ENGINEERING AND APPLIED SCIENCE

Interdisciplinary programs managed by the College (http://www.colorado.edu/engineering) are included here. The listing of courses includes interdisciplinary courses as well as those offered by the Engineering Honors Program (http://www.cuhonorsengineering.com) and the Herbst Program of Humanities for Engineers (http://www.colorado.edu/herbst).

Minor

- Biomedical Engineering - Minor (catalog.colorado.edu/undergraduate/colleges-schools/engineering-applied-science/programs-study/engineering-applied-science/energy-engineering-minor)
- Energy Engineering - Minor (catalog.colorado.edu/undergraduate/colleges-schools/engineering-applied-science/programs-study/engineering-applied-science/biomedical-engineering-minor)
- Global Engineering - Minor (catalog.colorado.edu/undergraduate/colleges-schools/engineering-applied-science/programs-study/engineering-applied-science/global-engineering-minor)

Certificate

- Engineering Leadership - Certificate (catalog.colorado.edu/undergraduate/colleges-schools/engineering-applied-science/programs-study/engineering-applied-science/engineering-leadership-certificate)
- Engineering, Science and Society - Certificate (catalog.colorado.edu/undergraduate/colleges-schools/engineering-applied-science/programs-study/engineering-applied-science/engineering-science-society-certificate)
- Lighting Design - Certificate (catalog.colorado.edu/undergraduate/colleges-schools/engineering-applied-science/programs-study/engineering-applied-science/lighting-design-certificate)

BMEN 2000 (3) Introduction to Biomedical Engineering
Reviews important aspects of biology and develops a basic understanding of the biomedical engineering field. Topics include physiological principles, biomechanics, bioinstrumentation, bioimaging, biotechnology and biomaterials.

Requisites: Restricted to Biomedical Engineering minors only.
Recommended: Prerequisite high school biology.
Grading Basis: Letter Grade

COEN 1100 (3) Computer Tools for Creative Problem Solving
Introduces students to computing tools used to solve real world math and science problems. Students will utilize a spreadsheet environment and a common programming language to solve a variety of intriguing problems. This purely online course is intended primarily for those with very little computing skills.
Recommended: Prereqs: one year of high school algebra and one year of geometry.
Grading Basis: Letter Grade

COEN 1236 (1) Precalculus Work Group
Develops and enhances problem solving skills for students enrolled in APPM 1235. Course is conducted in a collaborative learning environment with students working in groups under the guide of a facilitator.
Requisites: Requires enrollment in corequisite course of APPM 1235.
Grading Basis: Pass/Fail

COEN 1350 (1) Calculus 1 Work Group
Provides problem-solving assistance to students enrolled in APPM 1350. Student groups work in collaborative learning environment. Student participation is essential.
Repeatable: Repeatable for up to 2.00 total credit hours.
Requisites: Requires enrollment in corequisite course of APPM 1350 or APPM 1345.
Grading Basis: Pass/Fail

COEN 1360 (1) Calculus 2 Work Group
Provides problem solving assistance for students enrolled in APPM 1360. Conducted in a collaborative learning environment. Student work groups solve calculus problems with assistance of facilitator.
Requisites: Requires enrollment in corequisite course of APPM 1360.
Grading Basis: Pass/Fail

COEN 1400 (3) Project Design
Teams of first-year students solve real engineering design problems. Curriculum focuses on iterative design process, teamwork and team dynamics, supporting design with testing and analysis and technical writing.
Requisites: Restricted to students with 0-75 units completed and restricted to Pre-Engineering (PREN-COS) students only.

COEN 1500 (1) Introduction to Engineering
Provides an introduction to the engineering profession, including an examination of current discipline specializations and a focus on career paths for those trained in engineering. Provides sufficient knowledge of the engineering disciplines necessary to make an informed major choice.
Requisites: Restricted to students with 0-56 (Freshmen or Sophomore) College of Engineering or Pre-Engineering Arts and Sciences majors only.

COEN 1510 (1) Self Management and Leadership Principles 1
Prepares freshmen in their transition to college. Focuses on academic success strategies, time and stress management, study skills, and S.M.A.R.T. goal setting. Students identify their strengths and participate in peer-to-peer interaction to foster collaboration and positive behavior. Leadership capabilities, professional development, and insights into career interests are explored. Speakers provide students with unique insights into being successful students and engineers.
Requisites: Restricted to Engineering Goldshirt (PENG) students only.

