MANIPAL UNIVERSITY JAIPUR

School of Automobile Mechanical and Mechatronics Engineering

Department of Mechatronics Engineering
Course Hand-out

Theory of Machines| MC 1309 | 4 Credits

Session: Jul- Dec 2018 | Faculty: Mohit Jain

Course Outcomes: At the end of the course, students will be able to

MC1309.1 Outline the basics of mechanisms and machines like degree of freedom along with type of mechanisms and their equivalent mechanisms.

MC1309.2 Study of velocity analysis – linear velocities of various points on different links of a mechanism as well as the angular velocities of the links.

MC1309.3 Study of acceleration analysis – linear acceleration of various links of a mechanism as well as the angular acceleration of the links which further leads to force analysis of various links of a mechanism.

MC1309.4 To analyse a gear design and gear train. To calculate speed of various gears in gear train and in differential gears.

MC1309.5 Skill development to synthesis a mechanical mechanism as per the required motion and to understand the concepts of Gyroscope.

A.   SYLLABUS

Basic Concepts: Mechanism and machine, kinematic pair, link, chain and inversions, constrained and unconstrained motions, four bar mechanism, single and double slider crank mechanisms with inversions, quick return mechanism, toggle mechanism, Hooke's coupling. Velocity and Acceleration: Solution of simple mechanisms by relative velocity and acceleration method, Cams: Types of cams, Types of followers, Cam profiles, Graphical methods for simple harmonic motion, Uniform velocity and cycloidal motion, Radial and oscillating follower, Calculation of maximum velocity and acceleration of follower, Gears: Classifications, Law of gearing, Spur gear definitions, Involute tooth profile and in voluntometry, Determination of length of path of contact, Arc of contact, Contact ratio, Interference in involute gear, Minimum number of teeth on pinion to avoid interference, Parallel and crossed helical gear, Gear trains: Simple, compound, reverted and epicyclic gear train, Solution by tabular column method only, Torque transmitted by epicyclic gear train, Bevel epicylic gear train, Differential gear drive of an automobile, Static and dynamic balancing: Balancing of revolving masses in single plane and different planes (Graphical method). Balancing of in-line and V-Engine, Governors: Characteristics of governors, Porter and proell governor, Hartnell governor, Gyroscope: Gyroscopic couple of a spinning disc. Condition for stability of a four wheeler and two wheeler.

B.   TEXT BOOKS

i.   Theory of Machines, S.S.Rattan,, McGrawHill.
ii.   Theory of Machines and Mechanisms, Joseph E. Shigley, Oxford University Press.
iii. Kinematics and Dynamics of Machinery, R L Norton, McGrawHill.
iv.   Machines and Mechanisms Applied Kinematic Analysis, David H. Myszka, Pearson.