PHY 301: Electromagnetic Theory I, Fall 2018

Date of this version of the Syllabus: 12/08/2018

Course Description:

The application of Maxwell's equations to solve time-independent boundary-value problems and to study the interactions of electric and magnetic fields with bulk matter.

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 in Javits Lecture Center, Room 101

Course Instructor: Navid Vafaei-Najafabadi,
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Office: Physics D101
Office hours (preferred method of contact): **Thursday 3-5 pm**, Friday 2:30-3:30 pm

TA: David Frenklakh, david.frenklakh@stonybrook.edu
Office hours: Tuesday/Wednesday 3-4pm in Physics Help Room (Physics A129)

Course Material:

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 multi-variable calculus, for which this book is an excellent reference

3. Top Hat for Class Feedback

I highly encourage interactions during the class, but I do recognize that for a variety of reasons a written feedback platform may be required. Top Hat software (https://tophat.com) will allow

students to ask questions and engage in discussion anonymously (to your peers). It will also be used for short (ungraded) quizzes during the class to assess the class's learning. You will be able to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or through text message.
An email invitation will be sent to you by email, but if don't receive this email, you can register by going to TopHat's website and using the **code 084767**. Note, you will need to sign up for a subscription for the duration of the class.

Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the in app support button, or by calling 1-888-663-5491.

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 is as follows:

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

Learning Objectives:

Upon completing this course, students will be able to

- Recognize Maxwell's equation and identify the sources and the fields
- Calculate time independent electric field as a result of a given charge distribution
- Use PDE, method of images, and multipole expansion to solve for electric potential and fields
- Analyze the electric field resulting from bound and free charges to calculate the field in matter
- Calculate magnetic field resulting from time invariant currents
- Recognize the vector potential and explain how it can be applied
- Apply Maxwell's equation to relate time varying electric and magnetic fields

Grade Breakdown:

Homework: 5%
Homework will contain problem sets that will be posted on Friday and will be due by the end of the day on the next Friday.

Midterm 1: 25%
The first midterm will be **on October 5th in class**.

Midterm 2: 30 %
The second midterm will be **on November 9th in class**.
This midterm covers only the topics discussed after Oct. 5th (i.e. not cumulative)

Final: 40 %
Currently scheduled on **Thursday, December 20th** at 2:15- 5pm, location Javits 101 (usual class location)
Final exam will be cumulative, and will include all topics covered in class

You are responsible for insuring 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.

Extra credit: up to 5%
Up to 5% extra credit will be assigned for participating in TopHat (offline) discussions. Details will be announced throughout the course.

Notes on Homework

Every Friday five to ten homework problems from each chapter will be posted on Blackboard. The usual deadline would be 11:59 pm on the following Friday. 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 solution of all problems.
- Do not forget that simply copying somebody's solutions does not help you in a 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.
- Homework returned after the deadline could be accepted with reduced grading - 20% per day. Otherwise, it will be unfair for your classmates who are doing their job on time. Therefore, you should be on time to keep your grade high

Academic Resources:

If you find that you are still 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/due/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/