College of Engineering & Computational Sciences

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CECS comprises four of the academic units and one program at Mines:

Department of Applied Mathematics and Statistics
Department of Civil and Environmental Engineering
Department of Electrical Engineering and Computer Science
Department of Mechanical Engineering

EPICS Program

Through these departments and their programs, CECS addresses the challenges of a sustainable global society related to earth, energy and the natural and built environments by educating the next generation of leading engineering-citizen designers and scientists and expanding the frontiers of knowledge through research.

If you are looking for a challenge though a world class education, if you want the skills you need to make a difference in the world, if you are interested in pursuing original research, or if you want to be part of the rich traditions of an institution that has been committed to serving the people of Colorado, the nation, and the global community since the 1870’s, I invite you to join us in the College of Engineering and Computational Sciences at the Colorado School of Mines.

Sincerely, Kevin L. Moore, Dean

Courses

EGGN191. INTEGRATIVE DESIGN STUDIO IA. 4.0 Semester Hrs.
(I) (WI) Introduces students to human-centered design methodologies relative to open-ended problem solving using socially relevant challenges. Students in this first design studio course utilize a range of resources to explore ethical implications and test the logic of arguments for/against proposed design solutions. Hands-on activities and graphical visualization are utilized to approach the design process in a collaborative team environment. Students begin compiling a personal design portfolio that carries through their undergraduate studies for the Bachelor of Science in Engineering degree. 3 hours lecture; 3 hours lab; 4 semester hours.

EGGN192. INTEGRATIVE DESIGN STUDIO IB. 3.0 Semester Hrs.
(II) (WI) Students explore and participate in design activities as a member of a multi-year, multi-discipline project with teams consisting of freshman to possibly senior students working on the same project, and typically student-lead designs. The course focuses on technical open-ended problem solving in which students integrate teamwork and communications with the use of computer software tools and inclusion of the greater social, political, cultural, and economic factors that ultimately determine if a design is successful. Case studies or other illustrative approaches are used to facilitate discussions on what constitutes effective or harmful designs in areas of earth, energy and environment. Information gathering and modeling are used to support problem assessment and solution exploration. Prerequisites: EGGN191 and EGGN192 or the combination of EPIC151 and LAIS100. 3 hours lecture; 3 semester hours.

EGGN198. SPECIAL TOPICS. 1-6 Semester Hr.
(I, II) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once. Prerequisite: none. Variable credit; 1 to 6 credit hours. Repeatable for credit under different titles.

EGGN200. COMMUNICATION. 3.0 Semester Hrs.
(I, II) (WI) This course introduces future engineers to why communication matters in engineering and involves collaborative effort to convey technical details in socially embedded and socially transformative contexts. The course approach provides exposure to how engineers communicate a range and depth of sociotechnical content to varied audiences, in writing, orally, visually, electronically, and via contextual listening, and shows students ways in which communication functions via diverse genres, to multiple audiences, and for different purposes. With structured opportunity for feedback and revision, students both study and produce communication artifacts that aim to meet or exceed criteria for what constitutes legitimate evidence and context within and beyond diverse engineering fields. 3 hours lecture; 3 semester hours.

EGGN205. PROGRAMMING CONCEPTS AND ENGINEERING ANALYSIS. 3.0 Semester Hrs.
(I,II) This course provides an introduction to techniques of scientific computation that are utilized for engineering analysis, with the software package MATLAB as the primary computational platform. The course focuses on methods data analysis and programming, along with numerical solutions to algebraic and differential equations. Engineering applications are used as examples throughout the course. Prerequisite: MATH112 or MATH113 or MATH122. 3 hours lecture; 3 semester hours.

EGGN250. MULTIDISCIPLINARY ENGINEERING LABORATORY. 1.5 Semester Hr.
(I, II) (WI) Laboratory experiments integrating instrumentation, circuits and power with computer data acquisitions and sensors. Sensor data is used to transition between science and engineering science. Engineering Science issues like stress, strains, thermal conductivity, pressure and flow are investigated using fundamentals of equilibrium, continuity, and conservation. Prerequisites: PHGN200. 0.6 hours lecture; 2.7 hours lab; 1.5 semester hour.

