not allowed for both CIVE 182A and ENGR 123. Credit not allowed for both ENGR 101 and ENGR 123. Credit not allowed for both ENGR 111 and ENGR 123. Credit not allowed for both ENGR 114 and ENGR 123. Credit not allowed for both ENGR 123 and MECH 103. Credit not allowed for both ENGR 123 and MECH 104A.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

ENGR 298 Undergraduate Research Credits: Var[1-3] (0-0-0)
Course Description: Directed undergraduate research with a faculty mentor.
Prerequisite: None.
Registration Information: Written consent of research mentor; written consent of department chair.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 300 3D Printing Lab for Engineers Credit: 1 (0-3-0)
Course Description: Basics of 3D printing, technology, workflows, techniques and related software, focused on practical usage and project development in engineering. Topics include technology of devices, usage, calibration and tuning, repair and maintenance, and techniques for maximizing part quality with minimal waste.
Prerequisite: BIOM 100 or BIOM 101 or CBE 101 or CBE 101A or CIVE 102 or ECE 102 or ENGR 101 or MECH 103.
Registration Information: Sections may be offered: Online. Credit not allowed for both ENGR 300 and ENGR 381A1.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

ENGR 337 Engineering Thermodynamics Credits: 3 (3-0-0)
Course Description: First and second laws of thermodynamics, properties of pure substances, analysis of open and closed systems, applications of thermodynamic principles to power and refrigeration cycles.
Prerequisite: MATH 261 and PH 141.
Registration Information: Credit allowed for only one of the following: CBE 210, ENGR 337, MECH 237, MECH 337, MECH 339, or MECH 439.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 342 Engineering Fluid Mechanics Credits: 3 (3-0-0)
Course Description: Thermodynamic properties of fluids, control volume and differential analysis, conservation of mass, momentum, and energy, measurements, dimensional analysis, boundary layer theory, Navier-Stokes equations and exact solutions; internal and external flows, lift and drag, engineering applications such as pumps, compressors, turbines, airfoils, and open channel flow.
Prerequisite: MATH 340 and MECH 337, may be taken concurrently and PH 141.
Registration Information: Credit allowed for only one of the following courses: CBE 331, CIVE 300, ENGR 342, or MECH 342.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 370 Study Abroad: Grand Challenges in Engineering--China Credits: 3 (0-0-3)
Course Description: Faculty-led study abroad program that includes cultural, language, and engineering instruction. Course will be held at a host institution in China with instruction at CSU before the travel portion of the course.
Prerequisite: None.
Registration Information: Credit not allowed for both ENGR 370 and ENGR 382A.
Term Offered: Summer.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 370B Study Abroad--Netherlands: Engineering and Sustainability Credits: 3 (0-0-3)
Course Description: European approaches to sustainability engineering as practiced in the Netherlands. The United Nations Sustainability Goals (UNSDG) serve as a major framework for developing an understanding of engineering efforts related to these goals.
Prerequisite: MATH 160 and PH 141.
Restriction: Must not be a: Freshman.
Registration Information: Sophomore standing. Credit not allowed for both ENGR 370B and ENGR 382B.
Term Offered: Summer.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 382A Study Abroad: Grand Challenges in Engineering--China Credits: 3 (0-0-3)
Course Description: Faculty-led study abroad program that includes cultural, language, and engineering instruction. Course will be held at a host institution in China.
Prerequisite: None.
Registration Information: Credit not allowed for both ENGR 382 and ENGR 382A.
Term Offered: Summer.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 389 Engineering Cooperative Experience Credit: 1 (0-0-40)
Course Description: Semester-long full-time industry engineering experience in a position relevant to the student's major field.
Prerequisite: None.
Registration Information: Written consent of instructor. May be taken up to 9 times.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

ENGR 422 Technology Entrepreneurship Credits: 3 (3-0-0)
Course Description: Principles of technology-based entrepreneurship, including recognizing, analyzing, and acting on technology-based business opportunities; and development of an opportunity analysis.
Prerequisite: MGT 340.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 430 Engineering With Drones Credits: 3 (3-0-0)
Course Description: The history of unmanned aircraft systems (UAS), the types and classes, and basic architecture. UAS systems are examined from command-and-control links, automated flight controls, vehicle propulsion, and aerodynamic theory. Learn how to safely operate small unmanned aerial vehicles (sUAVs) as well as the technologies, concepts, and utilization of drones, including preparation for the FAA UAS commercial pilot license Part 107 exam.
Prerequisite: MATH 340 and PH 141.
Registration Information: Required field trips. Credit not allowed for both ENGR 430 and ENGR 480A1.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 478 Applied Engineering Data Analytics Credits: 3 (3-0-0)
Course Description: Practical applications of big data across engineering disciplines. Focus on data preparation, interpretation, parametric tests, and machine learning.
Prerequisite: BIOM 101 or CBE 101 or CIVE 102 or ECE 102 or ENGR 101 or MECH 103.
Restriction: Must not be a: Freshman, Sophomore.
Registration Information: Junior standing. Sections may be offered: Face-to-Face, Mixed Face-to-Face, or Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 486 Practicum Credits: Var[1-3] (0-0-0)
Course Description:
Prerequisite: None.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

