Ahmedabad University

Course	MEC302 Design,Materials and Manufacturing	Semester	Monsoon Semester 2024
Faculty Name(s)	Shuja Ahmed	Contact	shuja.ahmed@ahduni.edu.in
School	SEAS	Credits	4
GER Category:		Teaching Pedagogy Enable:NO	P/NP Course: Can not be taken as P/NP

Schedule	Section 1	01:00 pm to 02:30 pm	Wed	01-08-24 to 26-11-24
		02:30 pm to 04:00 pm	Mon	01-08-24 to 26-11-24
		05:00 pm to 06:00 pm	Mon	01-08-24 to 26-11-24
		06:00 pm to 07:00 pm	Mon	01-08-24 to 26-11-24

Prerequisite	ENR203 Material Science and Engineering & ENR204 Mechanics of Rigid Bodies & MEC0000 Materials and Process of Manufacture/MEC205 Materials and Process of Manufacture & MEC206 Computer Aided Design and Manufacturing & ENR100 Visualisation & ENR101 Product Realisation
Antirequisite	Not Applicable
Corequisite	Not Applicable

Course Description	Lectures:-

Lectures:-

• An introduction to machine element design, including material selection, followed by design for manufacture and producing the component.

• Topics include design basis, along with material selection, for various mechanical components

• Introduction to Mechanical Engineering Design- Materials, Load and Stress Analysis , Deflection and Stiffness

• Failure Prevention, Failures Resulting from Static Loading, Fatigue   Failure Resulting from Variable Loading

• Design of Various Mechanical Elements:

• Keys and Couplings

• Shafts and Shaft Components

• Screws, Fasteners, and the Design of Nonpermanent Joints

• Welding, Bonding, and the Design of Permanent Joints

• Mechanical Springs

• Rolling-Contact Bearings

• Lubrication and Journal Bearings

• Gears-General

• Spur and Helical Gears

• Bevel and Worm Gears

• Levers, Clutches, Brakes and Flywheels

• Flexible Mechanical Elements

• Power Screws

• Design for Manufacture (DFM)and Assembly (DFA)

Practicals:-

• Design exercises on the above followed by generation of manufacturing drawing, process planning, and manufacturing and measurement/quality assurance; introduction to lubrication and failure analysis.

• Designing, fabricating and assembling a complete machine that comprises several components; some components will be bought out

• A team of students will be given a design mandate to design, make, assemble and operate an engineered product with several components. The design will be developed in an iterative manner using principles of design for manufacture, design for assembly, safety, noise and vibration, lubrication, etc. In the semester, each team will make 2-3 machine products. They could include microprocessor's use and/or instruments.

References:

(1)   Mech Engg Design- Shigley

	(2) Design of Machine Elements-V Bhandari (3) Design and Manufacture: An Integrated Approach- Rod Black
Course Objectives	To enable the students to comprehend (1) The concept of Mechanical Design and its various aspects. (2) The design procedure of various Mechanical components and standardization To manufacture the designed components
Learning Outcomes	At the end of the course the students will be able to (1) Comprehend the failures of Mechanical components due to various types of loading. (2) select materials for the components to be designed (3) design the components (4) bring standardization to the dimensions of components (5) apply tolerances and surface finish to the components (6) manufacture the designed components and assemble them to make products
Pedagogy	Every lecture session will consist of at least one or more of the following (1) lecture (2) problem solving (3) Discussions (4) Case studies Laboratory session will involve design, make drawings ,manufacture and assemble
Expectation From Students	Able to appreciate the importance of the subject and fulfill the course objectives

Assessment/Evaluation	- Mid-Semester Examination: - Written - 25% - End Semester Examination: - Written - 25% - Other Components: - Practical - 30% - Quiz - 10% - Assignment - 10%
Attendance Policy	As per Ahmedabad University Policy.
Project / Assignment Details	The assignments will test the ability of the students to use the knowledge comprehended in designing various components and manufacture required for the project
Course Material	
Additional Information	Nil

