B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME64c – DESIGN OF TRANSMISSION SYSTEMS

(Professional Elective-II)

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Course Objectives: The objectives of the course are to make the students learn about

- Explain the various elements involved in a transmission system.
- Focus on the various forces acting on the elements of a transmission system.
- Design the system based on the input and the output parameters.
- Produce working drawings of the system involving pulleys, gears, clutches and brakes.
- Demonstrate the energy considerations in the design of motion control elements.

UNIT – 1: Flexible power transmission systems 10 Hrs

Flexible power transmission systems: Design of Belts – Flat Belts and Pulleys – V Belts and Pulleys – Design of chain drives – Wire ropes.

Design of bearing: Design of sliding contact bearing using Sommerfield number – Design using Mckee's equation – Selection of rolling contact bearings.

Learning Outcomes:

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

- Demonstrate the importance of bearings in the transmission system. **L2**
- Design sliding contact bearing using Somerfield number **L4**
- Solve problem on design of sliding contact bearing using Mckees's equation. **L3**
- Identify the factors required for the selection rolling contact bearings **L2**
- Choose various types of flexible power transmission systems. **L3**

UNIT – II: Spur and Helical gears 10 Hrs

Spur and Helical gears: Gear geometry – Kinematics – Forces on gear tooth – Stresses in Gear tooth – Selection of gear material based on bending stress and contact stress – Design of Spur gear – Power transmitting capacity, Parallel Helical Gears – Kinematics – Tooth proportions – Force analysis – Stresses in Helical gear – Design of helical gear – Crossed Helical gears.

Learning Outcomes:

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

- Explain Kinematics of different types of gears. **L2**
- Predict various forces and stresses acting on the gear tooth. **L3**
- Select materials for a gear based on bending and contact stresses **L3**
- Analyze the power transmitting capacity of a gear. **L4**
- Design a spur gear **L5**

UNIT – III: Bevel and Worm gears 8Hrs

Bevel and Worm gears: Straight Bevel gears – Kinematics – Force analysis – Stresses in straight bevel gear tooth – Design of bevel gear – Worm gearing – Kinematics – Forces - Friction and Efficiencies – Stresses in worm gear tooth.

Learning Outcomes:

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

- Identify the differences between the helical gear and a bevel gear. **L2**
- Solve problems on the design of helical gear. **L3**
- Explain the kinematics of helical, straight bevel gears and worm gears. **L3**
- Predict the various forces acting on the worm gear tooth. **L3**
- Select of helical, bevel and worm gears in power transmission **L3**

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UNIT – IV: Design of gear boxes **8 Hrs**

Design of Speed reducers – Design of multi speed gear boxes for machine tools – Structural and ray diagrams.

Learning Outcomes:

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

- Select the speed reducers in power transmission. **L3**
- Design speed reducers. **L5**
- Design of multi speed gear boxes for various applications. **L5**
- Draw ray diagrams of gear boxes. **L2**

UNIT – V: Elements of motion control **8 Hrs**

Internal – Expanding Rim clutches and Brakes – External – Contracting Rim clutches and Brakes – Band type Clutches – Cone clutches and Brakes – Energy considerations – Temperature rise – Friction materials.

Learning Outcomes:

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

- Explain on elements of motion control. **L2**
- Outline the importance of clutches and brakes in power transmission. **L2**
- Model various types of clutches and brakes. **L3**
- Solve problems on the design of clutches and brakes **L3**
- Calculate the temperature wise due to friction and select materials according. **L4**

Text Books:

1. Joseph Edward Shigley and Charles, R. Mischke, Mechanical Engineering Design, McGraw –Hill International Editions, 2000.
2. Machine Design- an integrated approach, (5th Edition) by Robert L. Norton, Pearson publisher, 2000

Reference Books:

1. Design Data, PSG College of Technology, DPV Printers, Coimbatore, 2005.
2. Malisa, Hand Book of Gear Design, Tata Mc Graw Hill, International Edition, 2000.
3. V.B. Bhandari , Design of Machine elements, Tata Mc Graw Hill, 2001.

Course Outcomes:

At the end of this Course the student will be able to

- Design pulleys, chain drives, rope drives and belt drives. **L5**
- Determine performance requirements in the selection of commercially available transmission drives. **L4**
- Design Brakes and Clutches **L4**
- Design various types of gear boxes. **L5**
- Select materials for various applications in the transmission elements. **L3**

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