University of the Incarnate Word
PHYS 2305 Physics I
Course Syllabus

Catalog Course Description:
2305 Physics
3 credit hours
This course is a study of the basic concepts of motion, energy, work, momentum, gravitation, fluids, heat, and thermal properties of matter.

Prerequisites:
MATH 2312 Calculus I

Context:
This class is the first semester of a two-semester, calculus-based classical physics course designed to meet the needs of majors in Biology, Chemistry, pre-professional students, Engineering Management, and for students in other science-related programs. This course is also open to all students who need to fulfill the four-hour laboratory science requirement. The course cannot be repeated for credit. Course audience is for freshman through senior level.

Course Overview:
Topics include an examination and analysis of concepts in mechanics, thermodynamics, vibrations, and wave motion. The course includes detailed qualitative studies of basic concepts and principles in Newtonian mechanics, heat, and wave motions, and the mathematical descriptions and analysis used in problem solving. Algebra and calculus will be used for mathematical analysis and problem solving. General problem solving strategies will be used to enable the student to understand the nature of a problem and to correctly solve the problem. Examinations will be given on each of the Physics topics to evaluate each student’s knowledge and comprehension.

Major Prerequisites by Topic: None

Course Outcomes:
Expected outcomes include:
1. Describe the three fundamental quantities of length, mass, and time; apply dimensional analysis to algebraic problem solving; apply conversions in the metric system
2. Describe the nature of linear motion; apply vectors in two-dimensional analysis of motion
3. Apply Newton’s Laws of Motion for objects within an inertial frame of reference
4. Construct free-body diagrams for objects
5. Describe and calculate quantities of work, energy, momentum, and circular motion
6. Explain Newton’s Universal Law of Gravitation and Kepler’s Laws of Planetary Motion; derive and apply equations based on these laws
7. Describe the nature of rotational equilibrium and rotational dynamics, the nature and behavior of different states of matter, heat, the Laws of Thermodynamics, the nature of vibrations, waves and sounds; derive and apply equations based on these concepts
Students will apply conceptual skills in deductive reasoning and critical thinking, apply mathematical analysis using algebra and calculus to all physics concepts, collect and organize data, display data through charts and graphs, and interpret data. Students will be able to set up experiments, collect data, make predictions, and interpret experimental results.

**Course Objectives:**
The objectives of the course are:
1. Understand the fundamental laws of motion as summarized in Newton’s three laws and their related concepts and principles
2. Apply these laws in conjunction with calculus
3. Construct an appropriate understanding of the mechanical properties of physical systems in an applied context.

**Topics Covered:**
1. Kinematics in one and two dimensions
2. Newton’s three laws of motion
3. Elementary study of friction
4. Work, mechanical energy, and power
5. Impulse, momentum, and collisions
6. Fixed-axis rotational kinematics
7. Torque, angular momentum, and Newton’s Second Law
9. Simple harmonic oscillation and pendulums
10. Basic wave properties and their mathematical description
11. Interference and superposition of waves
12. Standing waves on strings and in air columns

**Class/laboratory schedule:**
1. 150 minutes of Lecture per week. This Lecture will meet twice per week.

**Contribution of course to meet the professional component:**
Together with PHYS 2105, this course sets the foundation for undergraduate physics and engineering curriculum. Students perform experiments which illustrate basic physics concepts.

**Relationship to program outcomes:**
Provides the core level introduction to mechanics necessary for meeting the Engineering Management program objectives 3a.

**Evaluation methods:**
1. Homework
2. Quizzes
3. Exams

**Performance criteria:**
1. Course objectives 1 through 3 will be evaluated using the evaluation methods [1, 2, 3] noted above.
ABET Course Content:
Physics 100% or 3 Credits

Disability Accommodation:
The University of the Incarnate Word is committed to providing a supportive, challenging, diverse and integrated environment for all students. In accordance with Section 504 of the Rehabilitation Act – Subpart E and Title III of the Americans with Disabilities Act (ADA), the University ensures accessibility to its programs, services and activities for qualified students with documented disabilities.
For more information, contact the Student Disability Services Office:

Director, Moisés Torreescano
Academic Counselor, Cynthia Pino
Location Administration Building – Room 105
Phone (210) 829-3997
Fax (210) 829-6078

*Information listed above is contact information for Student Disability Services’ Academic Counselor, Cynthia Pino.

Academic honesty statement:
The highest standards of academic honesty are expected in the course. Forms of academic dishonesty include, but are not limited to cheating, plagiarism, counterfeit work, falsification of academic record, unauthorized reuse of work, theft, collusion. See the student handbook for definitions and procedures for investigation of claims of academic dishonesty.

Coordinator:
Professor Alison Whittemore, Chair, Department of Engineering

Persons who prepared this description:
Michael Frye, Assistant Professor, Department of Engineering

Approval Date of Syllabus: 1/2002