PHY 411 – Electrodynamics I

Schedule: (Remote), Tuesdays & Thursdays, 4:20-5:50 PM (*Winter 2021*)

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Course Webpage: d2l.depaul.edu

Textbook: Classical Electrodynamics, 3rd edition, John David Jackson, ISBN: 978-0471309321

Course Content: In this core course for the M.S. degree in Physics, we will learn about Maxwell's equations, electromagnetic waves, and allied concepts in electrostatics and magnetostatics. Part II of this course will finish with the remainder of the important topics in electrostatics and magnetostatics, and continue with advanced topics in radiation and relativistic electrodynamics.

Office Hours: Due to the special circumstances this quarter, all office hours will be on Zoom. **Information about these Zoom office hours is posted in D2L**. In addition, office hours are also available by appointment. Upon agreeing on a convenient time for such appointments, I will direct you to a Zoom session. If two or more students have the same questions, I may direct you to a shared Zoom session to save time, as long as you have no objections. Note that during all Fridays in January, I'll be away at all-day meetings of the CSH Promotion & Tenure Committee.

Grading Policy: There will be in-class exercises, homework assignments, a midterm, and a comprehensive final. The final must be taken to receive a passing grade. The course grade will be determined on the following basis:

Class Participation	**20%**
Formal Write-up	**5%**
Homework	**25%**
Midterm	**25%**
Final (comprehensive)	**25%**

The final grading scale will be the following (changes may be made if necessary, but only to the student's advantage):

A− to A: 85% and higher	B− to B+: 70%-85%	C− to C+: 55%-70%
D to D+: 40%-55%	F: less than 40%	

A grade of incomplete is given only under extreme circumstances (e.g., an extended stay in the hospital). An incomplete is not a mechanism to improve an unsatisfactory grade.

Class Participation: Participation in class is a significant component of this course accounting for 20% of the grade. Participation involves reading before class, being present in the zoom sessions during class, working on the assigned worksheet for the day with the members of your group, and asking questions whenever you need something explained or clarified. Classes will generally consist of mini-lectures interspersed with in-class exercises, which may be multiple-choice or descriptive questions meant to be answered orally or, more frequently, written activity on in-class worksheets. These worksheets will be available at the designated link on D2L, generally about an hour before class. The in-class exercises are meant to allow you to grasp the concepts before you go on to solve homework problems on your own. *No make-ups are allowed for in-class exercises*. The following are based on my philosophy that in order to learn, one must be a responsible stakeholder who comes to class prepared to participate in the activities and discussions planned for the day.

- Daily discussions will be based on worksheets and/or readings. You should do the assigned reading before coming to class. Like many other activities in this class, I am trusting you to do this (without having you go through reading quizzes). Remember, science is an activity based on trust. When you submit a paper for publication, the journal trusts that you have carried out the experiments, simulations, or analysis honestly in the manner stipulated for such activities. Please do not betray this trust.
- Absences, coming late to class, leaving early, and carrying on conversations (including private chats) when the instructor or another student is trying to make a point will all be cause for points subtracted from a daily count of points awarded.
- Although there are no make-ups for missed classes, you are allowed two unexcused absences for which you do not have to provide any documentation, unless you miss a third class, in which case you may be asked (at the discretion of the instructor) to provide documentation from the Dean of Students to be allowed to continue in the course.
- If you have only two absences during the quarter, you will be eligible to receive 40-100% of class points for the first absence and 40-80% for the second absence, with the actual number of points to be determined at the end of the quarter based on your general record of work completion in the course (i.e., if you've missed out on assignments and participation points, you may expect to be awarded fewer points for missed days).

Due to the special circumstances this quarter, all students have an even greater shared responsibility than usual to make sure that they cooperate to make each class a success.

- All classes this quarter will be conducted as Zoom sessions, unless the university announces that class meetings on campus are to be allowed again. Some classes may be asynchronous, and the instructor will provide advance information regarding such exceptions.
- It is your responsibility to arrange for a computer or laptop to join the Zoom sessions. Please arrange for a webcam if you don't have one. You must also have a functional microphone (either computer or external) so you can be heard.
- Please do not hop on and hop off Zoom sessions unless instructed to do so. Your class participation points require you to be present for the entirety of the session. Late arrivals and early departures will be penalized.
- Part or all of these sessions may be recorded. If a session is recorded, it will be made available in D2L.

