

INTEGRATED DESIGN ENGINEERING

Integrated design is a process defined by its use of highly collaborative, multidisciplinary teamwork and consideration of all aspects of an engineering project. The Integrated Design Engineering (<https://www.colorado.edu/program/ide/>) program (formerly Engineering Plus) provides students with a solid grounding in the fundamentals of engineering, and both instills and is structured by integrated design. Our majors customize their degree plans through their choice of one of six engineering emphases (selected from aerospace, architectural, civil, electrical, environmental or mechanical engineering) and a concentration in an approved second area such as business, engineering management, developing communities or STEM education. At the core of our program are three hands-on iterative design project courses that explore and reinforce engineering principles, and which jointly form a continuous experiential thread uniting the four-year IDE curriculum. These team-based projects showcase individual students' growing multidisciplinary knowledge and expertise toward developing vital skills in communication, innovation and leadership, as well as reinforce engineering methodologies required by the emphasis area capstone design experience. Our students graduate with the knowledge, skills and confidence required for success in a diverse and changing world.

Integrated design engineering is an approach that favors creativity, diversity and collaboration across disciplines in creating practical and innovative solutions in the service of humanity. Graduates from our program find enriching careers in engineering and related professional fields, establish and support new enterprises, teach secondary-level STEM education and enroll in graduate and professional degree programs.

For more information, visit the program (<https://www.colorado.edu/program/ide/>) website.

Course code for this program is GEEN.

Bachelor's Degree

- Integrated Design Engineering - Bachelor of Science (BSIDE) (<https://catalog.colorado.edu/undergraduate/colleges-schools/engineering-applied-science/programs-study/integrated-design-engineering/integrated-design-engineering-bside/>)

Faculty

While many faculty teach both undergraduate and graduate students, some instruct students at the undergraduate level only. For more information, contact the faculty member's home department.

Bielefeldt, Angela R. (https://experts.colorado.edu/display/fisid_110322/)
Director, Professor; PhD, University of Washington; P.E.

Davis, Melissa
Teaching Assistant Professor; Ph.D., California Institute of Technology

Godrick, Daniel (https://experts.colorado.edu/display/fisid_154955/)
Teaching Assistant Professor; M.S., University of Colorado Boulder; P.E.

Ramos, Katherine (https://experts.colorado.edu/display/fisid_168655/)
Teaching Assistant Professor, Associate Faculty Director; PhD, University of Notre Dame

Soltys, Michael A. (https://experts.colorado.edu/display/fisid_152021/)
Teaching Professor, Associate Faculty Director; PhD, University of Colorado Boulder

Stites, Nick
Assistant Professor Adjoint; PhD, Purdue University

Tisdale, Joany (https://experts.colorado.edu/display/fisid_172327/)
Teaching Assistant Professor; PhD, University of Colorado Boulder

Zarske, Malinda Schaefer (https://experts.colorado.edu/display/fisid_120823/)
Teaching Professor, Associate Faculty Director; PhD, University of Colorado Boulder

Courses

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.

GEEN 1017 (3) Engineering Drawing

Introduces CAD software; relevant concepts, including orthographic projection, sections, engineering drawing, geometric dimensioning and tolerancing; and rapid manufacturing methods. Final design project involves rapid prototyping. Not recommended for AREN majors.

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 are responsible for contributing towards their design project budget, workshop costs, and course arduino kit (approximately \$125).

Equivalent - Duplicate Degree Credit Not Granted: ASTR 2500, ASEN 1400, ASEN 1403 and ECEN 1400

Requisites: Restricted to College of Engineering majors with 75 or less cumulative hours or IUT On Track applicants only.

GEEN 1830 (1-4) Special Topics in Engineering

Explores topics of interest in engineering. Content varies by instructor and semester.

Repeatable: Repeatable for up to 6.00 total credit hours.

