

UNIVERSITY OF VERMONT
DEPARTMENT OF PHYSICS

PHYSICS 5300: ELECTROMAGNETIC THEORY

Fall 2025

Instructor:	Dr. Dennis Clougherty	Time:	TR 1:15-2:30 PM
Email:	dennis.clougherty+PHYS5300@uvm.edu	Place:	Waterman 402

Course Description: Development of Maxwell's theory of electromagnetism emphasizing its physical basis and the modes of mathematical description.

Prerequisites: Graduate student or undergraduate student with Instructor permission; knowledge of PHYS 4300 topics strongly recommended.

Objectives: Students will gain experience in using Maxwell's equations in quantitative problem-solving and will increase proficiency in visualizing scalar and vector fields.

Course Personnel:

Mohamed Elsayed, graduate teaching assistant (Mohamed.Elsayed@uvm.edu).

Office Hours: R 10-11 AM & by appointment.

References:

1. John David Jackson, *Classical Electrodynamics*, 3rd edition, (Wiley, 1998). (This is the required text for the course.)
2. L.D. Landau and E.M. Lifshitz, *The Classical Theory of Fields* (Butterworth-Heinemann, 1980).
3. Andrew Zangwill, *Modern Electrodynamics*, (Cambridge, 2012).
4. G. Arfken et al., *Mathematical Methods for Physicists*, 7th edition, (Academic, 2012). (This text is a popular reference for relevant mathematics.)

Course Outline:

1. Electrostatics and boundary-value problems
2. Magnetostatics
3. Time-varying fields
4. Wave propagation
5. Radiating systems
6. Special relativity and electromagnetism
7. Dynamics of charged relativistic particles
8. Lagrangian description of electrodynamics
9. Radiation damping and self-interaction

Online Resources:

1. Course web site: <http://brightspace.uvm.edu>
2. UVM Physics help sessions web site: <https://www.uvm.edu/cems/physics/help-sessions>
3. UVM tutoring center web site: https://www.uvm.edu/academicsuccess/tutoring_center
4. UVM Physics web site: <http://www.uvm.edu/physics/>
5. UVM student accessibility services (SAS): <http://www.uvm.edu/access>
6. Prof. Clougherty's web site: <http://go.uvm.edu/dpc/>

Grading Policy:

Homework (30%), Exams (15% each), Final (25%).

Important Dates:

Exam #1	September 16, 2025
Exam #2	October 14, 2025
Exam #3	November 20, 2025
Final Exam	December 11, 2025 (1:30-4:15 PM)

Please mark these dates in your calendar now. Exams will take precedence over medical appointments, travel plans, athletic events, and other personal activities. If you miss an exam, you will receive a score of zero unless excused by Professor Clougherty prior to the exam. As a general rule, only a verifiable illness is reason to miss an exam.

Class expectations:

1. *Attendance:* Regular attendance is important in mastering the material.
2. *Preparation:* Students are required to read the assigned text in advance of class. Please come to class with questions stimulated by your readings.
3. *Homework:* Homework assignments will be posted to the course web site on Brightspace. Please write up your complete and detailed solutions neatly. Please upload a scanned pdf of your solution to Brightspace in advance of the posted deadline.
4. *Exams:* Exams will be based on the homework problems. Exams are closed-book, but you can bring a single-page sheet with notes to use during the exam.
5. *Class recordings:* Our class sessions may be recorded for students in the class to refer back to, and for enrolled students who are unable to attend live. Students who participate online with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who unmute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the “chat” feature, which allows students to type questions and comments live.

Accommodations: In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact SAS, the office of Disability Services on campus. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly encouraged to meet with their faculty to discuss the accommodations they plan to use in each course. See <http://www.uvm.edu/access> for more information.

Academic Integrity: It is expected that all students will adhere to the University code of academic integrity. Students are prohibited from publicly sharing or selling academic materials that they did not author (for example: class syllabus, outlines or class presentations authored by the professor, practice questions, text from the textbook or other copyrighted class materials, etc.); and students are prohibited from sharing assessments (for example, homework or a take-home examination). Violations will be handled under UVM's Intellectual Property policy and Code of Academic Integrity.

(<https://www.uvm.edu/sites/default/files/UVM-Policies/policies/acadintegrity.pdf>)