**ENGINEERING PLUS**

The Engineering Plus (http://www.colorado.edu/eplus) program prepares graduates for exciting, diverse, and innovative professional careers and for graduate study in a wide variety of disciplines. The degree program provides a pathway through engineering for students interested in interdisciplinary, hands-on engineering design, coupled with a disciplinary engineering emphasis, plus the flexibility to explore another concentration of the students’ choice within, or external to, engineering. Students complete core engineering and design coursework, followed by coursework in their chosen engineering emphasis (i.e., Aerospace, Architectural, Civil, Electrical, Environmental, or Mechanical.) Students also choose a concentration area, which can be student-designed or an established concentration such as secondary math or science teaching, entrepreneurship, pre-medical, and many others. Graduates from the Engineering Plus program will find opportunities in many engineering enterprises, as well as unique positions enabled by their engineering emphasis and concentration choices.

**Program Objectives**

The Engineering Plus program prepares its graduates to make significant contributions in many diverse areas. Specifically, within five years of graduation our graduates will have achieved one or more of the following attributes:

- established themselves as excellent secondary science or math teachers, utilizing hands-on engineering design content in their curriculum;
- established themselves in professional careers, received a graduate or professional degree, or be enrolled in a graduate or professional degree program;
- played significant roles in an engineering or technical enterprise, including research and development of engineering systems and products, technical sales, technical training, and organizational education;
- advanced in professional standing based on their technical accomplishments and accumulated additional technical expertise to remain globally competitive;
- demonstrated professional and personal leadership and growth.

**Desired Outcomes**

The undergraduate degree in Engineering Plus prepares students to meet the following outcomes upon graduation:

- ability to identify, formulate, and solve engineering problems;
- understanding of the impact of engineering solutions in global, environmental, and societal contexts;
- ability to use the techniques, skills, and modern engineering tools necessary for engineering practice;
- ability to design a system, component, or process to meet needs within constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
- knowledge in a specified concentration that is a meaningful contribution to your selected engineering emphasis;
- applicable knowledge of engineering, science, and mathematics;
- ability to function on multidisciplinary teams;
- understanding of professional and ethical responsibilities;
- effective communication skills;
- ability to design and conduct experiments, as well as to analyze and interpret data;
- recognition for the need and ability to engage in life-long learning;
- knowledge of contemporary issues in engineering and technology.

**Course code for this program is GEEN.**

**Bachelor's Degree**

- Engineering Plus - Bachelor of Science (BS) (catalog.colorado.edu/undergraduate/colleges-schools/engineering-applied-science/programs-study/engineering-plus/engineering-plus-bachelor-science-bsep)

**GEEN 1010 (4) Engineering Explorations Through Physics**

Explore the world of engineering through understanding physics concepts, engaging in active learning assignments, and conducting hands-on labs and experiments. Students will analyze product designs and engineering decisions based on the physics surrounding the situation. Formerly COEN 1010.

**Requisites:** Restricted to College of Engineering majors with 75 or less cumulative hours.

**Grading Basis:** Letter Grade

**GEEN 1400 (3) Engineering Projects**

First-year students solve real engineering design problems in interdisciplinary teams. Design projects vary by section. Curriculum focuses on iterative design process, teamwork and team dynamics, supporting design with testing and analysis, and technical writing. Completed projects are exhibited at an end-of-semester design expo. Students responsible for contributing towards their design project budget and poster costs, and purchasing safety glasses (approximately $75).

**Requisites:** Restricted to College of Engineering majors with 75 or less cumulative hours.

**Grading Basis:** Letter Grade

**GEEN 2024 (3) Materials for Engineers**

Examines structure, properties, processing and uses of metallic, polymeric, ceramic and composite materials. Specific topics covered include perfect and imperfect solids, phase equilibria, transformation kinetics, mechanical and electrical behavior and failure modes. Approach incorporates both materials science and materials engineering applications.

**Requisites:** Requires a prerequisite course of PHYS 1110 (minimum grade C). Restricted to College of Engineering students only.

