



**DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING
MECHANICAL ENGINEERING PROGRAM, BSC.**

Course Syllabus

1. Course number and name

ME 430 Machine Design 1

2. Credits and contact hours

(3+0) 3 credit hours, 3 contact hours

3. Course type

Blended Learning Course (2+1)

4. Instructor's or course coordinator's name

Dr. Riyadh abu Mallouh

5. Textbook information

Shigley's Mechanical Engineering Design – Budynas and Nisbett, McGraw Hill, Tenth Edition, 2015.

a. Other supplemental materials

Machine Elements in Mechanical Design, R. L. Mott 5th Edition, Prentice Hall.

Machine Design an Integrated Approach, R. L. Norton, 5th Edition, McGraw Hill.

Fundamentals of Machine Component Design, Juvinall and Marshek, 4th Edition, McGraw Hill

6. Specific course information

a. Catalog description

Aspects of machine design: statistical nature, theories of failure and design for strength and design of machine elements.

b. Prerequisites or co-requisites

Prerequisite: ME 313 Solid Mechanics

c. The course is:

Required in the Mechanical Engineering Department



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7. Specific goals for the course

a. Course outcomes:

After completion of the course, students are expected to be able to:

1. Use standards and design criteria in the process of mechanical design
2. Decide on an appropriate failure model
3. Use numerical methods to solve the machine design problems.
4. Examine the machine elements under statics and dynamics load
5. Design an appropriate machine element using allowable load and required element life

b. The following student outcomes are addressed by the course:

SO-(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.

SO-(e) an ability to identify, formulate, and solve engineering problems

SO-(f) an understanding of professional and ethical responsibility

SO-(pc-3) prepare students to work professionally in mechanical systems



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1. Learning Outcomes and their Alignment with Program Educational Objective (PEO's), Methods of Delivery, and Assessment Methods:

Learning Outcomes	Program PEOs	Method of Delivery	Assessment Method
Course Outcomes			
CO-(1): Use standards and design criteria in the process of mechanical design.	-	Lectures (Example and Problems)	First Exam
CO-(2): Decide on an appropriate failure model.	-	Lectures (Example and Problems)	First Exam
CO-(3): Use numerical methods to solve the machine design problems	-	Lectures (Example and Problems)	Second Exam
CO-(4): Examine the machine elements under statics and dynamics load		Lectures (Example and Problems)	Second Exam
CO-(5): Design an appropriate machine element using allowable load and required element life		Lectures (Example and Problems)	Final Exam
Student Outcomes			
SO-(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.	2	Lectures (Example and Problems)	First Exam
SO-(e) an ability to identify, formulate, and solve engineering problems.	1, 3	Lectures (Example and Problems)	Second Exam
SO-(f) an understanding of professional and ethical responsibility.	1	Lectures (Example and Problems)	Final Exam
SO-(pc-3) prepare students to work professionally in mechanical systems		Lectures (Example and Problems)	Final Exam



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2. Weekly Teaching Plan

Week No.	Lecture	Topic	Method of Delivery
1	Sun (9-10)	Chapter 1: Introduction to Mechanical Engineering Design: Standards and Codes	Lecture
	Tue (9-10)	Chapter 1: Introduction to Mechanical Engineering Design: Economics	Lecture
	Thu (9-10)	Chapter 1: Introduction to Mechanical Engineering Design: Safety and Product Liability	Lecture
2	Sun (9-10)	Chapter 1: Introduction to Mechanical Engineering Design: Stress and Strength	Lecture
	Tue (9-10)	Chapter 1: Introduction to Mechanical Engineering Design: Design Factor and Factor of Safety	Lecture
	Thu (9-10)	Chapter 1: Introduction to Mechanical Engineering Design: Reliability and Probability of Failure	Lecture
3	Sun (9-10)	Chapter 3: Load and Stress Analysis: Equilibrium and Free-Body Diagrams	Lecture
	Tue (9-10)	Chapter 3: Load and Stress Analysis: Shear Force and Bending Moments in Beams	Lecture
	Thu (9-10)	Chapter 3: Load and Stress Analysis: Cartesian Stress Components	Lecture
4	Sun (9-10)	Chapter 3: Load and Stress Analysis: Mohr's Circle for Plane Stress	Lecture
	Tue (9-10)	Chapter 3: Load and Stress Analysis: Normal and Shear Stresses for Beams in Bending	Lecture
	Thu (9-10)	Chapter 3: Load and Stress Analysis: Torsion	Lecture
5	Sun (9-10)	Chapter 4: Deflection and Stiffness: Deflection Due to Bending	Lecture
	Tue (9-10)	Chapter 4: Deflection and Stiffness: Beam Deflections by Superposition	Lecture
	Thu (9-10)	Chapter 4: Deflection and Stiffness: Beam Deflections by Singularity Functions	Lecture
6	Sun (9-10)	FIRST EXAM	Lecture
	Tue (9-10)	Chapter 5: Failures Resulting from Static Loading: Static Strength	Lecture



