Course Outline for Engineering 10
INTRODUCTION TO ENGINEERING

Catalog Description:
ENGR 10 - Introduction to Engineering 2.00 units
Introduction to careers, activities, and topics related to the field of engineering, including computer applications, design and problem solving. Help students determine what degrees and certificates are needed to reach their engineering career of choice. Complete engineering sample projects including bridge design, 3D modeling/3D printing, robotics, and circuits. This course will help determine if engineering is the career for you.

Requisites: none

Grading Option: Optional

Discipline:

<table>
<thead>
<tr>
<th>Type</th>
<th>Units</th>
<th>Inside of Class Hours</th>
<th>Outside of Class Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>2</td>
<td>36.00</td>
<td>72.00</td>
</tr>
<tr>
<td>Laboratory</td>
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<tr>
<td>Clinical</td>
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<tr>
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<td>Total</td>
<td>2.00</td>
<td>36.00</td>
<td>72.00</td>
</tr>
</tbody>
</table>

Prerequisite Skills:
None

Measurable Objectives:
Upon completion of this course, the student should be able to:
1. describe the branches, functions, industries, careers, and job outlook of the major engineering disciplines including: electrical, mechanical, civil, industrial, materials, chemical, and bio/biomedical;
2. discuss the role of engineers in society and write about the duties and responsibilities of practicing engineers;
3. explain the steps required to become a practicing engineer;
4. outline the basic approach to engineering design and problem solving by listing the main elements of the “State-Gate” or similar design-process models;
5. analyze the benefits of professional organizations and professional licenses;
6. develop a personal educational plan to support transfer to a California State University (CSU) or University of California (UC) School/College of Engineering and to ultimately earn an engineering baccalaureate degree;
7. list several common, and some specialized software tools used by practicing engineers such as Internet Search Engines, MS Word, MSEexcel, MSPowerPoint, AutoCAD, SolidWorks, MATLAB, C++, Java;
8. construct a 3-view orthographic projection drawing of a simple three dimensional solid object;
9. list the major components of a formal engineering report including: the abstract, introduction, experimental apparatus/details, results & discussion, conclusions, references;
10. prepare a professional resume and cover letter for a job application;
11. describe the study skills that prepare a student for success in the college/university coursework required to earn a baccalaureate degree in engineering;
12. describe working in an engineering design-team, and major elements of team leadership by completing a final design project;
13. list major challenges facing USA engineers in the near future including energy production, environmental conservation/improvement, transportation systems, physical infrastructure, competitiveness and productivity;
14. state the seven SI base units, and convert between the various unit systems commonly used in engineering measurements and calculations;
15. define and discuss ethics in engineering;
16. compare engineering, science, and technology.

Course Content:
1. A brief history of engineering and the development of engineering disciplines
2. Engineering majors/disciplines descriptions
   A. Aerospace
   B. Agricultural
   C. Architectural
3. Engineering professional duties and responsibilities
   A. Technical problem solving
   B. Engineering design
   C. Engineering proposal development and writing
   D. Cost estimating
   E. Schedule development
   F. Engineering Human Resource allocation and planning
   G. Engineering analysis using graphical or analytical methods
   H. Presentation of designs or analyses to customers or company management
   I. Writing technical specifications
   J. Writing engineering and/or technical reports
   K. Designing and performing engineering tests
   L. Travel and field work

4. Engineering design process
   A. Problem identification
   B. Define goals and/or success criteria
   C. Research and gather published information/data
   D. Brainstorming to generate creative ideas
   E. Analyze and rank brainstorm ideas
   F. Develop and test subscale and/or full scale models
   G. Finalize/select solution path
   H. Communicate and specify solution plan
   I. Implement and commercialize
   J. Post implementation review & assessment, product end of life planning

5. Engineering professional organizations and licensing
   A. Functions of engineering societies such as the ASCE, ASME, IEEE, etc.
   B. Steps to earn the professional engineer license

6. Transfer/Major Research and Exploration
   A. Explore bachelor level engineering program options
   B. Information sources for majors courses and transfer articulation, including course catalogs and ASSIST.ORG
   C. Upper division courses needed to satisfy the selected engineering degree requirements
   D. University web sites and catalogs for degree requirements
   E. Work with the Community College counselor to develop a student education plan

7. Introduction to software tools used by practicing engineering
   A. MSWord for report writing
   B. MSExcel for numerical analysis and production of charts and graphs
   C. MSPowerPoint for presentations and live communication
   D. AutoCAD and SolidWorks for engineering design graphics ("blueprints")
   E. MATLAB for sophisticated numerical processing and graphics

8. Introduction to orthogonal projection drawing
   A. Projection planes
   B. Unfolding the “Glass Box”
   C. Proper positioning of the Orthographic views
   D. Use of hidden and center lines

