Course Code	18ME64	Course Title	Machine Design-II	Semester	VI
Credits	4	L – T – P –TL*	4 – 1 – 0 – 5	Teaching Hrs	56
Total Marks	100	CIE*	40	SEE*	60

***NOTE: L – Lecture; T – Tutorial; P – Practical; TL – Total;**
CIE – Continuous Internal Evaluation; SEE – Semester End Examination

Course Learning Objectives: This course will enable students to: • Select transmission elements like gears, belts, pulleys, bearings from the manufacturers' catalogue. • Design completely a mechanical system integrating machine elements. • Produce assembly and working drawings of various mechanical systems involving machine elements like belts, pulleys, gears, springs, bearings, clutches and brakes.	**Teaching Hrs**
Module-1 **Introduction Curved Beams**: Winkler - Bach equation, Stresses in curved beams of standard cross sections used in crane hook, Punching presses and clamps. **Springs:** Types of springs - Stresses in coiled springs of circular and non-circular cross sections and concentric springs. Springs under fluctuating loads, Leaf and carriage springs. Stress in Leaf springs. Torsion, Belleville and Rubber springs.	**12**
Module-2 **Gear drives:** Classification of gears, materials for gears, standard systems of gear tooth, lubrication of gears, and gear tooth failure modes. **Spur Gears:** Definitions, stresses in gear tooth: Lewis equation and form factor, design for strength, dynamic load and wear. Helical Gears: Definitions, transverse and normal module, formative number of teeth, design based on strength, dynamic load and wear.	**12**
Module-3 **Bevel Gears:** Definitions, formative number of teeth, design based on strength, dynamic load and wear. **Worm Gears:** Definitions, types of worm and worm gears, and materials for worm and worm wheel. Design based on strength, dynamic, wear loads and efficiency of worm gear drives.	**10**
Module-4 **Design of Clutches:** Necessity of a clutch in automobile, types of clutch, friction materials and its properties. Design of single plate, multi-plate and cone clutches based on uniform pressure and uniform wear theories. **Design of Brakes:** Different types of brakes, Concept of self-energizing and self-locking of brakes. Practical examples, Design of band brakes, block brakes and internal expanding brakes.	**10**

Module-5 **Lubrication and Bearings:** Lubricants and their properties, bearing materials and properties; mechanisms of lubrication, hydrodynamic lubrication, pressure development in oil film, bearing modulus, coefficient of friction, minimum oil film thickness, heat generated, and heat dissipated. Numerical examples on hydrodynamic journal and thrust bearing design. **Antifriction bearings:** Types of rolling contact bearings and their applications, static and dynamic load carrying capacities, equivalent bearing load, load life relationship; selection of deep grove ball bearings from the manufacturers‟ catalogue; selection of bearings subjected to cyclic loads and speeds; probability of survival.	**12**
Course outcomes: After a successful completion of the course, the student will be able to: CO1: Design curved beams & springs for different applications CO2: Design spur, helical, bevel and worm gears from strength; wear considerations using standard practices and standard data CO3: Design the brakes and clutches for different applications. CO4: Design journal bearings, ball and roller bearing use standard practices and standard data to design/select them.	
Question paper pattern: • The question paper will have ten full questions carrying equal marks. • Each full question will be for 20 marks. • There will be two full questions (with a maximum of four sub- questions) from each module. • Each full question will have sub- question covering all the topics under a module. • The students will have to answer five full questions, selecting one full question from each module.	
Text Book: 1.Maleev & Hartman’s, Machine Design in SI units, 5th Edition, C B S Publications, Delhi, 2005.ISBN:9788123906379 **Reference Books:** 1. Joseph Edward Shigley, Mechanical Engineering Design, Mc. Graw Hill, 8th Edition, 2008. ISBN:9780073529288. 2. V.B.Bhandari, Design of Machine Elements, TMH, 3rd Edition2007.ISBN: 9780070681748. **Design Data Hand Books:** 1. K. Mahadevan and Balaveera Reddy, Design Data Hand Book, C B S Publications, Delhi. ISBN:9788123901626. 2. Design Data Hand Book, K. Lingaiah, McGraw Hill, 2nd edition, 2003.	