Course Plan

School : School of Engineering
Department : Mechanical Engineering
Course Code : ME 311
Course Name : Machine Design- I

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1. Abstract

This is a core course designed for the 5th Semester undergraduate students of Mechanical Engineering. This course is directly focused on the basic of mechanical design, engineering material, design of some important machine elements or mechanical system such as shat, key, coupling, joints, drives, spring etc.

Course Objectives:

- To understand different types of shafts, coupling and keys, its failures, applications and determine standard design procedure for shaft, coupling and keys.
- To understand the design aspects of belts, chains, and springs; and its failure analysis.
- To understand the standard nomenclature, forces, failures, application, design procedure of in welded, bolted and riveted joints
- To understand the standard machine components and joints subject to various related design considerations, such as safety factor, service factor, stress concentration, and both static and dynamic failure criteria.
- To understand the various manufacturing issues in design, such as limits, fits, and tolerance.

2. Prerequisite of the course: Solid Mechanics (ME 201)

3. Course Outline and Time Plan

Sl. No.	Topics	Contents	L
1	Introduction to mechanical engineering design:	Overview of machine design, Need of design, Design procedure, Stress-strain, Strength, Rigidity, Engineering materials, Material considerations in design.	2
2	Design against static load:	Mode of failure, Factor of safety, Theories of failure: Maximum normal-stress theory, Maximum shear-stress theory and distortion-energy theory	5
3	Design against fluctuating load:	Fluctuating stresses, Fatigue failure, Endurance limit, Stress concentration, Notch sensitivity, Soderberg, Goodman and Gerber diagrams, Fatigue design under combined stresses.	5
4	Design of shafts, keys and couplings:	Shaft design for stresses (axial, bending and torsional) and combined loading, Shaft materials; Introduction to axle; Types of keys, Introduction to design of keys; Design of rigid and flexible couplings	7
5	Joints:	Permanent and detachable joints, Introduction to design of welded, bolted and riveted joint; Design of cotter and knuckle joints.	6
6	Belt and chain drives:	Flat and V-belts, Belt slip and creep, Stresses in the belts, Belt materials, Chain drives.	5
7	Mechanical springs:	Helical springs, Leaf springs, Spring materials, Design against static and fluctuating load.	5
8	Manufacturing considerations:	Standardization, Limits, Fits and Tolerance.	5
		Total	**40**

Textbooks

1. Bhandari, V.B. Design of Machine Elements, 3 rd ed., McGraw-Hill Edu. (India) Pvt. Ltd., New Delhi, 2014.
2. Gope, P.C. Machine Design: Fundamentals and Applications, PHI Learning Pvt. Ltd., New Delhi, 2012.

References

1. Bhandari, V.B., Machine Design: Data book, McGraw-Hill Edu. (India) Pvt. Ltd., New Delhi, 2014.
3. Spotts, M.F. Shoup,.T.E, Hornberger,.L.E, Jayram,.S.R., Venkatesh, C.V. Design of Machine Elements, 8th ed., Pearson Education, New Delhi, 2006.
4. Norton, R.L. Machine Design – An Integrated Approach, Pearson, 2nd ed., New Delhi, 2012.
5. Budynas, R.G. & Nisbett, K.J. Shigley's Mechanical Engineering Design, Tata McGraw-Hill, 9th ed.,New Delhi, 2011.

4. Evaluation Plan

Test No.	Marks	Duration (minutes)
Sessional test I	10	-
Mid term	30	90
Sessional test II	10	--
End term	50	120
Total	**100**	

All the tests will be held as per the schedule notified by the Controller of Examinations, Tezpur University.

5. Pedagogy:

Lectures, group study and project work, Assignments.

6. Course Outcomes (COs):

On successful completion of the course, students will be able to

CO1: Analyze the forces and stresses acting on various machine components, in particular shafts, shaft couplings, keys, belts, chains, and springs; as well as in welded, bolted and riveted joints.

CO2: Analyze and design of structural joints.

CO3: Design such machine components and joints subject to various related design considerations, such as safety factor, service factor, stress concentration, and both static and dynamic failure criteria.

CO4: Understand, identify and quantify failure modes of mechanical parts.

CO5: Incorporate various manufacturing issues in design, such as limits, fits, and tolerance