

Course Outline

Physics 3300A: Electromagnetic Theory I

Fall 2024

Subject to change: this version 3 September 2024

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Prerequisites: Physics 2101a/b and 2102 a/b or the former Physics 201/202. *Note:* Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Course Description:

A study of static electric and magnetic fields using vector calculus; time varying electric and magnetic fields, Maxwell's equations and solutions; radiation, wave propagation in continuous and discontinuous media, other topics as time permits

Learning Outcomes:

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

- Select an appropriate method to solve for electric potential or field in the vicinity of a static charge distribution in vacuum or linear media
- For certain types of symmetry, solve electrostatic problems using methods including Coulomb's Law, Gauss's Law, separation of variables, the method of images, and multipole expansion
- Apply the Biot-Savart Law and Ampere's Law to determine the magnetic field of static current distributions in vacuum and in linear media
- Show that the laws of geometric optics originate with Maxwell's equations at dielectric boundaries
- For certain types of symmetry, solve for induced electric and magnetic fields using Faraday's and Ampere's laws
- Find electrostatic energy and momentum for certain charge and current distributions

Course Materials:

Text: Introduction to Electrodynamics (5th ed.), David J. Griffiths (The 4th edition will also work)

Students will also need a non-graphing, non-wifi calculator for some exams. Students should check OWL (<https://westernu.brightspace.com/>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. Students are responsible for checking OWL on a regular basis. If students need assistance with the course OWL site, they can seek support on the OWL Brightspace Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Lectures and tutorials will be in-person. In the event of University-declared emergency during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will **not** change. Any assessments affected will also be conducted online as determined by the course instructor.

Method of Evaluation:

- Assignments: 30%
- Midterm Tests 35%
- Final Exam: 35%

Assignments: approximately 1 assignment every 2 weeks (6 assignments total)

Each assignment will consist of three to six problems, plus four to eight short answer questions. The problems will be long answer, with most marks awarded for the method of problem solving. **Assignments are due by 4 pm on their due date.**

The due date will be given when the problems are assigned. Late assignments will be penalized 10% per day for up to four days: assignments will **not** be accepted more than **four days** past the due date. **Submitting an assignment at 4:05 pm on the due date counts as one day late.**

For each assignment, each student has 2 “late days” which they may use without notifying the professor, and without securing accommodation; no penalty will be applied to assignment grades for these days. Note that the assignment due date is not changed by this accommodation, which is intended to replace formal accommodation for illness. Each student has an additional two “late days” which they may use at any time through the term, either both for a single assignment or one each for two assignments. Again, there is no need to notify the professor. These days will be automatically tallied as they are used. Once all late days have been used, the 10% per day penalty will be applied to any further late days.

Students may consult with one another when completing assignments, but every student must submit his or her own work. No peer consultation will be permitted on the exams.

All assignments are to be submitted electronically on or before the due date. Assignments will be uploaded as a single pdf to Gradescope (linked on the OWL site), and feedback will

be viewable there after the grades are uploaded to the gradebook. Assignments may be typed or written by hand and scanned. If using a phone camera, please pay attention to shadows and focus, and check that the pdf you upload has all your pages in order, and that each page is legible. Clearly identify each problem and question.

Midterm tests:

There will be **two midterms**, both held during class time, on October 8 and November 12. A formula sheet will be provided, and will be available before the test for studying. A non-graphing, non-wi-fi enabled calculator is permitted. No other aids are permitted, including extra sheets, computers, cell phones, smart watches, PDAs, advanced calculators or other electronic devices. Midterm 1 will cover material from Assignments 1 and 2 (typically Chapter 2 and possibly part of Chapter 3). Midterm 2 will cover material from Assignments 3 and 4 (typically Chapters 3 and 4).

If a student misses a midterm with accommodation, the makeups are at (Midterm 1) October 25, 4 pm and (Midterm 2) November 22, 4 pm. If a student misses the makeup exam, with accommodation, they will have their grade reweighted with the midterm grade going to the final exam. Alternatively, a student may choose to write the midterm during the next offering of the course, in 2025.

Final Exam:

The final exam is cumulative, and will consist of approximately 5 problems plus 10 short answer questions. A formula sheet will be provided. A non-graphing, non-wi-fi enabled calculator is permitted. No other aids. A single makeup date will be offered in January; a student missing the makeup with accommodation must write the final exam during the next offering of the course, in 2025.

Important dates:

5 Sept: First class
16 Sept: Assignment 1 due
30 Sept: Assignment 2 due
8 Oct: Midterm 1 (in class)
12-20 Oct: Reading Week
21 Oct: Assignment 3 due
25 Oct: Makeup for Midterm 1
4 Nov: Assignment 4 due
12 Nov: Midterm 2 (in class)
18 Nov: Assignment 5 due
22 Nov: Makeup for Midterm 2
2 Dec: Assignment 6 due
Final exam date TBA
Makeup for final exam TBA (early January)

The Department of Physics and Astronomy may, in rare cases, adjust the final course marks in order to conform to Departmental policy.

Student Absences

Academic Consideration for Student Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

Assessments worth less than 10% of the overall course grade:

For minor illnesses, students may use their free late days for more time on assignments. For more serious circumstances (illness or injury preventing work on the assignment for a period of two weeks, for example), the student should contact the instructor to ask about reweighting.

Assessments worth 10% or more of the overall course grade:

For work totalling 10% or more of the final course grade (the midterms), you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible in order to write the makeup exam. If the makeup exam also cannot be written, your grade will be reweighted or you may write the midterm at the next sitting of the course, in 2024. For further information, please consult the University's medical illness policy at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf.

The Student Medical Certificate is available at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For the policy on Academic Consideration for Student Absences – Undergraduate Students in First Entry Programs, see:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf

and for the Student Medical Certificate (SMC), see:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under [Special Examinations](#)).

Note: missed work can *only* be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential COVID-19 symptoms is **not** sufficient on its own.

[Accommodation and Accessibility](#)

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>.

Accommodation Policies

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.

[Academic Policies](#)

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

Only non-graphing, non-wifi-connecting calculators are permitted for tests and exams: no other electronic devices are permitted.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_und_ergrad.pdf.

In the event of a University shutdown, tests and examinations in this course will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course may require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at:

<https://remoteproctoring.uwo.ca>.

Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, 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.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/sc/digital/>.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>.