



ENGR 1 - Introduction to Engineering

Catalog Description

Transfer Status: CSU/UC

Unit(s): 3.00

Lecture: 34.00 Contact hours/68.00 Out of class hours/102.00 Total hours/2.00 Unit(s)

Lab: 51.00 Contact hours/0.00 Out of class hours/51.00 Total hours/1.00 Unit(s)

Total: 85.00 Contact hours/68.00 Out of class hours/153.00 Total hours/3.00 Unit(s)

Course Description: The course explores the career branches of engineering including the functions of an engineer in various settings and the industries in which engineers work. Topics will span the life cycle of the engineering professions from education to career including guided exploration of educational pathways, time-management, study-skill development through engineering-skill building activities focused on design and creation of products and ethical practices. The engineering process will be used to develop essential project management skills in the context of being introduced to ubiquitous systems used by engineers such as sensors, pneumatics, hydraulics, AC and DC motor control, simple electrical circuits, machine controllers, programming, and computational tools for testing and analysis. A spreadsheet program and high-level computer language programs are integral parts of the course. (C-ID ENGR 110).

Objectives

Upon successful completion of this course, the student should be able to:

1. Describe the role of engineers in society and classify the different engineering branches, the functions of an engineer, and industries in which they work.
2. Identify and describe academic pathways to bachelor's degrees.
3. Develop and apply effective strategies to succeed academically.
4. Explain engineering ethical principles and standards.
5. Demonstrate knowledge of effective practices for writing technical engineering documents and making oral presentations.
6. Analyze engineering problems using the engineering design process.
7. Demonstrate teamwork skills in working on an engineering design team.
8. Simulate the actions an engineer takes in considering automation of a machine or process, and then complete a proof-of-concept system to verify those decisions.

Course Content

Topic Titles / Suggested Time Topic

Lecture

<u>Topics</u>	<u>Lec Hrs</u>
Role of engineers in society and comparison of engineering, science and technology	2.00
Professional Engineer License	3.00
Professionalism and ethics	2.00
Engineering education: academic success, curriculum, pathways, preparation for upper division coursework	3.00
Engineering design, creativity, and problem-solving processes (includes working as a team member on an engineering design project)	2.00
Written and oral communication skills related to engineering	4.00
Overview of engineering fields	2.00
Exposure to modern engineering tools and practices	3.00
Design and fabrication of programmable systems: sensors, actuators, coding	2.00
Introduction to design process	4.00
Exposure to real world engineers through field trips and/or guest speakers	5.00
Computational methods and tools for Engineering: EXCEL, MATLAB, web-based calculators	2.00
Total Hours:	34.00

Lab

<u>Topics</u>	<u>Lab Hrs</u>
Build your Educational plan.	3.00
Microsoft EXCEL: Introduction and Fundamentals.	3.00
Microsoft EXCEL: Plotting, error bars, using functions.	3.00
Introduction to MATLAB. Fundamentals, working environment offered by the software.	3.00
Materials Engineering: structure, properties, processing, material selection.	3.00

Topics	Lab Hrs
Civil Engineering: Statics, Trusses, Transportation. Pasco Truss set and Truss solvers using Excel, Matlab, web-based application.	3.00
Design and build a structure with simple components (example: bamboo skewers, balsa wood, glue gun, steel wire). Analyze the structure, internal forces and deformation by simulation using MATLAB, EXCEL, or other applications.	3.00
Design , build and test systems using Diodes, Transistors, LEDs, Sensors.	3.00
Introduction to programmable systems and coding using Arduino.	3.00
Introduction to Error Analysis: measurement uncertainty, statistical estimation, error bars.	3.00
Design, build and analyze systems that include Mechanical and Electro-Mechanical Components Power Supplies, I/O Circuits and Devices (Sensors), AC and DC Motors, Gearing, Belts and Pulleys, Solenoids, Bearings and Bushings, Clutches and Brakes, Couplers, Motor Control (VFD's, Vector Drives), Pneumatics and Hydraulics in Machines, Machine Controllers.	3.00
2-D and 3-D drafting: Introduction to drafting software: Sketchup, Solidworks.	3.00
Electrical Engineering: Ohm's Law, Passive Electronics, Applications Circuit Construction Kit.	3.00
Programmable systems: choose sensors, actuators, control systems, servomotor control, calibration.	3.00
Programmable systems: adjusting parameters and parts, troubleshooting.	3.00
MATLAB: plotting, writing and running scripts, writing and calling functions.	3.00
Civil Engineering and Surveying: terrain models and AutoCad Civil 3D.	3.00
Total Hours:	51.00

Methods of Instruction

- A. Collaborative Group Work
- B. Field Trips
- C. Guest Speakers
- D. Homework: Students are required to complete two hours of outside-of-class homework for each hour of lecture
- E. Laboratory Experiments
- F. Lecture
- G. Problem-Solving Sessions

Methods of Evaluation

- A. Exams/Tests
- B. Oral Presentation
- C. Projects
- D. Homework
- E. Final Examination
- F. Class Discussion

Examples of Assignments

Reading Assignments

1. Read the chapter on the code of ethics for engineers and be prepared to discuss specific cases in which engineers make decisions based on their professional ethical code.
2. Read the chapter on team work and be prepared to discuss the 4-step method that guides the decision process during an engineering project.

Writing Assignments

1. Write a page to support your choice of the structure for the bridge project, based on the project guidelines.
2. Write two pages to respond to the following questions. What kind of Engineer would you like to become? Why?

Out-of-Class Assignments

1. Complete an education plan that includes every class along with its prerequisites, laid out by semester for a degree in engineering.
2. Use a spreadsheet to design a GANTT project timeline for the assigned project.

Recommended Materials of Instruction

Moaveni, S. (2020). Engineering Fundamentals: An Introduction to Engineering. *Cengage Learning Engineering*, 6th.

Raymond, B. L. (2019). Studying Engineering: A Road Map to a Rewarding Career. *Discovery Press*, 5th. 978-0979348723.

Minimum Qualifications

Engineering (Masters Required)

Created/Revised by: Bryant, Jennifer

Date: 05/02/2022