Syllabus: PHY509 – Classical Dynamics

(Fall 2005, MWF:4.00-4.50 PM, 219 Fronczak)

Lecturer:

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Textbooks:

main: "Theoretical mechanics of particles and continua" by Fetter and Walecka (F+W)
optional: "Classical Mechanics (3rd Ed.)" by H. Goldstein *et al.*

Grading Policy:

Attendence/Participation: 10 %
Homework: 30 %
Mid-term exam: 30 %
Final exam: 30 %

Introduction:

Classical mechanics has played the role of the underlying structure of all physics, not only in terms of building intuitions for physics as an exact science but also of providing mathematical frameworks as a theoretical tool. Everything in classical mechanics falls back into the Newton equation, $\mathbf{F} = m\mathbf{a}$. More elaborate and mathematical theories (Hamiltonian dynamics) derived from the Newton equation provide the bridge to modern physics. In the class, we will focus on the various formulation of mechanics, namely the Langrange and Hamilton formulations, and discuss its implications in the modern physics.

We will follow the text of Fetter and Walecka. This textbook covers the core classical mechanics subjects on graduate level concisely. Problem sets will consist of mostly 2 problems.

Lecture schedule (with one mid-term and final exams):

08/29-09/02	Introduction/Newton Mechanics
09/05-09/09	Central Force Problem
09/12-09/16	Scattering
09/19-09/23	Accelerated Coordiante System
09/26-09/30	Lagrangian Mechanics
10/03-10/07	Lagrangian Mechanics
10/10-10/14	Small Oscillations
10/17-10/21	Rigid Body
10/24-10/28	Rigid Body
10/31-11/04	Hamiltonian's Principle
11/07-11/11	Hamiltonian's Principle
11/14-11/18	Canonical Transformation
11/21-11/25	Canonical Transformation
11/28-12/02	Hamilton-Jacobi Theory
12/05-12/09	Adiabatic theorem, Liuville theorem
12/12-	Finals week