ME 36400
Systematic Engineering Design

Course Outcomes [Related ME Program Outcomes in brackets]

1. Understand and apply with a systematic design method. [2]
2. Ability to understand customer needs and translate needs to engineering specifications. [2]
3. Ability to generate concepts and use ideation techniques. [2]
4. Ability to develop layouts using embodiment design techniques. [1, 2]
5. Ability to generate designs that are manufacturable. [2]
6. Communicate design effectively to various stakeholders. [3]
7. Effectively work in a team environment. [5]
8. Ability to acquire and apply new knowledge and tools to support the design process. [7]

Planning and Clarification of Task

1. Understanding users' needs
2. Generating engineering specifications

Conceptual Design

1. Abstraction to identify essential problems.
2. Function structures
3. Working principles
4. Concept selection

Embodiment Design

1. Layout design
2. Diverse design considerations, such as modularity, quality, sustainability
3. Design guidelines, such as shape synthesis guidelines
4. Virtual and Physical Prototyping
5. Testing

Detail Design

1. Manufacturing considerations, including tolerances, material and process selection
2. Communicating designs to manufacturers
3. Assembly considerations
4. Economic considerations and cost estimation
5. Product lifecycle considerations

Guided Design Projects and Design Case Studies

Typical Examples:

1. Robotic vehicle design
2. Wearables and bio-mechanics design
3. Water filtration system
4. Design of a high-performance racing bicycle
5. HVAC design

COURSE NUMBER: ME 36400 **COURSE TITLE:** Engineering Design I

REQUIRED COURSE OR ELECTIVE COURSE: Required

TERMS OFFERED: Fall and Spring

TEXTBOOK/REQUIRED MATERIAL:
TBD

PRE-REQUISITIES:
ME 26400

COORDINATING FACULTY:

COURSE DESCRIPTION: The engineering design process including planning and clarification, conceptual design, embodiment design, and detail design. Identification of customer requirements and development of engineering specifications. Concept generation and selection. Rules and guidelines for embodiment design. Design considerations including quality, modularity, manufacturing, assembly, and economics. Detail design to support manufacturing.

ASSESSMENT TOOLS:

1. Homework
2. Design reviews
3. Peer evaluations

COURSE STRUCTURE/SCHEDULE:
Lecture - 2 days per week at 50 minutes
Lab - 2 days per week at 110 and 50 minutes

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RELATED ME PROGRAM OUTCOMES:

1. Engineering fundamentals
2. Engineering design
3. Communication skills
4. Ethical/Professional responsibilities
5. Teamwork skills
6. Experimental skills
7. Knowledge acquisition

PREPARED BY: Beth Hess, Min Liu, Francisco Montalvo, Jitesh Panchal **REVISION DATE:** October 30, 2024