Physics 541

Spring 2018 Semester

Electromagnetic Theory

Logistics

Instructor	Dr. Norman Mannella
Office	Nielsen Physics Building, Room 210
Telephone (UT)	(865) 974 - 6123
Email	nmannell@utk.edu
Lecture Time and Location	MWF, 10:10 – 11:00, Nielsen 306
Office Hours	By appointment, in my office

Electromagnetic Theory

This course develops a mathematically rigorous theory of the electromagnetic field. Since it forms a sound basis for later instruction in quantum mechanics and other subjects, the study of Electricity and Magnetism is of fundamental importance for the professional formation of physicists and engineers.

Prerequisites

The course presumes a familiarity with calculus and calculus concepts (vectors, vector, differential and integral calculus), linear algebra (matrices, determinants etc.), differential equations, Green functions. A basic knowledge of electricity and magnetism at the level of undergraduate physics courses (Griffith for example) is also expected.

General Course Description - Manifesto

The course will treat the following main subjects: Maxwell's equations, Static Fields, Summations and Boundary Value Problems, Multipoles, Time-dependent Fields, Special Relativity, Radiation Production and Transport.

With respect to introductory physics courses, the study of Electricity and Magnetism is here pursued rigorously using advanced mathematical techniques.

Textbooks and Supplementary References

At the graduate level, the standard reference is **Jackson**, **Classical Electrodynamics.** I will pull material from other sources as well.

The following textbooks are recommended as supplements to the course text.

Junior undergraduate level Texts:

any book adopted for classes such as PHY 135-136 or the like, such as

- **Young and Freedman, University Physics**
- **Knight, Physics for Scientists and Engineers**
- **Halliday, Resnick, Walker, Fundamental of Physics**

Senior undergraduate level Texts

- **"Electricity and Magnetism", by E. M Purcell, Vol II of Berkeley Physics Course**
- **"Introduction to Electrodynamics", by David J. Griffith**
- **"Electromagnetism", by Pollack and Stump**
- **"Foundations of Electromagnetic Theory", by John R. Reitz, Frederick J. Milford and Robert W. Christy**
- **"The Electromagnetic Field", by Albert Shadowitz**
- **"Electromagnetic Fields", by Roald K. Wangness**
- **"Electromagnetic Fields and Waves", by Lorrain and Corson**

Graduate level Texts

- **"Classical Electrodynamics", by J. D. Jackson**
- **"Modern Electrodynamics", by Andrew Zangwill**
- **"Classical Electrodynamics", by W. Greiner**
- **"Classical Electromagnetism", by Jerrold Franklin**
- **"Classical Electromagnetic Theory", by Jack Vanderlinde**
- **"Principle of Electrodynamics", by Melvin Schwartz**
- **"The Classical Electromagnetic Field", by Leonard Eyges**
- **"Classical Electricity and Magnetism, by Panofsky and Phillips**

Mathematical background:

for linear algebra and ordinary differential equations,

- **"Introduction to Linear Algebra and Differential Equations", by John W. Dettman, Dover Publications**

for differential and integral calculus

- **"Vector and Tensor Analysis", by A. I. Borisenko and I. E. Tarapov, Dover**
- **"Introduction to Vector and Tensor Analysis", by Robert C. Wrede, Dover**
- **"Introduction to Vector Analysis", by Harry F. Davis and Arthur D. Snider**

- **"Div Grad Curl and all that", by H. M. Schey**
- **"Advanced Calculus of Several Variables", by C. H. Edwards (Dover)**

Math Methods

- **"Mathematics of Classical and Quantum Physics", by Byron and Fuller, (Dover)**
- **"Physical Mathematics", by K. Cahill (Cambridge)**
- **"Mathematical Methods in Physics and Engineering", by J. W. Dettman (Dover)**
- **"Mathematics for Physicists", Dennery and Krzywicki (Dover)**
- **"Mathematical Methods of Physics", Mathews and Walker**
- **"Mathematical Methods for Physicists", Arfken and Weber**

Contacting the Instructor

I prefer personal contact to e-mail contact, and therefore encourage you to come to office hours, that you can schedule by an appointment. As another alternative, I am going to be in my office most of the time, if you show up chances are that I might see you, unless I am really in the middle of something. Call me in the office to check. **Anyhow, I strongly encourage you to come and see me.**

As a general rule, I do NOT address homework problems by e-mail. On the other hand, if you have a personal emergency, e-mail is fine.

Announcements, Lecture Notes, Course Material and Course Updates

Lectures and Canvas are my primary modes of communication with the class. Announcements, Lecture Notes, Course Material, Homework, solutions to Homework and Course Updates including definite dates for exams etc. will be posted on Online@UT (Canvas). Please note that it will be your responsibility to be aware of the content of any communication taking place in class, be it an announcement or anything related to the course material, in case you are not present. You are required to have an official UT email address (name@utk.edu or name@tennessee.edu) and read announcements on Bb and your email on a daily basis. Information that cannot be transmitted to you during the lectures or on Canvas, or any personal communication, will be given to you via email.

Homework

There will be approximately 8 - 10 problem sets. You will be notified on Bb when the HW is available. **Homework will always be collected at the beginning of the class session**, with due date specified on the HW itself and communicated in Bb when the HW is made available. Please note the following policies, which are quite strict:

No extensions or make-up problem sets will be given. If there are extremely serious circumstances supported by proper documentation, exception to this policy may be considered at my discretion.

Due dates and time for HW are firm. I post all assignments at least one week in advance, so please plan ahead. Problem sets turned in 1 day late will receive 90% of the maximum score. Your work will receive 0 points if turned in later than 1 day.

1 day late: 90% of maximum score. HW must be in my mailbox by 2 pm on the next day. HW turned in with further delay will not be graded.

Each problem will be graded on a 0 - 4 scale (0 = no work, 1 = poor, 2 = fair, 3 = good, 4 = excellent), or on a 0 – 8 scale if worth more points (0 = no work, 2 = poor, 4 = fair, 6 = good, 8 = excellent). Solutions to the HW will be either handed out in class or posted on Bb.

NB.: A point is a point: this means that different HW sets might have different total scores, and your total score will be given by the sum of the points that you will collect.

Questions regarding the HW problems may be asked in lecture or during office hours, NOT by email. For each HW set, I will make available for you a Forum in Bb where you can discuss among yourself.

Grading

The semester Grade will be based on the following Weighted Average:

Homework	=	**55%**
Midterm	=	**15%**
Final Exam	=	**30%**

For students with disabilities

Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss specific needs. I will then contact the Office of Disability Services at 865-974-6087 in Hoskins Library to coordinate reasonable accommodations for students with documented disabilities.

Cheating and Plagiarism will not be tolerated.

Cheating will not be tolerated. Everyone must have an equal chance to do well. The penalty for cheating on any aspect of this course will be an "**F**" for the course. This includes writing on your exam after I have announced it is ended, or any other unfair advantage taken over other students. No outside materials are permitted on any exam, except those provided by the instructor.

Plagiarism of any kind will not be tolerated. Working together on homework does not count as plagiarism. A line by line copy of another student's homework does. If you use a source (book, articles, internet material etc.), you must quote it. Use of a source without citation is plagiarism.

Cheating and/or plagiarism cases found to be in Violation of the Academic Honesty policies will result in disciplinary actions according to the University rules, without exception.