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.