Department of Mechanical Engineering

ME - 403 Mechanical Systems Design I

(Required)

Catalog Description: ME 403 (2-1-3)

Lectures and projects covering problem solving methodology in the design, analysis, and synthesis of mechanical and thermal systems. The student's academic background combines with engineering principles and topics to serve as a foundation for broad engineering projects. Emphasis on creative thinking and the engineering design process in projects involving optimal conversion of resources.

Prerequisites: ME 304 Fluid mechanics, ME 305 Introduction to system dynamics,
ME 312 Thermodynamics II, 316 Machine design
ME 407 Heat Transfer (Corequisite)

Textbook(s) Materials Required:

Text Book: Atila Ertas, Jesse Jones, The Engineering Design Process, John Wiley & Sons.

Lab manuals: SDRC IDEAS Series student guide Quickstart

Reference: Handouts prepared by instructor

Coordinator: Raj Sodhi, Ph.D., P.E., Professor ME

Prerequisites by Topic:

1. Understanding of engineering systems that utilize fluids (from ME 304 Fluid mechanics)
2. Understanding of modeling of mechanical systems (from ME 305 Introduction to system dynamics)
3. Understanding of working of thermal systems (ME 312 Thermodynamics)
4. Understanding of design process and design of machine elements (ME 316 Machine design)

Course Objectives[1]:

Objective 1:

To teach students the fundamentals of mechanical engineering design theory to design, create and select components of complete mechanical systems from the recognition of need and definition of design objectives, design innovation.

Objective 2:

To illustrate to students the setting up and solving of structured and unstructured design problems, stages of design.

Objective 3:

To teach students how to apply computer based techniques in the analysis, design/selection of mechanical systems and to enhance student's communication skills.

Topics[2]:

1. Engineering design process Chapter 1

2. Creativity and Innovation	Chapter1, handouts
3. Stages of design	Chapter 2, handouts
4. Structured and Unstructured Problems	Chapter 2, handouts
5. Mathematical Models Relevant to Design Synthesis	Chapters 3 and 5, handouts
6. Decision Support: Selection	Chapter 4, handouts
7. Optimization in Design	Chapter 6, handouts Computer Software handout
8. Safety and Environmental protection	Chapter 9, handouts
9. Project planning: Communications	Chapter 11, handouts IDEAS Guide
10. Project planning: Team related	Chapter 11, handouts
11. Stress analysis (FEA)	IDEAS Guide
12. Codes of ethics, and legal issues in engineering	Chapter 10, handouts

Evaluation Methods:

1. Quizzes
2. Homework
3. Exams
4. Reports

5. Computer Assignments
6. Mini projects

Schedule: Lecture 3 hours and Lab 2 hours per week

Professional Component: Engineering Design

Programs Objectives Addressed: A, B, C, D, E

Course Outcomes[3] :

Prepared by: Raj Sodhi **Date:** September 2006.

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[1] Capital Letters in parenthesis refer to the Program Objectives of the Mechanical Engineering Department. Listed in Sec 2 d Tables B-2-9, B-2-12. Table B-2-8 links Program Objectives with the ABET a-k Criterion.

[2] Topi**c** numbers in parenthesis refer to lecture hours. (three hours is equivalent to 1 week)

[3] Outcome numbers in parenthesis refer to evaluation methods used to assess the student performance. Lower case letters in parenthesis refer to ABET a-k outcomes.