Fall 2019

ME 403-001: Mechanical Systems Design

H. V. Kountouras

ME-403

Mechanical Systems Design

TEXT: Atila Ertas, Jesse Jones, The Engineering Design Process, John Wiley & Sons, 1996 2 Edition
LAB MANUAL: Engineering Design with SolidWorks 2017, Planchard & Planchard, SDC Publications

WEEK	TOPIC	PROJECT ASSIGNMENTS
1	Introduction/Engineering Design Search on Process/CAE/CAD/CAM/CAE Library Awareness User Skills	**Proj #1:** MCAE Software Literature Search.
2	Structured and Unstructured Problems	
3	Design Methods	
4	Creative Design/Ideation	**Proj #2:** Solid Model Design
5	Innovations in Engineering Design	
	EXAM # 1	
6	Design Synthesis/Mathematical Models	
7	Decision Processes/Material Selection	**Proj #3:** FEA Simulation in Mechanical Systems
8	Decision Support: Selection Problem	
9	Finite Element Analysis/Modeling and Simulation in Mechanical and Thermal/Fluid Systems	**Proj #4:** FEA Simulation in Thermal Systems
	EXAM #2	
10	Decision Support: Compromise Problem	
11	Optimization Methods in Design: Overview	
12	Optimization/Mathematical Methods	**Proj #5:** Design Proposal For ME 408
13	Leadership and Professionalism in Engineering/ Engineering Law/Engineering Ethics	
14	**FINAL EXAM**	

September 9, 2019 (Kountouras)

COURSE NUMBER	**ME 403**		
COURSE TITLE	**Mechanical Systems Design I**		
Credits and Contact hours	3 credits and (2-1-3) (lecture hr/wk - lab hr/wk – course credits)		
Course Coordinator	Harry Kountouras		
Course Description	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(s)	ME 304 Fluid mechanics, ME 305 Introduction to system dynamics, ME 316 Machine design		
Corequisite(s)	ME 407 Heat transfer		
Required, Elective or Selective Elective	Required		
REQUIRED MATERIALS	Atila Ertas, Jesse Jones, The Engineering Design Process, John Wiley & Sons, 1996 2nd edition. Engineering Design With SolidWorks, Planchard and Planchard, SDC Publications, 2017		
Other supplemental materials (not Required)	Handouts prepared by instructor.		
Computer Usage	Use of SolidWorks software		
Course Learning Outcomes/ Expected Performance Criterion:	**Course Learning Outcomes:** Upon completing this course, students will be able to:	**SOs***	**Expected Performance Criteria**
	1 **Demonstrate** an understanding of the phases of the morphology of design	1, 2, 3	**Exam Question** (80% of the students earn a grade of 75% or better on this question)
	2. **Plan** the design sequence to achieve final mechanical design	1, 3	**Design Project Proposal** (80% of the students earn a grade of 70% or better on the project)
	3. **Identify** the economic, environmental, social, legal, ethical and health and safety issues associated with the engineering design process and professional practice.	1, 3	**Written Reports** (Concepts so central to the course that nearly 100% of students must show clear understanding)
	4. **Demonstrate** an understanding of various ideation techniques by creating a new conceptual design.	2, 3, 6	**Exam Question** (80% of students earn a grade of 70% or better on the question)
	5. **Select** a suitable design from a list of conceptual designs to meet the design	1, 2, 6	**Exam Question** (80% of students earn a grade of 70% or better on this question)

	goals		
	6. **Select** suitable design components and materials from various alternatives to fulfill the design goals	1, 2, 6	**Exam Question** (80% of students earn a grade of 70% or better on this question)
	7. **Use** Mechanical Computer Aided Engineering (MCAE) software to generate solid models as they pertain to the engineering design and manufacturing process.	2, 3, 7	**Project** (80% of students earn a grade of 70% or better on the project)
	8. **Use** Mechanical Computer Aided Engineering (MCAE) software to perform mechanical and thermal simulations as they pertain to the engineering design and manufacturing process.	1, 2, 3, 4,5	**Project** (80% of students earn a grade of 70% or better on the project)
	9.**Apply** optimization techniques to the design and development of project design related components	4, 5	**Exam Question** (80% of students earn a grade of 70% or better on the exam question)
	10. **Explain** the manufacturing processes of the components associated with the design models	1, 2, 3	**Project** (80% of students earn a grade of 70% or better on the project)
	11. **Write** a comprehensive capstone design project proposal	1, 3	**Design Project Proposal** (80% of students earn a grade of 75% or better on the project)
	12. **Demonstrate** ability to work as part of an integrated team	1, 3	**Design Projects** (80% of students earn a grade of 70%or better on the project)
Class Topics	1. Engineering design process 2. Creativity and Innovation 3. Stages of design 4. Structured and Unstructured Problems 5. Mathematical Models Relevant to Design Synthesis 6. Decision Support: Selection 7. Optimization in Design 8. Safety and Environmental protection 9. Project planning: Communications 10. Project planning: Team related		

Student Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**
(Scale: 1-3)	3	3	3	2	2	3	2

3 – Strongly supported 2 – Supported 1 – Minimally supported

* Student Outcomes