PHYS 263: University Physics III Laboratory

Spring 2026

Instructor: Frank Cline
E-mail: fcline@gmu.edu
Office: Planetary Hall 242 (office hours) Krasnow 101 (other)
Office Hours: Mondays 1:30 – 2:30 pm or by zoom.

Course Description:

Prerequisites: C or higher in PHYS 261. Co-requisite: PHYS 262. Experiments in optics and modern physics, including techniques for recording, graphically and statistically analyzing, and reporting data. PHYS 263 University Physics III Lab is approved for the Natural Sciences category in the Mason Core:

https://masoncore.gmu.edu/natural-science-lab-and-non-lab/

The course will emphasize four aspects of experimental physics: designing experiments, developing technical and practical laboratory skills, analyzing and visualizing data, and communicating results.

- Design experiments: develop, engineer, and troubleshoot experiments within such constraints as cost, time, safety, and available equipment.
- Develop technical and practical laboratory skills: experience a range of standard laboratory measurements while being cognizant of device limitations
- Analyze and visualize data: analyze and display data using statistical methods and a high-level programming language (python or MATLAB) and critically interpret the validity, limitations, and uncertainties of the data and results.
- Communicate results: present in both written and oral formats experimental results with reasoned arguments supported by evidence.
  - Writing help and advice

    Notes on writing
    A suggested outline
  - Help and advice for presentations

    Notes on presentations

Each unit, except for the first one, exercises all these skills. The first unit introduces and exercises the analysis, visualization, and computational techniques that will be employed in all other units.

Schedule:

Dates	Exercise Units
26 January & 2 February	Measurement, Uncertainty and Scientific Programming
9 & 16 February	Characterizing the Atmosphere
23 February & 2 March	Pressure and Temperature
9 March	Fall Break—No Class
16 & 23 March	Total Internal Reflection
30 March & 6 April	Calibrating a Function Generator
13 & 20 April	Measuring a Refractive Index
27 April & 4 May	Light Intensity and Distance

Organization: Two weeks are allocated to each exercise unit. The first unit, on measurement, uncertainty, and scientific programming, requires reading text, solving embedded problems, and completing programming exercises. Solutions to the following embedded problems must be turned in by the end of the second class meeting (2 February; solutions to the remaining problems and programming exercises will be submitted with the pre-lab work of relevant exercise units):

- Measurement and Uncertainty note: problems 1 – 8 and 11 – 13
- Scientific programming (in python or MATLAB): tasks 1 - 6

The remaining six units are experiments. At a minimum, these will be designed and run by the end of each unit's first meeting. Ideally, data analysis will also be completed then. Each unit's second meeting is reserved for presentations and submission of reports.

Students will design experiments and collect data with their lab partners. They may, if they so choose, analyze the data with these partners. Pre-lab work, reports, and presentations must be completed individually.

Grading: All exercise units, except for the first one, contribute equally to the final grade. The first unit is worth 10 points, allocated as a fraction of the required problems and exercises completed correctly. Each of the remaining 6 units will be graded on a scale of 15 points:

Experiment design: 3 points
Performing the experiment: 3 points
Data visualization and analysis: 3 points
Written report: 3 points
Presentation: 3 points

Notebook: A notebook, of the sort without loose papers, is required. A bound composition notebook is preferred, a spiral notebook is acceptable, but a three-ring binder is not. Pages in the notebook should be numbered consecutively, either by the manufacturer or by hand, and never removed from the notebook. Entries should never be erased or blacked/whited out. A single line through a mistake is all that is necessary. The notebook must be brought to every class meeting. All pre-lab and lab work must be entered in the notebook.

Pre-lab: Only students with pre-lab work completed (in their lab notebooks; tape, staple, or glue graphs and tables produced) and approved by the instructor will be assigned to a lab station.

Lab Stations and Partners: Each student must present their lab notebook with pre-lab work completed to the instructor before being assigned a station and partner. Once this work is approved by the instructor, lab stations and partners will be assigned in the order of the instructor's approval.