Formal Write-up: This is an enhanced homework activity, in which you will write up 1-2 problems (depending on length) in the formal manner of a publishable paper. Details will be provided in D2L.

Homework: Homework assignments will usually be due in D2L by 9 PM on Mondays (unless announced otherwise).

Except for the homework assignment due the week of the Midterm (for which late submissions will ***not*** be allowed), late homework will be accepted until 8 AM on Friday (or as announced, if the regular deadline is not Monday) for 80% credit; after that it will not be accepted; but contact the instructor before the regular deadline for exceptions past this late deadline in extenuating circumstances (may require documentation from the Dean of Students); such extensions may be provided at the instructor's discretion, but likely no more than once for the quarter. Submit late homework into the D2L Dropbox set up for late submissions – no other form of submission will be accepted. In particular, do not attach homework to email to make an end-run around the D2L deadline or late deadline; such emails are automatically deleted and do not count as submissions.

Again, due to the special circumstances this quarter, only the submissions conforming to the following criteria will be graded; all other submissions will receive a grade of zero.

- Each homework assignment must be submitted as one single PDF file; no other format will be graded.
- You may write out solutions by hand, scan as one PDF file, and submit. Or, you may use the latex template provided and generate a PDF to submit. Or, you may use Microsoft Word, but you must save and submit as (one) PDF.
- Number questions and sub-parts correctly. You will receive zero points if you have not numbered a question or sub-part, even if you answered it correctly.
- Plots are meant to be drawn using Matlab, or whatever software you feel comfortable with (but not online calculators). Hand-drawn graphs will receive a score of zero.

All homework will be graded using the following procedure.

- If a problem is answered perfectly on submission, you will earn 10/10 (or scaled according to the total points on each problem, and scaled appropriately for late submissions).
- If a problem is answered with a minor error, you will earn 7/10 (or scaled accordingly).
- If a problem is answered with (a) major error(s), you will earn 3/10 (or scaled accordingly).

Students earning 3/10 or 7/10 (or scaled accordingly) will then have a chance to review my solution, and turn in a report discussing what you did wrong on the problem. Depending on the quality of this report, students who got 3/10 on their first version will be eligible to score up to a maximum of 8/10, whereas students who got 7/10 on their first version will be eligible to score up to a maximum of 9/10. These reports must be turned in by the deadline indicated in order for students to be eligible to receive the higher scores. *Unlike the initial submission, there are no late deadlines for these reports; they must be turned in by the stipulated deadline*.

Midterm and Final Examination: The Midterm and Final Examination (see Class Schedule for date) will likely be conducted online; details will be provided as the quarter progresses. Note, therefore, that no early exams will be allowed.

Since this is a core course for the Master's degree, the conduct of the Midterm and Final Examination will be a carefully-monitored activity. You will have access to all materials posted on D2L and your Jackson text. You are not permitted, however, to access the internet for any other materials. You may be asked to remain on a zoom session for the duration of the exam (although you will be assigned to your own breakout session to avoid interruptions by other students), and you may be asked to keep your camera turned on for the duration of the exam. Exams will be paced so that anyone who is trolling the internet for solutions will likely not be able to finish the exam on time.

Make-up Exams: Make-up for Midterm and Final Exams will only be allowed for illness, serious family emergencies, special curricular requirements (e.g., attendance at conferences), participation in official university sponsored activities, active military duty, and court-imposed legal obligations. Note that sleeping through an exam because the alarm didn't go off and family vacation time do not appear on this list. *A written communication from the Dean of Students is required*. The instructor must be notified in advance that a student will miss the exam. If circumstances make advance notice impossible (such as suffering a concussion on the way to the test), the student must contact the instructor as soon as possible and no later than the end of the day the exam was scheduled. The student should make every effort to schedule her/his make-up exam as soon as possible. If the student misses the final and does not contact the instructor before it has been graded, the student will receive a score of zero on that test.

