Course Type	Course Code	Name of the Course	L	T	P	Credit
DC	MMC 202	Theory of Machines	3	1	0	11

Course Objective

The objective of the course is to present the fundamentals and applications of kinematic and dynamic analyses of different mechanisms.

- To understand the force-motion relationship in components subjected to external forces and analysis of standardmechanisms.
- To understand the concept of generalized forces and the Principle of Virtual Work.
- To develop an understanding of static & dynamic balancing, flywheel and Turning Moment diagram analysis, principlesof governors, and gyroscopic force analysis.
- To understand the effects of dynamics of vibrations and its significance on engineering design.

Learning Outcomes

Upon successful completion of this course, students will:

- have a broad understanding of kinematic and dynamic analyses of different mechanisms.
- be able to design different cam profiles for various follower motions.
- be able to design the components of a basic reciprocating engine.
- be able to analyze different mechanisms, e.g., steering gear, brake, clutch, governor, gyroscope, etc.

Unit No.	Topics to be Covered	L+T	Learning Outcome
1.	Mechanisms and machines, Kinematic pairs, Kinematic chains, Mobility of mechanisms, Equivalent mechanisms, Four-bar chain and slider crank mechanisms, and their inversions	7+2	This unit will help the students understand the basic elements of mechanisms.
2.	Velocity and acceleration analysis of planar linkages	5+2	This unit will let the students draw and analyze the velocity and acceleration of planar mechanisms.
3.	Types of cams and followers, Analysis of different motions, Layout of cam profiles	4+1	This unit will acquaint the students with the designing basics of cam profiles for different follower motions.
4.	Types of gears, Terminology and definitions of gear, Law of gearing, gear trains - Simple, Compound, Reverted, and Epicyclic	4+2	This unit will help the students understand different types of gear and analyze different types of gear trains.
5.	Hooke's joint, Steering gear mechanism, Brakes, Clutches, and Dynamometers	5+1	This unit will help the students in analyzing different types of mechanisms of lower kinematic pairs.
6.	Dynamic analysis of reciprocating engines, Turning moment diagram, Flywheel	5+1	This unit will help in the dynamic analysis of the slider crank mechanism, four-link mechanism, and the application of D'alembert's Principle in solving the problems based on dynamic mechanism.
7.	Static and dynamic balancing of reciprocating & rotary masses, Balancing of in-line engines	4+1	This unit will help the students to get acquainted with the balancing techniques of unbalanced machines.

8.	Governors and Gyroscopes	5+2	This unit will help the students understand different types of governors and their applicability. The students will get to know the critical features of various types of governors. This unit will also help in understanding the application of the gyroscopic principle in several types of machinery like airplanes, ships, and automobiles.
9.	Free, Forced, and Damped vibrations, Whirling of shaft, Vibration measuring instruments	3+2	This unit will help in understanding various types of vibrations occurring in machine components. The students will further be able to predict the force analysis in mechanical systems and related vibration issues and can able to solve the problem.

Text Books:

1. Theory of Machines and Mechanisms, by John J. Uicker, Gordon R. Pennock & Joseph E. Shigley, OxfordUniversity Press.
2. Kinematics and Dynamics of Machinery, by Robert L. Norton, McGraw Hill India.
3. Theory of Machines, by S. S. Rattan, McGraw Hill India.

Reference Books:

1. Mechanisms of Machines, by W. L. Cleghorn, Oxford University Press.
2. Theory of Machines, by R. S. Khurmi, S. Chand Publications.
3. Theory of Machines, by Thomas Bevan, CBS Publishers and Distributors.
4. Mechanical Vibrations, by G. T. Grover, Nem Chand and Bros.
5. Mechanics of Machines, by R. C. Stephens and J. Hannah and, A Butterworth-Heinemann Title.