

Introductory Experimental Physics 1
Phys-UA 71
Fall 2024
Syllabus

Instructor: Frank Moscatelli, fm70@nyu.edu , Office: 838 in 726 Broadway

Office Hours: T, Th, 2:00 – 3:00, or by appointment

Lecture: M 11:00-12:15 Meyer 122

Laboratory Sections, Meyer 224, and instructors

M 12:30-3:30 Daniel Bateman

T 9:00-12:00 Giorgi Arsenadze

T 2:00-5:00 Giorgi Arsenadze

Texts: *An Introduction to Error Analysis*, Second Edition, by John R. Taylor,
Introduction to Python for Science and Engineering by David Pine. Available online
via an NYU computer account or vpn
<https://www.taylorfrancis.com/books/mono/10.1201/9780429506413/introduction-python-science-engineering-david-pine>

Course Description: Physics is a quantitative empirical science. All theories hypothesized must be verified by measurement. Physicists, therefore, must be thoroughly familiar with experimental techniques. The laboratory program in the NYU physics major tract consists of 5 one-semester courses: Introductory Experimental Physics 1 & 2; Intermediate Experimental Physics 1 & 2; and Advanced Experimental Physics. Each of these are separate credit carrying entities not connected to any other courses.

For our class, you will attend a lecture every Monday and **one** of the laboratory sections listed above. As a separate, credit bearing entity, there will be homework assignments, and a final exam associated with the lecture. This is in addition to the laboratory reports. See below.

The objectives of this class are to introduce essential experimental techniques including set up and operation of basic laboratory equipment. Every measurement made in a laboratory, however, is subject to uncertainties. The determination of these as well as their effect on the stated outcome of an experiment is the important subject of error analysis, which will comprise the topics in the first three lectures (lectures begin on 9 Sept.)

Modern experimental techniques also include computational data analysis. For this reason, you will learn the programming language called Python. Many of you might have some experience with Python already, but we assume no prior knowledge. The first three laboratory meetings will be devoted to Python programming.

Timeline (tentative)

Week	Lecture	Lab
Sept. 9	Uncertainty and propagation of error	Programing
Sept. 16	Mean, standard deviation	Programing
Sept. 23	Linear regression, curve fitting	Programing
Sept. 30.	Uncorrelated error, quadrature, numerical Differentiation	Motion 1& 2
Oct. 7	Newton's three laws	Newton II
Oct. 14	Holiday	No lab
Oct. 21	The role of conservation laws	Energy conservation
Oct. 28	Vector calculus	Work – energy
Nov. 4	Translational symmetry	Collisions in 1-D
Nov. 11	Midterm - quiz	Ballistic pendulum
Nov. 18	Rotational symmetry I	Centripetal force
Nov. 25	Rotational symmetry II	No lab
Dec. 2	Angular momentum, moment of inertia	Rotational motion
Dec. 9	Lab makeup week	Make up

Grading: You will do all three computational labs and then be graded on seven of the remaining experiments. That is, you can miss one experiment, or we will drop your lowest.

Lab reports	65%
Homework	15%
Midterm	5%
Final	15%

Academic integrity Physics is a collaborative science; I encourage you to work together with your lab partner on writing reports. You learn by explaining things to each other. Of course, merely copying a lab report is not only disallowed, but a violation of academic honesty codes. And we will catch you. Academic integrity is the ethical foundation of your studies at NYU. By following the principles of academic integrity, you are affirming the personal value of your own education and your membership in a community of scholars that includes both faculty members and students. All students in the course are required to follow the Academic Integrity policies for CAS courses. Any violation of these policies is a serious offense that I will report to our Director of UG Studies and our departmental Chair.

Disability Accommodations and Accessibility: Finally, let me affirm that I am committed to creating an inclusive and accessible classroom environment for students of all abilities. Students who may need academic accommodations are advised to reach out to the Moses Center for Student Accessibility as early as possible in the semester for assistance (212-998- 4980 or mosescsd@nyu.edu). Information about the Moses Center can be found at <http://www.nyu.edu/csd>. Knowing that ability status may shift during our time together, please let me know how I can best support your learning needs. If you need any support in connecting with the Moses Center or other resources, please also let me know.