

# PHYS 2240 - Physics III with Calculus Lab | Spring 2025

**Class Meeting Time & Location\***: Thursdays, 5:30 PM - 7:20 PM, Kinard 220

**Student Hours:** MWF 1:00 PM - 2:00 PM or by appointment

\*If the instructor has not arrived at the classroom by 5:45 PM, the students are free to leave.

**PHYS 2240 Physics III with Calculus Lab (CRN #####)** - Experiments involve atomic, molecular, and nuclear systems. Wave particle dualism of light and matter is emphasized. Calculators and computers are used in statistical treatment of data.

Prerequisite or concurrent enrollment: PHYS 2220 Physics with Calculus III (CRN #####).

**Instructor (GTR):** Benjamin Amend (he/him)

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**Laboratory Manager:** Dr. Daniel Thompson

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*In this laboratory course, I (Ben) am committed to fostering an inclusive and supportive learning environment where every student feels valued and empowered to succeed. Physics is not about innate ability—it is about curiosity, persistence, and the belief that you can learn and grow. I firmly believe that everyone can do physics, and my goal is to provide the tools, guidance, and encouragement you need to realize your potential.*

*Our classroom will be a space where diverse perspectives and experiences are celebrated, where questions are welcomed, and where mistakes are seen as opportunities to learn. Together, we will create an environment where everyone belongs and can contribute to the shared pursuit of understanding the physical world.*

## Course Learning Outcomes:

- 1.) Gain proficiency in the use of various laboratory instruments and tools, applying them effectively to gather accurate and reliable data.
- 2.) Develop the ability to design detailed and effective experimental procedures using provided equipment, even with minimal initial instruction, fostering independent critical thinking.
- 3.) Apply theoretical concepts from waves, optics, special relativity, quantum mechanics, and atomic physics to real-world laboratory experimentation and analysis.

## **Required Materials:**

- Composition Notebook
- Writing Utensils
- Calculator
- Note that **no lab manual is required** for this course. All lab readings will be provided online.

## **Course Modality & Attendance Policy:**

This is an in-person course, and regular attendance is expected. If you have to miss a class due to illness or an emergency, please let me (Ben) know as soon as possible, and submit a Notification of Absence (NoA) form so that the absence can be considered 'excused'. Note that the NoA form must be received within one week of the expected absence, and you may be asked to provide documentation.

You are granted one excused absence without having to complete additional make-up work - your participation and notebook entry for that week will simply not count towards your total grade. If you must miss more than one lab session, you will be assigned a 'virtual make-up lab' that must be completed by the beginning of the final lab meeting of the semester. If you are absent from a lab session and the absence is *not* excused, you will receive scores of 0 for both your participation grade and your notebook entry grade for that lab, unless you have been in communication with me about extenuating circumstances.

## **Course Cancellation Policy:**

In the event of inclement weather or a personal emergency on my behalf, requiring the cancellation of an in-person lab session, you will complete a virtual version of the scheduled experiment. Virtual lab activities are prepared for every experiment in this course and will ensure that at least two of the three learning goals are met, even in the absence of an in-person session. Specific instructions for accessing and completing the virtual lab will be provided as needed.

## **Course Schedule:**

January 14 <sup>th</sup> (Tuesday)	Last day to register, add a class, or declare audit
<b>January 16<sup>th</sup> (Thursday)</b>	<b>Acoustic Resonance</b> Acoustic Resonance Pre-Lab Questions Due
January 20 <sup>th</sup> (Monday)	Martin Luther King Jr. holiday
January 22 <sup>nd</sup> (Wednesday)	Last day to drop a class or withdraw from the University without a W
<b>January 23<sup>rd</sup> (Thursday)</b>	<b>Interference &amp; Diffraction of Light</b> Interference & Diffraction of Light Pre-Lab Questions Due

