ME 4182 Capstone Design (Required)

Catalog Description: ME 4182 Capstone Design (1-6-3)

Prerequisites: ME 2110 Creative Decisions and Design, COE 3001 Mechanics of Deformable Bodies, ME 3017 System Dynamics, ME 3180 Machine Design or ME 4315 Energy Systems Design, ME 3210 Design, Materials, and Manufacture, ME 3345 Heat Transfer, and MATH 3670 Probability and Statistics with Applications

Teams apply a systematic design process to real multidisciplinary problems. Problems selected from a broad spectrum of interest areas, including biomedical, ecological, environmental, mechanical, and thermal.

Textbook: No textbook.

References: Eugene A. Avallone, Theodore Baumeister, and Ali M. Sadegh, *Marks' Standard Handbook for Mechanical Engineers*, 11th Edition, McGraw-Hill, 2007.

Karl T. Ulrich and Steven D. Eppinger, *Product Design and Development*, 5th Edition, McGraw-Hill, 2011.

Harold Rothbart and Thomas H. Brown, *Mechanical Design Handbook*, 2nd Edition, McGraw-Hill, 2006.

Richard G. Budynas and J. Keith Nisbett, *Shigley's Mechanical Engineering Design*, 9th Edition, McGraw-Hill, 2011.

George E. Dieter and Linda C. Schmidt, *Engineering Design. A Materials and Processing Approach*, 5th Edition, McGraw-Hill, 2012.

ME 4315 Energy Systems Analysis and Design references.

Topics Covered:

1. Problem definition.
2. Specification formulation within given constraints.
3. Review of design process and design ideation.
4. Human factors.
5. Market research.
6. Product and patent research.
7. Manufacturing considerations.
8. Safety and risk assessment.
9. Liability and ethics.
10. Environmental and sustainability considerations.
11. Proof-of-concept methods.
12. Codes and standards.

Course Outcomes:

Outcome 1: To enable students to synthesize the knowledge and skills acquired in their undergraduate curriculum, in the context of a realistic design project.

1.1 Students will be able to identify relevant topics from earlier courses, then apply them to their design project.

1.2 Students will be able to critically evaluate designs using engineering criteria and predictive usage.

Outcome 2: To develop in students the ability to address a broad range of requirements, including most of the following: performance, economic, marketing, environmental, sustainable, manufacturing, ethical, safety, social, and regulatory.

2.1 Students will demonstrate an ability to identify and specify design requirements, from general problem descriptions within the applicable realistic constraints.

2.2 Students will be able to systematically develop a design from the problem statement to a detailed, proof-of-concept design meeting all of the specifications.

Outcome 3: To prepare for the professional design environment, through teamwork and by enhancing student's communication abilities.

3.1 Students will be able to clearly communicate design ideas and information.

3.2 Students will be able to work collaboratively and responsibly as a team.

3.3 Students will demonstrate the ability to facilitate their learning by identifying design issues and questions that require additional investigation beyond their basic undergraduate curriculum knowledge, then formulating appropriate courses of action.

Correlation between Course Outcomes and Student Outcomes:

ME 4182											
	Mechanical Engineering Student Outcomes										
Course Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Outcome 1.1	X		X	X	X		X	X	X	X	X
Course Outcome 1.2	X		X	X	X		X	X	X	X	X
Course Outcome 2.1	X		X	X	X	X	X	X	X	X	X
Course Outcome 2.2	X		X	X			X		X	X	X
Course Outcome 3.1				X			X				
Course Outcome 3.2				X		X	X				
Course Outcome 3.3				X			X	X	X	X	X

GWW School of Mechanical Engineering Student Outcomes:

(a) an ability to apply knowledge of mathematics, science and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

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