

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

**Title:** University Physics for Scientists & Engineers Majors: Part II

**Code:** FISI 3172 Section OU1 PHYS 3172

Number of Credits: 4

Prerequisites: PHYS 3171-3173 (Physics I and Physics Laboratory I)

Co-requisite: PHYS 3174 (Physics Lab II), MATH 3152 (Calculus II)

**Professor: Ronald Selsby    Room C-311    M W F 10:00 – 11:20 AM**

**This course is now a ‘Virtual Class’ given at the above stated times**

**Description**

Second 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: Angular Momentum: general rotation and the cross product of vectors, conservation of angular momentum; Electrons, Protons and charge; atoms, molecules and Batteries; conductors and insulators. Electric Charges and associated Electric Fields, from molecular dipoles and between charged separated metal plates; Electric Potential, Capacitance and electric potential energy; The electron Gun and electron deflection in a cathode ray tube; Current and Resistance; Kirchhoff Laws and Circuits; Magnetic Fields, magnetic force and Ampere’s Law; the electric motor; Faraday’s Law of Electromagnetic Induction; The electric generator, AC vs DC current and the transformer; Inductance, the inductor as a circuit element; Maxwell’s correction to Ampere’s Law, Maxwell’s laws and Electromagnetic Waves; Hertz’s electromagnetic waves and the development of Radio. (Geometrical Optics; Interference, Young’s Double Slit experiment; Refraction and Diffraction all will be covered in the associated 3174 Laboratory course.) FISI 3172 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: FISI 3172)

## Course Content and Time Distribution

- Week 1: Chapter 11 Angular Momentum  
Week 2: Chapter 13 Fluids  
Week 3: Chapter 14 Harmonic Oscillations  
Week 4: second order linear differential equations with constant coefficients  
The damped Oscillator and the Driven oscillator and Resonance  
Week 4: EXAM I (Chapters 11, 13, 14)  
Week 5: Chapter 21...charge, conductors, insulators...Batteries, Electric Field of  
Molecular dipoles and charged Plates  
Week 6: Chapter 24 (the Capacitor) Chapter 23 Electric Potential (Volts)  
Electric potential energy, the electron Gun, electron deflection  
Week 7: Chapter 22 Gauss' Law  
Week 8: EXAM II 21, 22, 23, 24(parallel plates only)  
Week 9: Chapter 25, 26 current, Ohm's law, Kirchhoff circuit law  
RC circuit (exponential decay, growth)  
Week 10: Chapter 27 The Magnetic Field, Lorentz force, motion of a charged  
particle in a magnetic field, Ampere's Law, discovery of the electron  
Week 11: Chapter 28 and  
EXAM III (25, 26, 27 and 28)  
Week 12: Chapter 29 Faraday's Law of electromagnetic Induction, the generator  
The transformer. AC Circuits  
Week 13: Inductance as a circuit element. Chapter 30 Maxwell's correction to  
Ampere's Law, Maxwell's Equations, The electromagnetic wave and Light.  
Week 14: The LC Oscillator, Hertz Waves and Radio  
Week 15 Summary of Classical mechanics and Electromagnetism  
Finals EXAM IV as schedules 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. 15% of the grade is based on class participation, attendance and homework problems solved. 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 3<sup>rd</sup> of 4<sup>th</sup> 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.

### **REASONABLE ACCOMMODATION**

The University of Puerto Rico complies with all federal, state and regulations concerning discrimination, including "The American Dissabilities Act" (Law ADA) and Law 51 of the Commonwealth of Puerto Rico. Students receiving vocational rehabilitation services should contact the teacher at the beginning of the semester to plan for reasonable accommodation and necessary support equipment in accordance with the recommendations of the Office of Matters for Persons with Disabilities (OAPI) of the Dean of Students. A request for reasonable accommodation does not exempt the student from meeting the academic requirements of the course.

### **ACADEMIC INTEGRITY**

The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR General Student Regulations (Certification Num. 13, 2009-2010, of the Board of Trustees) states that "academic dishonesty includes, but is not limited to: fraudulent actions, obtaining grades or grades academics using false or fraudulent simulations, copying all or part of another person's academic