Syllabus, Physics 451, Intermediate Mechanics I, 3 credits

Designation: Required for undergraduate Physics majors and Engineering Physics majors.

Course Description: Vector calculus, Lagrangian and Hamiltonian formulations of Newtonian mechanics. Topics include central force motion, dynamics of rockets and space vehicles, rigid body motion, noninertial reference frames, oscillating systems, classical scattering, and fluid mechanics.

Prerequisite: Physics 213 or 215, and Math 291.

Corequisite: Math 392.


Class Web Pages: http://www.physics.nmsu.edu/~kanani/PHYS451.html

Course Objectives: In this course you will develop a more comprehensive understanding of the fundamental ideas underlying classical mechanics (Newton’s laws and conservation laws). You will learn mathematical techniques for application of these ideas to solving problems. You will also learn alternative formulations of these basic principles (Lagrangian and Hamiltonian) based on the principle of least action and on the calculus of variations.

Topics Covered: Vector calculus, Newton’s laws, special techniques for solving Newton’s second law, oscillations, non-inertial reference systems, gravitation and orbital dynamics, rigid-body mechanics, calculus of variations, Lagrangian mechanics, normal coordinates.

Class Schedule: Three 50 minute classes or two 75 minute classes per week; two midterm exams; two hour final exam during exam week.

Contribution of Course to Professional Component: This course sets the foundation for undergraduate physics and engineering curriculum. Students learn basic physics mechanics concepts, how to apply them, and how to solve physical problems. The course provides three credits of physics.

Relationship of Course to Program Outcomes: This course teaches students to:
Identify, formulate and solve engineering and physics problems.

PHYSICS 451: Intermediate Mechanics I
Fall 2006

Lectures: Tuesdays-Thursdays, 8:55-10:10 AM, Gardiner Hall, Room 218
Instructor: Kanani Lee, kanani@physics.nmsu.edu, (505) 646-1811
Office: Gardiner Hall, Room 153
Office hours: Tuesdays, Wednesdays 1:30-2:30 pm or by appointment


Topics: Vector calculus, Newton’s laws, special techniques for solving Newton’s second
law, oscillations, non-inertial reference systems, gravitation and orbital dynamics, rigid-
body mechanics, calculus of variations, Lagrangian mechanics, normal coordinates.

Study center: Teaching assistants will be available for consultation in the physics study
center located in Gardiner Hall, Room 225. This is also a good place to meet other
students who are working on the same assignment.

Reading: You will benefit most from the assigned reading if you complete it before
coming to class. If there is something you read (or I discuss) that you don't understand,
please ask about it—chances are there are a number of other students with the same
question. Some of the reading assignments will have associated questions posted on the
class web site. Responses to reading questions will be due before class and will count as
part of the participation grade.

Homework: There will be 10 homework assignments corresponding to the ten chapters
we will cover during the semester. Each homework set will be handed out at the start of
each chapter and due at the beginning of class on the day we start on the following
chapter (see schedule). Homework assignments will be posted on the course website as
pdf files on the day they are assigned. Solutions will be posted online soon thereafter. It
is important that you try each homework problem and understand the homework rather
than just obtain answers. To this end, it may be useful to work with others in the class.
The homework assignments will likely take many hours to complete, so plan accordingly:
trying to finish an assignment the night before it is due will likely mean a very long night
and/or possible unfinished problems. All of your homework solutions must be worked
out and have proper units, else full credit will not be given.

Exams: There will be two midterms plus a final exam. The midterm exams will
emphasize new material, but may include earlier material as well. The final exam will be
comprehensive with an emphasis on the material introduced after the last midterm.

Withdrawals: You will not be automatically dropped from the course. If you are
worried about your grade, I encourage you to discuss them with me, particularly as the
last day to drop (October 17th) approaches. I will give you some indication of your
standing in the course before this date.
Course grade: I base my grades on your performance as compared to the overall class performance. The grades will be updated and posted on my office door shortly after each homework or exam is graded. Your course grade will be based on homework assignments, reading quizzes and any work done in class, two midterms, and final exam, weighted as follows:

Homework (10 homework assignments, each worth 3.5%): 35%
In-class work, reading and participation: 10%
Midterms (2 midterm exams, each worth 15%): 30%
Final exam: 25%
TOTAL: 100%

Ground rules: In general, late homework will not be accepted for grading (the solutions will be posted soon after class) and makeup exams will not be given. Students who are passing the course and absent on university business have an automatic right to make up missing work; please inform me of this absence in advance. If you miss an exam due to illness, please bring a note from the student infirmary or a physician. If you miss an exam without a valid excuse, you will be given a zero for that exam.

Additional University Policies

Plagiarism: Any student found guilty of academic misconduct, either intentional or unintentional, shall be subject to disciplinary action. Please see the following websites for details:
  - http://www.nmsu.edu/%7Evpsa/SCOC/misconduct.html
  - http://lib.nmsu.edu/instruction/plagiarismforstudents.htm

Students with disabilities: If you have or believe you have a disability, you may wish to self-identify. Feel free to call Michael Armendariz, Coordinator of Services for Students with Disabilities, at 505-646-6840 with any questions you may have on student issues related to the Americans with Disabilities Act (ADA) and/or Section 504 of the Rehabilitation Act of 1973. All medical information will be treated confidentially.

Discrimination policies: Feel free to call Jerry Nevarez, Director of Institutional Equity, at 505-646-3635 with any questions you may have about NMSU's Non-Discrimination Policy and complaints of discrimination, including sexual harassment.