DESIGN OF TRANSMISSION ELEMENTS

Course Code	20ME3603	Year	III	Semester	II
Course Category	Program Core	Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Pre-requisites	Strength of Materials
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course outcomes: At the end of the course, the student will be able to:

CO	Statement	Skill	BTL	Units
CO1	Understand the operating principles and their merits and demerits of various transmission elements	Understand	L2	1,2,3,4,5
CO2	Select suitable belt drives, bearings and associated elements from manufacturers catalogues under given loading conditions	Apply	L3	2,3
CO3	Analyze the brakes and clutches under the given loading conditions	Apply	L3	4
CO4	Design of shafts, keys, couplings, bearings and spur and helical gear drives for the given loading conditions	Analyse	L4	1,2,5

Contribution of Course outcomes towards achievement of programme outcomes & Strength of correlations (High:3, Medium: 2, Low:1)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1									3	1
CO2	3	3	1	1									3	1
CO3	3	3	1	1									3	1
CO4	3	3	1	1									3	1

Syllabus		
Unit	Contents	Mapped COs
I	**Shafts:** Transmission Shafts, Shaft Design on Strength Basis, Shaft Design on Torsional Rigidity Basis, ASME Code for Shaft Design, 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.	CO1, CO4
II	**Belt and Chain drives:** Belts and their construction. Geometrical Relationships, Analysis of Belt Tensions, Condition for Maximum Power, Selection of Flat-belts from Manufacturer's Catalogue, Pulleys for Flat Belts, V- belts, Selection of V-belts, **Chain Drives:** Roller chains, geometric relationships, polygonal effect of chain, power rating of Roller Chains, Sprocket Wheels, design of chain drives.	CO1, CO2
III	**Rolling Contact Bearings:** Bearings, Types of Rolling-contact Bearings, Selection of Bearing-type, Static Load Carrying Capacity, Stribeck's Equation,	CO1, CO2,

	Dynamic Load Carrying Capacity, equivalent bearing load, load-life relationships, load factor, selection of bearings from manufacturer's catalogue. Bearing with Probability of Survival other than 90 Per Cent **Sliding Contact Bearings:** Types of Bearings, bearing materials, Lubrication, types of lubricants, properties of lubricants, Lubrication modes, bearing modulus, McKee's equations, design of journal bearing. Bearing Failures.	**CO4**
IV	**Friction Clutches:** Clutches, Torque Transmitting Capacity, Multi-disk Clutches, Friction Materials, Cone Clutches, Centrifugal Clutches, Energy Equation, Thermal Considerations **Brakes:** Brakes, Energy Equations, Block Brake with Short Shoe, Block Brake with Long Shoe, Pivoted Block Brake with Long Shoe, Internal Expanding Brake, Band Brakes, Disk Brakes, Thermal Considerations	**CO1, CO3**
V	**Spur Gears:** Gear Terminology, Classification of Gears, Module and Face width-power rating calculations based on strength and wear considerations **Helical Gears** – Pressure angle in the normal and transverse plane Equivalent number of teeth-. Beam Strength of Helical Gears. Wear Strength of Helical Gear	**CO1, CO4**

Learning Resources
Text Book(s):
1. V.B. Bhandari, Design of Machine Elements, 3/e, Tata McGraw Hill, 2010.
References:
1. J.E. Shigley, Mechanical Engineering Design, 2/e, Tata McGraw Hill, 1986. 2. R.L. Norton, Machine Design an Integrated approach, 2/e, Pearson Education, 2004. 3. M.F.Spotts and T.E.Shoup, Design of Machine Elements, 3/e, Prentice Hall (Pearson education), 2013.