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	Thu (9-10)	Chapter 5: Failures Resulting from Static Loading: Stress Concentration	Lecture
7	Sun (9-10)	Chapter 5: Failures Resulting from Static Loading: Maximum-Shear-Stress Theory for Ductile Materials	Lecture
	Tue (9-10)	Chapter 5: Failures Resulting from Static Loading: Distortion-Energy Theory for Ductile Materials	Lecture
	Thu (9-10)	Chapter 5: Failures Resulting from Static Loading: Coulomb-Mohr Theory for Ductile Materials	Lecture
8	Sun (9-10)	Chapter 5: Failures Resulting from Static Loading: Maximum-Normal-Stress Theory for Brittle Materials	Lecture
	Tue (9-10)	Chapter 5: Failures Resulting from Static Loading: Modifications of the Mohr Theory for Brittle Materials	Lecture
	Thu (9-10)	Chapter 6: Fatigue Failure Resulting from Variable Loading: Approach to Fatigue Failure in Analysis and Design	Lecture
9	Sun (9-10)	Chapter 6: Fatigue Failure Resulting from Variable Loading: Fatigue-Life Methods	Lecture
	Tue (9-10)	Chapter 6: Fatigue Failure Resulting from Variable Loading: The Endurance Limit	Lecture
	Thu (9-10)	Chapter 6: Fatigue Failure Resulting from Variable Loading: Fatigue Strength	Lecture
10	Sun (9-10)	Chapter 6: Fatigue Failure Resulting from Variable Loading: Endurance Limit Modifying Factors	Lecture
	Tue (9-10)	Chapter 6: Fatigue Failure Resulting from Variable Loading: Stress Concentration and Notch Sensitivity	Lecture
	Thu (9-10)	Chapter 6: Fatigue Failure Resulting from Variable Loading: Fatigue Failure Criteria for Fluctuating Stress	Lecture
11	Sun (9-10)	Chapter 7: Shafts and Shaft Components: Shaft Materials	Lecture
	Tue (9-10)	Chapter 7: Shafts and Shaft Components: Shaft Design for Stress	Lecture
	Thu (9-10)	SECOND EXAM	Lecture
12	Sun (9-10)	Chapter 7: Shafts and Shaft Components: Deflection Considerations	Lecture
	Tue (9-10)	Chapter 7: Shafts and Shaft Components: Critical Speeds for Shafts	Lecture
	Thu (9-10)	Chapter 7: Shafts and Shaft Components: Miscellaneous Shaft Components	Lecture
13	Sun (9-10)	Chapter 7: Shafts and Shaft Components: Limits and Fits	Lecture
	Tue (9-10)	Chapter 8: Screws, Fasteners, and the Design of Nonpermanent Joints: Thread Standards and Definitions	Lecture



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	Thu (9-10)	Chapter 8: Screws, Fasteners, and the Design of Nonpermanent Joints: The Mechanics of Power Screws	Lecture
14	Sun (9-10)	Chapter 8: Screws, Fasteners, and the Design of Nonpermanent Joints: Threaded Fasteners	Lecture
	Tue (9-10)	Chapter 8: Screws, Fasteners, and the Design of Nonpermanent Joints: Joints—Fastener Stiffness	Lecture
	Thu (9-10)	Chapter 9: Welding, Bonding, and the Design of Permanent Joints: Welding Symbols	Lecture
15	Sun (9-10)	Chapter 9: Welding, Bonding, and the Design of Permanent Joints: Butt and Fillet Welds	Lecture
	Tue (9-10)	Chapter 9: Welding, Bonding, and the Design of Permanent Joints: Stresses in Welded Joints in Torsion	Lecture
	Thu (9-10)	Chapter 9: Welding, Bonding, and the Design of Permanent Joints: Stresses in Welded Joints in Bending	Lecture

3. Grade Distribution:

Assessment	Grade	Week No.
- Midterm Exam	30%	7 th Week
-Assignments (Reports /Quizzes/ Seminar / Tutorials/ Home works)	20%	1-16 th Week
- Final Examination	50%	16 th Week

Note: Make-up exams will be offered for valid reasons. It may be different from regular exams in content and format.