III B.TECH - II SEMESTER

DESIGN OF MACHINE MEMBERS - II

Course Code: ME6T2 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 Period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- To introduce the concept, procedures, and data to analyze machine elements in power transmission systems.
- To apply principles of design to mechanical power transmission elements such as shafts, keys & couplings, bearings, belts and gears.
- Analyze the mechanical power drives by considering the stresses and interrelationships among the elements.
- Implement basic principles for design of power screws

COURSE OUTCOMES

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

1. Analyze and Design shafts keys and couplings under loading conditions
2. Select suitable bearings and its constituents from manufacturers catalogues under given loading conditions
3. Select suitable belt drives and associated elements from manufacturers catalogues under given loading conditions
4. Analyze wire ropes and power screws subjected to loading
5. Apply the design concepts to estimate the strength of the gear

Pre Requisites: Design of machine Members-I, Kinematics of Machinery

UNIT I

SHAFTS:

Design of solid and hollow shafts for strength – For Bending, Torsion, Combined bending and torsion and combined bending, torsion and axial loads

KEYS & COUPLINGS:

Types of Keys, Design of square and flat keys, Rigid couplings – Muff, split muff and Flange couplings, Flexible coupling- Bushed-Pin Flexible coupling

UNIT II

SLIDING CONTACT BEARINGS:

Types of Bearings, Bearing materials, Lubrication, types of lubricants, properties of lubricants, Journal bearing design (using Mckee's equation and Raimondi and Boyd charts & tables)

ROLLING CONTACT BEARINGS:
Types of Bearings, Static load, Dynamic load, Equivalent radial load, selection of bearings from Manufacturers catalogue

UNIT III
BELT DRIVES:
Flat belts, Belt constructions, Geometrical relationships, Analysis of belt tensions, condition for maximum power, Selection of Flat belts from manufacturer's catalogue V Belts, Selection of V-belts from manufacturer's catalogue, Chain drives, Selection of chains from manufacturer's catalogue

UNIT IV
WIRE ROPES:
Wire ropes construction, classification, Designation, stresses in wire ropes, selection of wire ropes
POWER SCREWS:
Forms of threads – Torque required to lift and lower the load, self-locking screw, efficiency, collar friction, Design of screw and Nut, Design of Screw Jack

UNIT V
SPUR GEARS:
Classification of gears, Terminology of spur gear, Force analysis, Gear tooth failures, Beam Strength of gear teeth, Dynamic tooth Load, wear tooth load, Lewis Equation.
HELICAL GEARS:
Terminology of helical gears, force analysis, Beam Strength of helical gears, effective load on gear tooth, wear strength of helical gears, Lewis Equation.

Learning resources

Text books:

1. Design of Machine Elements, (3rd Edition) by V.B. Bhandari, Tata McGraw Hill Publishers, New Delhi, 2014.
2. Machine Design an Integrated Approach, (5th Edition) Robert L. Norton, Pearson Education Limited, New Delhi, 2013.

Reference books:

1. A Textbook of Machine Design (SI Units) (12th Edition) by P. C. Sharma, Dr. D. K. Aggarwal, S. K. Kataria & Sons, New Delhi
2. Mechanical Engineering Design, (8th Edition) by Joseph Shigley, Charles R Mischke, Tata McGraw Hill Publishers, New Delhi, 2008.
3. Design of Machine Elements by C. S. Sharma, Kamlesh Purohit, Prentice Hall of India Private Limited (PHI), New Delhi, 2009.
4. A Textbook of Machine Design by R S Khurmi, J K Guptha, (25th Edition), S Chand & Company Ltd., New Delhi, 2005.

DATA BOOKS TO BE ALLOWED IN EXAMINATION:

1 Design data hand book by K Mahadevan & K Balaveera Reddy, (4th Edition), CBS Publishers, 2013.

2 Design Data Hand Book, (First Design Data Hand Book, (First Edition),

S. Md. Jalaluddin, Anuradha Publications, Chennai, 2009.