

# 動力學 (Dynamics) 課程綱要

## I Newtonian Dynamics

Space and Time, Kinematics of Particles, Newton's Laws, Balance Laws of Motion of a Particle, Pendulum Problems, Motion in Central Force Field, Law of Universal Gravitation, Motion of System of Particles, The Many Body Problems

## II. Motion of Rigid Body in a Moving Reference Frame

Kinematics of Rigid Body, Rotation of Coordinate System in Space, Rotation of Vector in Space, Motion relative to a Moving Coordinate System  
Motion on the Surface of Earth

## III Dynamics of a Rigid Body

Dynamic Specification of a Rigid Body, Equations of Motion, Motion of a Top, Sliding and Rolling of Rigid Bodies, Collisions of Rigid Bodies

## IV Lagrangian Dynamics

Constraints and Generalized Coordinates, Principle of Virtual Work, D'Alembert's Principle, Lagrangian Equation for Holonomic Systems, Lagrangian Equations for Non-holonomic Systems, Cyclic Coordinates and Routh's Method,

## V Hamiltonian Dynamics

Calculus of Variations, Hamilton's Principle, Legendre's Transformation, Hamilton's Equations, Hamiltonian and Conservation Laws, Small Oscillations, Free vibration and Forced Vibration

**Grades:** Midterm (35%), Final (45%), Homework (20%)

Text Book & References:

© A. L. Fetter & J. D. Walecka, *Theoretical Mechanics of Particles and Continua* (Ch.1-3, 5, 6), McGraw-Hill, Taiwan Edition, 1996.

1. H. Goldstein, *Classical Mechanics* (2nd Ed., Ch.1-5, 8), Addison & Wesley, 1980.

2. L. Meirovitch, *Methods of Analytical Dynamics* (Ch.1-4), McGraw-Hill, 1994.

3. B. Lindsay & S. Margenau, *Foundations of Physics*, Dover, 1959.