

## Saint Louis University, Madrid Campus

### Division of Science & Engineering

**Professor:** Francisco Prieto, Ph.D

**Course name:** Physics I

**Course code:** PHYS-131

**Semester:** Fall 2014

**Credit Hours:** class: 3 credits; lab: 1 credit

**Lecture room:** Room PAH-24

**Email:** fprieto@slu.edu

**Office location:** Padre Arrupe Hall, first floor

**Office hour:** Monday 11:00 – 13:00 and upon request

**Add/Drop period:** Last day to drop: Sept. 15. Last day to drop with W: Oct. 30

**Prerequisites:** MATH-141. Must enroll also in a PHYS-132 lab section.

#### Course Objectives:

To provide a clear and logical presentation of the basic concepts and principles of physics, and to allow the student to develop his analytical and problem solving skills. The course is appropriate for students majoring in biology, the health professions, and other disciplines, including environmental, earth and social sciences, and economics. The mathematical techniques used in this course include algebra, geometry, and trigonometry, but no calculus.

#### **Physics Program Objectives**

- A. A firm understanding of the principles of physics.
- B. Ability to apply the principles of physics to problems of both fundamental and practical interest.
- C. Ability to design and conduct experiments, as well as to analyze and interpret data.
- D. Knowledge and application of advanced mathematics.
- E. Ability to communicate effectively and professionally in oral and written formats.

#### **Student Learning Outcomes**

Program Objectives	Student Learning Outcomes
<b>A</b>	<ul style="list-style-type: none"> <li>A.1. Describe the SI unit system and convert units.</li> <li>A.2. Show answers with correct scientific notation and number of significant figures.</li> <li>A.3. Show the homogeneity of physical equations by using dimensional analysis.</li> <li>A.4. Represent a vector into rectangular components.</li> <li>A.5. Describe and apply the kinematics equations of translational motion of a single particle in one and two dimensions.</li> <li>A.6. Describe and apply the kinematic equations of rotational motion of a rigid body</li> <li>A.7. Apply Newton's laws of motion to solve problems on translational motion of a particle.</li> <li>A.8. Apply the fundamental laws of rotational motion to solve problems on rotational motion of a rigid body.</li> <li>A.9. Apply the equations of static and dynamic equilibrium of a particle and a rigid body.</li> <li>A.10. Apply the Work-Energy Theorem to the translational and rotational motion.</li> <li>A.11. Apply the Principle of Linear/Angular momentum and Linear/Angular impulse.</li> <li>A.12. Calculate the center of mass of a many-particle system.</li> </ul>

	A.13. Apply law of conservation of momentum to solve problems on collisions. A.14. Solve problems on the elastic properties of materials. A.15. Solve problems on static fluids. A.16. Describe the oscillatory motion. A.17. Describe Simple Harmonic Motion qualitatively and quantitatively.
<b>B, D</b>	B.1. Represent graphically a physical system using the free-body diagram technique. B.2. Identify the essential aspects of a problem, connect it to related areas of physics, formulate a strategy for solving the problem, apply appropriate techniques to arrive at a solution, test the correctness of the solution, and interpret the result. B.3. Show strong mathematical skills.
<b>C</b>	C.1. Analyze and interpret physics data represented graphically.
<b>E</b>	J.1. Communicate clearly and effectively the solution of a problem.

### **Course description:**

Motion in One Dimension. Vectors and Two-Dimensional Motion. The Laws of Motion. Work and Energy. Momentum and Collisions. Circular Motion and the Law of Gravity. Solids and Fluids.

### **Textbook:**

Serway, Faughn  
*Physics*  
9<sup>th</sup> Ed., Thomson Brooks/Cole

**References:** College Physics, H. Young, 9 Edition, Pearson 2012  
Lectures of physics, vol. I, II, III / The Feynman (530 FEY)  
Practical physics, 2 texts / Squires (530.078 SQU)

**Grading system:** The grade will be obtained from the following areas:

Homework/Participation: **10 %**

Reading quizzes: **5%**

Quizzes: **10 %**

First Mid-term Exam: **25 %**

Second Mid-term Exam: **25 %**

Final Exam: **25 %**

### **Grading Scales:**

100 < A < 90%,

89% < A- < 87%

86% < B+ < 84%

83% < B < 80%

79% < B- < 77%

76% < C+ < 74%

73% < C < 70%

69% < C- < 66%

65% < D < 60%

F < 60%

## POLICY STATEMENT ON ACADEMIC INTEGRITY

The following is a statement of minimum standards for student academic integrity at Saint Louis University.

