VII Semester

DESIGN OF TRANSMISSION SYSTEMS

(PROFESSIONAL ELECTIVE-V)

Course Code: 19ME1174

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Course Outcomes: At the end of the course, the student will be able to
CO1: Select chain drives and wire ropes
CO2: Calculate dimensions of helical and bevel gear teeth
CO3: Explain basic concepts, applications and design of power screws.
CO4: Design speed reducer gear box
CO5: Design piston and connecting rod

UNIT- I **12 Lectures**

Introduction to transmission systems: Overview
Chain Drives: Types of chains, sprocket design and dimensions, design of chain drives, chordal effect in chains, power rating of roller chains.
Wire Ropes: Types of wire ropes, wire diameter and rope cross-section, selection of steel wire ropes, factor of safety, stresses in wire ropes.

Learning Outcomes: At the end of this unit, the student will be able to
1. describe the different types of chains (L2)
2. select suitable chain drive and apply chordal effect in chains (L4)
3. calculate the various stresses induced in wire ropes (L3)

UNIT- II **12 Lectures**

Helical Gears: Tooth load components in helical gears, beam strength and Lewis equation, effective tooth load, velocity factor (Barth's equations), Buckingham's equation, wear strength of helical gears.
Bevel Gears: Types of Bevel Gears, bevel gear terminology, analysis of bevel gear, force analysis, beam strength and wear strength of bevel gears, effective load on gear tooth.

Learning Outcomes: At the end of this unit, the student will be able to
1. apply Lewis equation in the design of helical gears (L3)
2. analyze beam strength and wear strength of bevel gears (L4)
3. determine effective tooth load on bevel gears (L3)

UNIT- III **10 Lectures**

Power Screws: Threads in Power screws, terminology, standard dimensions of power screws, torque values, self-locking and efficiency of power screw, friction collar and coefficient of friction, efficiency of self-locking screw, differential and compound power screws, power required for lifting or lowering loads.

Learning Outcomes: At the end of this unit, the student will be able to
1. calculate the torque required for lifting and lowering the load for a given application (L3)
2. explain the difference between differential and compound screws (L2)
3. determine the efficiency of power screws (L3)

UNIT- IV **8 Lectures**

Design of Gear boxes: Multi-stage speed reducers, Multi-speed Gear boxes, Mechanical speed variation: Maximum and Minimum speed, structural formula, structural diagram (speed diagram), kinematic layout, Ray diagram, design procedure for Multi-speed gear box.
Learning Outcomes: At the end of this unit, the student will be able to
1. explain procedure for design of multi-speed gear boxes (L2)

2. differentiate between speed reducer and other gearboxes (L2)
3. design of gear boxes (L6)

UNIT-V **8 Lectures**

Design of IC Engine Components (Complete design): Design of Piston, Connecting rod, Crankshaft.

Learning Outcomes: At the end of this unit, the student will be able to

1. design piston for given loads (L6)
2. calculate various stresses induced in the connecting rod (L3)
3. design different types of crankshafts (L6)

Text Books:

1. Kamaraju Ramakrishna, *Design of Machine Elements*, 1st Edition Oxford University press, 2017. (Unit I to IV)
2. P.C. Sharma and D.K. Agarwal, *Machine Design*, S.K. Kataria and Sons, 9th Edition, 1999, Reprint 2008. (Unit-V)

Reference Books:

1. Shigley, J.E and Mischke, C.R, *Mechanical Engineering Design*, 3rd Edition, Tata McGraw-Hill, 2005.
2. Maleev and Hartman's, *Machine Design in SI Units*, Ed. Grover, CBS series publishers, 6th Edition, 2015.
3. V.B. Bhandari, *Design of Machine Elements*, 3rd Edition, Tata McGraw-Hill, 2010.

Note : Design data book is permitted during the examination.