Fall 2011

Institute of Applied Mechanics
National Taiwan University

Dynamics (M4010)

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Schedule：Tu (3,4), Th (2) at IAM#109

This course is intended to familiarize the students with the basic concepts, principles and methods of *dynamics* at the intermediate level. It is a self-contained course open to senior undergraduate and graduate students in all fields of science and engineering. Prerequisites are calculus, engineering mathematics (vector, matrix and ordinary differential equation) and a course on dynamics at first level.

Outline：

A. Dynamics of Particles

Space and Time, Euclidean Space and Tensors, Kinematics and Newton's Laws of a Particle, Motion of a System of Particles, The Pendulum Problem, Motion in a Central Force Field, Dynamics of a Particle in a Moving Frame of Reference, System of Variable Masses

B. Dynamics of Rigid Bodies

Conservation of Mass, Euler's Postulates and Balance Laws of Linear and Angular Momentum, Kinematics of Rigid Bodies and Finite Rotation, Moment of Inertia and Kinetics for Rigid Bodies, Sticking, Sliding and Rolling of Rigid Bodies, Gyroscopic Motion, Collisions of Rigid Bodies

C. Principles of Mechanics

Principle of Virtual Work, D' Alembert's Principle, Lagrangian Equations for Holonomic and Non-Holonomic Systems, Stability, Gibbs-Appell Equations, Spinning Top, Two Rolling Wheels Connected to a Rigid Rod

D. Hamiltonian Dynamics and Small Oscillation

Hamilton's Principle, Legendre Transformation, Hamiltonian Equations and Conservation Laws, Small Oscillation (optional)

References

1. **A. L. Fetter & J. D. Walecka, *Theoretical Mechanics of Particles and Continua*, McGraw-Hill, New York, 1980**.
2. H. Goldstein, *Classical Mechanics*, Addison & Wesley, Reading, 1980
3. B. Lindsay & S. Margenau, *Foundations of Physics*, Ox Bow Press, Woodbridge, 1981.
4. Classnotes

Grades：Midterm (30%), Final (50%), Homework (20%)