Grading Procedure: All problems graded for this course (in-class, homework, reports to improve homework scores, and tests) will be graded not only for correctness of the final result, but also for the method of solution. You must explicitly *show the work* that was done by you in getting to the solution. This means that you must explicitly display the *stream of consciousness* that you used to go from the statement of the problem to its solution via application of the appropriate physical principle(s), a logically complete sequence of mathematical manipulations, together with phrases that illustrate why you chose each step the way you did, wherever such phrases may be necessary. In particular, *you may be asked to "come" to my office* (in a zoom session) *without advance notice* and explain your steps on a homework problem if I deem that some or all of your work on a particular problem does not follow a logical, clear, and connected sequence of steps in reaching a solution (but only at my discretion; I may choose to take points away, instead, for such omissions). In summary, the problems are meant to test whether *you* understand the material, *not* as an intellectual exercise for the instructor to interpret your solution in order to fill in holes left by you.

Students with disabilities: If you are registered with the Office of Students with Disabilities, please make an appointment with the course instructor to discuss any academic accommodations you may need. If you need academic accommodations and are not registered with the Office of Students with Disabilities, please contact the office at 2250 N. Sheffield, Room 307, or by telephone at (773) 325-7290 (TTY 773-325-7296). Upon individual request, this syllabus can be made available in alternative forms.

Academic integrity: Plagiarism is the act of presenting the work of another and claiming it as one's own; this applies whether the other person is a student or author, whether the material is obtained from handwritten or computer-generated notes, published work or online. As such, plagiarism is unacceptable, and it will be dealt with according to university procedures as outlined in the Student Handbook. Please refer to the Student Handbook for a detailed description of what constitutes the above behavior. Penalties will include a failing grade in the course and may include suspension or expulsion from the university, at the sole discretion of the instructor. Note that if two or more solutions are found to be similar, all concerned parties will be penalized, that is, the instructor will hold all parties equally responsible, without determining who copied from whom.

In particular, it is considered an academic integrity violation *if you look at any source other than* Jackson to find the solution to a homework problem. Such sources would include, but not be limited to, another text, the internet, solutions obtained from your friends or students, either at DePaul or at another university or organization, etc. The only exceptions allowed are Griffiths Electrodynamics text for undergraduates, and a math handbook (e.g., Schaum's Mathematical Handbook of Formulas and Tables). The minimum penalty for an academic integrity violation is a zero on the homework, with an F in the course at the sole discretion of the instructor. In short, look only at Jackson (and Griffiths and a math handbook) and no other reference, when you are solving homework problems. *For your formal write-up*, however, you are welcome (and encouraged) to consult additional references.

Class Schedule: A class schedule is provided on the next page. Note that this is tentative, and changes may be made at the discretion of the instructor. A column labeled ``Assignments due'' has been provided on the extreme right for you to keep a record when homework assignments, and other materials, are due if you prefer to record them in one space; note that all of this information will be in D2L.

The space above intentionally left blank for your notes; the Class Schedule is on the next page.

Class Schedule

(Class Schedule is tentative, and changes may be made at the sole discretion of the instructor.)

Day & Date	Topics & Other Activity	Assignments due (space for you to keep track; all information on D2L)
T 1/5	Introduction, & Math You Should Know	
Th 1/7	Pre-Maxwell to Maxwell's Equations	
T 1/12	Wave Propagation (Sec. 7.1)	
Th 1/14	Sec 7.1 (contd.) & Polarization (Sec. 7.2)	
T 1/19	Reflection & Refraction (Sec. 7.3)	
Th 1/21	Total Internal Reflection (Sec. 7.4)	
T 1/26	Dispersion (Sec. 4.5, 4.6, & 7.5)	
Th 1/28	Dispersion – contd.	
T 2/2	Vector and Scalar Potentials (Sec. 6.2)	
Th 2/4	Green Functions	
T 2/9	Laplace Equation (Sec. 2.7, 2.8 & 3.1)	
Th 2/11	**Midterm Examination**	
T 2/16	Legendre Polynomials (Sec. 3.2)	
Th 2/18	Spherical Harmonics (Sec. 3.5)	
T 2/23	Multipole Expansion (Sec. 4.1)	
Th 2/25	Magnetostatics (Sec. 5.1-5.4)	
T 3/2	Magnetostatics – contd. (Sec. 5.6 & 5.8)	
Th 3/4	Method of Images (Sec. 2.1-2.5)	
T 3/9	Ionospheric Propagation (Sec. 7.6)	
Th 3/11	Overflow & Review	
Final Exam	**Final Examination (2 hr): Begins at 4:20 PM on Tue, March 16, 2021**	