Course-Plan

School : School of Engineering
Department : Mechanical Engineering
Course Code : ME 312
Course Name : Machine Design- II

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1. Abstract

This is a Second level core course designed for the 6th Semester undergraduate students of Mechanical Engineering. With the understanding of Machine Design-I, this course is directly focused on the design of some important machine elements or mechanical system such as brake and clutch system used in automobiles, gear and gear trains, flywheels, bearings, Power screw etc. The course also introduces design of machine elements using finite element method.

2. Objectives:

- To understand different types of clutches and brakes, its failures, applications and determine standard design procedure for single and multi-plate clutches and different types of brakes.
- To understand the design aspects of flywheel, stresses induced in the flywheel and its failure analysis.
- To understand the standard nomenclature, forces, failures, application, design procedure of Spur and Helical gears and to determine standard geometry under given loading condition by using design data hand book.
- To understand the standard nomenclature, forces, failures, application, design procedure of Bevel and Worm gears.
- To understand the screw nomenclature and design of power screws- geometry, loadings and stresses.
- To introduce with the finite element analysis of design of machine components using ANSYS.

3. Prerequisite of the course: Machine Design-I (ME311)

4. Course Outline and Time Plan

Sl. No.	Topics	Contents	L
1	Introduction to design process, morphology of design, designing methods	A brief introduction to: Design procedures, Material selection and Design analysis under different loading conditions.	1
2	Design of Brakes	Types of brakes, Energy absorbed by the brakes, Design of Block, Band and Disc brakes (Internal and external shoe) ; Absorption, Transmission and Torsion Dynamometer.	4
3	Design of Clutches	Classification, application and design of friction clutches, Disc or Plate clutches, Cone clutches.	4
4	Design of Flywheel	Design approach, Stresses in flywheel	3
5	Design of Gears	Design of Spur gears, Helical gears, Bevel gears and Worm gears, Lewis equation, Lewis form factor, design based on strength dynamic and wear loads, Design of Gear boxes.	12
6	Design of Bearings	Types of bearings, Ball and Roller bearings, Static and dynamic load carrying capacity, Load life relationship, Taper roller bearing, bearing materials	8
7	Design of Power Screw	Forms of thread, I.S.O. Metric screw thread, bolted joint in tension, Torque required for bolt tightening, Stresses in screw, Efficiency of screw.	4
8	Miscellaneous Topics: Overview of design of IC engine components; Introduction to the Computer Aided Design, Design using finite element analysis.	Overview of design of IC engine components Introduction to the Computer Aided Design, use of design software like pro-E and ANSYS.	4
		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.

5. Evaluation Plan

Test No.	Marks	Duration (minutes)
I	25	30
II (Major I)	40	75
III (Design Project)	25	--
Major II	60	120
Total	**150**	

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

6. Pedagogy:

Lectures, group study and project work, Assignments.

7. Expected Outcome:

After completion of this course, students shall be able to

1. apply Knowledge of Machine Design for designing and analysis of mechanical components used in Industries,

2. design and select gears for a typical application under different loading conditions and also able to analyze gears and gear trains,
3. Select, design and analyze brakes and clutch systems, flywheels for different applications,
4. understand the standard geometry, applications, failures of different kinds of bearings and based on that able to design and develop bearings as per the requirement,
5. analyze power screws used in many design applications,
6. understand the basics of finite element modelling of a typical machine element.