GEEN 2010 (3) Engineering Tools and Analysis

Taught by engineering faculty, this course utilizes active learning pedagogies to connect math content to engineering problems (across multiple disciplines) by using real engineering tools. Students are introduced to circuits, multimeters, oscilloscopes, sensors and more. They learn to program in MATLAB (no previous programming experience necessary). Students work collaboratively with other students to collect and analyze experimental data. There is one lecture, one mixed lecture/hands-on problem session, and one lab period each week.

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 design cycle and more engaged user-testing, in order to infuse student projects with robustness necessary for public-use products. Students responsible for contributing towards their design project budget, workshop, and expo costs (approximately \$100). Cannot be taken concurrently with GEEN 3400.

Requisites: Restricted to students with 45-180 credits (Sophomores, Juniors or Seniors) or requires prerequisite course of GEEN 1400 or COEN 1400 or ASEN 1400 or ECEN 1400 (minimum grade C-). Restricted to College of Engineering majors or IUT On Track applicants only

GEEN 2830 (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.

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 and APPM 1360 or MATH 2300 (all minimum grade C-). Restricted to College of Engineering majors or IUT On Track applicants only.

GEEN 3010 (3) Circuits for Engineers

Examines basic concepts of electricity, digital systems, circuit analysis, and circuit design. 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, basic diode and transistor circuits, operational amplifiers, and microcontrollers. Students are challenged to integrate their knowledge in a final design project.

Requisites: Requires a prerequisite course of PHYS 1140 and a prerequisite or corequisite course of (APPM 2360 or MATH 2130 and MATH 3430) (all minimum grade C-). Restricted to College of Engineering undergraduate majors only.

GEEN 3024 (3) Materials Science 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. Formerly GEEN 2024.

Equivalent - Duplicate Degree Credit Not Granted: MCEN 2024

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

Grading Basis: Letter Grade

GEEN 3400 (3) Invention and Innovation

Introduction to business development and product innovation with a hands-on approach. Students explore invention process, hone their engineering design skills, and explore initial stages of entrepreneurship (patenting, intellectual property, marketing research, and raising capital). Student teams design, create, and test a commercial product, and exhibit at an end-of-semester design expo. Students are responsible for contributing towards their design project budget, workshop, and expo costs (approximately \$100). Cannot be taken concurrently with GEEN 2400.

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. Links theory and application with labs and a design project involving a functioning thermodynamic process.

Equivalent - Duplicate Degree Credit Not Granted: MCEN 3012 or AREN 2110

Requisites: Requires prerequisite course of PHYS 1110 (minimum grade C-). Restricted to College of Engineering majors only.

GEEN 3853 (4) Data Analysis for Engineers

Learn to design and execute experiments and analyze the results. Topics covered include measurement fundamentals, design of experiments, probability, descriptive statistics, linear regression, propagation of uncertainty, and hypothesis testing (t-tests and ANOVA).

Equivalent - Duplicate Degree Credit Not Granted: MCEN 3047

Requisites: Requires prereqs PHYS 1140 (APPM 1360 or MATH 2300) (ASEN 1320 or CHEN/ECEN 1310 or CSCI 1200 or 1300 or 1310 or 1320). Requires prereq or coreqs (ECEN/GEEN 3010 or MCEN 3017) (WRTG 3030 or 3035 or ENES 1010 or 3100 or ENLP 3100) (all min grade C-

GEEN 4400 (3) Teaching Design

Examines teaching engineering design to a variety of audiences including secondary schools, project teams, and other communities. Students examine the process of teaching hands-on design including scoping, stages of team evolution, and iteration. Students also explore different design methods, the development of engineering identity, and the interface between engineering and society. Students practice integrating design thinking into local schools and companies, develop ready-to-use tools and resources, and explore the design education literature.

Requisites: Requires prerequisite courses of GEEN 1400 and GEEN 2400 and prerequisite or corequisite course of GEEN 3400 (all minimum grade B).

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 Integrated Design Engineering (IDEN-BSIDE) students only.