**Grading Basis:** Letter Grade

**GEEN 2400 (3) Engineering Projects for the Community**

Design engineering products for local community clients, with emphasis on humanitarian engineering and integrated systems with electrical, mechanical, and software components. Students are challenged to take design projects to a higher level by requiring an additional iteration through the design cycle and more engaged user-testing, in order to infuse student projects with the robustness necessary for public-use products.

**Requisites:** Requires prerequisite course of GEEN 1400 or COEN 1410 or ASEN 1408 or ASEN 1408 or ECEN 1400 (minimum grade C). Restricted to College of Engineering majors only.

**Grading Basis:** Letter Grade
GEEN 2851 (3) Statics for Engineers
Examines vector treatment of force systems and their resultants; equilibrium of frames and machines, including internal forces and three-dimensional configurations; static friction; properties of surfaces, including first and second moments; hydrostatics; and minimum potential energy and stability.
Equivalent - Duplicate Degree Credit Not Granted: CVEN 2121 and MCEN 2023
Requisites: Requires prerequisite course of PHYS 1110 (minimum grade C-). Requires a prerequisite or corequisite course of APPM 2350 or MATH 2400. Restricted to College of Engineering majors only.

GEEN 3010 (3) Basic Electronics
Examines basic concepts of electricity, digital systems, circuit design and circuit analysis. Specific topics covered include analysis of electric circuits by use of Ohm’s law, network reduction, node and loop analysis. Thevenin and Norton theorems, DC and AC signals, transient response of simple circuits, transfer functions, basic diode and transistor circuits, operational amplifiers and microcontrollers.
Requisites: Requires a prerequisite course of PHYS 1140 and a prerequisite or corequisite course of APPM 2360 (all minimum grade C). Restricted to College of Engineering undergraduate majors only.
Grading Basis: Letter Grade

GEEN 3400 (3) Invention and Innovation
Introduction to invention and product innovation with a hands-on approach. Students explore the invention process, hone their engineering design skills, and explore the initial stages of entrepreneurship (patenting, intellectual property, marketing research, and raising capital). Student teams design, create, and test a potentially commercial product, and exhibit at an end-of-semester design expo.
Requisites: Restricted to students with 57-180 credits (Junior or Senior) College of Engineering students only.

GEEN 3830 (1-4) Special Topics
Explores topics of interest in engineering. Content varies by instructor and semester.
Repeatable: Repeatable for up to 9.00 total credit hours.
Requisites: Restricted to College of Engineering undergraduate students only.

GEEN 3852 (3) Thermodynamics for Engineers
Explores fundamental concepts and basic theory, including first and second laws of thermodynamics, properties, states, thermodynamic functions and cycles.
Equivalent - Duplicate Degree Credit Not Granted: MCEN 3012
Requisites: Requires prerequisite course of APPM 2350 or MATH 2400 (minimum grade C). Restricted to College of Engineering majors only.

GEEN 3853 (3) Fluid Mechanics for Engineers
Introduces fluid mechanics and momentum transfer, emphasizing the application of these principles to engineering systems.
Equivalent - Duplicate Degree Credit Not Granted: CHEN 3200 and CVEN 3313 and MCEN 3021
Requisites: Requires prerequisite courses of APPM 2350 or MATH 2400 and CHEN 2120 or MCEN 2023 or CVEN 2121 (all minimum grade C). Requires a prerequisite or corequisite course of APPM 2350. Restricted to College of Engineering majors only.

GEEN 4400 (3) Teaching Design
For pre-service math, science and engineering educators, this course focuses on teaching engineering design in secondary schools. Students examine the process of teaching hands-on design, including scoping, stages of team evolution, development of engineering identity and iteration. Students engage in practice of integrating design thinking into secondary math/science curriculum, develop ready-to-use tools and resources and explore the design education literature.
Requisites: Requires prerequisite courses of GEEN 1400 and EDUC 4060 (all minimum grade B). Requires corequisite course of GEEN 3400. Restricted to Engineering Plus (GEEN) majors in CU Teach math, biology, chemistry or physics (TMMA, TSBI, TSCH, TSPH).
Grading Basis: Letter Grade

GEEN 4848 (1-6) Independent Study
Subjects arranged in consultation with instructor and undergraduate advisor. Department consent required.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to Engineering Plus (GEEN) students only.
Grading Basis: Letter Grade