Session Plan

NO.	TOPIC TITLE	TOPIC & SUBTOPIC DETAILS	READINGS,CASES,ETC.	ACTIVITIES	IMPORTANT DATES
0	Topic Title	Topic & Subtopic Details	Readings, Cases, etc.	Activities	
1	Introduction and Basic concepts	Introduction to Mechanical Engineering Design- Materials,Load and Stress Analysis , Deflection and Stiffness	Book1	Lecture and interaction	
2	Failures of Machine components	Failure Prevention, Failures Resulting from Static Loading,	Book1	Lecture ,Solving problems, and interaction	
3	Failures of Machine components	Fatigue Failure Resulting from Variable Loading	Book1	Lecture ,Solving problems, and interaction	
4	Design of Mechanical Components:	Keys and Couplings	Book 2	Lecture, Solving problems, and interaction. Quiz2	
5		Shafts and Shaft Components	Book 1	Lecture, Solving problems	
6	Design of Mechanical Components	Screws, Fasteners	Book 1	Lecture ,Solving problems, and interaction.	
7	Design of Mechanical Components	Design of Non-permanent Joints	Book 1	Lecture ,Solving problems, and interaction	
8	Design of Mechanical Components	Design of Permanent Joints	Book 1	Lecture ,Solving problems, interaction	
9	Design	Design of Welded Joints	Book 1	Lecture ,Solving problems, and interaction	
10	Design of Mechanical Components	Mechanical Springs-Helical	Book 1	Lecture ,Solving problems, and interaction	

11		Mechanical Springs-Torsional	Book 1	Lecture ,Solving problems, and interaction	
12	Design of Mechanical Components	Rolling-Contact Bearings	Book 1	Lecture ,Solving problems, and interaction	
13	Design of Mechanical Components	Lubrication and Journal Bearings	Book 1	Lecture ,Solving problems, and interaction	
14	Design of Mechanical Components	Gears-General, Spur	Book 1	Lecture ,Solving problems, and interaction	
15		Mid Sem Examination			
16		Helical Gears	Book 1		
17	Design of Mechanical Components	Bevel Gears	Book 1	Lecture ,Solving problems, and interaction	
18	Design of Mechanical Components	Clutches	Book 1	Lecture ,Solving problems, and interaction	
19	Design of Mechanical Components	Clutches	Book 1	Lecture ,Solving problems, and interaction	
20	Design of Mechanical Components	Levers	Book 2	Lecture ,Solving problems, and interaction	
21	Design of Mechanical Components	Brakes	Book 1	Lecture ,Solving problems, and interaction	
22	Design of Mechanical Components	Flywheels	Book 1	Lecture ,Solving problems, and interaction	
23	Design of Mechanical Components	Flexible Mechanical Elements	Book 1	Lecture ,Solving problems, and interaction	

24	Design of Mechanical Components	Flexible Mechanical Elements	Book 1	Lecture ,Solving problems, and interaction	
25	Design of Mechanical Components	Power Screws	Book 2	Lecture ,Solving problems, and interaction	
26	Design of Mechanical Components	Power Screws	Book 2	Lecture ,Solving problems, and interaction	
27	Design of Mechanical Components	Design of Parts Subjected to Buckling	Book 2	Lecture ,Solving problems, and interaction	
28	Geometric Dimensioning & Tolerancing	Geometric Dimensioning &Tolerancing	Book 1	Lecture ,Solving problems, and interaction	
29		Reflection and review-1			
30		Reflection and review-2			
31	Lab session	Selection of Problem on Design of a product-1 and thorough study			
32	Lab session	Selection of Materials and arrival of procedure of Design			
33	Lab session	Design of the components selected			
34	Lab session	Design and standardization of the components of product-1 selected			
35	Lab Session	Preparation of Solid Model and 2D drawing			
36	Lab Session	Preparation of Solid Model and 2D drawing			
37	Lab Session	Manufacture of the components			

38	Lab Session	Manufacture of the components			
39	Lab Session	Assembly of components to make product-1			
40	Lab session	Selection of Problem on Design of a product-2 and thorough study			
41	Lab session	Design and standardization of the components of product-2 selected			
42	Lab Session	Preparation of Solid Model and 2D drawing			
43	Lab Session	Manufacture of the components			
44	Lab Session	Manufacture of the components			
45	Lab Session	Assembly of components to make product-2			