COEN 1520 (1) Self Management and Leadership Principles 2
Continuation of COEN 1510. Self-management and student development is reiterated. Includes time and stress management, study skills and S.M.A.R.T. goal setting for the "master" student. Leadership explored through group projects. Students complete professional development activities and assignments geared toward preparing students for engineering internships and research opportunities. Advising on different engineering department provided to support major selection and course scheduling.
Requisites: Requires prerequisite course of COEN 1510 (minimum grade C-). Restricted to Engineering Goldshirt (PENG) students only.
COEN 1550 (1) YOU'RE@CU: Undergraduate Career Seminar
Exposes first or second year undergraduate students to engineering research careers through a partner program (YOU'RE@CU), panel discussions with researchers in academics and industry, and exposure to research labs. Restricted to YOU'RE@CU participants. Department consent required.
Grading Basis: Pass/Fail

COEN 1830 (1-3) Special Topics
Explores topics of interest in engineering. Content varies by instructor and semester.
Repeatable: Repeatable for up to 9.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to students with 0-56 (Freshmen or Sophomore) College of Engineering majors only.

COEN 2050 (3) Engineering Leadership Gateway
Examines concepts of engineering leadership and the essential skills required to become an effective leader. Together students will explore leadership principles, creative and critical thinking, interpersonal skills (e.g. collaboration, conflict resolution, leading in diverse communities), intrapersonal development (e.g. self-appraisal, reflective practice, personal leadership philosophy), organizational competencies (e.g. planning, sustainability, climate), effective communication and ethical decision-making. Fulfills Engineering humanities/social science requirements.
Requisites: Restricted to Engineering Leadership Program (PENL) students only.

COEN 2350 (1) Calculus 3 Work Group
Provides problem solving assistance to students enrolled in APPM 2350. Conducted in a collaborative learning environment. Student work groups solve calculus problems with the assistance of a facilitator.
Requisites: Requires enrollment in corequisite course of APPM 2350.
Grading Basis: Pass/Fail

COEN 2500 (1) Industry 101: Technical Career and Professional Development
Connects students to the world of technical work, helping them gain an understanding of themselves and develop a unique, professional identity. Knowledge will be gained about how to research various industries and how to make an informed decision about career paths. Structured lessons will be incorporated that will cover resumes, interview preparation, communication skills, proper professional etiquette and employer expectations, self-exploration and connections with industries.
Grading Basis: Letter Grade

COEN 2830 (1-3) Special Topics
Explores topics of interest in engineering. Content varies by instructor and semester.
Repeatable: Repeatable for up to 9.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

COEN 2850 (1-3) Independent Study
Provides opportunities for independent study at the lower-division undergraduate level. Subject and/or project agreed upon by the student and the instructor to fit the needs of the student.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

COEN 3050 (3) Complex Leadership Challenges
Approaches leadership as a process of inquiry, empathy, and action, cultivating skills leaders need to understand, communicate about, and generate innovative approaches to complex issues. Each student conducts extensive, principled research about a complex social issue of their choice, investigating its multidimensionality by applying different analytic lenses. Instructor consent required for students not in Engineering Leadership.
Requisites: Restricted to Engineering Leadership Program (PENL) students only.
Grading Basis: Letter Grade

COEN 3051 (2) Leadership Seminar 1: Launching the Leadership Experience
Practicing needs assessment, decision-making and planning skills, students take this seminar to prepare for their Leadership Experience (required for completion of the Engineering Leadership Certificate). Students work in collaboration with each other, their Engineering Leadership Program mentors and campus/community organizations and leaders to lay the foundation for and launch their individually unique Leadership Experiences.
Requisites: Requires a prerequisite course of COEN 2050 (minimum grade C-). Restricted to Engineering Leadership Program (PENL) students only.
Grading Basis: Letter Grade

COEN 3052 (2) Leadership Seminar 2: Leadership Experience
Tackling a leadership experience of their own design, students undertake a key component of the Engineering Leadership Program experience and a requirement for the completion of the Engineering Leadership Certificate. Guides students through a process of planning, executing and evaluating their leadership experience and progress toward personalized leadership development goals. Coursework involves working with a mentor, collaborating with peers and conducting research.
Requisites: Requires a prerequisite course of COEN 2050 (minimum grade D-). Restricted to Engineering Leadership Program (PENL) students only.
Grading Basis: Letter Grade

COEN 3053 (2) Leadership Seminar 3: ELP Synthesis and Final ePortfolio
Progressing through this course, students complete the ePortfolio that demonstrates fulfillment of the requirements of the Engineering Leadership Certificate, reflecting upon synthesizing and discerning practical applications of the leadership experiences tackled throughout their time at CU.
Requisites: Restricted to Engineering Leadership Program (PENL) students only.
Grading Basis: Letter Grade

