

Dynamics of Machinery

Course Code:	28512
Number of Credits:	3
Type of Course:	Theoretical
Prerequisite:	Dynamics
Course length:	51 hours

Outline:

1- Basic Concepts in Kinematics:

Definition of mechanisms and machines; lower-pair and higher-pair connectors; planar linkages; spatial linkages; four-bar linkage; slider-crank mechanism; six-bar chains; kinematic chains; floating members; kinematic inversion; degrees of freedom; transmission, deviation, and pressure angles; cams and followers; cams profiles; gear trains; planetary gear trains; instantaneous centers; center of curvatures; the Euler-Savary equation; the inflection circle; equivalent linkages.

2- Kinematic Analysis of Planar Mechanisms:

Analytical Method:

Position analysis of linkages using algebraic method; displacement, velocity, and acceleration analysis of linkages and cams using complex polar vector notation; velocity analysis of gears, planetary gear trains, and gearboxes.

Graphical Method:

Velocity diagram; velocity analysis using instantaneous centers; acceleration diagram; velocity and acceleration diagrams using auxiliary points.

3- Dynamic Analysis of Planar Mechanisms:

Impressed forces including gravity; reaction forces including friction; static force analysis; kinetic energy; flywheels; inertia forces and inertia torques; gyroscopic effects; balancing of rotary systems; balancing of reciprocating systems; dynamic force analysis.

References:

- [1] P.E. Nikravesh, “*Computer-Aided Analysis of Mechanical Systems*”, Prentice Hall, Inc., 1988.
- [2] R.L. Norton, “*Design of Machinery*”, McGraw-Hill, Inc., 1992.
- [3] J.E. Shigley and J.J. Uicker, “*Theory of Machines and Mechanisms*”, McGraw-Hill, Inc., 1995.
- [4] D.H. Myszka, “*Machines and Mechanisms*”, Pearson Education, Inc., 2005.