

PHY 301: Electromagnetic Theory I, Fall 2020

Date of this version of the Syllabus: 08/06/2020

Course Description:

This course is devoted to the applications of Maxwell's equations to time-independent boundary-value problems and interactions of electric and magnetic fields with bulk matter. **Due to the COVID-19 situation, the course will be held entirely online, including office hours and exams. Lectures will be recorded and posted on [BlackBoard](#). All exams will be online and synchronous, you should plan to attend the Zoom meetings on the exact time announced below for exams.** (Be aware that the summer time in the US ends on November 1 if you are outside of the US.)

Prerequisite: PHY 251 and PHY 277 or permission of department; MAT 203 or MAT 205 or AMS 261 or MAT 307

Advisory Corequisite: MAT 341

3 credits

Class Meeting Times: Monday/Friday 1:00-2:20 PM (Eastern Time) in the online Zoom classroom. The Zoom lectures/ office hours will be scheduled on the website [BlackBoard](#) and can be accessed through it. All instructor correspondence will be sent to your SBU email account.

Course Instructor: Mykola Dedushenko and Kantaro Ohmori

(The first half (until October 12th) will be taught by Dedushenko, the second half by Ohmori)

e-mail :

Dedushenko: mdedushenko@scgp.stonybrook.edu

Ohmori: komori@scgp.stonybrook.edu

Office: Online, via Zoom. If you need to meet one of the instructors outside the office hours, please write an email.

Office hours (preferred method of contact, all times are in ET zone):

Thursday 3-5 pm, Friday 2:30-3:30 pm (after class), via Zoom. ID and password will be posted on BlackBoard. Until Oct 12 held by Dedushenko, after Oct 12 -- by Ohmori.

TA:

TBD

Required equipment:

1. A device with Zoom (<https://it.stonybrook.edu/services/zoom>) and Internet connection. The device should have or be connected to a camera and a microphone which Zoom can access. You are responsible for having a reliable computer and Internet connection throughout the term.
2. A camera or a scanner with which photocopies of answer sheets for exams will be taken (A smartphone with apps like [Notes \(iOS default app\)](#), [Google Drive \(Android\)](#), CamScanner etc. should be enough).

Course Materials:

1. Required Text

Introduction to Electrodynamics, D. J. Griffiths

This book is the primary text for the course. For this course, we will primarily follow the material in chapters 1-7 of this book

2. Recommended Text

Multivariable Calculus, R. Larson

This book was recommended as a reference. Electrodynamics heavily relies on the knowledge of multivariable calculus, for which this book is an excellent reference

Topics & Approximate Timeline:

The focus of the class will be on topics covered in Ch. 1-7 of the Introduction to Electrodynamics by Griffiths. These topics and the approximate time devoted to each during the semester are as follows:

1. Ch 1: Introduction to Maxwell's equations and a brief review of vector calculus (1.5 week)
2. Ch 2: Electrostatics: charge, field and potential (3 weeks)
3. Ch 3: Special techniques in electrostatics (2 weeks)
4. Ch 5: Magnetostatics: current, field and vector potential (2.5 weeks)
5. Ch 7: Electrodynamics and Maxwell equations (2 weeks)
6. Ch 4: Electric field in dielectrics: polarization (1 weeks)
7. Ch 6: Atoms and solids in magnetic field: magnetization (1 weeks)

Chapters 1,2,3 will be taught by Dedushenko, Chapters 5,7,4,6 will be taught by Ohmori.

Learning Objectives:

Upon completing this course, students will be able to

- Recognize Maxwell's equation and identify the sources and the fields
- Solve mathematical problems involving vector calculus, including those that involve divergence and Stokes theorems

- Calculate time independent electric field as a result of a given charge distribution
- Use separation of variables, method of images, and multipole expansion to solve for electric potential and fields
- Calculate magnetic field resulting from time invariant currents
- Calculate the vector potential and the corresponding magnetic field vectors from time invariant current densities
- Apply Maxwell's equation to relate time varying electric and magnetic fields
- Analyze the electric field resulting from bound and free charges to calculate the electric field in matter
- Analyze the magnetic field resulting from bound and free currents to calculate the magnetic field in matter

Grade Breakdown:

Homework: 10%

Homework will contain problem sets that will be posted on Friday and will be due by 9:00 am (Eastern Time) on the Monday after a week (e.g. the first homework will be posted on August 28th and due by 9:00 am (Eastern Time) on September 7th). Homework should be uploaded to Blackboard.

