Physics 3300 A: Electromagnetic Theory I

Fall 2025 (*Version 1.0, August 25, 2025*)

Course Information: Physics 3300A, Electromagnetic Theory I, Fall Term 2025, Three lecture hours per week, Tuesdays 10:30am-12:30pm and Thursdays 11:30am-12:30pm, in PAB 150

Prerequisites: Physics 2101A/B; Physics 2104A/B (or the former Physics 2102A/B); Calculus 2302A/B or Calculus 2502A/B (or Numerical and Math Methods 2276A/B or Numerical and Math Methods 2277A/B or the former Applied Math 2276A/B or the former Applied Math 2277A/B).

→ Physics 3300 requires a good command of multivariable vector calculus ←

Instructor: Prof. Aaron Sigut, asigut@uwo.ca, (519) 679-2111 x86718. My office hours will be set via an OWL poll during the first week of class.

Content/Learning Objectives: Topics include: electrostatics, electric fields in matter, magnetostatics, magnetic fields in matter, and electrodynamics culminating in Maxwell's equations.

By the end of this course, students should be able to

1. Select an appropriate method to solve for the electric potential and electric field given a static charge distribution in a vacuum or linear material.
2. Solve electrostatic problems using methods including Coulomb's law, Gauss's Law, the method of images, the multiple expansion, and the Laplace's equation.
3. Apply the Biot-Savart Law and Ampere's Law to determine the magnetic field of steady current distributions in a vacuum or linear material.
4. Solve for induced induced electric and magnetic fields using Faraday's and Ampere's laws.
5. Show that Maxwell's equations imply the conservation of electric charge and predict the existence of electromagnetic waves.
6. Confidently use the tools of multivariable vector calculus implied above.

Text: *Introduction to Electrodynamics, Fifth Edition*, David J. Griffiths, (2024, Cambridge University Press). The fourth edition is very similar to the fifth and could be used; however, all class references to the text will be for the fifth edition. The text is available from the Western Bookstore at a cost of $80 (ebook) or $103.30 (physical book). Note that Griffiths also serves as the textbook for Electromagnetic Theory II, Physics 4351B.

Evaluation: Three assignments, two mid-term tests, and a final exam will determine your grade.

Component	Due Date	Weight
Assignment 1	Tuesday, September 30	8.0%
Midterm 1	Tuesday, October 7	16.0%
Assignment 2	Tuesday, November 11	8.0%
Midterm 2	Tuesday, November 18	20.0%
Assignment 3	Thursday, December 4	8.0%
Final Exam	TBD (December 11-22)	40.0%

Test/Exam Policies: The two mid-term tests and final exam are subject to the following:

- The midterms and final are closed-book exams. A formula sheet will be provided, and this will include the inside front and back covers of the text (Vector derivatives; Fundamental theorems; Basic equations of electrodynamics; Fundamental constants; Spherical and cylindrical coordinates). No other notes or aids will be allowed.
- The 20% weight will be placed on your highest mark mid-term and 16% on the other. This requires both midterms to be written. If one or more of the midterms are missed, the weighting is as follows
  - Missed midterm 1: The 16% will be distributed as an extra 6% on midterm 2 and an extra 10% on the final exam.
  - Missed midterm 2: The 20% will be placed on the final exam, making the final worth 60%.
  - Missed both midterms 1 and 2: The 36% will be placed on the final exam, making the final worth 76%.
- The first mid-term will test the entire course up to that point, while the second mid-term will test mainly material covered since the first midterm. The final exam is a three hour cumulative test of the entire course.
- The mid-terms are during our regular Tuesday class time, 10:30am-12:30pm.
- A Sharp EL-5xx series calculator, or other calculator without text capacity, is permitted during the tests. No other electronic devices are permitted.
- Missed Final Exam: Documentation must be provided to an academic counselor in your home faculty in order for you to receive permission to write a make-up. If you miss the make-up, documentation must be again provided, and you will write the exam at the next sitting of this course's final exam (typically one year later).

Assignment Policies: The three assignments are subject to the following:

- The use of Generative AI Tools in the completion of course assignments is prohibited.
- You are free to discuss problem approaches with other students; however, the submitted solutions must be your own. Identical assignments will be treated as a case of plagiarism.
- Problem sets must be handwritten, either with pen and paper or an electronic device with a stylus.
- Problem sets must be scanned to a single file and uploaded to the OWL course site by the beginning of class on the due date. The filename of the problem set must be of the form uwoname_probsetN.pdf. Your uwoname is the first part of your UWO email address. For example if I was submitting problem set 1, I would submit the file asigut_probset1.pdf.
- Late assignments will be penalized 10% per day for up to five days. Weekends are included in the day count. Assignments will not be accepted after five days so that solutions can be posted in advance of the mid-terms.
- If an assignment cannot be completed due to illness, . . . , the weight of that assignment will be distributed equally among the completed assignments.

- My experience is that attempting to do the course assignments yourself has a strong, positive effect on your mark, even if you lose marks on the assignments. This follows from the weighting of the course components in which 76% of the marks come from tests and exams that you complete alone.

General Policies on Missed Coursework: Students must familiarize themselves with the University Policy on Academic Consideration – Undergraduate Students in First Entry Programs, posted on the Academic Calendar:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf,

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:
https://registrar.uwo.ca/academics/academic_considerations/

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request without supporting documentation in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

1. The final examination scheduled during the December 2025 examination period.

If a student mistakenly submits their one allowed Academic Consideration request without supporting documentation for the assessments listed above, the request cannot be recalled and reapplied. This privilege is forfeited.

Passing Grade: To pass the course, you must satisfy two criteria:

1. obtain a weighted-average of at least a 50% on all course components listed above,
2. obtain a weighted-average of at least 50% on the two midterms and the final exam. Note that this policy *does not mean* that if you fail a midterm(s), you automatically fail the course.

Final Mark Distribution: In rare cases, the Department of Physics and Astronomy may adjust the final course marks in order to conform to Departmental policy.

Support Services: Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, requests for relief, exam conflicts, and many other academic-related matters:
https://www.uwo.ca/sci/counselling/
Students who are in emotional/mental distress should refer to Mental Health@Western (https://uwo.ca/health/) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have

experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at:
https://www.uwo.ca/health/student_support/survivor_support/get-help.html
To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Religious Accommodation: When conflicts arise with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible, but not later than two weeks prior to the writing of the examination (or one week prior to the writing of the test). Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays - https://www.edi.uwo.ca

Accessibility: Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf.

Scholastic Offenses: Scholarly offenses are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offense, in the following pdf documents:
https://uwo.ca/univsec//pdf/academic_policies/appeals/scholastic_offences.pdf
https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

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