Physics 321b

Classical Mechanics II
Midterm: TBD, (likely to be after the reading break)

3 hrs/week, lectures begin on Jan 6, 2015.

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Recommended Texts:
L.D. Landau & Lifshitz, *Mechanics*, Volume I of the series
H. Goldstein *Classical Mechanics*

NB: The book by L&L is very concise, and has few examples. H. Goldstein has more examples.

Homework

Home assignments is an important part of the course, and contribute heavily to the final grade. Make sure that you hand in the assignment on time. Late assignments are not accepted.

Practice Problems

In preparation for the exams (midterm and final), practice problems will be provided.

Grades

The course grade will be determined from various components of the course in the following way:
(a) The homework assignments will count for 20 %.
(b) The midterm exam will count for 15 %.
(c) The labs will count for 15 %.
(d) The final will count for 50%. *One has to pass the final exam to get a passing grade.*

NB: Use of calculators in exams. On all examinations the only acceptable calculator is the Sharp EL-510R. This calculator can be bought in the Bookstore for about $10. DO NOT bring any other calculator to the examinations.

Tentative Schedule

1. Introduction, Review of Phys321a.

Review of main concepts of classical mechanics

2. Lagrange mechanics

Action and Lagrange function. Generalized coordinates
Hamilton's principle. Euler-Lagrange equations. Conservation laws.
Application of Lagrange mechanics to simple[st] systems

3. From point particles to solid bodies

Main conepts of solid body motion.
Euler's angles and Euler's equations

4. Particle in external EM and gravitational fields

Action for a free relativistic particle
EM fields in the action via the vector-potential
Equations of motions; solutions for simple field configurations
Backreaction of radiation on particle trajectory
Small perturbations of Keplerian orbits

5. Hamilton dynamics

Legendre transformations, Hamilton function and Hamilton's EOM
Poisson brackets
Canonical transformations and application to simple problems
Action as a function of coordinates
Maupertuis principle (another form of "least action")
Hamilton-Jacoby Equation

6. Adiabatic processes and applications

Adiabatic invariants; action-angle variables
Liouville's therem
Notion of Boltzmann equation, particle scattering and collision integral

7. From point particles to fields - time permitting

Lagrange density for the scalar and vector fields
Derivation of Maxwell's equations from variational principle
Least action for the ray of light