University at Albany
Course: APHY 140 Physics I Mechanics (1772)
Course APHY 145 Physics Lab I (1773)

Term Length:
Full Year: September to May

Location and Meeting Times:
Monroe Woodbury High School
Room 413 ABCDEF Days
Room 413 Lab B and F Days

Instructor:
Christian Fracchia

Instructor's Contact Information:
e-mail: physicsfrac@gmail.com
phone: 845-460-7000
fax: 845-460-7090
Office hours:
Wednesday: 2:10 to 3:15 and 2nd Period on ABDF days

Prerequisites/Corequisite:
Calculus

Course Description/Overview/Objectives: This course is designed for students planning on studying Engineering, Physics or Mathematics in college. It is offered for students that have taken the Honors/Regents Physics course and have attained a minimum grade of 85.
Since this a calculus-based course there is a co-requisite of AP Calculus AB or BC.

In a six day cycle the class will meet 8 times with two of these meetings designated as laboratory class. This will result in 120 classes of 42 minutes during the Fall semester.

This course meets the natural science SUNY general education program requirements. Lab work involves inquiry-based investigations that foster the use and understanding of the scientific method. Class examples and problems help to create an understanding of physics and its application outside of the classroom.

The Instructional goals of the course are:

- Developing a basic knowledge of physics including theories and techniques, and general principles.
- Developing an ability to ask physical questions and to obtain solutions to these questions by use of intuition, formal logic and experimental investigation.
- Fostering an appreciation of the physical world and the discipline of physics, curiosity and creativity.

- Understanding connections of physics to other disciplines and to societal issues.

The aim of the course is to develop one's ability to:

- Read, understand, and interpret physical information in verbal, mathematical and graphical formats.
- Describe and explain the sequence of steps in the analysis of a particular physical phenomenon or problem
- Use mathematical reasoning in a physical problem or situation
- Perform experiments and interpret the results of observation, including making an assessment of experimental uncertainties.

Grading Scheme:

93-100 A
90-92 A-
87-89 B+
83-86 B
80-82 B-
77-79 C+
73-76 C
70-72 C-
67-69 D+
63-66 D
60-62 D-
Grade <60 E

This course is A-E graded and there are no P/F or S/U options for this course.

Grading:

APHY 140
Homework: 30%
Tests & Quizzes: 70%

APHY145
Lab Notebook 100%

Attendance: It is essential that you attend every class and do all the homework assigned. When absences exceed 5 there will be a deduction of 5% off the final grade for each additional day absent.

Learning Objectives for General Education Natural Sciences Courses

Natural Sciences courses enable students to demonstrate:

-an understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence;

-an understanding of the application of scientific data, concepts, and models in the natural sciences;

-an understanding of the major principles and concepts that form the basis of the knowledge covered in the course and a command of the relevant terminology appropriate for basic discourse in the particular discipline or disciplines of the course;

-that they have become more knowledgeable consumers of scientific information and are prepared to make informed decisions on contemporary issues involving scientific information acquired in the course.

Standards of Academic Integrity:
The University at Albany expects all members of its community to conduct themselves in a manner befitting its tradition of honor and integrity. Members are expected to assist the University by reporting suspected violations of academic integrity to appropriate faculty and/or administrative offices. Behavior that is detrimental to the University's role as an educational institution is unacceptable. Claims of ignorance, of unintentional error, or of academic or personal pressures are not sufficient reasons for violations of academic integrity.

The following are examples of the types of behaviors that are defined as academic dishonesty and are therefore unacceptable:

Plagiarism: Presenting as one's own work the work of another person. Plagiarism includes paraphrasing or summarizing without acknowledgment, submission of another student's work as one's own, the purchase of prepared research or completed papers or projects, and the unacknowledged use of research sources gathered by someone else; **Cheating on Examinations:**
Giving or receiving unauthorized help before, during, or after an examination;
Multiple Submission: Submitting substantial portions of the same work for credit more than once;
Sabotage: Destroying, damaging, or stealing of another's work or working materials;
Unauthorized Collaboration: Collaborating on projects, papers, or other academic exercises that is regarded as inappropriate by the instructor(s);
Falsification: Misrepresenting material or fabricating information in an academic exercise or assignment; and
Bribery: Offering or giving any article of value or service to an instructor in an attempt to receive a grade or other benefits not legitimately earned or not available to other students in the class.
Circumventing Security: Users are prohibited from attempting to circumvent or subvert any system's security measures. Users are prohibited from using any computer program or device to intercept or decode passwords or similar access control information.
The violations listed above should be reported to the UHS Program Office immediately. All parties involved will be directed accordingly.

Curriculum Map

Kinematics (September 9-30th)
- Motion in one dimension
- Motion in two dimensions, including projectile motion
  - Displacement
  - First and second derivative
  - Average speed/velocity
  - Instantaneous speed/velocity

Average acceleration
Instantaneous acceleration
Constant acceleration
Free Fall
Laboratory: Accelerated motion on the air track

Vectors
Vector algebra
Vectors components (rectangular, polar)
Unit vector notation
Addition and Subtraction
Scalar (dot) Product
Vector (cross) Product
Laboratory: Data Reduction using Excel
Test

Newton's Laws of motion (October 1st-November 17th)
Static Equilibrium (first law)
Mass
Weight, Normal Force and Tension
Dynamics of a single particle (second law)
Free body diagrams
Friction (static and kinetic)
Velocity dependent forces
Terminal velocity
Laboratory: Newton's 2nd Law
Laboratory: Velocity dependent forces

Systems of two or more objects (third law)
Test

Work, energy, power (November 20thrd-Dec18th)
Work done by constant force
Work done by variable force
Conservative and Non-conservative forces
Conservation of Energy
Power
Hooke's Law
Laboratory: Elastic Potential Energy
Laboratory: Conservation of Mechanical Energy
Test

Systems of particles, linear momentum (January 4th-January 31st)
Center of mass
Impulse and momentum

Conservation of linear momentum
Collisions in 1 and 2 dimensions
Elastic and inelastic Collisions
Laboratory: Impulse and Momentum using Data Studio
Elastic Collisions and 2D Motion
Test

Circular motion and rotation (February 4th-February 14th)

Uniform circular motion
Torque and rotational statics
Rotational statics
Rotational kinematics and dynamics
Angular momentum and its conservation
Laboratory: Vector analysis and 2D Motion
Laboratory: Moment of Inertia of a point mass
Moment of Inertia of a solid disk
Laboratory: Concurrent, coplanar forces
Test

Oscillations and gravitation (February 16th-28th)

Simple harmonic motion (dynamics and energy relationships)
Mass on a spring
Pendulum and other oscillations
Newton's Law of gravity
Orbits of planets and satellites
Circular
General
Laboratory: Conical pendulum
Test

Rotation (March 2nd-March 15th)

Angular quantities
Rotation with constant acceleration
Relating linear and angular variables
Rotational Kinetic Energy
Rotational Energy
Test

Rolling Torque, and Angular Momentum (March 17th – April 1st)

Newton's 2nd Law in angular form
Net Torque Equations
Angular momentum of systems of particles
Angular momentum of rigid bodies
Test

Oscillations (April 1st –April 19th)

Simple Harmonic Motion
Energy in SHM
Pendulums
SHM related to Circular Motion
Test

Review (April 22nd-30th)

Final Exam (First week of May)