9. Engineering reports
   A. Technical reports for engineering peers
   B. Technical and status reports for engineering management
   C. Technical and status reports for customers
   D. Technical reports for publication
   E. Technical reference research: Engineering/science libraries, publication data bases (e.g., INSPEC, Compendex, SciSearch)
   F. Numbering and referencing figures and tables
   G. Nomenclature and appendix sections
   H. Importance of clear, concise, and quantitative abstracts or executive summaries

10. Personal professional presentation
    A. Elements of a polished resume
    B. Writing cover and thank you letters
    C. Preparation for a job interview
    D. Professional comportment during a job interview

11. Engineering study skills
    A. Attend every class/lab meeting, pay attention, take notes, ask questions
    B. Outline the textbook, work many example problems
    C. Extra effort in Engineering, Math, Science and English (writing) courses as these form the basis for engineering practice
    D. Engage in CREATIVE activities
    E. Use of graphics as synthesis and analysis tools
    F. Forming study groups
    G. Test/exam preparation and taking strategies
    H. Understanding and leveraging different learning styles
    I. Time management and prioritization

12. Engineering teams and leadership
    A. Team attributes: common purpose, leadership, effective communication, creativity amplification, collegial relationships, effective planning and coordination of efforts
    B. Team life cycle: forming, storming, norming, performing, adjourning
    C. Modes of team action
    D. Paths to leadership: innate, great events, transformational
    E. Leader attributes
    F. Leadership styles

13. Major engineering challenges
    A. Compare potential energy sources in terms of pros & cons, costs & benefits
B. Transportation systems, particularly roads and air-travel, nearing capacity with constraints on added capacity
C. Ageing physical infrastructure - $-capital and engineering resources needed to update
D. Competitiveness and productivity – need for more, better educated, and more creative engineers

14. Engineering unit systems
   A. Historical development of unit systems
   B. Physical definitions of the seven SI base units
   C. Mathematical operations on units; e.g., raising units to powers
   D. Conversion between unit systems with published conversion factors

15. Engineering ethics
   A. Nature of ethics
   B. Nature of engineering ethics
   C. NSPE/NCEE code of ethics for engineers
   D. Engineering ethics and legal considerations

Methods of Presentation
1. Lecture/Discussion
2. Textbook reading
3. Guest lectures by professors from transfer universities
4. Guest lectures by practicing engineers
5. Guest lectures by former Chabot students who have transferred to university schools/colleges of engineering
6. Audio-visual materials
7. Class and group discussions
8. Demonstration
9. Hands-on Activities
10. Group Activities
11. Group Presentations
12. Portfolio Development
13. Portfolio Development
14. Problem Solving
15. Written assignments
16. Presentation of audio-visual materials

Assignments and Methods of Evaluating Student Progress

1. Typical Assignments
   A. Report on the requirements for becoming a registered professional engineer in your state. Also report on how registration would be beneficial to your engineering career.
   B. Which of Herrmann's (whole brain model) quadrants best describes your dominant thinking style? Which one is the weakest?
   C. Estimate how much of an automobile's tire wears off in one revolution.
   D. Make a 3-view orthographic projection sketch of the object shown at right. Use a scale of 1-square = 5mm
   E. Use MATLAB Help to learn about the command “linspace.”
   F. Calculate each of the following unit conversions to four significant figures: 340 BTU/s to watts, 3458° to radians, 25 hectares to square meters, 240 horsepower to watts, 67 851.22 kWh to joules, 2x10-7 miles to meters, and 773 °F to Kelvins.

2. Methods of Evaluating Student Progress
   A. Homework
   B. Exams/Tests
   C. Final Examination
   D. Class Participation
   E. Critical thinking exercises
   F. Final Examination or Project
   G. Group Projects
   H. Journals
   I. Midterm Examination
   J. Oral Presentation
   K. Portfolios
   L. Projects
   M. Written assignments

3. Student Learning Outcomes
   Upon the completion of this course, the student should be able to:
   A. Describe the Engineering-Practice in THREE Major Engineering Fields (e.g.: CHEMICAL, CIVIL, ELECTRICAL, INDUSTRIAL, MATERIALS, MECHANICAL) including Specific EXAMPLES of Projects, Products, or Processes which an Engineer in each of these fields might Design.
   B. Describe the Ethical Responsibilities of Practicing Engineering in terms of three Components: the general nature of ethics, general ethical models, and the engineering ethical code established by the National Council of Examiners of Engineering and Surveying (NCEES)

Textbooks (Typical):

Special Student Materials
1. Engineering Notebook

Abbreviated Class Schedule Description:

Introduction to careers, activities, and topics related to the field of engineering, including computer applications, design and problem solving.

Requisites: none