PHYS 4330 Electricity and Magnetism II
Course Syllabus

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Office hours For outside classroom discussion you can see me during office hours: MW 11:05am-12:20pm, TR 01:40-02:40pm or *by appointment*.

Text David J. Griffiths, Introduction to Electrodynamics, New Edition, ISBN-13: 9780321856562; Publisher: Pearson; Publication date: 10/10/2012. It is a widely used text book for electricity and magnetism course at the undergraduate level. Although it is not required for this course, physicists usually consider the following book as "a lifelong" reference text: John D. Jackson, Classical electrodynamics, 3rd edition (Wiley and Sons, New York, 1999).

Course contents This course is a continuation of Electricity and Magnetism I (PHYS 4310) and therefore PHYS 4310 is one of the prerequisite. We will start from where Dr. Robertson stopped in PHYS 4310 (chapter 7-Electrodynamics) and cover all the material up to the end of chapter 9- Electromagnetic waves. We will also cover selected advanced topics from chapter 10 (Potentials and fields), chapter 11 (Radiation), and Chapter 12 (Electrodynamics and Relativity). For the complete list of topics that will be covered refer to the table. These topics, like the topics you covered in PHYS 4310, require a good background in mathematics which include integral and differential calculus, vector algebra, and vector calculus (Divergence, gradient, curl). You have studied all these topics in PHYS 3150 & PHYS 3160 (Topics and Methods of Theoretical Physics I & II) which are also the prerequisite for this course. My lecture note is integrated to the mathematical methods you covered in these courses and therefore I recommend you to access my note for Topics and Methods of Theoretical Physics I & II at https://www.mtsu.edu/faculty/derenso/docs/THeoretical-Physics-I/Lecture-Note/Theo-Phys-I-Math-Methods.pdf.

Grading The course grade will be determined by your performance on the homework assignments and the exams.

Homework	**30%**	**Grade**	**A**	**B$^+$**	**B**	**B$^-$**	**C$^+$**	**C**	**C$^-$**	**D$^+$**	**D**	**D$^-$**	**F is < 60**
Midterm Exam	**35%**												
Final Exam	**35%**	**Min Score**	**90**	**87**	**83**	**80**	**77**	**73**	**70**	**67**	**63**	**60**	

Participation & grading *The grading scale is fixed. However, there will be additional **0-4 points** that will be added to your final average score depending on your full attendance, active participation in class, and the effort that you put on in solving all the problems assigned in the homework assignments. Attendance sheet that you will sign on will be provided at the beginning of each class.*

Homework There will be a weekly homework assignment. Homework assignments will be distributed in class or posted on the course. Each homework assignment consists of at least five problems. These problems primarily be selected from your textbook, in some cases, with some modifications. It may also include problems outside from the textbook some of which I would make up. Among these problems, **two would be mandatory**. ***I will grade all the problems you worked out and turned in. Working out all the problems including the none mandatory ones contributes to the extra 0-4 points that will be added in your final average score***. Therefore, it is for your own advantage to solve all the problems in each homework assignment. Each homework assignment (the two mandatory problems) will receive a maximum of hundred points. The lowest homework score will be dropped. Solutions will be posted on the course website for each homework assignment. Here, I list some ingredients that make a homework useful to you, and easy to read and evaluate for me:

- Work out the details (mathematical steps, conceptual steps) and fully explain your line of reasoning. This is the only way to fully test and show your understanding of the technicalities and of the concepts.
- Use words, not only formulas. This is a class in physics and not math, and usually the math is supplemented with many physical arguments.

- Highlight your results.
- Always check that the result makes sense physically, i.e. whether it has the correct physical units and, if it is a numerical result, the correct order of magnitude. In some cases, I will ask you to come up with a numerical result in some physical units: the physical units and the sign are as important as the number.
- The solution of each problem ***must*** be presented according to the order assigned in the homework. You must also begin the solution to each problem on a new page. ***Never use the back pages!***
- You ***must*** turn the solutions of each homework assignment along the cover page in class on the due date with your signature on it.
  If the steps of the solution of a problem are not readable, credit will not be given although the result seems to be right.

Due date: Homework assignments are due at the beginning of class one week after it is assigned. No mercy will be granted on the due date and time. Remember, I give partial credit, so the last 10 minutes of work will not make much difference.

Late policy: I accept problem sets up to three days late from the due date for 50% credit, and after that not at all. You may turn in part on time and part late. Please make a note in the space provided on the problem set cover page if it is being split this way. You do not need to contact me to turn in a problem set late at 50% credit, or to turn in part on time and part late.

Extensions: You will have one full-credit one-week extension for this semester. No need to contact me just write it on your problem set. Otherwise, extensions are granted for good reasons only-physical or mental health issues, family emergency, etc. You must contact me before the homework due date and you must provide some sort of proof (e.g., note from health center, counseling center, etc…). A heavy amount of other coursework is not sufficient reason for an extension (though you may use your free extension in such circumstances - ***so save it until you really need it!***).

Solutions: I will post the solution sets to each HW assignment on the course website. I return Graded problem sets to you in class *roughly* one week after they are due. If you are absent, you must pick it from my office in a week period. After a week, you will not be able to get it as I often recycle unwanted papers. You should keep a copy of your homework sets so you can review them with the solutions.

Collaboration: I permit collaboration on homework assignment, but each student's solution must be the result of his or her own understanding of the material. You must use collaboration work carefully. If you rely on your colleagues too much, you will do poorly in the fixed-time, independent in class exam environment. I have observed that students with good exam scores tend to have done well on homework, but that good homework scores do not predict good exam scores.