The University is a community of learning, whose effectiveness requires an environment of mutual trust and integrity, such as would be expected at a Jesuit, Catholic institution. As members of this community, students, faculty, and staff members share the responsibility to maintain this environment. Academic dishonesty violates it. Although not all forms of academic dishonesty can be listed here, it can be said in general that soliciting, receiving, or providing any unauthorized assistance in the completion of any work submitted toward academic credit is dishonest. It not only violates the mutual trust necessary between faculty and students but also undermines the validity of the University's evaluation of students and takes unfair advantage of fellow students. Further, it is the responsibility of any student who observes such dishonest conduct to call it to the attention of a faculty member or administrator.

Examples of academic dishonesty would be copying from another student, copying from a book or class notes during a closed-book exam, submitting materials authored by or editorially revised by another person but presented as the student's own work, copying a passage or text directly from a published source without appropriately citing or recognizing that source, taking a test or doing an assignment or other academic work for another student, tampering with another student's work, securing or supplying in advance a copy of an examination without the knowledge or consent of the instructor, and colluding with another student or students to engage in an act of academic dishonesty.

Where there is clear indication of such dishonesty, a faculty member or administrator has the responsibility to apply appropriate sanctions. Investigations of violations will be conducted in accord with standards and procedures of the school or college through which the course or research is offered. Recommendations of sanctions to be imposed will be made to the dean of the school or college in which the student is enrolled. Possible sanctions for a violation of academic integrity include, but are not limited to, disciplinary probation, suspension, and dismissal from the University. The complete SLU Academic Honesty Policy can be found at the following link: [http://spain.slu.edu/academics/academic\\_advising/docs/Academic\\_integrity.pdf](http://spain.slu.edu/academics/academic_advising/docs/Academic_integrity.pdf)

### **Policies:**

- (1) Students are encouraged to participate in class discussions and to ask questions.
- (2) Announcements may be made during the semester.
- (3) Useful information for the course may be found on the web: <https://myslu.slu.edu>.
- (4) Syllabus, reading and homework problems are subject to change.
- (5) Students are responsible for all lecture material, handouts and assigned reading.
- (6) **It is mandatory to attend all classes unless a reasonable excuse is given.** Any unexcused absences in excess of **3** will result in a lowered grade and even in automatic failure in the course.

(7) **Make up exams are not given.** Students who legitimately miss an exam, due to a doctor's visit or family emergency must provide written documentation of the circumstances. A letter from the university counselor is accepted. Exams that are missed illegitimately result in a score of F. Grades for these students will be based on the remaining exams. Missing more than one exam results in an F grade.

(8) In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. Students who think they might benefit from these resources can find out more about:

- Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.
- University-level support (e.g., tutoring/writing services, Disability Services) by visiting the Academic Dean's Office (San Ignacio Hall) or by going to [http://spain.slu.edu/academics/learning\\_resources.html](http://spain.slu.edu/academics/learning_resources.html).

Students who believe that, due to a disability, they could benefit from academic accommodations are encouraged to contact Disability Services at +34 915 54 58 58, ext. 204, send an e-mail to [counselingcenter-madrid@slu.edu](mailto:counselingcenter-madrid@slu.edu), or to visit the Counseling Office (San Ignacio Hall). Confidentiality will be observed in all inquiries. Course instructors support student accommodation requests when an approved letter from Disability Services has been received and when students discuss these accommodations with the instructor after receipt of the approved letter.

### **Course Outline:**

Week	
1	<b>Measurement:</b> Standards of length, mass and time. Dimensional analysis. Significant figures. Coordinate systems and frames of reference. Trigonometry.
2	<b>Motion in one dimension.</b> Displacement. Average velocity. Acceleration. Motion with constant acceleration. Free falling bodies.
3	<b>Vectors and two-dimensional motion.</b> Vectors and scalars. Velocity and acceleration in two dimensions. Projectile motion
4	<b>The laws of motion.</b> Force. Newton's laws. Applications of Newton's laws.
5	<b>The laws of motion.</b> Applications of Newton's laws. Force of friction
6	<b>First Mid Term Exam</b>
7	<b>Work and energy.</b> Kinetic energy and the Work-Energy Theorem.
8	<b>Work and energy.</b> Potential energy. Conservative and nonconservative forces. Conservation of mechanical energy. Power.
9	<b>Momentum and collisions.</b> Momentum and impulse. Conservation of momentum.
9	<b>Momentum and collisions.</b> Collisions. Glancing collisions. Angular momentum.
10	<b>Second Mid Term Exam</b>
11	<b>Circular motion and the law of gravity.</b> Angular speed and angular acceleration. Rotational motion under constant angular acceleration.

	Centripetal acceleration
12	<b>Rotational equilibrium and rotational dynamics.</b> Torque. Torque and the second condition for equilibrium.
13-14	<b>Solids and fluids.</b> States of matter. Density and pressure. Variation of pressure with depth. Buoyant forces and Archimedes' principle. Fluids in motion

**Examinations:**

First Mid-term Examination: 9 October 2014 (14:30-15:45)

Second Mid-term Examination: 11 November 2014 (14:30-15:45)

Final Examination: 19 December 2014 (12:00-14:00)