

MECH 440A: Mechanical Engineering Design Project I

Catalog description: 3.0 units

System design methods applied to mechanical systems. Group design projects. Consideration of the manufacturing cost, and environmental and social impact. Oral and written presentation of results. Initial design of the capstone design project to be continued in MECH 440B. This is a writing proficiency (WP) course; a grade of C- or better certifies writing proficiency for majors.

Prerequisites: ENGL 130 (or equivalent) with a grade of C- or higher, MECH 140, MECH 200, MECH 340, MFGT 160

Recommended: CIVL 302, MECA 380, MECH 308, MECH 338

Course objectives: This course together with MECH 440B have as objectives for students to

1. Define a problem requiring a hardware solution
2. Work as a member of an engineering design team
3. Use project management concepts to organize and schedule tasks
4. Evaluate customer needs and write engineering specifications
5. Design hardware to meet engineering specifications
6. Design hardware to meet cost, environmental, safety, and ethical constraints
7. Fabricate or supervise the fabrication of hardware
8. Test hardware to determine its compliance with specifications
9. Communicate technical information to peers, both orally and in writing

Course outcomes: After completing MECH 440A and MECH 440B, students shall be able to

1. Function effectively as a member of student design team
2. Evaluate customer requirements and write engineering specifications for a problem requiring a hardware solution
3. Prepare a Gantt chart for planning a design project
4. Perform functional decomposition and generate concepts from a problem statement and engineering specifications
5. Evaluate design concepts using a decision matrix
6. Transform design concepts into product components with detailed drawings for fabrication
7. Design and undertake a test procedure for evaluating the performance of a prototype product
8. Orally communicate the results of a design-build-test project
9. Prepare a written final document that describes in detail all aspects of a design-build-test project

Topics covered: The topics covered in MECH 440A and MECH 440B are

1. Introduction to the engineering design process: what is engineering design, measuring effective design, concurrent design, types of design, design teams and personalities, documentation, overview of the design process

2. Development of engineering specifications: quality functional deployment (QFD), determining customer requirements and their relative importance, identifying and evaluating the competition, generating specifications and target values
3. Project planning: identifying tasks, sequencing tasks, estimating personnel-time-resources, the Gantt chart, ISO-9000
4. Concept generation and evaluation: functional decomposition, developing concepts for each function, sources for generating concepts, concept evaluation techniques, decision matrices, robust decision-making
5. Product design: elements of product design, importance of drawings, types of drawings, dimensions and tolerances, bill of materials, generating product designs, material selection, robust design, design for manufacturability, vendors, cost budgeting, testing the product

Class/Laboratory schedule

One hundred minutes of lecture and one hundred fifty minutes of laboratory per week

Contribution of course to meet the professional component

This course contributes to the student's ability to work professionally in the thermal and/or mechanical systems areas including the design and realization of such systems.

Relationship of course to Mechanical Engineering Program Outcomes

This course contributes principally to Program Outcomes A, C, E, F, G, and H.