Phys 246: College Physics Lab 2

Spring 2023 (SYNC ONLINE)

Section ID:	**2D1**
Instructor:	**Dr. Gabriele Belle**
Office:	"Virtual Office" on Blackboard Collaborate
Email:	**gbelle@gmu.edu** ***Please note:*** *All communication via email to your instructor must be through your GMU email account. Your instructor may send information to you via Blackboard email. Make sure you check your email account regularly.*
Office Hours:	Mondays from 11 am to noon.
Course Material:	The lab manual is made available on Blackboard as a set of handouts.
Meeting Room:	**Virtual classroom – Blackboard Collaborate Ultra**
Meeting Time:	**W 4:30 pm to 7:10 pm**

Course Description

Physics 246 is a laboratory course intended to provide students with practical experience in physics. In this online version of the course, students will use simulations and data from real experiments to inquire about electricity; resistive and capacitive circuits; the nature of light; the concepts of mirrors and lenses; and the light emitted by a hydrogen gas discharge lamp. It is a core course related to biological systems for life sciences. The goals and learning outcomes are listed below.

Course Goals:

1. To enhance material covered in the main lecture course by exposing students to the actual modeling of the theories and equations discussed in lecture and applying these concepts to biological topics when possible.
2. To teach students the basic techniques of computerized data acquisition and data analysis which includes proper usage of uncertainties, proper graphing and tabular creation techniques, and finally proper analysis of data.

Blackboard Login Instructions
Access to MyMason and GMU email are required to participate successfully in this course. Please make sure to update your computer and prepare yourself to begin using the online format BEFORE the first day of class. Check the IT Support Center website. Navigate to the Student Support page for help and information about Blackboard. In the menu bar to the left you will find all the tools you need to become familiar with for this course. Take time to learn each. Make sure you run a system check a few days before class. Become familiar with the attributes of Blackboard and online learning.

Required Textbooks
Any College Physics textbook can be used as a reference.

Course Learning Outcomes
1. Understand how scientific inquiry is based on investigation of evidence from the natural world, and that scientific knowledge and understanding-
    a. evolves based on new evidence
    b. differs from personal and cultural beliefs.
2. Recognize the scope and limits of science.
3. Evaluate scientific information (e.g., assess credibility and validity of information).
4. Participate in scientific inquiry and communicate the elements of the process, including:
    a. making careful and systematic observations,
    b. developing and testing a hypothesis,
    c. analyzing evidence, and
    d. interpreting results

Nature of Course Delivery
The format of this online course is online synchronous. The course is structured around 11 learning units consisting of virtual labs with focus on data analysis. Assignments must be submitted before or on the due date. Due dates are specified in the Blackboard content folder.

Technology Requirements
Hardware: You will need access to a Windows or Macintosh computer with at least 2 GB of RAM and access to a fast and reliable broadband internet connection (e.g., cable, DSL). A larger screen is recommended for better visibility of course material. You will need speakers or headphones to hear recorded content and a headset with a microphone is recommended for the best experience.

Software: This course uses Blackboard as the learning management system. You will need a browser and operating system that are listed compatible or certified with the Blackboard version available on the myMason Portal. See supported browsers and operating systems. Log in to myMason to access your registered courses. Online courses typically use Acrobat Reader, Java, and Windows Media Player, QuickTime and/or Real Media Player. Your computer should be capable of running current versions of those applications. Also, make sure your computer is protected from viruses by downloading the latest version of Anti-Virus software.

Students owning Macs or Linux should be aware that some software only runs on Windows. You can set up a Mac computer with Boot Camp or virtualization software so Windows will also run on it. Watch this video about using Windows on a Mac. Computers running Linux can also be configured with virtualization software or configured to dual boot with Windows.

Course-specific Hardware/Software

Scientific Calculator: You may also use a graphic calculator instead of a simple scientific calculator

Pasco Capstone: this software is essential for analyzing the given data. Download link: https://www.pasco.com/products/software/capstone#downloads-panel
Installation instructions and license number are in the class resource folder.

Java: This software is needed for certain simulations.

