

Quantum Universe PHY225 - Spring 2025

Instructor: Paul Saulnier. You may call me Paul.

Office: OHS 208: (507) 933-6123

Office Hours: **MWF 9:10-10:20 a.m.** and **W 11:45-12:45** and **W 3:00-3:30 p.m.**, other times by arrangement. Just shoot me an email and we will arrange a time.

Text: Modern Physics, 3rd ed. by Serway / Moses / Moyer

Recommended Reference: *Mathematical Handbook of Formulas and Tables*, by Murray R. Spiegel, Schaum's Outline Series. You won't find a better one for 3 × the cost!

Classes: **MWF 10:30-11:35 a.m.** in OHS 220

Prerequisites: **PHY-215 and PHY-250 with a grade of C or better.**

Educational Philosophy: You are responsible for learning the material covered in this course. I am here to organize, structure, explain, and present the material and provide examples as well as answer questions. But the only way for **you** to learn the material in this course is to personally engage with it. Watching me or others work with the material will not do. Learning requires personal engagement and effort.

Classroom Dynamics: I strive to have a relaxed atmosphere in the classroom. I want everyone to feel welcome and to feel comfortable asking questions. The chances are that if you have a certain question it is likely that you are not the only one. There is no such thing as a "stupid question". Everything and anything is "easy" if you know how to do it well and everything and anything is "hard" if you do not. It is all of us together in this joint learning endeavor. All of us (me included) striving to understand physics better! As the course material is sequential, it is important that you understand material topic X before proceeding to topic Y. So, ask questions early and often as necessary.

Department Ethos: As is expected in any course in the physics department, each student is asked to work, along with the instructor and their student peers, to develop a culture of cooperation and inclusion within our department. The physics major can be challenging, and we all need the respect and support of others. While it would be unreasonable to assume that every single person will develop a close working relationship with every other, it is expected that each individual will be supportive of, and have a positive influence on, every member of the departmental community that they encounter.

Attendance: Regular class attendance is expected. If you miss a class **for any reason** you are responsible for the material covered during the class, including any assignments introduced or in-class group work. You are responsible for your education and for meeting the course expectations.

Homework: Homework will be assigned approximately every week. Late homework will be accepted at the discretion of the instructor, with the loss of 10% per day of the total score (provided that you do not have a valid reason for not submitting the homework on time). Homework should be your own work, however, some collaboration is expected.

Makeup: Missed exams may be made up at the discretion of the instructor with prior notification and a valid excuse only.

Final Exam: **Either Thursday, May 1st or Friday, May 2nd in OHS 220, TBD. I am waiting for the Registrar to schedule this exam.**

Coverage: We will be covering the following chapters in more or less detail.

- Chapter 1 - Relativity I
- Chapter 2 - Relativity II
- Chapter 3 - The Quantum Theory of Light
- Chapter 4 - The Particle Nature of Matter
- Chapter 5 - Matter Waves

Exam 1 - Target Date, February 14th, 2025

- Chapter 6 - Quantum Mechanics in One-Dimension
- Chapter 7 - Tunneling Phenomena (Less)
- Chapter 8 - Quantum Mechanics in Three Dimensions
- Chapter 9 - Atomic Structure

Exam 2 - Target Date, March 28th, 2025

- Chapter 10 - Statistical Physics
- Chapter 11 - Molecular Structure (Less)
- Chapter 12 - The Solid State (Less)
- Chapter 13 - Nuclear Structure
- Chapter 14 - Nuclear Physics Application (Less)

Exam 3 - Target Date, April 28th, 2025

- Chapter 15 - Elementary Particles (as time permits)

<u>Evaluation:</u>	There will be three unit exams	3 × 20%
	Comprehensive final exam	20%
	Homework	20%

Final course grades will be assigned using the following scale as a guide:

94-100	A	74-78	C+
90-94	A-	70-74	C
86-90	B+	66-70	C-
82-86	B	62-66	D+
78-82	B-	58-62	D
		0-58	F

Please note that these ranges are only guidelines. Final grades will also take into account the instructor's evaluation of the student's attendance and evidence of improvement.

Instructor's Note: My job in this class is to help you learn 20th century physics. I take this responsibility seriously and I would ask you to help me do my best. Specifically, I would encourage you to ask questions about the material during class and speak with me outside of class to discuss any course related concerns. Don't wait until the end of the semester to inform me of your concerns - by then it is too late. Your opinion is important to me.

Academic Accommodations:

Gustavus Adolphus College is committed to ensuring equitable and inclusive learning environments for all students. If you have a disability and anticipate or experience

barriers to equal access, please speak with the accessibility resources staff about your needs. A disability may include mental health, attentional, learning, chronic health, sensory, physical, and/or short-term conditions. When appropriate, staff will guide students and professors in making accommodations to ensure equal access. Accommodations cannot be made retroactively; therefore, to maximize your academic success at Gustavus, please contact them as early as possible. Accessibility resources staff are located in the Academic Support Center (<https://gustavus.edu/asc/accessibility/>) (x7227). The Accessibility Resources Coordinator can provide further information.

Academic Honesty: By writing your name on any graded assignment for this class, you are attesting to the fact that it has been completed in accord with the college's academic honor policy. I take this responsibility seriously and I expect that you will also. If you have any doubt about what constitutes appropriate use of someone else's work, please ask.