

PHY203: ELEMENTARY PHYSICS I (Summer Session 01 , 2022)

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Lecture Time: 4.00pm-7:45pm

Text: University Physics - 1e Ling, Moebs, Sanny, et al. Published by OpenStax

This is a freely available textbook from Openstax website (openstax.org)

Office Hours: By appointment. You can also walk in if I am free.

Course Description

Introduction to Newtonian mechanics. Kinematics and dynamics of particles and systems of particles. Motion of rigid bodies and oscillatory motion. Conservation principles. (Lec. 3) Pre: credit or concurrent enrollment in MTH 141 and concurrent enrollment in PHY 273. Intended for science or engineering majors.

Course Goals

1. To develop a conceptual and quantitative understanding of kinematics.
2. To develop a conceptual and quantitative understanding of forces.
3. To develop a conceptual and quantitative understanding of work, energy, and energy conservation.
4. To develop a conceptual and quantitative understanding of linear momentum and linear momentum conservation.
5. To develop a conceptual and quantitative understanding of rotational kinematics, rotational dynamics, and angular momentum conservation.
6. To develop a conceptual and quantitative understanding of oscillations and simple harmonic motion.

General Education Areas

This course satisfies URI's general education areas: "Scientific, Technology, Engineering, and Mathematical Disciplines" (Full); and "Mathematical, Statistical, or Computational Strategies" (Partial).

Learning Outcomes

1. To demonstrate an understanding of the basic concepts of classical mechanics.
2. To apply a conceptual understanding of classical mechanics to physics problems.
3. To develop problem-solving strategies and techniques appropriate to classical mechanics.
4. To be able to carry out quantitative solutions of classical mechanics problems.
5. To be able to carry out, analyze, and present the results of classical mechanics laboratory experiments.

Examinations: There will be four unit exams. **These exams are closed book.** Calculators will be permitted. The dates and times for the exams will be announced in the class.

No make-up exams will be offered.

Course Units: The course is divided into four units as follows:

- Unit:1: Measurement and Vectors, Motion in one, two and three dimensions, Newton's laws, Additional applications of Newton's laws
- Unit:2: Work and kinetic energy, Conservation of energy, Momentum, Conservations of linear momentum
- Unit:3: Rotation, Angular Momentum,
- Unit:4: Gravity, Oscillations

Homework Assignments: Homework will be assigned during class. Late homework will earn only half credit.

Course Grade:

Exams 1,2,3and 4	80%
Homework	10%
Group work	10%

Lecture quizzes and attendance: extra credit points

Grading Scheme:

A(93-100); A-(90-93); B+(87-90); B(83-87); B-(80-83); C+(77-80); C(73-77); C-(70-73); D+(67-70); D(60-67); F(<60).

Lab:

All students must also register for PHY273. If you have previously taken this course and have passing credit, you will not need to register again.

PHY273: PHY 273 – ELEMENTARY LABORATORY I

Registration

Each student registered for PHY203 must also register for **two sections of PHY273.**

First Lab Meeting

You will be performing your first experiment on the first lab meeting for each experiment. Each week of experiment will be followed by an analysis lab. You must purchase a **Laboratory Notebook** prior to your first meeting, and bring it. See below for the description of the Lab Notebook. The **Laboratory Manual** is sold at the bookstore. Both the Lab Notebook and the Lab Manual are required for this course.

Laboratory Manual

The **PHY273 Laboratory Manual** contains detailed descriptions of all scheduled experiments. You are expected to read the Lab Manual before coming to conduct your experiments.

Laboratory Notebook

You must bring a **Laboratory Notebook** that is quad-ruled for graphs and has sequentially numbered pages and pages bound to stay. Spiral notebooks or notebooks without page numbers are not acceptable. A *National Brand, Computation Notebook*, Model No;43-648 is recommended. These are usually available at the URI bookstore. You may use this same notebook in subsequent semesters for PHY274 and PHY275.