MS Excel or equivalent spreadsheet software: Spreadsheet software is essential for data analysis.

Google Chrome: The only browser in which Blackboard Collaborate Ultra works well.

Course Schedule

Week	Date	Lab Activity	Description and Purpose of the Assignment
1	01/25	Introduction	Familiarize yourself with the course and review the Measurement uncertainties handout. Introduce yourself on the Discussion board. No lab assignment due but complete your review and your personal introduction by the listed due date. Your instructor will explain the course.
2	02/01	Standing Waves	Resonance – investigating standing waves on a string. Students will inquire how the number of antinodes depends on parameters such as tension and frequency.
3	02/08	Electrostatics	Electric Charge – how can we measure it? Students will use a Faraday Pail to determine the amount of charge on a metallic sphere.
4	02/15	Capacitor	Measuring capacitance. – How does capacitance depend on the distance between the plates?
5	02/22	Building a Circuit	Series and parallel circuits – Students will investigate circuit parameters such as total resistance and total capacitance in series-parallel circuits and also learn how to predict them.
6	03/01	Ohm's Law	Measuring current and voltage in series-parallel resistive circuits. - Students will predict circuit parameters such as voltage and current and test their predictions through measurement.
7	03/08	RC Decay	Discharging a capacitor – Measuring the exponential voltage decay of a capacitor. Students

Week	Date	Lab Activity	Description and Purpose of the Assignment
			will find different ways to determine the time constant of a resistor-capacitor circuit.
8	03/13 -03/17	*Spring Break*	*No Classes*
8	03/22	Electron Charge-to-Mass Ratio	Electrons meet a magnetic field – students will determine the e/m ratio by measuring the radius of the electron beam and varying the magnetic field.
9	03/29	Geometric Optics 1	Mirrors– how can we construct an image? – Students will explore color and reflection of visible light and investigate image creation with spherical mirrors.
10	04/05	Geometric Optics 2	Lenses – students will explore how to create an image with various types of lenses.
11	04/12	Polarization	Reducing the intensity of a wave with polarizers. – Students will investigate how the intensity of a light wave depends on the polarization angle.
12	04/19	Atomic Spectra	The hydrogen spectrum – Students will explore the hydrogen spectrum of a gas discharge lamp and find the wavelengths of the Balmer series.
13	04/26	Make-up Lab	Students work on the lab they had missed
14	05/03		*No Classes*

Assignments Description

Your lab report consists of three parts, the prelab, the results, and an abstract. All assignments must be completed individually.

1) ***Prelab:*** To prepare for the lab you need to be familiar with the concepts of the lab and the equations used. In your pre-lab document record:
   a) Title of the experiment, date, and names of all lab partners.
   b) A brief statement encompassing the purpose of the experiment.
   c) A table of units of all physical quantities related to the experiment.
   d) A list of equations.
   e) An outline of the approach to be performed.
   f) Your hypothesis
   g) You are expected to submit your pre-lab prior to the lecture. If this prelab preparation is not submitted, an automatic deduction of 20% will be assessed.

2) ***Results:*** Each group must submit to the instructor a typed lab report consisting of the following material at the end of each lab:
   a) Picture(s) of the apparatus with parts labeled if applicable (you can copy the picture from the handout)

b) An Excel spreadsheet with results including graphs, summarized data, including correct units, and tables. Graphs must have a chart title and the axes must be labeled.
c) Analysis and if applicable calculations with clear results; the results must have the appropriate significant figures, and units.
d) A brief statement of the results and a conclusion summarizing what was done in the experiment as well as its outcome. In the conclusion, a comparison of the results to the theory is required.

3) ***Abstract:*** Each student must submit, before the beginning of the next class meeting, an overview of the experiment completed previously. This abstract should be a brief, one – or two –paragraph statement summarizing what was done in the experiment and the principal results. It should be self-explanatory. It must be typed. Hand written and late abstract will not be accepted. You can electronically submit your abstract and upload it to the assignment drop box.

The prelab and the abstract require individual work, while the results require group work.

