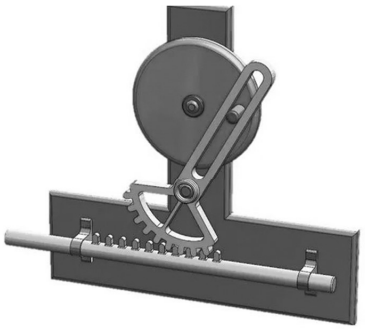
22ME204 ANALYSIS OF MECHANISMS AND MACHINES



Source: Image source: https://www.indiamart.com/proddetail/mechanism-animation-service-21076545188.html

Hours Per Week :

L	T	P	C
2	2	2	4

PREREQUISITE KNOWLEDGE: Fundamental physics, Mathematics, Engineering Drawing.

COURSE DESCRIPTION AND OBJECTIVES:

This course mainly deals with the concepts of mechanisms and machines that are commonly deployed in industries. The objective of this course is to understand the basic mechanisms and analyze the motion and forces transmitted through various mechanisms and components of machines.

MODULE-1

UNIT-1 **6L+6T+6P=18 Hours**

Mechanisms: Kinematic chains, Inversion of four bar mechanism; Kinematics and Kinetics of four bar mechanism, Steering gear mechanisms; Transmission Drives – Flywheel, Cams and gears.

UNIT-2 **10L+10T+10P=30 Hours**

Analysis of Mechanisms: Inversions of Four Bar Mechanisms, Davis Steering Gear Mechanism, Ackerman Steering Gear Mechanisms, cams with several input motions, gear trains for various applications, Engine flywheel, machine flywheel.

PRACTICES:

- To demonstrate Kinematic links, pairs, chains, mechanisms, Inversion of four bar
- mechanisms.
- To perform kinematic analysis of Four bar and It's inversions using SAM/COMSOL.
- To plot velocity diagram for four bar and slider crank mechanism.
- To Evaluate Davis steering gear mechanisms using SAM/COMSOL.

MODULE–2

UNIT-1 **6L+6T+6P=18 Hours**

Dynamics of Machines: Balancing of rotating and reciprocating masses, Balancing of single and cylinder reciprocating engines, Gyroscopic effect, Vibrations – Types, Single mass and Two mass System, critical speed of shafts

UNIT–2 **10L+10T+10P=30 Hours**

Dynamic Analysis of Machines: Balancing of Engines and Compressors, Gyroscopic Effect in Aeroplanes, Automobiles and Ships, Vibration Analysis of Spring Mass Systems, Damping Systems.

PRACTICES:

- To Analyze the Static and dynamic balancing of rotating masses using ADAMS.
- To determine unbalance mass required for complete balancing of rotor system.
- To calculate the critical speed of shafts.
- To estimate radius of gyration and the moment of inertia of connecting rod.
- To determine the natural frequency of 1DOF and 2DOF systems.

SKILLS:

- ✓ *Compute velocity and acceleration of links in mechanisms.*
- ✓ *Evaluate inertia forces on a moving machine component using ADAMS.*
- ✓ *Estimate the mass required for balancing of rotating and reciprocating machine*
- ✓ *components.*
- ✓ *Measure the resonant frequency of vibrating systems.*

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Estimate velocity and acceleration of different links of a machine.	Apply	1	1, 2
2	Analyze the inertia forces acting on different links of a machine.	Analyze	1	1, 2
3	Calculate the amount of unbalance mass in rotating and reciprocating machinery.	Evaluate	2	1, 2, 3
4	Determine the amplitude and frequency of vibrations on machine systems.	Evaluate	2	1, 2, 9
5	Develop mechanisms required for various societal applications.	Create	1,2	1,2,4,5,9

TEXT BOOKS:

1. John J. Uicker, Gordon R. Pennock & Joseph E. Shigley, “Theory of Machines and Mechanisms”, Oxford University Press, 4th Edition, 2016.
2. William T Thomson, “Theory of Vibration with Applications”, Reprint 1st Edition, 2017.

REFERENCE BOOKS:

1. J. Michael McCarthy, “Introduction to Theoretical Kinematics: The mathematics of movement”, MDA Press, 1st Edition, 2018.
2. Antonio Simón Mata, Alex Bataller Torras, Juan Antonio Cabrera Carrillo, Francisco Ezquerro Juanco, “Fundamentals of Machine Theory and Mechanisms”, Springer, 1st Edition (Reprint), 2018.