Mathematical software: I allow use of mathematical software like Mathematica, but I strongly discourage you from using it unless solving the problem without mathematical software is very cumbersome and time consuming. When it comes to using mathematical software, I would like to quote a physicist: *"It is absolutely essential that you develop a strong intuition for basic calculations involving linear algebra, differential equations, and the like. The only way to develop this intuition is by working lots of problems by hand; skipping this phase of your education is a really bad idea."*

Exams There will be a midterm and final exams each worth 35% and both have in-class and take-home portions. The take home portion for the midterm exam will be distributed one week before the in class exam (***February 27, 2020***) and it will be due on the in-class portion exam day (***March 05, 2020)***. The final exam would be comprehensive. I distribute the take-home portion in class on ***Tuesday, April 28, 2020*** and will be due on the in-class final exam day, ***Thursday, May 7, 2020*** **(10:00 am - 12:00 p.m.)**. All in class exams will be closed book.

Dropping It is the policy of the Department of Physics & Astronomy that no drops will be approved after the deadline posted in the university's course Schedule Book. The deadline for dropping ***without a grade***

for this semester is ***February 03, 2020.*** Deadline for students to drop a course with a grade of "W" is ***March 29, 2020.***

Disabilities If you have a disability that requires assistance or accommodation, or if you have questions related to any accommodations for testing, note takers, readers, etc, please speak with me as soon as possible. Students may also contact the Office of Disabled Students Services (898-2738) with questions about services.

Lottery Scholarship To retain Tennessee Education Lottery Scholarship eligibility, you must earn a cumulative TELS GPA of 2.75 after 24 and 48 attempted hours and a cumulative TELS GPA of 3.0 thereafter. You may qualify with a 2.75 cumulative GPA after 72 attempted hours (and subsequent semesters), if you are enrolled full-time and maintain a semester GPA of at least 3.0. A grade of C, D, F, or I in this class may negatively impact TELS eligibility. Dropping a class after 14 days may also impact eligibility; if you withdraw from this class and it results in an enrollment status of less than full time, you may lose eligibility for your lottery scholarship. Lottery recipients are eligible to receive the scholarship for a maximum of five years from the date of initial enrollment, or until a bachelor degree is earned. For additional Lottery rules, please refer to your Lottery Statement of Understanding form (http://www.mtsu.edu/nancial-aid/forms/LOTFOD.pdf) or contact your MT One Stop Enrollment Counsel or (http://www.mtsu.edu/one-stop/counselor.php).

Academic Honesty Academic misconduct will not be tolerated in the Department of Physics and Astronomy. Offenses include, but are not limited to: Plagiarism, Cheating, Fabrication, and Facilitation. Instances of academic misconduct will, at a minimum, result in a zero for the assignment in question, followed by submission of a formal complaint to the Office of Judicial Affairs. If signs of cheating are detected or observed, all parties involved (copiers and facilitators) will receive a grade of zero and be included in the report. There will be no exceptions, all instances will be reported. Details regarding MTSU and TBR policy, including definitions for the offenses listed above, are available at http://www.mtsu.edu/juda_/integrity.php.

IX Statements

1. Students who believe they have been harassed, discriminated against or been the victim of sexual assault, dating violence, domestic violence or stalking should contact a Title IX/Deputy Coordinator at 615-898-2185 or 615-898-2750 for assistance or review MTSU's Title IX website for resources. http://www.mtsu.edu/titleix/
2. MTSU faculty are concerned about the well-being and development of our students and are legally obligated to share reports of sexual assault, dating violence, domestic violence and stalking with the University's Title IX coordinator to help ensure student's safety and welfare. Please refer to MTSU's Title IX site for contact information and details. http://www.mtsu.edu/titleix/

Topics	
	Revision
	Relevant mathematical methods from theoretical Physics I
	Electrostatic
	Special Topics
	Electric field in matter
	Magnetostatic and Magnetic field in matter
Chap. 7	Electrodynamics
	7.1 Electromotive force
	7.2 Conductivity and density of the free electrons
	7.3 Electromotive force
	7.4 Electromagnetic Induction and Faraday's Law
	7.5 Inductance
	7.6 Energy in a magnetic field
	7.7 Maxwell's Equations
	7.8 Maxwell's Equation in matter
Chap. 8	Electromagnetic conservation laws
	8.1 Conservation of charge
	8.2 Conservation of energy
	8.3 Conservation of momentum
Chap. 9	Electromagnetic Waves
	9.1 Review of waves
	9.2 Important terminologies in a sinusoidal waves
	9.3 Wave Boundary conditions
	9.4 Polarization
	9.4.1 Electromagnetic waves in vacuum
	9.4.2 Electromagnetic waves in matter
	9.5 Absorption and Dispersion
	9.6 Guided Waves
Chap. 10	Selected advanced topics in electrodynamics

	10.1 Potentials and Fields
	10.2 Gauge Transformation
	10.3 Retarded Potential
	10.4 Radiation
	10.5 Dipole radiation: electric and magnetic dipole radiation
	10.6 Relativistic Electrodynamics
	10.7 Review of Special Theory of relativity
	10.7.1 The Lorentz coordinate transformations
	10.7.2 Relativistic length contraction
	10.7.3 Relativistic time dilation
	10.7.4 Relativistic velocity Transformations
	10.8 Magnetism as a relativistic Phenomenon
	10.9 How the Fields Transform
	10.10 The Field Tensor
	10.5 Electrodynamics in Tensor Notation
	10.4 Radiation
	10.5 Dipole radiation: electric and magnetic dipole radiation