

# Physics 4351 B: Electromagnetic Theory II

*Winter 2023 (Jan-Apr 2024) [Version 1.0, January 8, 2024]*

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**Office Hours:** set via an OWL poll during the first week of class.

**Software Tools:** You should have access to the following:

Software tool	Used for . . .
Web Browser	OWL: announcements, grades, assignments
Microsoft Stream (Microsoft Teams)	Supplementary lectures (on-line delivery, if required)

As all Western students have a Microsoft Office 365 subscription, both MS Teams and MS Stream are available for free. I will use MS Stream to post the occasional on-line lecture. I have no plans to use Teams; however, if there is a transition to on-line learning during the term, MS Teams will be the main content delivery mechanism via synchronous, on-line lectures.

**Text:** *Introduction to Electrodynamics, Fourth Edition*, by David J. Griffiths. This is the same text as used in Physics 3300A (Electromagnetic Theory I). I will follow this text very closely. Note that a new 5th edition of Griffiths is to be released in 2024; however, this edition will not be used.

I will also briefly discuss quantization of the electromagnetic field, a topic not covered in the Griffiths text. Here I will use Sections 14.2 (The Hamiltonian for the Electromagnetic Field) and 14.3 (Quantizing the Radiation Field) from *A Modern Approach to Quantum Mechanics, 2nd Edition*, by John S. Townsend. As this is the text for Quantum Mechanics I (Physics 3200B) and Quantum Mechanics II (Physics 4251A), all students should have access to this material.

**Prerequisite:** Physics 3300a. Success also requires a good command of vector calculus.

**Content:** This course covers Chapters 8 through 12 of the Griffiths text. Topics include:

- Chapter 8: Conservation Laws
- Chapter 9: Electromagnetic Waves
- Chapter 10: Potentials and Fields; Quantizing the Radiation Field
- Chapter 11: Radiation
- Chapter 12: Relativistic Formulation of Electromagnetism

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

Component	Due, in class	Weight
Assignment 1	Monday, January 22	7.5%
Assignment 2	Monday, February 5	7.5%
Midterm 1	Monday, February 12	15.0%
Assignment 3	Monday, March 4	7.5%
Midterm 2	Monday, March 18	20.0%
Assignment 4	Monday, April 1	7.5%
Final Exam	TBD (April 11-30)	35.0%

- There are two mid-term tests worth 35% of your final grade; contrary to the table above, 20% will be placed on your highest mark mid-term and 15% on the other. This weighting requires that both midterms be written. If one or both of the midterms is missed, the weighting is as described in the section “Missed Midterm(s)” below.
- 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 test. Both tests are closed-book, although formula sheets are provided (see below).
- The mid-terms are during our regular class time, 9:30-10:30am. In the event of a transition to on-line learning, remaining tests will be done remotely and proctored with MS Teams.
- There is a final exam during the April examination period worth 35% of your grade. The final exam is a three hour, closed-book, cumulative test of the entire course.
- The remaining 30% of your grade will come from four problem sets (worth 7.5% each). The due dates for the problem sets are given in the table above. Problem sets are posted two weeks before they are due.
- The midterms and final are closed-book exams. A formula sheet will be provided. 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.
- A Sharp EL-5xx series calculator, or other calculator without text capacity, is permitted during the tests. No other electronic devices, are permitted.

#### **Additional Course Policies:**

- **Passing Grade:** To obtain a passing grade in this course you must satisfy two criteria: (1) obtain a weighted-average of at least a 50% on all course components, and (2) obtain a weighted-average of at least 50% on the two midterms and the final exam. This policy *does not imply* that if you fail a test, you fail the course.
- **Late Assignment(s):** Late assignments will be penalized 20% per day for up to four days. Weekends are included in the day count.

If an assignment cannot be completed due to illness or other reason, the weight of that assignment will be distributed equally among the completed assignments. You do not need to obtain supporting documentation in this case; however, you must notify me by the due date that the assignment cannot be completed.

- **Missed Midterm(s):** You must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For Faculty of Science students, start the process at the following link:

[www.uwo.ca/sci/counselling/procedures/academic\\_consideration\\_for\\_absences/illness.html](http://www.uwo.ca/sci/counselling/procedures/academic_consideration_for_absences/illness.html)

In the case of missed midterms, the other test components will be re-weighted as follows:

- **Missed midterm 1:** 15% will be placed as an extra 5% on midterm 2 and an extra 10% on the final exam. Therefore midterm 2 will be worth 25% and the final exam, 45%, of the final grade.
- **Missed midterm 2:** An extra 20% will be placed on the final exam, making it worth 55% of the final grade.
- **Missed both midterm 1 and 2:** An extra 35% will be placed on the final exam, making it worth 70% of the final grade.
- **Missed Final Exam:** Documentation must be provided to an academic counsellor in your home faculty in order for you to receive permission to write a make-up (usually scheduled for May 1). 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).
- **Final Grade Distribution:** The Department of Physics and Astronomy, in rare cases, may adjust the final course marks in order to conform to Departmental policy.

**Academic Misconduct:** Scholarly offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the following pdf document:

[www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf)

- **Cheating:** University policy states that cheating is a scholastic offence which can result in an academic penalty, including expulsion from the program. If you are caught cheating, there will be no second warning. Cheating also includes having available any electronic devices other than a watch and an approved calculator at tests and exams. You may not have a cell phone accessible during tests or exams, even to use it as a calculator or watch.
- **Plagiarism:** Students must write their assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing (such as footnotes or citations). Plagiarism is a major academic offence.

The most common form of plagiarism in a course such as Physics 4351 is for students to copy solutions from the Instructors Solutions Manual for the Griffiths text. Be aware that it is quite easy for me to detect solutions copied from the Solutions Manual.

My experience is that attempting to do the course assignments yourself has a net positive effect on your mark, even if you lose marks on the assignments. This follows from the weighting of the course components in which 70% of the marks come from tests and exams in which you will not have access to solutions. Note that working on problems in a group

and discussing solution approaches is not a form of plagiarism. However each student must submit solutions in his or her own words. Identical assignments will be treated as a case of plagiarism.

**Student Support:** Students who are in emotional or mental distress can find many options to seek help at Health and Wellness Western.

[www.uwo.ca/health/psych](http://www.uwo.ca/health/psych)

**Religious holidays:** For purposes of this policy, the University has approved a list of dates which are recognized religious holidays which require members of those religions to be absent from the University; this list is updated annually and is available at Departmental, Deans' and Faculty advising offices.

**Accessibility:** Please contact me if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Western Accessible Education for any specific questions regarding an accommodation.

[academicsupport.uwo.ca](http://academicsupport.uwo.ca)