COURSE TITLE	**MACHINE DESIGN-II**
COURSE CODE	**01ME2603**
COURSE CREDITS	**5**

Objective:

1 The objective of this course is to equip students with the knowledge and skills required to design key mechanical components such as I.C. engine parts, rolling contact bearings, and various types of gears and gearboxes.

Course Outcomes: After completion of this course, student will be able to:

1 Apply fundamental design principles to determine the dimensions and stresses in I.C. engine components such as cylinder, piston, connecting rod and crankshaft.

2 Analyze the performance in rolling contact bearings under various loading and speed conditions, using standard design procedures.

3 Evaluate the suitability of spur gear materials and design parameters for specific power transmission requirements in mechanical systems.

4 Apply standard equations and design methodologies to calculate the size and strength of helical gears considering static and dynamic loading.

5 Analyze the layout and transmission ratio in gearboxes using ray diagrams and geometric progression to meet operational speed requirements.

6 Analyze the geometry, tooth terminology and load conditions of straight and spiral bevel gears.

Pre-requisite of course: Machine Design and Industrial Drafting, Machine Design-I

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	2	0	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Design of I.C. Engine Components** Introduction, selection of type of engine, engine power requirements, Design of cylinder and cylinder liners, design of cylinder head, Design of piston, piston ring, piston pin, Design of connecting rod, whipping stress in connecting rod, Design of center crankshaft and overhung crankshaft	14
2	**Design of Rolling Contact Bearings** Classification, static load carrying capacity, Stribeck's equation, dynamic load carrying capacity, Load-life relation, selection of bearing from catalogue, Design for cyclic load and speed, Bearing with probability of survival other than 90%, Lubrication for rolling contact bearing	8

Contents : Unit	Topics	Contact Hours
3	**Design of spur gears** Classification of gears, selection of type, gear terminology, Standard system of gear tooth, interference and undercutting, gear tooth failures and gear materials, Force and stress analysis, dynamic effects, fatigue strength, factor of safety, Module and face width, power rating calculation based on beam strength and wear strength consideration	8
4	**Parallel axis helical gears** Introduction, pressure angle in normal and transverse plane, helix angle, Equivalent numbers of teeth, force and stress analysis, estimating size of helical gears	4
5	**Design of gear boxes** Introduction, geometric progression, general design procedure, Selection of best structure diagram, selection of gear layout and ray diagram, Determination of number of teeth on gears	8
6	**Design of bevel gears – MOOC**** Bevel Gears: Introduction, tooth terminology, straight and spiral bevel gears, Force and stress analysis, equivalent number of teeth, safety of bevel gears	0
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**To design the ball bearing for various application.** To design the ball bearing for various application.	2
2	**To design the cylindrical roller bearing for various application.** To design the cylindrical roller bearing for various application.	2
3	**To design the cylinder for given requirements of an engine.** To design the cylinder for given requirements of an engine.	2
4	**To design the tapper roller bearing for given application.** To design the tapper roller bearing for given application.	2
5	**To design the spur gears for given requirements.** To design the spur gears for given requirements.	2
6	**To design the piston for given requirements of an engine.** To design the piston for given requirements of an engine.	2
7	**To design the helical gears for given requirements.** To design the helical gears for given requirements.	2
8	**To design the connecting rod for given requirements of an engine.** To design the connecting rod for given requirements of an engine.	2
9	**To design the gear box for given requirements of machine tool.** To design the gear box for given requirements of machine tool.	2
10	**To design the crank shaft for given requirements of an engine.** To design the crank shaft for given requirements of an engine.	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
11	**To design the bevel gears for given applications.** To design the bevel gears for given applications.	2
12	**Make 3-D model of any gear or bearing component using CAD Software.** Make 3-D model of any gear or bearing component using CAD Software.	2
Total Hours		**24**

Textbook :

1 Design of Machine Elements, Bhandari, V.B., Tata McGraw-Hill, 2002

2 Machine Design Data Book, Bhandari, V.B., Tata McGraw-Hill, 2002

References:

1 Design of Machinery, Design of Machinery, Norton R.L, Tata McGraw-Hill, 2001

2 Mechanical Engineering Design, Mechanical Engineering Design, Shigley J.E and Mischke C. R. , Tata McGraw-Hill, 2000

3 Machine Design, Machine Design, P.C.Sharma & D.K. Agrawal, S.K.Kataria & Sons, 2005

4 Mechanical Design: An Integrated Approach, Mechanical Design: An Integrated Approach, Ansel C. Ugural and S. K. Fenster, CRC Press, 2014

5 Fundamentals of Machine Component Design, Fundamentals of Machine Component Design, Robert C. Juvinall and Kurt M. Marshek , Wiley, 2011

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
0.00	0.00	45.00	35.00	20.00	0.00

Instructional Method:

1 Presentation

2 Animations

Supplementary Resources:

1 https://archive.nptel.ac.in/courses/112/105/112105234/

2 https://www.machinedesignonline.com/