Table 1: *point distribution for each assignment*

Prelab	2 points
Results	4 points
Abstract	4 points
Total:	**10 points**

Table 2: Assignment due dates

Prelab	The pre-lab is always due by 11:59 pm the day BEFORE the lab
Results	The results group report is always due by the end of each class session. If you need more time ask your instructor for an extension.
Abstract	Abstracts are due by 11:59 pm the day BEFORE the next lab.

Course Policies

Late Assignments: All assignments must be turned in on the due date. Late submission will not be accepted unless you were granted an extension due to special circumstances.

Instructor-Student Communication: I will respond to your emails within 24 hours. If I will be away from email for more than one day, I will post an announcement in the Blackboard course folder. Before sending an email, please check the following (available on your Blackboard course menu) unless the email is of a personal nature:

1. Syllabus
2. Ask the Instructor (on the discussion board)
3. On-demand Blackboard videos on how to use Blackboard features, and Technical Requirements.

Feel free to respond to other students in the Ask the Instructor forum on the discussion board if you know the answer.

Lab Manual:
Each assignment is accessible through Blackboard. You are expected to read the handout prior to coming to the virtual class and you must have access to each lab handout during the lab period.

Lab Groups:
Students will work in groups. Groups consist of 2-3 students. All members of a group should be involved in conducting each virtual lab experiment. Each group will have access to its own Blackboard Collaborate Ultra room in which they are presenters. Students should take turns working on the data analysis so that everyone gains the same experience working with Excel and the data acquisition system.

Pre-Lab Lecture:
There will be an introductory lecture for each lab. The instructor will only discuss the application of these basic physical concepts relevant to the experiment. The recording of this lecture will be posted in the content folder of each lab experiment.

If a student misses more than three labs he/she cannot pass this course.

Grading Scale

A+	96.7%---100%	A	93.3%---96.7%	A-	90%---93.3%
B+	86.7%---90%	B	83.3%---86.7%	B-	80%---83.3%
C+	76.7%---80%	C	73.3%---76.7%	C-	70%---73.3%
D	60%---70%				
F	Below 60%				

Grade Determination:

Assignment	Points	Total
11 Assignments (10 points each)	110	100%

University Policies and Resources
Academic Integrity: GMU is an Honor Code university; please see the university catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Plagiarism is a violation of the honor code. All work done outside the lab must be completed individually. Students may discuss their work with their lab partners but the work must

be done individually and copying is strictly forbidden. Any two abstracts/pre-labs that have identical sentences or have paragraphs with identical structure will be considered plagiarism.

Sharing of instructor created materials, particularly materials relevant to assignments or exams, to public online "study" sites; accessing materials uploaded to study sites by other students to complete an assignment; sharing and uploading any of your own answers or finished work to a third-party study site; using ChatGPT to answer assignment questions or write an abstract is considered a violation of the Honor Code.

No grade is important enough to justify academic misconduct. The Honor Code can be found here. It is your responsibility to see me if you have questions about these policies.

Students are required to comply with all university policies. For more information go to https://universitypolicy.gmu.edu/all-policies/

Withdrawal: If you need to withdraw from this course you must do it within the University established time frame. For spring 2023 the last day to withdraw with no tuition penalty is February 6. From then on tuition penalties apply. See the GMU academic calendar https://registrar.gmu.edu/calendars/spring_2023/ for other important dates.

Diversity and inclusion: We seek to create a learning environment that fosters respect for people across identities. We welcome and value individuals and their differences. We encourage all members of the learning environment to engage with the material personally, but to also be open to exploring and learning from experiences different than their own.

Resources

Office of Disability Services:
If you are a student and you need academic accommodations, please see me and contact the Office of disability Services (ODS) at 993-2474. All academic accommodations must be arranged though the ODS. https://ds.gmu.edu/

Other Useful Campus Resources:
Learning services Department helps students with time management and study skills. Use this resource for short classes, videos to watch, or counseling toward becoming a master of your own time. https://ulife.gmu.edu/

Writing Center:
A114 Robinson Hall; (703)993-1200 https://writingcenter.gmu.edu/

Counseling and Psychological Services (CAPS):
(703)993-2380; https://caps.gmu.edu/