Academic Standards: Academic Standards exist to promote authentic scholarship, support the institution's goal of maintaining high standards of academic excellence, and encourage continued ethical behavior of faculty and students to cultivate an educational community which values integrity and produces graduates who carry this commitment forward into professional practice.

As members of the George Mason University community, we are committed to fostering an environment of trust, respect, and scholarly excellence. Our academic standards are the foundation of this commitment, guiding our behavior and interactions within this academic community. The practices for implementing these standards adapt to modern practices, disciplinary contexts, and technological advancements. Our standards are embodied in our courses, policies, and scholarship, and are upheld in the following principles:

- **Honesty:** Providing accurate information in all academic endeavors, including communications, assignments, and examinations.
- **Acknowledgment:** Giving proper credit for all contributions to one's work. This involves the use of accurate citations and references for any ideas, words, or materials created by others in the style appropriate to the discipline. It also includes acknowledging shared authorship in group projects, co-authored pieces, and project reports.
- **Uniqueness of Work:** Ensuring that all submitted work is the result of one's own effort and is original, including free from self-plagiarism. This principle extends to written assignments, code, presentations, exams, and all other forms of academic work.

Violations of these standards—including but not limited to plagiarism, fabrication, and cheating—are taken seriously and will be addressed in accordance with university policies. The process for reporting, investigating, and adjudicating violations is outlined in the university's procedures. Consequences of violations may include academic sanctions, disciplinary actions, and other measures necessary to uphold the integrity of our academic community.

The principles outlined in these academic standards reflect our collective commitment to upholding the highest standards of honesty, acknowledgment, and uniqueness of work. By adhering to these principles, we ensure the continued excellence and integrity of George Mason University's academic community.

Student responsibility: Students are responsible for understanding how these general expectations regarding academic standards apply to each course, assignment, or exam they participate in; students should ask their instructor for clarification on any aspect that is not clear to them.

Accommodations for Students with Disabilities: Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements

and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit https://ds.gmu.edu/ for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu. Phone: (703) 993-2474.

Student responsibility: Students are responsible for registering with Disability Services and communicating about their approved accommodations with their instructor *in advance* of any relevant class meeting, assignment, or exam.

FERPA and Use of GMU Email Addresses for Course Communication: The Family Educational Rights and Privacy Act (FERPA) governs the disclosure of education records for eligible students and is an essential aspect of any course. **Students must use their GMU email account** to receive important University information, including communications related to this class. Instructors will not respond to messages sent from or send messages regarding course content to a non-GMU email address.

Student responsibility: Students are responsible for checking their GMU email regularly for course-related information, and/or ensuring that GMU email messages are forwarded to an account they do check.

Title IX Resources and Required Reporting: As a part of George Mason University's commitment to providing a safe and non-discriminatory learning, living, and working environment for all members of the University community, the University does not discriminate on the basis of sex or gender in any of its education or employment programs and activities. Accordingly, **all non-confidential employees, including your faculty member, have a legal requirement to report to the Title IX Coordinator, all relevant details obtained directly or indirectly about any incident of Prohibited Conduct** (such as sexual harassment, sexual assault, gender-based stalking, dating/domestic violence). Upon notifying the Title IX Coordinator of possible Prohibited Conduct, the Title IX Coordinator will assess the report and determine if outreach is required. If outreach is required, the individual the report is about (the "Complainant") will receive a communication, likely in the form of an email, offering that person the option to meet with a representative of the Title IX office.

For more information about non-confidential employees, resources, and Prohibited Conduct, please see University Policy 1202: Sexual and Gender-Based Misconduct and Other Forms of Interpersonal Violence. Questions regarding Title IX can be directed to the Title IX Coordinator via email to TitleIX@gmu.edu, by phone at 703-993-8730, or in person on the Fairfax campus in Aquia 373.

Student opportunity: If you prefer to speak to someone ***confidentially***, please contact one of Mason's confidential employees in Student Support and Advocacy (SSAC), Counseling and Psychological Services (CAPS), Student Health Services (SHS), and/or the Office of the University Ombudsperson.