Midterm 1: 25%

The first midterm will be **on October 5th in class**.

Midterm 2: 25 %

The second midterm will be **on November 9th in class**.

This midterm does not cover the topics covered by the midterm 1 (i.e. not cumulative).

Final: 40 %

Currently scheduled on **Thursday, December 17th** at 2:15- 5pm (EST zone), Final exam will be cumulative, and will include all topics covered in class

Exams are also held **ONLINE** (details will be provided later).

You are responsible for ensuring that you can attend all exams at the scheduled days and times. An important part of your responsibility at the beginning of the semester is to make sure your schedule will allow for an orderly adherence to the class and exam calendars. If you miss an exam without a valid excuse that must be **documented in writing**, you will NOT be allowed to make up that missed exam. Your grade on it will be zero.

Notes on Homework

Every Friday five to ten homework problems from each chapter will be posted on Blackboard. The usual deadline would be the following the Monday after a week. Homework represents the

primary avenue of practice for the course material. Don't wait until the last minute to work on them!

Rules Regarding Homework:

- You may collaborate with your classmates on the homework if you are contributing to the solution. You must personally write up the solutions of all problems.
- Do not forget that simply copying somebody's solutions does not help you in the long run (especially on the exam).
- You may (and are encouraged to) use the library and all available resources to help solve the problems. Use of Mathematica, other software tools and spreadsheets are encouraged.
- Late homework: Homework is accepted until the end of the Monday class, but will incur a 20% penalty after 9 am (ET).

Academic Resources:

If you find that you are struggling with the course material throughout the semester, consider taking advantage of resources provided by the university:

Student Success Resources:

A helpful resource is the "*For Students*" section linked from the Stony Brook homepage: <http://www.stonybrook.edu/for-students> as well as the Division of Undergraduate Education website: <http://www.stonybrook.edu/commcms/duel/index.html>.

Academic Success and Tutoring Center:

This important program opened in September 2013. Information can be found at: http://www.stonybrook.edu/commcms/academic_success/.

Posting and Updating of This Syllabus

This Syllabus will be posted on Blackboard. When, from time to time, it may be updated, all students will be notified by an Announcement posted in Blackboard and sent via email to your official University email address. Please make sure you're looking at the most recent version: Check the first page of each one to see the date of the version you're looking at!

University Policies

Student Accessibility Support Center (SASC) Statement:

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact the Student Accessibility Support Center (SASC), ECC (Educational Communications Center) Building, room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the staff at the Student Accessibility Support Center (SASC). For procedures and information go to the following website: <http://www.stonybrook.edu/ehs/fire/disabilities>

Academic Integrity Statement:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management Statement:

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.

Regarding Equivalent Opportunity/Religious Absences:

https://www.stonybrook.edu/sb/bulletin/current/policiesandregulations/policies_expectations/equivopportunity_religiousabsences.php

Student Participation in University-Sponsored Activities:

By their participation in campus-related activities such as research conferences, dramatic or musical performances, intercollegiate athletic competitions, or leadership meetings, students make contributions to the University. In recognition of the students' commitment both to their regular academic programs and to related activities, the University makes every effort to accommodate unique situations.

Students are responsible for presenting a printed copy of semester obligations to all their professors at the beginning of the semester to alert them to activities that may present conflicts. Instructors are required to make arrangements for students to complete examinations, quizzes, or class assignments early or late if the student's participation in a University-related activity results in the student's absence from the class when such work is due. Some events occur only by invitation during the semester, and instructors should make accommodations for these students.

Minimal instructional and student responsibilities:

www.stonybrook.edu/sb/bulletin/current/policiesandregulations/policies_expectations/

