

UNIVERSITY OF PUERTO RICO
RÍO PIEDRAS CAMPUS
COLLEGE OF NATURAL SCIENCES
DEPARTMENT OF PHYSICS

Title: University Physics for Science & Engineering Majors: Part I

Code: PHYS 3171 (FISI 3171 Section OU1)

Number of Credits: 4

Pre-requisites: MATH 3018 or MATH 3023-3024 (Pre-Calculus)

Co-requisite: FISI 3173 (Physics Lab I), MATH 3151 (Calculus I)

Description

First part of a calculus-based introductory Physics course for majors, designed to give them a sound background in Classical Physics that prepares them well for taking upper level Physics courses. It includes: Kinematics; Newton's Laws; Work, Energy and Conservation of Energy; Collisions and Conservation of Momentum; Rotational Kinematics; Torque and Angular Momentum; Equilibrium; Waves and Sound. This course provides the tools for the students to develop: (1) a basic understanding of Classical Physics laws and their application; (2) proficiency with the mathematics used to solve Physics problems; (3) problem-solving skills and strategies; (4) ability to communicate in writing and orally their understanding of Physics concepts and their application to problem solving.

Objectives

Through this course, the students will:

- Read the sections of the book corresponding to the topics of the course and attempt solving problems before they are discussed in class, in order to bring specific difficulties and questions for class discussion.
- Solve Physics problems independently in order to apply and show their understanding of basic Physics laws discussed in class.
- Apply calculus concepts to the solution of Physics problems
- Practice and develop problem-solving skills and strategies showed in class and in textbooks
- Communicate their understanding of Physics concepts and of their application by detailing their reasoning in written problem solutions and during class verbal communication

(syllabus continuation: Physics I, PHYS 3171)

Course Content and Time Distribution

Week 1:	Kinematics and Mathematical Review
Week 2:	Problems in Kinematics and Vectors
Week 3:	Projectile Motion (Exam I on Chapters 1, 2 & 3)
Week 4:	Newton's Laws: The Free Body Diagram; no friction; constant friction;
Week 5:	Newton's Laws: Centripetal acceleration; $F = -bv$ and the exponential function
Week 6:	Kepler's Laws and Newton's Synthesis
Week 7:	Exam II (Chapters 4,5 &6) Begin Work and Energy
Week 8:	Work-Energy Theorem, the Spring
Week 9:	Potential Energy and the Conservation of Energy
Week 10:	Impulse, Collisions and Conservation of Momentum
Week 11:	Center of Mass: Point Masses; Continuous Matter and $X_{CM} = (1/M) \int r \, dm$
Week 12:	the rocket problem; Exam III (Chapters 7,8 & 9)
Week 13:	Rotational Kinematics Moment of Inertia ($I = \int r^2 \, dm$)
Week 14:	Torque, Angular Momentum and Applications of Newton's laws
Week 15:	Rotational Kinetic Energy and conservation of energy
Finals:	Exam IV (Chapter 10) as scheduled by the registrar

Instructional Strategies

The professor combines discussion, lectures, audiovisual materials, and demonstrations to convey the content of the course. Early in the semester, the students are assigned problems sets that give them experience in problem solving and prepare them for the examinations. In these problem sets, the students have to detail in writing their reasoning and their application of Physics concepts. The class discussions and laboratories (PHYS 3173) are synchronized to insure that the lab activities produce timely reinforcement of concepts discussed in class.

Minimum Required Facilities

Lecture room with audiovisual equipment and demonstration experiments available on request.

Student Evaluation

Four partial examinations (the final exam is the fourth) are given during the semester. The exams are 100 point each and $(\text{total points}/4) \times 0.85 = 85\%$ of the grade. Four problem sets are also assigned, corresponding to the topics on each exam. They each are worth 25 points. The $(\text{total points})/4 \times 0.15 = 15\%$ of the grade. The students are expected to detail in writing their understanding and the reasoning applied in the solution of the problems, in addition to the mathematical steps. Each problem set is due the day of the corresponding exam.

Grading System

The overall score is determined by calculating the percentage of points obtained by the student. Grades are then assigned according to the standard curve: 100-90% = A, 89-80% = B, 79-70% = C, 69-60% = D, 59-0% = F.

Bibliography

1. **Physics for Scientists & Engineers (volume I), Douglas C. Giancoli, Prentice Hall, 2008**
Either 3rd or 4th edition (ISBN 0-13-227358-6) is the required text.
2. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker, Wiley, 2002
3. Physics for Scientists & Engineers, Raymond A. Serway, Saunders Publishing, 2002

Rights of Students with Disabilities

UPR complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act 1990 (ADA) and the Commonwealth of Puerto Rico Law 51. Students receiving services through Rehabilitaci3n Vocacional must contact the professor at the beginning of the semester in order to plan for a reasonable accommodation and any required support equipment according to the recommendations given by the Oficina de Asuntos para las Personas con Impedimentos (OAPI) of the Dean of Students. Likewise, students with special needs that require some type of accommodation must contact the professor.