General Physics Laboratory

Syllabus

Course Objective

Physics is a science that gives great emphasis to experimental verification of its principles. No theory to describe a phenomenon is accepted as valid unless the theory has been rigorously tested by experiment. You are about to begin a course in experimental physics, and we ask that you imagine that you are the first group to experimentally investigate each phenomenon, indeed, your results are unique. You are unlikely to make a new discovery, but you will discover things that are not mentioned in the theory or laboratory instructions. You learn in this course how to:

- Directly observe certain phenomena discussed in theory.
- Experience and explore relationships between measurable quantities. This involves probing a system (that is, the experimental equipment) by varying the magnitudes of some physical quantities and observing their effects on other parameters of the system.
- Gather and evaluate experimental data. Gain skills that teach you what data to record, when to record, and analyze the recorded data.
- Obtain an appreciation for the limited precision of measurements and the uncertainties involved in experimentation.
- Be objective (that is, not to bias the results of an experiment through preconceptions). The results of your measurements may be at odds with your expectations and should lead you to question the experimental method, reliability of the equipment, validity of the underlying assumptions, or your experimental skills.
- Use a theoretical model to obtain a desired quantity from the data acquired in the experiment. The model for each experiment is provided for you in these instructions, but you need to
understand every step of the analysis to obtain the final results and answer the companion questions in the report.

- **Communicate** these results to others in the form of a **written report**. All of us have to prepare reports for others to explain what we have been doing.

**Safety**

When conducting experiments it is essential that you comply with regulations designed to ensure your safety. The laboratory contains a number of potentially hazardous devices and materials, and you should always be on the alert for potential danger(s) arising from your actions and those of other students around you. Most general safety matters relate to common sense precautions:

- Do not eat or drink in the laboratory.
- Do not connect electrical equipment to a power source until the instructor’s approval.
- Be careful handling glass objects, and do not open the case of any instrument.

Pay attention to specific hazards in particular experiments, which are noted in the instructions, e.g., the use of high voltage or high power light sources and lasers.

**In the event of an accident, immediately alert your instructor.**

**Course Structure**

During the first meeting of the semester your instructor will explain the specifics of the course, the policies, and give you an introductory lecture on Error Analysis. On the next six meetings you will be taking a pre-lab quiz and performing an experiment. Specific laboratory instructions are provided in the course manual that is available in the Resources section of the course site. Day-by-day schedule of classes can also be found in the Resources folder.

**Course Policies**

**In Class:**

**Before each laboratory class, read the instructions for the experiment, and the relevant sections of Analysis and Microsoft Excel manual available as a course resource. You may also need to refer to the accompanying lecture course textbook.** Every experimental class starts with a pre-lab quiz. Failure to prepare properly will lead to a poor grade for the quiz and may cause you to waste time in the
lab. This may also risk your ability to complete the experiment and required post-processing exercise in the allotted time. A penalty can be incurred by poor performance in class.

**Make sure to bring a laptop and a USB flash drive to every laboratory class.** You are required to use your laptop to complete a part of the analysis in class. Each experimental station is interfaced with a computer and the data accumulated during the experiment will be recorded in a raw data file generated by the measurement software. You will be able to e-mail or save the data file and receive it using your laptop.

**You cannot work with the same partner for more than one experiment in the course.** You will be paired with a student to perform the experiment, but for each new experiment you should have a different partner. Both students are expected to equally participate in taking measurements.

**Have your instructor inspect the data sheet before you exit the experiment software.** At the end of class, hand the printed data sheet to the instructor.

**Grading:**
Total grade for the course is comprised from the pre-lab quiz grade (15%) and report grade (85%) averaged over the six experiments. Specific grading policy is provided by instructor.

**Preparing and submitting reports:**
Reports must be prepared in accordance with the requirements stipulated in the accompanying document entitled "Lab Report Format" which can be found in the Resources folder of the course page.

NYU Classes is the web portal through which you will be submitting your reports, receiving information from your instructor, and learning about your grades. Instructions on how to upload a report, learn about your grades and see instructor's messages will be provided to you by the instructor. Help could also be obtained from the university help desk. If you experience difficulties in submitting your report, e-mail to your instructor immediately with explanation of the problem you experienced. As an exception, instructor may allow you to e-mail the report.

**Reports are due exactly ONE WEEK AFTER THE EXPERIMENT IS PERFORMED.** There is a penalty of FIVE POINTS PER DAY on reports submitted late. If several reports are submitted late, the combined penalty will make passing the course impossible, so it is very important to submit the reports on time. The only exception to this rule is when the due date falls on an official university holiday (when no classes meet). On such an instance the deadline is postponed by the number of days of the holiday. **This policy is not extended to the late penalty for late reports. Every day after the due date, whether it is a holiday or not, counts as 5 points for penalty!**
There is an absolute deadline for submitting any report which is specified in the Class Schedule ("Last Day to Submit Reports"). You will not be able to submit report after the absolute deadline.

At the next lab session, the graded report will be available for your review and comment. **You are strongly encouraged to discuss your report and grade with your instructor**, so that you can make improvements in subsequent reports.

**No passing grade is given in the course unless all the experiments have been performed and all reports submitted.** Makeup for missed experiment(s) can be provided only in exceptional cases and only after supporting documents (such as a doctor’s note) are presented to the instructor. Be sure to inform your instructor as soon as possible about your need for a makeup.

**Academic dishonesty:**

Each member of the team MUST write the report individually. Your lab report cannot be a copy or contain any material copied from your lab partner’s report, or any other report or the lab manual. If copying or duplication, even in part, is detected, the grades of all reports involved the duplication will be reduced to zero. Repeated offence would lead to an automatic “F” grade for the course and reporting the case to the Dean of Student Affairs for processing. The university academic dishonesty policy can be found on the school website: [http://engineering.nyu.edu/academics/code-of-conduct/academic-dishonesty](http://engineering.nyu.edu/academics/code-of-conduct/academic-dishonesty).

**PH-UY 2131 “General Physics Laboratory II”**

**List of experiments**

**Experiment 1: Capacitance and Dielectrics.** Measuring a permeability of air and a dielectric using a parallel palate capacitor.

**Experiment 2: Magnetic Field and Induction.** Measuring a permeability of a paramagnetic using a solenoid and a pick-up coil.

**Experiment 3: Standing Waves on a String.** Obtaining resonances of string oscillation and measuring the speed of mechanical waves traveling along the string.

**Experiment 4: Reflection, Refraction and Polarization of Light.** Measuring index of refraction of Plexiglas using Snell’s Law and observing Brewster’s angle.

**Experiment 5: Diffraction and Interference of Light.** Measuring laser wavelength, slit width and diffraction grating constant.

**Experiment 6: Speed of Sound in Air.** Measuring speed of sound in air at different temperatures.