

King Fahd University of Petroleum & Minerals
MECHANICAL ENGINEERING DEPARTMENT
ME 414: Design Project I

Catalogue Description (1-0-1):

This capstone design project course integrates various components of the curriculum in comprehensive engineering experience so that the basic sciences, mathematics, and engineering sciences which the student has learned in his freshman-to-senior years of study can be applied. It considers design of a complete project or system including establishment of objectives and criteria, formulation of the problem statements, preparation of specifications, consideration of alternative solutions, feasibility considerations, and detailed engineering designs. The design should take into consideration appropriate constraints such as economic factors, safety, reliability, ethics and environmental and social impact. Submission of a written report is an essential requirement for completion of the course. Team design projects, where appropriate, are highly encouraged.

Status in Curriculum (Required or Elective): Required (offered Fall & Spring)

Prerequisites: ME 307

Co-requisites: None

Prerequisites by Topics:

- Engineering Drawing
- Material Science
- Mechanical Engineering Design
- Manufacturing Processes
- Thermal Science

Textbook:None

References:

Engineering Design Methods: Strategies for Product Design, by Nigel Cross, John Wiley & Sons, 3rd edition, 2000.

Coordinators:Dr. Jafar Albinmoussa & Dr. Abdul-Aleem Bangalore Jabbar, Mechanical Engineering

Goals:(general objectives)

The course integrate knowledge acquired from various courses in a capstone manner, involving groups of students in open-ended design effort. The course introduces students to the life cycle of a design project within a team environment.

Course Outline (Lecture Topics):

1. Design Specifications: Recognizing needs and preparing design specifications (2 class)
2. Conceptual design: Description of operational scenarios. Identifying preferred system configuration. Identification of major components. Specifying safety and environmental impacts. Initial major make-or-buy decisions. (3 class)
3. Preliminary design: Work on basic layout. Select components. Subsystem schedules and costs. Develop test and analytical base. Develop actual cost estimates. Complete Interface Control Document. Outline of documents: Safety, Operations, Test and Evaluation, Spares and maintenance (3 class)
4. Detailed Design: Design actual pieces to be built. Determination of design margins. Detailed design of subsystems with drawings. Design tooling and fabrication. Design Tooling and Fabrication Process. Identification of any special handling. Test major items. Finalize overall performance estimates. Completion and detailed analysis and test hardware and software. Reliability assessment (3 class)
5. Team work: Team dynamics. Communication skills. Responsibility and accountability. Team leadership. Meetings: Agenda and proper documentation. Time management. Conflict management (2 class)
6. Presentation Skills: Tips on how to make an effective presentation (1 class)

Design Activities/Projects:

Students are involved in a complete design cycle: identifying needs, conceptual design, design selection process, engineering analysis, prototyping and testing.

Computer Usage:

Students are encouraged/requested to utilize available computer software in the department such as Microsoft Word, Excel and PowerPoint and addition to SolidWorks, LABVIEW, FLUENT, ANSYS, EES, and

MATLAB.

Laboratory:

None

Assessment Tools:

- 1) Attendance, logbook, gantt chart
- 2) Accomplishment of design tasks
- 3) Written report

Course Learning Outcomes:

- I- The student should be able to identify customer needs as well as current global and local demands.
- II- The student should be able to write product design specifications with engineering metrics
- III- The student should be able to know how to generate design concept
- IV- The student should be able to hand-sketch and utilize CAD tools and present design concepts
- V- The student should be able to work in team to analyze the design through engineering principles
- VI- The student should be able to test the designed product, assess its performance, and refine it if needed
- VII- The students should be able to effectively communicate their designs through written reports and oral presentations.

Course Learning Outcomes mapped to Student Outcomes:

Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course-to-Student outcome mapping	V	VI	I, II	V	I, II, III, V	I, II	II, III, IV, VII	I	I	I	III, IV, V VI
Emphasis*	S	S	M	M	S	M	S	M	M	M	S

* L: Little/None M: Moderate S: Strong

Status of Continuous Improvement review of this Course:

Date reviewed: 22 February 2015

Reviewed by: Dr. Jafar Albinmoussa

Prepared by: Dr. Abdul-Aleem Bangalore Jabbar

Date prepared: January 29, 2014