



Course Name:

Dynamics

Course Number: 20-012	Credit: 3
Program: Undergraduate	Course Type: Technical required
Prerequisite: Statics	Corequisite: -

Course Description (Objectives):

The main objective of this course is to develop the capacity to predict the effects of force and motion when analyzing an engineering problem. In fact, Dynamics is that branch of mechanics which deals with the motion of bodies under the action of forces. The study of dynamics in engineering usually follows the study of statics, which deals with the effects of forces on bodies at rest. Dynamics has two distinct parts: *kinematics*, which is the study of motion without reference to the forces which cause motion, and *kinetics*, which relates the action of forces on bodies to their resulting motions. A thorough comprehension of dynamics will provide one of the most useful and powerful tools for analysis in engineering.

Course Content (outline):

- **Introduction to Dynamics**
History and Modern Applications, Basic Concepts, Newton's Laws, Units, Gravitation, Dimensions.
- **Kinematics of Particles**
Introduction, Rectilinear Motion, Plane Curvilinear Motion, Space Curvilinear Motion, Relative Motion (Translating Axes), Constrained Motion of Connected Particles.
- **Kinetics of Particles**
Introduction, Force, Mass, and Acceleration, Work and Energy, Impulse and Momentum, Impact, Central-Force Motion, Relative Motion.
- **Plane Kinematics of Rigid Bodies**
Introduction, Instantaneous Center of Zero Velocity, Motion Relative to Rotating Axes.
- **Plane Kinetics of Rigid Bodies**
Introduction, Force, Mass, and Acceleration, Work and Energy, Virtual Work, Impulse and Momentum.
- **Vibration and Time Response**



Introduction, Free Vibration of Particles, Forced Vibration of Particles, Vibration of Rigid Bodies.

References:

- Engineering Mechanics, Dynamics, James L. Meriam, L. G. Kraige & J. N. Bolton, 9th Edition, John Wiley & Sons, Inc., 2018.
- Dynamics of Structures, Theory and Applications to Earthquake Engineering, Anil K. Chopra, 5th Edition, Pearson Education Limited, 2020.
- Vector Mechanics for Engineers, Statics and Dynamics, Ferdinand P. Beer, E. R. Johnston, D. F. Mazurek, P. J. Cornwell & B. P. Self, 11th Edition, McGraw-Hill Education, 2016