ENGR 496 Group Study Credits: Var[1-3] (0-0-0)
Course Description:
Prerequisite: None.
Terms Offered: Fall, Spring.
Grade Modes: Instructor Option, Traditional.
Special Course Fee: No.

ENGR 498 Undergraduate Research Credits: Var[1-3] (0-0-0)
Course Description: Directed undergraduate research with a faculty mentor.
Prerequisite: None.
Registration Information: 30 credits in engineering and/or science; written consent of instructor.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 502 Engineering Project and Program Management Credits: 3 (3-0-0)
Course Description: Engineering program management fundamentals, program planning and control strategies, risk assessment, work breakdown structures and costing options.
Prerequisite: None.
Registration Information: Credit not allowed for both ENGR 502 and MECH 501. Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 510 Engineering Optimization: Method/Application Credits: 3 (3-0-0)
Course Description: Optimization methods; linear programming, network flows, integer programming, interior point methods, quadratic programming, engineering applications.
Prerequisite: MATH 261 and MATH 229.
Registration Information: Credit not allowed for both ENGR 510 and MATH 510. Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 520 Intelligent Decision Support Systems Credits: 3 (3-0-0)
Course Description: Introduction to intelligent engineering decision support systems (iDSS) for normative and descriptive approaches in decision analysis. Concepts include theories of decision-making, multi-objective analysis and optimization, intelligent representations of human behavior - AI decision surrogates – expert systems – case based reasoning, and decision-making under risk and uncertainty.
Prerequisite: None.
Restriction: Must not be a: Freshman, Sophomore.
Registration Information: Junior standing and completion of AUCC category 1B required. Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 522 Object-Oriented GIS Programming for Engineers Credits: 3 (3-0-0)
Course Description: Object-oriented GIS programming with C# & .NET framework; integration of GIS libraries; development of custom desktop GIS applications in engineering.
Prerequisite: CIVE 577.
Restriction: Must be a: Graduate, Professional.
Registration Information: Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 525 Intellectual Property and Invention Systems Credits: 3 (3-0-0)
Course Description: Focused on the appropriate application of “patterns for patenting” together with intuition, inspiration, and cross-disciplinary connecting. De-mystify “inventing” as applied to science, engineering and technology.
Prerequisite: None.
Restriction: Must not be a: Freshman, Sophomore.
Registration Information: Junior standing. Sections may be offered: Online. Credit not allowed for both ENGR 423 and ENGR 525.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 531 Engineering Risk Analysis Credits: 3 (3-0-0)
Course Description: Estimation and risk identification, development of mitigation techniques.
Prerequisite: ECE 303 or STAT 303 or STAT 315.
Registration Information: Credit not allowed for both ECE 531 and ENGR 531. Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 533 Spaceflight and Biological Systems Credits: 3 (3-0-0)
Course Description: Starting with an understanding of the different components of gravity, explore spaceflight’s direct and indirect impact on all major biological systems, culminating with a consideration of how spaceflight can be made more sustainable.
Prerequisite: None.
Restriction: Must not be a: Freshman, Sophomore.
Registration Information: Junior standing. Sections may be offered: Online.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 535 Modeling Human Systems Behavior Credits: 3 (3-0-0)
Course Description: An introduction to human systems modeling and the rigor and application of theory and quantitative methods to understand and characterize human behavior, with specific applications to engineering systems and decision making.
Prerequisite: ECE 303 or STAT 303 or STAT 311 or STAT 315.
Registration Information: Sections may be offered: Face-to-Face, Mixed Face-to-Face, or Online. Credit not allowed for both ENGR 535 and ENGR 581A6.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 540 Design Analysis of Engineering Experiments Credits: 3 (3-0-0)
Course Description: Strategies to acquire meaningful data from engineered experiments and create useful models with the data. Techniques include comparative tests, analysis of variance, randomized block designs, factorial designs, fractional factorial designs, regression, response surfaces, stochastic processes and system model identification.
Prerequisite: CIVE 203 or ECE 303 or STAT 301 or STAT 303 or STAT 315.

