

Subject Code	Courses	L	T	P	Hrs.	Credits
ME5EL01	Kinematics and Dynamics of Machine	4	0	0	4	4

Unit 1

Analysis Vs Design: Basic concept, Phases in Design Processes Characteristics of Mechanical design, Considerations in design, Formulations of mechanical design problem, Modelling of mechanical systems: Physical and Mathematical models, Identification of variables and parameters, Numerical simulations.

Unit 2

Failure Analysis: Theories of failure (MNS, MSS, DET), Coulomb-Mohr Theory, Prevention of failures, Understanding failures under Static loading. Dynamic Loading And Its Behavior: Fatigue strength, S-N curve, Goodman, Gerber and Soderberg relations, modified Goodman.

Unit 3

Introduction to Kinematics: Analysis and Design of Mechanisms, Mechanisms and machines, Mobility of mechanisms, four bar chain, Inversions: Single slider crank chain, double slider crank chain. Velocity and Acceleration Analysis: Instant centers of velocity, velocity of slip, Analytical solutions for velocity analysis, Coriolis Acceleration.

Unit 4

Graphical Analytical Linkage Synthesis: Two position synthesis for rocker output, Three position synthesis, Position synthesis for more than three positions (four and six bar quick return), Coupler curves, Exact and approximate straight line mechanisms. Two position synthesis for rocker output, Comparison of analytical and graphical two position synthesis, three position syntheses.

Unit 5

Mechanical Component Design analysis and Balancing: CAM Design: SVAJ diagrams, Double and single dwell cam design. Design of Gears and Bearings, Interference in gears, Differential gear train, Rolling contact, Sliding contact. Primary balancing (Balancing of rotating system), Secondary balancing, balancing for two cylinder engine, multi cylinder engine, 4 cylinder 4stroke engine, 6 cylinder engine, V-engine.

Unit 6

Surface Failures: Adhesive, Abrasive, Corrosive, Surface fatigue. Analysis And Synthesis Of IC Engine Components: Machine tool and IC engine components, Engine Dynamics, Case studies.

Text / References:

1. Kinematics and Dynamics of Machinery -RL. Norton, Tata McGraw Hill, 2009
2. Machine Design an Integrated Approach -RL. Norton, Pearson , 2004
3. Mechanical Engineering Design -Shigley et al., Tat McGraw Hill, 2011