COEN 3210 (3) Climate Change and Engineering
Explores the fundamentals of climate change science, but from an engineering perspective. After learning the fundamentals, the relationship between climate change and different engineering disciplines will be discussed. Topics covered include geoenvironmental, renewable energy, sustainable engineering, coastal engineering, building design, etc. Career options and entrepreneurial opportunities will also be discussed.
Requisites: Requires prerequisite courses of PHYS 1110 and APPM 1350 (minimum grade D-). Restricted to junior or senior College of Engineering and Applied Science majors only.
Grading Basis: Letter Grade
COEN 3930 (3-6) Engineering Internship/Co-op
Students enrolled in this course participate in a pre-approved internship or cooperative education program with an employer that allows them to explore the relationship between theory and practice and demonstrate evidence of significant learning (e.g., academic assignments and employer/sponsor evaluations). Pass/Fail only. Up to 3 credits may apply towards BS degree program's Free Electives (even if student has multiple enrollments in this course and/or COEN 4950). Students should contact the CEAS Extracurricular Programs Manager for more information. Minimum 2.75 cumulative GPA is required.
Repeatable: Repeatable for up to 24.00 total credit hours.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.
Grading Basis: Pass/Fail

COEN 4830 (1-3) Special Topics
Explores topics of interest in engineering. Content varies by instructor and semester.
Repeatable: Repeatable for up to 9.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

COEN 4850 (1-3) Independent Study
Provides opportunities for independent study at the upper-division undergraduate level. Subject and/or project agreed upon by the student and the instructor to fit the needs of the student.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

COEN 4950 (1-6) Global Engineering Internship
Students enrolled in this course participate in a pre-approved global internship with an employer that allows them to explore the relationship between theory and practice and demonstrate evidence of significant learning (e.g., academic assignments and employer/sponsor evaluations). Pass/Fail only. Up to 3 credits may apply towards BS degree program's Free Electives (even if student has multiple enrollments in this course and/or COEN 3930). Students may also earn COEN 4950 credit for international internship facilitated through CU-approved providers that contract with CU's Education Abroad Office. These placements must be pre-approved by the student's department/program to be eligible for credit. Students should contact the CEAS International Programs Director for more information. Minimum 2.75 cumulative GPA required.
Repeatable: Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.
Grading Basis: Pass/Fail

COEN 5830 (1-6) Special Topics
Explores topics of interest in engineering. Content varies by instructor and semester. May be repeated for up to 9 total credit hours.
Repeatable: Repeatable for up to 9.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to College of Engineering graduate students only.
Grading Basis: Letter Grade

EDEN 5001 (3) Special Topics in Development Engineering
At the graduate level, covers topics of interest in development, for both domestic and international locations. Content varies by section and from semester to semester.
Repeatable: Repeatable for up to 12.00 total credit hours. Allows multiple enrollment in term.

EHON 1151 (3) Critical Encounters
Explores critical, literary and philosophical approaches to the following related problems: 1) how we organize knowledge and construct meaning, and 2) how we locate a sense of self as both individuals and members of various groups amidst the resources and demands of competing interpretations, traditions challenges and circumstances. Department restriction, honors standing or instructor consent required.
Requisites: Restricted to Engineering Honors Program (PEHN) students only.

EHON 1500 (1) Honors Reading Group
Faculty led reading seminars, focusing on specific test or texts chosen by the faculty. Special attention will be paid to group formation and the process of collaborative learning.
Requisites: Restricted to Engineering Honors Program (PEHN) students only.
Additional Information: Engineering Honors Course

EHON 3843 (3) Special Topics
Explores different important themes relative to the Engineering Honors Program. Check with department for specific semester topics.
Repeatable: Repeatable for up to 3.00 total credit hours.
Requisites: Restricted to Engineering Honors Program (PEHN) students only.
Additional Information: Engineering Honors Course

EHON 4051 (1) Dimensions of Leadership
Explores the many dimensions of leadership that exceed technical knowledge: the ethical, societal, cultural, interpersonal, and personal. Through seminars, workshops and exposure to leaders, students will reflect upon their engineering education in light of the multifaceted demands of effective leadership and their own personal career goals. Students will take an active role in shaping the course. Department restriction, honors standing or instructor consent required.
Repeatable: Repeatable for up to 3.00 total credit hours.
Requisites: Restricted to students with 57-180 credits (Juniors or Seniors).