EGGN291. INTEGRATIVE DESIGN STUDIO IIA. 3.0 Semester Hrs.
(I) Students work on an entrepreneurial or client project that may be a short-duration project or continuation of a multi-year, multi-discipline project with teams consisting of freshman to possibly senior students working on the same project, and typically student-lead designs. The course focuses on technical open-ended problem solving in which students integrate teamwork and communications with the use of computer software tools and inclusion of the greater social, political, cultural, and economic factors that ultimately determine if a design is successful. Case studies or other illustrative approaches are used to facilitate discussions on what constitutes effective or harmful designs in areas of earth, energy and environment. Information gathering and modeling are used to support problem assessment and solution exploration. Prerequisites: EGGN191 and EGGN192 or the combination of EPIC151 and LAIS100, MATH112, CHGN121, and PHGN100. 3 hours lecture; 3 semester hours.

EGGN292. INTEGRATIVE DESIGN STUDIO IIB. 3.0 Semester Hrs.
(II) Students focus on significant contribution to a design project, building proficiency as they incorporate their core and distributed science studies, and begin to integrate their studies in distributed engineering as may be appropriate to the project. Communication of the design approach is emphasized. Prerequisites: EGGN291, EGGN191 and EGGN192 or the combination of EPIC151 and LAIS100. 3 hours lecture; 3 semester hours.

EGGN298. SPECIAL TOPICS. 1-6 Semester Hr.
(I, II) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once. Prerequisite: none. Variable credit; 1 to 6 credit hours. Repeatable for credit under different titles.
EGGN301. HUMAN-CENTERED PROBLEM DEFINITION. 3.0 Semester Hrs.
(I, II) This class will equip students with the knowledge, skills and attitudes needed to identify, define, and begin solving real problems for real people, within the socio-technical ambiguity that surrounds all engineering problems. The course will focus on problems faced in everyday life, by people from different backgrounds and in different circumstances, so that students will be able to rise to the occasion presented by future workplace challenges. By the end of this course, students will be able to recognize design problems around them, determine whether they are worth solving, and employ a suite of tools to create multiple solutions. The follow up course --“Design for People”-- will enable students to take the best solutions to the prototype phase. 3.0 hours lecture; 3.0 semester hours.

EGGN350. MULTIDISCIPLINARY ENGINEERING LABORATORY II. 1.5 Semester Hr.
(I, II) (WI) Laboratory experiments integrating electrical circuits, fluid mechanics, stress analysis, and other engineering fundamentals using computer data acquisition and transducers. Fluid mechanics issues like compressible and incompressible fluid flow (mass and volumetric), pressure losses, pump characteristics, pipe networks, turbulent and laminar flow, cavitation, drag, and others are covered. Experimental stress analysis issues like compression and tensile testing, strain gage installation, Young's Modulus, stress vs. strain diagrams, and others are covered. Experimental stress analysis and fluid mechanics are integrated in experiments which merge fluid power of the testing machine with applied stress and displacement of material specimen. Co-requisites: MEGN351 or CEEN310 and CEEN311 or MEGN312. 0.6 hours lecture; 2.7 hours lab; 1.5 semester hours.

EGGN391. INTEGRATIVE DESIGN STUDIO IIIA. 3.0 Semester Hrs.
(I) (WI) Design Practicum augments the engineering core and addresses content and depth that students may not have otherwise acquired through separate Engineering Core courses. This design studio is intended as preparation for the Design Practicum/Field Session studio EGGN392 and includes modules on technical engineering drawings, system simulation and optimization. Project management skills are emphasized. Prerequisites: EGGN291, EGGN292 and EGGN200. 3 hours lecture; 3 semester hours.

EGGN392. INTEGRATIVE DESIGN STUDIO IIIB. 3.0 Semester Hrs.
(II) (WI) Students in Design Practicum incorporate instruction from their Engineering Core to drive technical feasibility assessment of a project for a client. This studio serves as the Field Session experience for students in the BSE program and places students in a professional practice experiential environment. Teaming and leadership skills are emphasized. This course also places strong emphasis on the economic and business aspects of a project, including development of a detailed techno-economic assessment. Prerequisites: EGGN391 and EBBN201. 3 hours lecture; 3 semester hours.