Registration Information: Sections may be offered: Face-to-Face, Mixed Face-to-Face, or Online. Credit not allowed for both ENGR 540 and ENGR 581A5.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 546 AR/VR Biometrics and Sensing for Training Credits: 3 (3-0-0)
Course Description: Application of biometrics and sensor engineering with augmented reality/virtual reality technologies to develop integrated training for dangerous environments. Training applications include spaceflight, wind turbine upkeep, and hazardous waste site cleanup.
Prerequisite: None.
Restriction: Must be a: Graduate.
Registration Information: Graduate standing. Sections may be offered: Online and Mixed Face-to-Face.
Term Offered: Summer.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 550 Numerical Methods in Science and Engineering Credits: 3 (3-0-0)
Also Offered As: MATH 550.
Course Description: Numerical methods, including finite elements, finite differences, spectral methods, method of lines, and conservation laws; stability and convergence analysis for PDEs; and applications in science and engineering.
Prerequisite: MATH 340 or MATH 345 or MATH 530.
Registration Information: Sections may be offered: Online. Credit not allowed for both ENGR 550 and MATH 550.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 565 Electrical Power Engineering Credits: 3 (3-0-0)
Also Offered As: ECE 565.
Course Description: Analysis of power systems in terms of current, voltage, and active/reactive power; introduction of computer-aided tools for power systems.
Prerequisite: (ECE 332 with a minimum grade of C) and (ECE 340 with a minimum grade of C or ECE 342 with a minimum grade of C).
Restriction: Must not be a: Freshman, Sophomore.
Registration Information: Sections may be offered: Online. Credit not allowed for both ECE 565 and ENGR 565.
Term Offered: Fall (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 570 Coupled Electromechanical Systems Credits: 3 (3-0-0)
Course Description: Coupled electrical and mechanical systems and the analysis of energy transfer between these systems. Analysis of field energy and the relationship between electrical, mechanical and electromagnetic forces.
Prerequisite: ECE 202 or ECE 204.
Registration Information: Sections may be offered: Online. Credit not allowed for both ENGR 570 and ENGR 581A2.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 596 Group Study-Systems Engineering Skills Credits: Var[1-2] (0-0-0)
Course Description: Topics related to building specialized skills relevant for the systems engineering field.
Prerequisite: None.
Registration Information: Bachelor's degree required. Sections may be offered: Online.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 597 Group Study in Systems Engineering Credits: 3 (0-0-3)
Course Description: Special and contemporary topics in the field of systems engineering.
Prerequisite: None.
Restriction: Must be a: Graduate.
Registration Information: Graduate standing. Sections may be offered: Online.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 665 Stochastic Simulation in Engr Applications Credits: 3 (3-0-0)
Course Description: Probabilistic treatment of uncertainties in modeling behavior of engineering systems; basic and advanced stochastic simulation techniques for evaluating stochastic system performances; Bayesian model updating and model selection; applications in reliability and risk assessment of infrastructure systems under random loading, and calibration of engineering models using measurement data.
Prerequisite: CIVE 203 or STAT 301 or STAT 315.
Restriction: Must be a: Graduate, Professional.
Registration Information: Credit not allowed for both CIVE 680B1 and ENGR 665.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 667 Advanced Model-Based Systems Engineering Credits: 3 (3-0-0)
Course Description: Theory and application of formal systems architecture modeling.
Prerequisite: ENGR 567.
Restriction: Must be a: Graduate, Professional.
Registration Information: Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 697 Group Study Credits: Var[1-6] (0-0-0)
Also Offered As: ECE 697.
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Credit not allowed for both ENGR 697 and ECE 697.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Traditional.
Special Course Fee: No.

ENGR 699 Thesis Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Sections may be offered: Online.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

ENGR 786 Applied Systems Engineering Practicum Credits: Var[1-9] (0-0-0)
Course Description: Research techniques, critical thinking, evaluation criteria, and methods of technical writing.
Prerequisite: (ENGR 502) and (ENGR 531 or CIS 600 or CIS 670).
Restriction: Must be a: Graduate, Professional.
Registration Information: Written consent of advisor.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

ENGR 795 Independent Study Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Sections may be offered: Online.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

ENGR 799A Dissertation: PhD Credits: Var[1-18] (0-0-0)
Course Description: Dissertation for PhD in System Engineering Program.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Written consent of advisor. Sections may be offered: Online.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

ENGR 799B Dissertation: Professional Doctorate Credits: Var[1-9] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Written consent of advisor. Admission to Professional Doctorate of Engineering, Systems Engineering.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.