



SECOND SEMESTER 2020-21
COURSE HANDOUT

Date: 12-01-2021

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

Course No	:	ME/MF F221
Course Title	:	Mechanisms and Machines
Instructor-in-Charge	:	J S Rathore
Tutorial Instructors	:	Amol Marathe, Amit R Singh, J S Rathore, Venkatesh KP Rao

1. Course Description:

Kinematics analysis of planar mechanism: Introduction to mechanisms, displacement, velocity, acceleration analysis, synthesis of planar mechanism, cam design, kinematics of gears, gear trains, Dynamics of machines: static force analysis, dynamic force analysis (planar), dynamics of reciprocating engines, balancing, flywheels, gyroscopes. Introduction to spatial and compliant mechanism.

2. Scope and Objective of the Course:

The first part deals with kinematics of simple mechanisms and motion generation, which lays foundation for further study in Dynamics and Vibration. The second part introduces some of basic concepts in the analysis of dynamic systems, kinetics of machine parts.

3. Text Books:

- T1: Theory of Machines and Mechanisms by Uicker J.J., Pennock G.R., Shigley J.E., Oxford Univ. Press, NY, 3rd Ed., 2003.
- T2: Theory of Mechanisms and Machines, Amitabh Ghosh and Ashok K. Malik, Allied East West Press Pvt. Ltd., 3rd Ed.

4. Reference Books:

- R1: Mechanism Design: Analysis and Synthesis, A. Erdman and G. Sandor, Prentice-Hall, 1984.

5. Course Plan:

Lecture	Topics	Reference	Learning outcomes
1- 2	Introduction to Kinematics	CH 1: T2	Degree of Freedom, Types of Kinematic Joints, Inversions, Grashof's law
3-7	Vector Polygon Method for Velocity and Acceleration	CH 2 : T2 CH 3 and 4: T1	Velocity and Acceleration Diagram of Kinematic Chain
8-10	Cam and Follower Systems	CH 5: T1 CH 8: T2	Different types of Cams, Motion Analysis and Motion Synthesis of Cam, Cam Profile drawing
11-14	Gear Trains	CH 10: T1	Direction of Rotation, Speed and Torque determination of Simple, Compound and Planetary gear systems



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Lecture	Topics	Reference	Learning outcomes
15-17	Analytical solutions of Velocity & Acceleration	CH 2, 3 and 4 (T2)	Analytical and Position Vector Method of determination of Velocity and Acceleration
18-21	Dynamic Force Analysis	CH 4 (T2)	D'Alemberts Principle, Graphical Method, Vector Method, Complex Algebra Method
22-25	Dynamics of Reciprocating Engines	CH 5 (T2)	Introduction, Gas Forces, Dynamic Analysis, Equivalent Masses, Inertia Forces, Crank Shaft, Torque Analysis
26-27	Flywheels	CH 5 (T2)	Introduction, Dynamic Theory
28-30	Gyroscopes	CH 4 (T2)	Motion of Gyroscopes, Euler's Equation
31-34	Balancing	CH 7 (T2)	Dynamic Unbalance, Single Plane, Multi-plane Balancing, Multi-cylinder Balancing
35-36	Introduction to spatial and compliant mechanism	Class notes	Elastic links, applications, Degrees of freedom

6. Evaluation Scheme:

Evaluation Component	Weightage	Date & Time
Mid sem. Exam.	30%	Refer Timetable
Tutorials	30%	Monday 1st Hour
Compre. Exam.	40%	May 7, 2021

- 7. Chamber Consultation Hour:** Will be informed separately by individual tutorial instructor.
- 8.** All notices will be communicated via email and put up on Nalanda portal.
- 9. Make-up Policy:** Make-up (Mid sem and Compre exam) will be granted only to genuine cases.
- 10. No makeup for tutorials.** Four evaluative tutorials will be conducted and best three will be considered for evaluation.

Instructor-In-Charge
ME/MF F 221