

# 50:750:302 – Electromagnetic Waves & Optics

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<b>Office</b>	CNS 216C	<b>Final Exam</b>	TBA

**Class meeting time: T & TH, 6:00 p.m. - 7:20 p.m.**

**Text:** “**Physics**, “Introduction to Electrodynamics” 3<sup>rd</sup> or 4<sup>th</sup> edition by David J. Griffiths & “Optics” 5<sup>th</sup> edition by Eugene Hecht

ISBN-10: 0133977226, *Hardcover*

ISBN-10: 1292096934, *Paperback*

You are welcome to purchase older versions of this text, but please be aware that I will be assigning readings and homework problems based on the 5<sup>th</sup> edition. If you choose to use an older edition, you will be responsible for cross-referencing assigned chapter readings and homework problems.

## **Description:**

This course focuses on the principles of electrodynamic waves and optics and is primarily taught to junior level physics majors. The prerequisites for this course include Modern Physics and Calculus I – III. This course utilizes many techniques from vector calculus (Calculus III).

The course will start with lectures based on *Introduction to Electrodynamics* with a focus on applying Maxwell’s Equations to various different boundary conditions, the energy perspective of electromagnetic waves, and radiation. In the second phase of this course, you will become familiar with the propagation of light, interference, diffraction, and the superposition of waves. These topics will be explored using various mathematical techniques such as geometry, trigonometry, and complex variables. The goal of this course is to provide a strong understanding of the behavior of light.

## **Specific Student Learning Outcomes (SLOs) Objectives:**

1. Learn methods used to solve the wave equation
2. Understand phenomenon such as refraction, reflections, and scattering
3. Study the way light behaves as it propagates through various geometric surfaces
4. Understand the concept of Diffraction and the applications that take advantage of it
5. Understand various kinds of Polarization

## **Details:**

- 1) I will be available during office hours to provide you will help on the course material and answer any questions you may have. If you need assistance outside of office hours, please email me to schedule a time.
- 2) **There are no make-up exams.** If you miss an exam, you must provide a written medical excuse or the equivalent. If the excuse is accepted, you receive the average of the other three exams that you will have completed. If you miss the final exam, you will need a medical excuse **and** must contact the instructor within 48 hours of the final to discuss your options (not taking the final exam is not an option).
- 3) Homework will be assigned for each chapter, but not every assignment will be collected and graded. You are strongly advised to have tried all problems by the due date as I typically review some of the problems in class and you will gain the most benefit from this

if you have done the homework problems beforehand. The exams will be based on the homework and the lecture notes.

- 4) In addition to exams, I reserve the right to administer quizzes that will count towards your final grade. There will be no make-up quizzes. Students missing a lecture quiz will receive a zero for that quiz. The lecture quizzes are intended to assess your study habits and help you stay on track.

### Grading:

- 4 Hourly Examinations (3 semester + 1 final) – 20% each, total 80% of final grade
- Homework– 20% of final grade

A	90-100%	C	67-75%
B+	87-89%	D	55-66%
B	80-86%	F	<55%
C+	76-79%		

### Instructor's Statement:

- Do not engage in any form of academic dishonesty. I will report any violations of this policy to the campus Judicial Officer. If you do not know what academic dishonesty is, please consult this statement:  
<http://www.camden.rutgers.edu/RUCAM/info/Academic-Integrity-Policy.html>.
- Please note that it is necessary to explain all steps that you take on exams – make an effort to **clearly** show your work. Answers without justification will not be accepted!
- Do not use cell phones in class or disrupt class in any way. If you do so, you will be asked to leave and will not be welcomed back for the rest of the class period. The use of computers will be at my discretion – in general they will not be necessary.
- Attendance is strongly suggested at all class meetings in accordance with the policies and guidelines set forth in the student manual.
- Attending the lecture is not enough. Take notes in class and read the relevant sections in the textbook. In addition, make sure to review all example problems and attempt all the homework problems.

### Class Resources:

Lecture notes, answer keys, homework solutions, and announcements will all be posted on the course's Canvas site.

<https://canvas.rutgers.edu/>

### Tentative Class Outline:

Phase 1: Lectures based on Introduction from Electrodynamics by: *David J. Griffiths*

Overview: Maxwell's Equations, Energy of Electric and Magnetic Fields

Chapter 8: Conservation Laws

Chapter 9: Electromagnetic Waves

#### Test 1

Chapter 10: Potentials and Fields

Chapter 11: Radiation

#### Test 2

Phase 2: Lectures based on Optics by: *Eugene Hecht*

Chapter 4: Propagation of Light

Chapter 5: Geometric Optics

#### Test 3

Chapter 8: Polarization

Chapters 9 & 10: Interference & Diffraction