



# Intermediate Dynamics

## MECHENG 5030

**Credit Hours:**

3.00

---

**Course Levels:**

Undergraduate (1000-5000 level)

Graduate

---

**Course Components:**

Lecture

---

**Course Description:**

This course emphasizes dynamics of single/multi-degree-of-freedom systems, including particles and rigid bodies, and is aimed as an extensive introduction to the principles of analytical mechanics. Of particular interest is the investigation of Lagrange's equations of motion for particles and rigid bodies.

---

**Prerequisites and Co-requisites:**

Prereq: 2030, or permission of instructor.

---

**Course Goals / Objectives:**

- Achieve a high level of competency in analyzing and solving dynamics problems in stationary and moving reference frames, through the proper set-up and execution of Newton-Euler equations.
  - Develop the ability to establish various forms of Lagrange's equations of motion for discrete mechanical systems.
  - Develop the ability to understand the relationship/equivalence between Lagrange's and Newton-Euler equations of motion
  - Develop a strong understanding of the principles of variational calculus, and Lagrange and Hamilton formalisms
  - Develop the ability to simulate the dynamics of systems whose motion is described using Lagrange's & Newton-Euler equations.
  - Develop the ability to derive and solve differential equations describing small motions about equilibria in dynamical systems.
-

**Course Topics:**

- Kinematics of Particles
  - Kinematics of Rigid Bodies
  - Dynamics of Particles and Rigid Bodies
  - Introduction to Analytical Mechanics
  - Introduction to Variational Calculus
  - Lagrange's Equations
  - Ideas on Friction, and Animations using Matlab
- 

**Designation:**

Elective