ENEN 2820 (1-6) Special Topics
Explores topics related to energy engineering. Content will vary by semester and instructor.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

ENEN 4321 (3) Oil and Gas Processing
Provides a foundation in the fundamentals of oil and gas processing, including discovery, extraction and refining. Due to the importance of oil and gas in the current energy infrastructure, this course provides a broad understanding of the industry to students interested in energy engineering.
Requisites: Restricted to students with 57-180 credits (Juniors or Seniors).

ENEN 4321 (3) Oil and Gas Processing
Provides a foundation in the fundamentals of oil and gas processing, including discovery, extraction and refining. Due to the importance of oil and gas in the current energy infrastructure, this course provides a broad understanding of the industry to students interested in energy engineering.
Requisites: Restricted to students with 57-180 credits (Juniors or Seniors).

Grading Basis: Letter Grade
ENEN 4600 (3) Interdisciplinary Energy Engineering Projects
Prepares students to analyze energy systems from technical, economic, and policy perspectives, with project topics varying by semester. Provides historical and contemporary context of the energy landscape. Emphasizes application of engineering fundamentals for the design and evaluation of real world energy systems. Projects will be completed in interdisciplinary teams.
Requisites: Requires prerequisite courses of ENVS 3621 and CHEN 3660 (all minimum grade C). Restricted to Energy Engineering Minor (ENMR-MIN) majors only.
Grading Basis: Letter Grade

EN 4840 (1-6) Special Topics
Explores topics related to energy engineering. Content will vary by semester and instructor.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

HUEN 1010 (3) Humanities for Engineers
Explores a wide variety of challenging and interesting humanistic themes (love, responsibility, ambition, etc.) in many forms (fiction, philosophy, plays, poetry, art, music, etc.). In small discussion-based classes, emphasizes the writing, public speaking and critical thinking skills needed to excel as a professional engineer. Fulfills College of Engineering writing requirement for first-year freshmen only.
Requisites: Restricted to students with 0-26 (Freshmen) College of Engineering majors only.

HUEN 1843 (3) Special Topics
Explores different important themes in the humanities; check with the department for specific semester topics.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to students with 0-56 credits (Freshmen or Sophomore) College of Engineering majors only.

HUEN 1850 (3) Engineering in History: The Social Impact of Technology
Explores how engineering has shaped who we are, how we think, and what we think about, by examining preconceived notions of progress, property, time, and work. Textbook readings plus original sources in philosophy, literature, psychology, and economics provide a rich and stimulating tour of engineering history.
Requisites: Restricted to students with 0-56 (Freshmen or Sophomore) College of Engineering majors only.

HUEN 2010 (3) Tradition and Identity
Explores the place and possibility of personal identity both within and against the influence of tradition, including family, culture, language, and social, political and economic institutions. Via literature and film, wrestles with the nature of freedom, self-determination, and belonging.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

HUEN 2020 (3) The Meaning of Information Technology
Surveys the history of information technologies and modern techniques of information production, storage, transmission, and retrieval. Emphasizes understanding not only the technological transformations in interpersonal, organizational, and mass communication, but also the technological, social and political changes that underlie the movement toward a digital society.
Equivalent - Duplicate Degree Credit Not Granted: ATLS 2000
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

HUEN 2100 (3) History of Science and Technology to Newton
Spans invention and discovery from the Stone Age to the age of Newton, raising questions about culture, history, and personal expectation; studies Pyramids, odometers, cathedrals, Galileo, etc., on the way.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

HUEN 2120 (3) History of Modern Science from Newton to Einstein
Surveys the great discoveries and theoretical disputes from Newtonian celestial mechanics to the theory of relativity. Includes physics, astronomy, chemistry, geology, and biology; closely examines scientific method, evolution, light and quantum theory. Uses original sources by Newton, Faraday, Lavoisier, Darwin, etc., for immediate contact with the great minds in science.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

HUEN 2130 (3) History of Modern Technology from 1750 to the Atomic Bomb
Surveys the great innovations from the Steam Age to the Atomic Age: transportation, modern construction, communications, internal combustion, etc. Supplements textbook accounts with drawings, patents, and original selections by Edison, Carnegie, Tesla, Bell, etc. Studies the sociological impact of social change via contemporary sources in literature, philosophy, painting and film.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

HUEN 2210 (3) Engineering, Science, and Society
Explores challenges that engineering and science pose for society plus the ways that societies shape or impede science and engineering. Case studies range from contemporary issues (global warming, nuclear weapons, and genetic engineering) to classic cases (the execution of Socrates). Core texts in the Western Tradition supplement contemporary articles and films.
Requisites: Restricted to College of Engineering majors only.