	Notebook Check I (Turn in Notebooks)
<b>January 30<sup>th</sup> (Thursday)</b>	<b>Microwave Optics</b> Microwave Optics Pre-Lab Questions Due
<b>February 6<sup>th</sup> (Thursday)</b>	<b>Mirrors &amp; The Law of Reflection</b> Mirrors & The Law of Reflection Pre-Lab Questions Due
<b>February 13<sup>th</sup> (Thursday)</b>	<b>Lenses &amp; The Law of Refraction</b> Lenses & The Law of Refraction Pre-Lab Questions Due
<b>February 20<sup>th</sup> (Thursday)</b>	<b>NO LAB MEETING</b> Work on 'Midterm' Report
<b>February 27<sup>th</sup> (Thursday)</b>	<b>Relativistic Doppler Shift</b> Relativistic Doppler Shift Pre-Lab Questions Due 'Midterm' Report Due Notebook Check II (Turn in Notebooks)
<b>March 6<sup>th</sup> (Thursday)</b>	<b>Relativistic Energy &amp; Momentum</b> Relativistic Energy & Momentum Pre-Lab Questions Due
<b>March 13<sup>th</sup> (Thursday)</b>	<b>Blackbody Radiation</b> Blackbody Radiation Pre-Lab Questions Due
<b>March 17<sup>th</sup> (Monday) - March 21<sup>st</sup> (Friday)</b>	<b>NO LAB MEETING</b> Spring Break
<b>March 27<sup>th</sup> (Thursday)</b>	<b>The Photoelectric Effect</b> The Photoelectric Effect Pre-Lab Questions Due
<b>April 3<sup>rd</sup> (Thursday)</b>	<b>Atomic Emission Spectra</b> Atomic Emission Spectra Pre-Lab Questions Due
<b>April 10<sup>th</sup> (Thursday)</b>	<b>NO LAB MEETING</b> Work on Final Projects
<b>April 17<sup>th</sup> (Thursday)</b>	<b>Final Project Presentations</b> Notebook Check II (Turn in Notebooks)
<b>April 24<sup>th</sup> (Thursday)</b>	<b>Make-Up Labs (If Needed)</b>
<b>April 28<sup>th</sup> (Monday) - May 2<sup>nd</sup> (Friday)</b>	Final Exams (No Final Exam for This Lab)

## **Grading Scheme:**

Course assignments are weighted as follows (rubrics for the final reports, as well as for the lab notebooks, will be provided separately):

<b>Engagement &amp; Participation</b> <i>Attending lab meetings and actively engaging with lab partners and course content fosters collaboration and independent critical thinking, helping you develop effective experimental procedures.</i> <ul style="list-style-type: none"><li>● Students must be actively involved in experiments</li><li>● Students must only use devices for lab-related activity</li><li>● Students must arrive to class on time</li></ul>	5%
<b>Pre-Lab Questions</b> <i>These questions test your understanding of the lab readings and prepare you for the experiments.</i>	10%
<b>Post-Lab Questions</b> <i>By reflecting on your work and analyzing collected data, you deepen your ability to connect theoretical concepts from the lecture to real-world experimentation and analysis.</i>	10%
<b>Lab Notebook Checks (x3)</b> <i>The lab notebook serves as a record of your experimental designs, thought processes, and iterative improvements, directly supporting the development of critical thinking and effective experimental procedures.</i> <ul style="list-style-type: none"><li>● Rubric provided in the 'Course Documents' module</li></ul>	15% (x3)
<b>Midterm Report</b> <i>The midterm report allows you to articulate your understanding of theoretical concepts and their practical application to laboratory work, reinforcing your ability to connect lecture content to real-world experimentation.</i> <ul style="list-style-type: none"><li>● Rubric provided in the 'Course Documents' module</li></ul>	15%
<b>Final Project (Poster, Report, or Presentation)</b> <i>The final project, presented as a group, highlights your proficiency in using laboratory tools, designing experiments, and applying theoretical concepts to analyze and interpret data.</i> <ul style="list-style-type: none"><li>● Rubric provided in the 'Course Documents' module</li></ul>	15%

Letter grades and cutoffs are established as follows:

<b>A</b>	90% - 100%
<b>B</b>	80% - 89.99%
<b>C</b>	70% - 79.99%
<b>D</b>	60% - 69.99%
<b>F</b>	0% - 59.99%

Expect a grading turnaround time of 1 week for any given assignment. You are always welcome to discuss your grade with me right after a class period, during office hours, or online via email or Zoom. **This must be done within 1 week of receiving your returned, graded assignment.**

Late work can still be turned in, but will only be graded for up to 50% of the maximum score.