For every one of the five experiments, observations, data, graphs, calculations, interpretations, and conclusions must be recorded in the Lab Notebook. Do not remove pages under any circumstances. If you make a mistake in writing, simply cross it out, and make corrections in the next available space. You are allowed to paste printed graphs and tables into the Lab Notebook pages. Your TA will provide more instructions during the introductory meeting.

Note: You must complete your writing in the Lab Notebook while you are in the laboratory. Your performance in the PHY273 Lab will be evaluated on the basis of your Lab Notebook. There will be no other written reports.

Make-up Labs

You must complete every one of the five experiments. Otherwise, you will receive zero points for the experiments missed. If you have a legitimate reason to miss a laboratory session, you may ask **in advance** permission from the TA to participate in another laboratory section. For each student with a valid excuse there will be **only one** make-up lab available at the end of the semester.

Laboratory Schedule

Each of the PHY273 laboratory sections meets twice a week for two hours in East Hall Room 102. You will be conducting five experiments over the semester.

Experiment

- Intro Meeting
- Motion in 1D (free fall)
- Motion in one 1D (analysis)
- Motion in 2D (projectiles)
- Motion in 2D (analysis)
- Newton's laws (expt.)
- Newton's laws (sim.)
- Collisions (experiment)
- Collisions (simulation)
- Rotational dynamics (expt.)
- Rotational dynamics (analysis.)
- Make-up Lab (Pendulum)

Conducting a Laboratory

At the beginning of each experiment, the teaching assistant (TA) will give a brief introduction to the relevant material (the goals, physical principles, measurement techniques, data analysis, error estimate) and explain how to handle any particular piece of equipment.

While the work on the experiment proceeds, the TA will circulate among the students and, with leading questions, assist understanding of the work. It is the students' responsibility and obligation to ask questions about any aspect of the experiment or the underlying physics which is unclear to them.

Make sure you know your TA's name, email address, and office phone number, so you may contact her/him later when you need more information.

Keeping the Laboratory Notebook

During the first session of each experiment, you will record pertinent information, set up tables, sketch the equipment, perform the experiment, gather data, and begin a preliminary analysis. Use your time in the laboratory efficiently. Do not leave the laboratory before the session is over. You may take the Lab Notebook with you when you leave the first session, for your own study.

During the second session of each experiment, you will perform a more detailed analysis of your data, compare your results with other groups' results, and participate in class discussion of your results. For some experiments, you will also conduct computer simulations. You will record all pertinent information in your Lab Notebook during the session and **hand in your Notebook to your TA before you leave the room**. You cannot take the Lab Notebook home with you after the second session. The TA will grade your Notebook and return it to you before the next experiment.

For each experiment, your Lab Notebook must include the following items:

- A sketch of the apparatus with significant dimensions indicated and a brief description of its purpose.
- The data taken from measurements recorded in tabular form including the appropriate units.
- Graphs (histograms or line graphs) appropriately labeled and accompanied by explanatory captions.
- An estimate of the expected error of each observation and a statement of how these errors affect the uncertainty of the final result.
- A discussion and interpretation of the results obtained in light of the goals of the experiment.

Grading Scheme

The evaluation of each entry in your Lab Notebook will be based on the following items:

- Descriptions, definitions, and sketches (20 pts)
- Data tables (20 pts)
- Graphical representation of experimental data (20 pts)
- Error estimate (20 pts)
- Interpretation and conclusions (20 pts)

These items do not necessarily represent separate sections in the Lab Notebook. However, each item must be present conspicuously. Each item will be awarded up to 20 points for a total of 100 points per experiment

The letter grade for PHY273 lab will be calculated by your total number of points divided by 5. There will be no scaling of grades.

A(93-100); A-(90-93); B+(87-90); B(83-87); B-(80-83); C+(77-80); C(73-77); C-(70-73); D+(67-70); D(60-67); F(<60).