

Course Title	ADVANCED MACHINE DESIGN - I
Course Code	MD124
Course Credit	Lecture : 04
	Practical : 01
	Tutorial : 00
	Total : 05

Course Objective

The objective of the course is to -

- Apply the systematic engineering design process including, problem definition, information collection, concept generation & selection, and design configuration to design of mechanical systems and elements.
- Identify and apply applicable theoretical methods of stress and strain determination for mechanical systems and elements under various external and internal loads.

Detailed Syllabus

Sr. No.	Name of chapter & Details	Hours Allotted
SECTION - I		
1	General Design Procedure Design Philosophies, DFA, DFM, Reliability, Concurrent Engineering, Aesthetics and Ergonomics, Brief review of principal stresses, Theories of Failure. Advanced Materials, Composite Materials, ceramics and super alloys. Mechanics of Anisotropic materials.	5
2	Design based on Fatigue Design against fatigue, factors affecting fatigue behavior, Theoretical stress concentration factor and notch sensitivity factor. Fatigue under complex stresses, cumulative fatigue design. Linear damage (Miner's Rule), Manson's method.	14
3	Design based on Creep True stress and true strain, creep phenomenon, creep parameters, stress relaxation. Designing components subjected to creep.	9
	Total	28
SECTION – II		
4	Rotating Discs and Rotating Cylinder Discs with uniform thickness. Discs with uniform strength. Stresses in rotating cylinder with and without internal pressures.	8
5	Design of Circular and Non-Circular Plates with different loading conditions and supports	10

6	Fracture Mechanics: Griffith theory, Concept of SIF and K_{IC} Crack Tip Plasticity. Determination of plastic zone. size and shape. Fatigue crack propagation and life estimation	10
	Total	28

Instructional Method and Pedagogy:

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

Students Learning Outcomes:

At the end of the course the students will be able to

- Analyze and dimension both simple products as well as subsystems of more complicated mechanical products in an engineering manner.
- Apply basic criteria for designing products considering e.g. load lines, load distribution, adaptation for manufacturing.

Reference Books:

1. Metal fatigue in Engg. –Ali Fatemi, Ralph Stephens, John-wiley and sons publication.
2. Process Equipment Design-Brownell & Young
3. Mechanical Analysis & Design – Burr & Cheatham, PHI
4. Mechanical Engg. Design - Joseph E. Shigley, Charles R. Mischke, Richard G. Budynas, McGraw Hill
5. CMTI Handbook-TMH publication.
6. Process Equipment Design-Joshi
7. Machine Component Design by William Orthwin, Jayco Publication

Additional Resources

- www.nptel.iitm.ac.in