## Academic Integrity

As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form.

All infractions of academic dishonesty by undergraduates must be reported to Undergraduate Learning for resolution through that office. In cases of plagiarism instructors may use the [Plagiarism Resolution Form](#).

### Additionally, for undergraduate classes:

Plagiarism, which includes the intentional or unintentional copying of language, structure, or ideas of another and attributing the work to one's own efforts. Graded works generated by artificial intelligence or ghostwritten (either paid or free) are expressly forbidden.

See the Undergraduate [Academic Integrity Policy website](#) for additional information and the current catalog ("Academic Regulations" section) for the policy. Send questions to [UGSintegrity@clemson.edu](mailto:UGSintegrity@clemson.edu).

For graduate students, see the current [graduate student handbook](#) for all policies.

## Accessibility

Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to this class should let

the instructor know and are encouraged to request accommodations through SAS (Student Accessibility Services) as soon as possible. To request accommodations through SAS, please see this link: [www.clemson.edu/academics/student-accessibility-services/how-to-register/requesting-accommodations](http://www.clemson.edu/academics/student-accessibility-services/how-to-register/requesting-accommodations). You can also reach out to SAS with questions by calling 864-656-6848, email [CUSAS@clemson.edu](mailto:CUSAS@clemson.edu) or visiting SAS at the ASC Suite 239. Contact the office for the most updated drop-in schedule if you would prefer not to schedule an appointment.

## **The Clemson University Title IX Statement Regarding Non-Discrimination**

Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy or related conditions (including pregnancy, childbirth, termination of pregnancy, lactation, recovery from the foregoing, or medical conditions related to the foregoing), national origin, age, disability, veteran's status, genetic information or protected activity in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sex discrimination (including sex-based harassment and sexual violence) as mandated by Title IX of the Education Amendments of 1972. This Title IX policy is located on the Access Compliance and Education website. Ms. Alesia Smith is the Clemson University Title IX Coordinator, and the Assistant Vice President of Equity Compliance. Her office is located at 223 Brackett Hall, 864-656-3181 and her email address is [alesias@clemson.edu](mailto:alesias@clemson.edu). Remember, email is not a fully secured method of communication and should not be used to discuss Title IX issues.

*Clemson University aspires to create a diverse community that welcomes people of different races, cultures, ages, genders, sexual orientation, religions, socioeconomic levels, political perspectives, abilities, opinions, values and experiences.*

## **Emergency Preparation**

Emergency procedures have been posted in all buildings and on all elevators. Students should be reminded to review these procedures for their own safety. All students and employees should be familiar with guidelines from [Clemson University Public Safety](#).

Clemson University is committed to providing a safe campus environment for students, faculty, staff, and visitors. As members of the community, we encourage you to take the following actions to be better prepared in case of an emergency:

1. Familiarize yourself with all possible exits, safer locations, and other key information on the emergency evacuation maps in this building, and those that you visit regularly.
2. Make a plan for how you would Run, Hide, and Fight in case of an active threat in this building, and those that you visit regularly. For example:
  - a. Run – what are all the possible exits in this building, and the routes to them?
  - b. Hide – what are the potential hiding locations in this room and building that are out of sight of doors and windows, how do you lock the door(s), how would you barricade the door(s) and windows, where do you turn off the lights?
  - c. Fight – What tools are available in this room and building, should you have to fight?
3. Ensure you are signed up for emergency alerts. Alerts are only sent when there is a potential threat to safety, a major disruption to campus services, and once-monthly tests.

4. Download the Rave Guardian app to your phone.  
[\(https://www.clemson.edu/cusafety/cupd/rave-guardian/\)](https://www.clemson.edu/cusafety/cupd/rave-guardian/)
5. Learn what you can do to prepare yourself for the hazards that affect our locations.  
[\(http://www.clemson.edu/cusafety/EmergencyManagement/\)](http://www.clemson.edu/cusafety/EmergencyManagement/)