ENGR 10: INTRODUCTION TO ENGINEERING

Foothill College Course Outline of Record

Heading	Value
Units:	5
Hours:	4 lecture, 3 laboratory per week (84 total per quarter)
Advisory:	ENGL 110 or ESLL 125; UC will accept for transfer credit either ENGR 10 or ENGR 49, not both; not open to students with credit in ENGR 20.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- Communicate effectively through written documents and oral presentations
- Identify, formulate and solve problems that have real world constraints
- Work as a contributing member of a functional team

Description

A first experience in engineering, this course is open to all students intending to major in engineering or who want to try out engineering. Students will gain experience with project management and design, insights from discussions on ethics and environmental impact and skills in written and oral technical communication.

Course Objectives

The student will be able to:
A. Profession: Describe the branches of engineering, possible careers, and job prospects.
B. Education: Identify and describe academic pathways to four-year degrees; develop and apply effective strategies to succeed academically.
C. Ethics: Discuss engineering ethical principles and standards.
D. Communication: Communicate technical knowledge effectively through written documents and oral presentations.
E. Design: Identify, analyze, and develop solutions for engineering problems using the engineering design process.
F. Teamwork: Work collaboratively in a team setting.
G. Tools: Use modern engineering tools and practices.

Course Content

A. Profession:
1. Branches of engineering
2. Career prospects, such as potential industries/companies, job outlook, and examples of type of work
3. Engineering professional associations
4. Professional engineers: how to become one and significance of having the title
B. Education:
1. Required academic preparation and college transfer requirements
2. College readiness
a. Attendance
b. Due dates
c. Time management
d. Tardiness and late work
3. Academic success
a. Positive attitude, goals, motivation
b. Commitment, perseverance and responsibility
c. Creativity
d. Study strategies
e. Good communication (oral and written) and interpersonal skills
f. Good social association and team skills
C. Ethics:
1. Engineers Code
2. Workplace expectations
3. Ethical decisions that engineers encounter
D. Communication:
1. Written communication
a. Research papers
b. Emails
c. Memos
d. Essays
e. Proposals
f. Formal reports
g. Documentation
2. Oral communication
a. During team meetings
b. Informal presentations
c. Formal presentations
3. Project management
a. Task list
b. PERT chart
c. Gantt chart
4. Visual communication
a. 2-D sketches
b. 3-D sketches
E. Design:
1. Understanding the users and their needs
2. Defining problem
3. Researching and gathering information
4. Prototyping
5. Testing
6. Iterating
F. Teamwork: work collaboratively in a team setting
1. Brainstorming
2. Facilitating team meetings
3. Leadership and team structure
4. Project management
a. Setting goals
b. Agreeing on procedures
c. Staying on track
G. Tools: use modern engineering tools and practices
1. Presentation software
2. Internet as a research tool
3. Computer programming (such as NXT Lego Mindstorms, Excel, Matlab, and JCreator Pro or other appropriate programming environment)

Lab Content

A. Orientation to the world of engineering: discuss perspectives on the engineering career and real-life engineering challenges
B. Approaching a design situation using simple machine principles, brainstorm and sketch out ways these principles will be used in the design project
C. Understanding the principles that govern a machine's actions; perform tests on gears, motors, power, and signals
D. Applying the concepts to building the design project: test connections, mechanical assembly, electronics, system integration, computer-robot interface
E. Planning and designing added capabilities: sketch prototype, make design decisions, organize tasks
F. Designing, building, programming: apply concepts and practice engineering skills
G. Making the design project work: testing and troubleshooting is a part of the engineering process
H. Demonstration and design review: demonstrate the design project and give reviews on design
I. Reflection and lessons learned: discuss engineering experience, other applications

Special Facilities and/or Equipment

A. Laboratory equipped with a sufficient number of computers
B. Appropriate software, such as:
1. Microsoft Office (Word, Powerpoint, Excel)
2. An appropriate graphics package (Google SketchUp or SolidWorks)
3. For robotics version: NXT Mindstorms Software
4. For alternative energy version: Graphical programming environment (possibility: National Instruments LabView)
C. Experimental apparatus for testing principles of mechanics and measuring forces; force spring scale, hardware
D. Experimental apparatus for testing basic electrical circuits and motors; digital multimeter, wire-strippers, soldering iron
E. Prototyping materials
F. LEGO NXT robotics kits
G. When taught via Foothill Global Access, on-going access to computer with email software and hardware and video conferencing capabilities; email address.

Method(s) of Evaluation

A. Lab-based assignments, computer tasks, and projects
B. Written reports, which may include:
1. Essay
2. Memo
3. Proposal
4. Formal report
C. Oral presentations
D. One (1) written midterm exam
E. Final project presentation, demonstration, and team project report
F. Comprehensive written final examination

Method(s) of Instruction

Lecture, laboratory, demonstration. Active student learning is encouraged in the asking of questions, small and large-group discussion, and reflection.

Representative Text(s) and Other Materials

Horenstein, Mark N. Design Concepts for Engineers. 4th ed. Pearson Higher Education, 2010.

Oakes, William, Les Leone, and Craig Gunn. Engineering Your Future: A Comprehensive Introduction to Engineering. 9th ed. Oxford University Press, 2016.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Reading assignments: Weekly reading assignments from text, handouts, web resources, lab notes, and outside sources. Approximately 30 pages of reading each week.

B. Laboratory exercises: Weekly assignments are based on realistic tasks and work projects that would be performed as a practicing engineer. Each progressive lab exercise helps prepare the student to learn and apply integrated engineering fundamentals and skills needed to design, build, and test the final project.

C. Writing assignments: An engineering career-exploration project, a current event summary paper, and a product life cycle analysis.

Discipline(s)

Engineering