Revised 12/10/2004

PH 461/561 Classical Mechanics I

Fall Semester 2004

Instructor and Office Hours:
Dr. Renato Camata, camata@uab.edu, Thursdays 11:00am – 12:00pm (CH 343)
(Other times by appointment)

Textbook: Analytical Mechanics, 6th edition, Fowles & Cassiday

Other useful books: Mechanics
K. R. Symon
Addison-Wesley

Classical Dynamics of Particles and Systems
J. B. Marion
Academic Press

The Feynman Lectures on Physics vol 1.
R. P. Feynman, R. B. Leighton, M. Sands
Addison-Wesley

Course Description: Kinematics and dynamics, including central forces, rotating coordinate systems, and generalized coordinates. Lagrangian and Hamiltonian formulations of mechanics.

Prerequisite: PH 222 and MA 252

Web Page: http://www.phy.uab.edu/~rcamata/PH461-561.htm
(Class information and grades will be posted on this web page)

Course Grade:
50% - Problem Sets
50% - Exams (Three exams – equal weight)
Turning in all assigned work is a necessary condition for an **A** grade

Homework Policy:
Group work and discussions prior to turning in homework are appropriate.

Work for extra credit:
No additional work will be assigned for extra credit

Special accommodations:
Please contact Dr. Camata for an appointment to discuss special accommodations.

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Course outline

1. Vector Analysis (Text Chapter 1)
   (a) Vector algebra
   (b) Scalar and vector products
   (c) Derivative of a vector
   (d) Cartesian, cylindrical and spherical coordinates

2. Newtonian Mechanics: Particle motion in one dimension (Text Chapter 2)
   (a) Newton's laws of motion
   (b) Constant force
   (c) Position-dependent forces
   (d) Velocity-dependent forces
   (e) Time-dependent forces

3. Oscillations (Text Chapter 3)
   (a) Harmonic motion
   (b) Damped harmonic motion
   (c) Force harmonic motion

4. Newtonian Mechanics: Particle motion in three dimension (Text Chapter 4)
   (a) Conservative forces
   (b) Separable forces
   (c) Harmonic oscillator in three dimensions
   (d) Charge particles in electric and magnetic fields
   (e) Constraints

5. Non-inertial frames of reference (Text Chapter 5)
   (a) Accelerated translation and rotation of coordinate systems
   (b) Laws of motion and the Earth's rotation
   (c) The Foucault Pendulum

6. Central forces and Celestial Mechanics (Text Chapter 6)
   (a) Gravitation
   (b) Central force problems
   (c) Scattering

Addendum (12/10/04):
(The following sections will be added to PH 461/561 Syllabus for Fall 2005)

Course Activities:** This course will comprise formal lectures integrated with classroom discussions and written problem-solving exercises assigned bi-weekly by the instructor. Through these activities, undergraduate students enrolled in **PH 461** are expected to acquire a solid understanding of classical mechanics and a high degree of problem-solving skills in the subject. Graduate students enrolled in **PH 561** will be

required to demonstrate this same proficiency of **PH 461** students and, in addition, develop an advanced level of problem-solving skills in this area by completing an Advanced Project. This Advanced Project will consist in the solution of a complex real-world mechanics problem. Students will be allowed to choose their Advanced Project topic from a list of proposed problems made available by the instructor during the third week of classes. Alternatively, **PH 561** students may also be allowed to work on an Advanced Project problem inspired by their graduate research, if applicable, or other advanced mechanics problems of their interest. The design and scope of the specific problem to be solved in the Advanced Project requires the approval of the instructor and this decision must be finalized by the end of the third week of classes. Students will have the remainder of the semester to complete their Advanced Project and will be encouraged to integrate the knowledge and skills developed in this course with learning experiences from other courses and/or research activities.

Course Grade:**

PH 461 *(Undergraduate)*	**PH 561** *(Graduate)*
50% - Problem Sets	25% - Problem Sets
50% - Exams*	50% - Exams*
-	25% - Advanced Project

* Three exams – equal weight
** These additional activities for PH 561 students (i.e., Advanced Project) and corresponding grading standards will be introduced in Fall 2005.