EGGN398. SPECIAL TOPICS. 1-6 Semester Hr.
(I, II) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once. Prerequisite: none. Variable credit; 1 to 6 credit hours. Repeatable for credit under different titles.

EGGN401. PROJECTS FOR PEOPLE. 3.0 Semester Hrs.
(I, II) Work with innovative organizations dedicated to community development to solve major engineering challenges. This course is open to juniors and seniors interested in engaging a challenging design problem and learning more about Human Centered Design (HCD). The course will be a mixture of lecture and lab aiming at developing engineering solutions to real problems affecting real people in areas central to their lives. Repeatable for elective credit with a Maximum of 6 Total Hours. 1.0 hour lecture; 4.0 hours lab; 3.0 semester hours.

EGGN408. INTRODUCTION TO SPACE EXPLORATION. 1.0 Semester Hr.
(I) Overview of extraterrestrial applications of science and engineering by covering all facets of human and robotic space exploration, including its history, current status, and future opportunities in the aerospace and planetary science fields. Subtopics include: the space environment, space transportation systems, destinations (Low-Earth orbit, Moon, Mars, asteroids, other planets), current research, missions, and projects, the international and commercial perspectives, and discussion of potential career opportunities. This seminarstyle class is taught by CSM faculty, engineers and scientists from space agencies and research organizations, aerospace industry experts, and visionaries and entrepreneurs of the private space commerce sector. Prerequisites: None; 1 hour lecture; 1 semester hour.

EGGN450. MULTIDISCIPLINARY ENGINEERING LABORATORY III. 1.0 Semester Hr.
(I, II) Laboratory experiments integrating electrical circuits, fluid mechanics, stress analysis, and other engineering fundamentals using computer data acquisition and transducers. Students will design experiments to gather data for solving engineering problems. Students are recommending design improvements to a refrigerator, diagnosing and predicting failures in refrigerators, computer control of a hydraulic fluid power circuit in a fatigue test, analysis of structural failures in an off-road vehicle and redesign, diagnosis and prediction of failures in a motor/generator system. Prerequisites: EGGN350 or EENG382. Co-requisites: EENG307. 3 hours lab; 1 semester hour.

EGGN491. SENIOR DESIGN I. 3.0 Semester Hrs.
(I, II) (WI) This course is the first of a two-semester capstone course sequence giving the student experience in the engineering design process. Realistic open-ended design problems are addressed for real world clients at the conceptual, engineering analysis, and the synthesis stages and include economic and ethical considerations necessary to arrive at a final design. Students are assigned to interdisciplinary teams and exposed to processes in the areas of design methodology, project management, communications, and work place issues. Strong emphasis is placed on this being a process course versus a project course. This is a writing-across-the-curriculum course where students' written and oral communication skills are strengthened. The design projects are chosen to develop student creativity, use of design methodology and application of prior course work paralleled by individual study and research. Prerequisite: Field session appropriate to the student's specialty, for BSE Mechanical Specialty and BSME students, completion of MEGN481, for BSE Civil Specialty and BSCE students, concurrent enrollment or completion of any one of CEEN443, CEEN445, CEEN440, or CEEN415. 2 hour lecture; 3 hours lab; 3 semester hours.
EGGN492. SENIOR DESIGN II. 3.0 Semester Hrs.
(I, II) (WI) This course is the second of a two-semester sequence to give the student experience in the engineering design process. Design integrity and performance are to be demonstrated by building a prototype or model, or producing a complete drawing and specification package, and performing pre-planned experimental tests, wherever feasible, to verify design compliance with client requirements. Prerequisite: EGGN491. 1 hour lecture; 6 hours lab; 3 semester hours.

EGGN497. SUMMER PROGRAMS. 15.0 Semester Hrs.

EGGN498. SPECIAL TOPICS. 1-6 Semester Hr.
(I, II) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once. Prerequisite: none. Variable credit; 1 to 6 credit hours. Repeatable for credit under different titles.