NEW YORK UNIVERSITY
COLLEGE OF ARTS AND SCIENCES – DEPARTMENT OF PHYSICS
Course Outline PHYS-UA-131: Electricity & Magnetism I
Fall 2019

Lectures: Mondays & Wednesdays 11:00 AM – 12:15 PM; 726 Broadway, Room 1067

Recitations: Mondays 3:30 – 4:45 PM & Wednesdays 4:55 – 6:10 PM; 726 Broadway, Room 802

Instructor: Prof. Anthony R. Pullen
Contact: pullen.teaching.nyu@gmail.com, 212-998-7634
Office: 726 Broadway, Room 938
Office Hours: Wednesdays 1:00 – 2:00 PM and by appointment

TA: Nanoom Lee
Contact: nanoom.lee+em1@nyu.edu
Office: 726 Broadway, Room 1043
Office Hours: Thursdays 1:00 – 2:00 PM

Course Website:
Located on NYU Classes

Course Description

Electromagnetism governs most of the physical interactions we experience daily, from powering our machines and telecommunications to allowing us to sit in chairs. Classical electromagnetism, developed throughout history but formalized in the 18th and 19th centuries, also laid the foundation for the modern theories of relativity and quantum mechanics. Classical electromagnetism is a critical component of a physicist's toolkit.

This course will develop the classical theory of electromagnetism using the tools of vector calculus. We will cover the following topics:

- Electrostatics
- Magnetostatics
- Electrodynamics
- Electromagnetic waves
- Special relativity.

Prerequisites

- Physics I-III (PHYS-UA-95)
- Mathematical Physics (PHYS-UA-106)

See Prof. Pullen if you have not satisfied these prerequisites.

Required Textbook

- D. J. Griffiths, *Introduction to Electrodynamics* (4th Edition), 2013

Other References

- E. M. Purcell and D. J. Morin, *Electricity and Magnetism* (3rd Edition), 2013 – E&M text for the Berkeley Physics Courses
- Feynman Lectures in Physics, Vol. 2 – Feynman's freshman E&M course at Caltech
- L. D. Landau and E. M. Lifshitz, *The Classical Theory of Fields* – more advanced than Griffiths
- Andrew Zangwill, *Modern Electrodynamics* (1st Edition), 2013 – 1st year grad text
- J. D. Jackson, *Classical Electrodynamics* – infamous grad text

Problem Sets

Problem sets will consist of material covered in the lectures. The problem sets will be posted on the course website on Monday and are due at 5:00 PM the following Monday. They can either be handed to me at the lecture upon arrival or dropped in the marked box located in the mailroom for the Physics Department administrative offices on the 10th floor of 726 Broadway. DO NOT slide your problem set under my office door or the TA's; they will not be accepted. Solution sets will be posted on the course website on the Tuesday after its due. Graded problem sets will be returned the following Monday in lecture.

The lowest problem set grade is dropped from your final grade. A missed problem set can count as your lowest grade to be dropped.

Problem sets should be attempted without discussing them with other students or looking at solution sets. Example problems will be solved both in lecture and in recitations, but there is no substitute for finding the solution for a problem on your own without the steps given to you, in order to truly master the concepts. Only if a student is truly stuck should they discuss the problem with the instructor, the TA, or other students. However, students are always required to turn in their own independent write-ups of the problem solutions.

Late Homework Policy: Problem sets will not be accepted after 5:00 PM on Monday. No exceptions. Problem sets can be submitted electronically if away from campus, **but they must be in by 5:00 PM Monday Eastern Standard Time.**

Exams

Students will be provided an equation sheet with important formulas during exams.

Missed Exam Policy: A doctor's note is required to make-up an exam. **Traveling is not a valid reason to miss an exam**; do not schedule any travel overlapping with the midterm or final exams. Exams must be taken under supervision.

Midterm

The midterm will be on Wednesday, October 23 during normal class time.

Final
The final exam will be on Monday, December 16, 10:00 – 11:50 AM, in 726 Broadway, Room 1067.

Grading

- Problem Sets (dropping lowest score) – 30%
- Midterm – 30%
- Final – 30%
- Floating – 10%

The 10% floating component will be added to whichever of the other 3 components the student scored the highest, effectively making that component 40%.

Tentative Schedule
The following schedule is tentative and subject to change, except for the midterm and final exams.

Week	Class Dates	Topics	Griffiths Chapters	Problem Set Due
Week 1	Wed 9/4	Coulomb's Law	2.1	
Week 2	9/9, 9/11	math review, Gauss' Law	1, 2.2	9/16
Week 3	9/16, 9/18	potential energy	2.3, 2.4	9/23
Week 4	9/23, 9/25	conductors, Laplace eq.	2.5, 3.1	9/30
Week 5	9/30, 10/2	multipoles, Lorentz force	3.4, 5.1	10/7
Week 6	10/7, 10/9	magnetic field	5.2, 5.3	10/15
Week 7 (fall break)	No class Mon 10/14 Tues 10/15, 10/16	vector potential	5.4	10/21
Week 8	10/21, 10/23	review, midterm		
Week 9	10/28, 10/30	Faraday's Law	7.1, 7.2	11/4
Week 10	11/4, 11/6	induction, Maxwell's equations	7.2, 7.3	11/11
Week 11	11/11, 11/13	Poynting's Theorem	8.1, 9.1	11/18
Week 12	11/18, 11/20	EM waves, principle of relativity	9.2, 12.1	11/25
Week 13 (Thanksgiving)	11/25 No class 11/22	special relativity	12.1	12/2
Week 14	12/2, 12/4	energy-momentum	12.1,12.2	12/9
Week 15	12/9, 12/11	mechanics & E&M, Final review	12.2,12.3	
Week 16	Mon 12/16 (10:00 – 11:50 AM)	Final exam		