SAGRADO
Universidad del Sagrado Corazón

SCHOOL OF HEALTH AND SCIENCES

SYLLABUS

TITLE:	General Physics I
CODE:	FIS 203
PREREQUISITE	MAT 201
COREQUISITE	FIS 203L
CREDITS:	4 credits | 45 contact hours | 45 lab hours | 1 term

DESCRIPTION

Physics course developed in theoretical and experimental form where the methodology of active learning is used so that science students acquire knowledge about kinematics in one and two dimensions, dynamics, circular motion and gravitation, work and energy, particle systems and conservation of linear momentum, kinematics and rotational dynamics, angular momentum and torque, balance of rigid bodies, and fluid mechanics.

JUSTIFICATION

The basic education of every science student requires a knowledge of the laws and principles that govern the universe. It is also important for students to experimentally corroborate these laws and principles of physics related to Newtonian mechanics and fluids, and to develop computational models related to physics. This course allows science students to apply this knowledge in their professional development, whether in the area of natural sciences or in areas of health.

COMPETENCES

The course develops the following competences in students:

- **Critical questioning**
- **Research and exploration**

OBJECTIVES

After completion of the course, students will be able to:

1. Represent vectors in polar and Cartesian form to perform vector operations.
2. Solve problems of moving bodies under known conditions.
3. Analyze the forces acting on an object to predict its motion, both translational and rotational.
4. Solve movement problems using energy considerations.
5. Solve motion problems using conservation of linear and angular momentum.
6. Solve problems related to fluid mechanics

CONTENTS

I. Introduction
   A. Dimensional analysis
   B. Vectors
      1. Vectors and scalars
      2. 2. Vector properties
      3. 3. Vector addition
      4. 4. Components and unit vectors

II. Kinematics
   A. One-dimensional movement
      1. Speed & acceleration
      2. Constant acceleration
      3. Free fall
   B. B. Two-dimensional movement
      1. Displacement, speed, and acceleration
      2. Constant acceleration
      3. Projectiles
      4. Relative motion

III. Dynamics
   A. Newton's Laws of Motion
      1. Strength
      2. Weight
      3. Friction

- B. Applications of Newton’s laws
    1. Circular motion
        a. Uniform circular motion
        b. Radial and tangential acceleration
        c. Centripetal force
        d. Non-uniform circular motion
    2. Gravitation
        a. Kepler’s laws
        b. Newton's law of universal gravitation
        c. Motion of planets and satellites
- C. Collisions
    1. Linear momentum and impulse
    2. One-dimensional collision
    3. Two-dimensional collisions
    4. Center of mass

IV. Work and energy

- A. Introduction
    1. Scalar product vectors
    2. Constant strength work
    3. Variable strength work
    4. Kinetic energy
    5. Power
- B. Energy conservation
    1. Conservative and non-conservative forces
    2. Potential energy
    3. Mechanical energy conservation
    4. Energy-work theorem

V. Rotational motion

- A. Rotational kinematics
    1. Relationship between angular and linear quantities
    2. Rotational motion of solid bodies
- B. Rotational dynamics
    1. Vector product

2. Torque
3. Equilibrium conditions in rigid bodies
4. Center of gravity

C. Angular momentum and its conservation

VI. Fluid mechanics

A. Hydrostatics

1. Pressure and density
2. Archimedes' principle

B. Hydrodynamics

1. Continuity equation
2. Bernoulli's equation

LABORATORY EXPERIENCES

A. Measurements and uncertainty
B. Graph construction
C. Uniformly accelerated rectilinear motion
D. Movement of projectiles in the plane
E. Balance of concurrent forces
F. Newton's second law
G. Static friction
H. Energy diagram
I. Linear momentum
J. Density of bodies
K. Archimedes’ principle

METHODOLOGY

The following strategies from the active learning methodology are recommended:

- Lectures
- Flipped classroom
- Problem discussion and analysis
- Collaborative learning
- Procedure and problem-solving oriented coaching
- Demonstration and practical exercises
- Problem based learning

EVALUATION

Participation	10%
Partial assignments	40%
Compositions	10%
Immersion experience	20%
Final exam	20%
Total	**100%**

LEARNING ASSESSMENT

The institutional assessment rubric is applied to the course's core activity.

BIBLIOGRAPHY

TEXTBOOK

Young, H., Freedman, R. (2020). *Sears and Zemansky's University Physics With Modern Physics* (15th ed.). Pearson.

REFERENCES

Giancoli, D. (2016). *Physics: Principles with Applications* (7th ed.). Pearson

Knight, R. (2017). *Physics for Scientists and Engineers: A Strategic Approach with Modern Physics* (4th ed.). Pearson

Serway, R., Jewett, J. (2015). *Physics for Scientists and Engineers* (9th ed.). Cengage

ELECTRONIC RESOURCES

Coronado, G., Fernández, J. L. (2020). *Fisicalab*. https://www.fisicalab.com

University of Colorado Boulder. (2020). *PhET Interactive Simulations*. https://phet.colorado.edu/es/simulations/category/physics

For more information resources related to the course's topics, access the library's webpage http://biblioteca.sagrado.edu/

REASONABLE ACCOMMODATION

For detailed information on the process and required documentation you should visit the corresponding office. To ensure equal conditions, in compliance with the ADA Act (1990) and the Rehabilitation Act (1973), as amended, any student in need of reasonable accommodation or special assistance must complete the process established by the Vice Presidency for Academic Affairs.

ACADEMIC INTEGRITY

This policy applies to all students enrolled at Universidad del Sagrado Corazón to take courses with or without academic credit. A lack of academic integrity is any act or omission that does not demonstrate the honesty, transparency, and responsibility that should characterize all academic activity. Any student who fails to comply with the Honesty, Fraud, and Plagiarism Policy is exposed to the following sanctions: receive a grade of zero in the evaluation and / or repetition of the assignment in the seminar, a grade of F (*) in the seminar, suspension, or expulsion as established in the Academic Integrity Policy effective in November 2022.