HUEN 2840 (3) Lower Division: Independent Study
Offers opportunity for lower-division Engineering students to do independent study work in humanities, appropriate to their academic level. Subject determined, with a Herbst instructor, to fit the needs of the student. Department and faculty consent required.
Repeatable: Repeatable for up to 9.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.
Grading Basis: Letter Grade

HUEN 2843 (1-3) Special Topics
Explores different important themes in the humanities; check with the department for specific semester topics.
Repeatable: Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

HUEN 3100 (3) Advanced Humanities for Engineers
Explores what it means to be a fully human being: through group discussion, closely examines individual works of culturally and historically significant philosophy, literature and art. Includes extensive writing. Fulfills the College of Engineering & Applied Science writing requirement. Department prerequisite: a minimum GPA of 3.0.
Requisites: Restricted to students with 57-180 credits (Junior or Senior) College of Engineering students only.
HUEN 3200 (3) Humanities for Engineers 2
Continues HUEN 3100’s discussion of the human condition by exploring culturally and historically significant works of multiple genres in small-group seminars. Alert class participation is required, and writing skills will be honed through regular assignments.
**Requisites:** Requires prerequisite course of HUEN 3100 (minimum grade D-). Restricted to students with 57-180 credits (Junior or Senior) College of Engineering students only.

HUEN 3350 (3) Gods, Heroes and Engineers: The Western Quest for Excellence
Investigates the intensely competitive quest of the ancient Greeks for excellence in everything from art and literature to science and war and also the odyssey of the mind generated by this quest, culminating in our modern world.
**Requisites:** Restricted to students with 57-180 credits (Junior or Senior) College of Engineering students only.

HUEN 3430 (3) Ethics of Genetic Engineering: A Multidisciplinary Approach
Investigates the metaphorical, ideological and scientific constructs that inform debates over the genetic modification of humans, animals and plants. Begins with a close reading of Shelley’s Frankenstein, proceeds to a consideration of philosophical arguments for and against human modification and concludes with a consideration of the scientific and political contexts that inform the regulation of genetically modified foods.
**Requisites:** Restricted to College of Engineering (ENGRU) undergraduates only.
**Grading Basis:** Letter Grade

HUEN 3543 (3) History of Western Medicine
Introduces the intriguing and appalling history of western medicine, from prehistory to the present. Includes grave-robbers, leeches and the Black Death. This course links past to present, in discussion of evidence, innovation, ethics and standards of medical education and practice. Based on original sources, textbook accounts and modern scholarship, and featuring student presentations on the Disease of the Week.
**Requisites:** Restricted to College of Engineering (ENGRU) undergraduates only.
**Grading Basis:** Letter Grade

HUEN 3700 (3) Culture Wars in Rome
Investigates in Rome, Italy (during Maymester), the cultural contrasts among three different cities: ancient, pagan, aristocratic Rome; medieval, Christian, theocratic Rome; and modern, secular, democratic Rome. Draws on evidence from Roman literature, politics, art and architecture. Must have completed a minimum of 26 credit hours by start of course. Requires some preparatory work in Boulder.

HUEN 3720 (3) Voices of Vienna: Freud, Wittgenstien, Mozart
Study and visit Vienna, a city famous for Mozart’s music, Freud’s psychology and Wittgenstein’s philosophy. As the seat of the Habsburg Empire, Vienna was a rich cultural and political center; it was a crossroads for international trade and exciting new ideas. As the lively capital of present-day Austria, it remains in the forefront of social change.
**Grading Basis:** Letter Grade

HUEN 3750 (3) Xi’an, China: Self-Awareness and Images of the Other
Explores Chinese culture abroad, focusing on ideas of self and other within special historical, social, political, and economical circumstances. Chinese and American concepts of self and society, and of individual, collective, and national identities will be analyzed. Held on the campus of Xi’an Jiaotong University, China.
**Recommended:** Prerequisite completion of lower-division Humanities course.
**Additional Information:** Departmental Category: Asia Content

HUEN 3840 (1-3) Independent Study
Offers an opportunity for students to do independent work in the humanities. Subject arranged to fit the needs of the student. Department consent required.
**Repeatable:** Repeatable for up to 9.00 total credit hours. Allows multiple enrollment in term.
**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) College of Engineering students only.

HUEN 3843 (1-3) Special Topics
Explores different important themes in the humanities, check with department for specific semester topics.
**Repeatable:** Repeatable for up to 6.00 total credit hours.
**Requisites:** Restricted to students with 57-180 credits (Junior or Senior) College of Engineering students only.

HUEN 4200 (3) Humanities for Engineers 4
Provides opportunity to pursue a variety of humanistic themes related to Herbst Humanities Program.

HUEN 4800 (1) Leadership & Ethics in the Real World