

**Basics:**

Instructor: Kent Yagi  
Office: Physics 318  
Lectures: 9:30–10:45am Tu Th, Physics room 210  
Office hours: Monday 14:00–16:00  
(You are welcome to come to my office at other times.)  
Phone: 982-2329  
e-mail: ky5t@virginia.edu  
Grader: Charlie Glaser

Class Web Page: UVA Collab *19F PHYS 7410*

**Textbook:**

- J. D. Jackson, *Classical Electrodynamics*

For reference, *Introduction to Electrodynamics* by Griffiths is an excellent introductory textbook.

**Grade weighting:**

30% Homework  
25% Midterm exam  
45% Final exam

**Homework:** Homework will be assigned every week. Problems will be uploaded under “Assignments” in Collab website. Answers will be uploaded under “Resources” in the same website. Late homework submission will be assessed a penalty, which will grow as time increases. Discussing the problems with each other is encouraged, but I expect each individual to write up their own solutions without direct copying. Copying another person’s solution that you did not substantially participate in is unacceptable. In a limited number of occasions, you may ask for an extension of due dates in advance provided you have good reasons to do so.

You may be able to find some of the solutions online or from students who have taken this course before, but **try solving problems by yourself first**. The primary purpose of assigning these problems is for you to **struggle and learn**. Also, don’t just write down answers, **show derivations!**

Mid-term and final exams will contain problems that are very similar to homework problems, so take the latter seriously and make sure that you can solve them on your own.

**Attendance:** You are responsible for the material presented in class, turning in your homework on time, knowing problem assignments, and knowing any administrative announcements made, such as changes to the syllabus or changes to the scheduling of homework or exams.

**Exam Dates:** Exams to be held in the normal classroom.

**MID-TERM EXAM, Thursday, October 17, 9:30 a.m. – 10:45 a.m.**

**FINAL EXAM, Tuesday, December 10, 2:00 p.m. – 5:00 p.m.**

## Topics to be covered

We will study Chapters 1–6 of Jackson, as well as some mathematical preliminaries, including **(but not limited to)**

### 1. Mathematical Preliminaries

- Vector Analysis
- Fourier Transform
- Helmholtz Theorem

### 2. Electrostatics

- Coulomb's Law
- Gauss' Law
- Scalar Potential
- Poisson and Laplace Equations
- Green's Theorem
- Boundary Conditions
- Method of Images
- Orthogonal Functions and Expansions
- Fourier Series and Integrals
- Separation of Variables
- Two-dimensional Potential Problem
- Cauchy-Riemann Relations
- Legendre Polynomials
- Spherical Harmonics
- Bessel Functions
- Multipole Expansion
- Dielectric Media and Polarizability

### 3. Magnetostatics and Magnetodynamics

- Biot and Savart Law
- Ampère's Law

- Vector Potential
- Multipole Expansion
- Paramagnetism and Diamagnetism
- Magnetization
- Boundary Value Problems
- Magnetic Scalar Potential
- Magnetic Shielding
- Magnetic Induction

#### 4. Maxwell's Equations and Conservation Laws

- Maxwell's Equations
- Gauge Transformations
- Wave Equations and Retarded Solutions
- Macroscopic Electromagnetism
- Poynting Theorem
- Retarded Green Function

**Finally...** YOUR COMMENTS AND FEEDBACK ARE WELCOME!