PHYS4392-001-1222

Fundamental principles of electrodynamics, including electrostatics, magnetostatics, electric potential, electric and magnetic fields in matter, simple behavior of time-dependent electric and magnetic fields, and Maxwell's equations.

Prerequisites: PHYS 1304, MATH 3302, MATH 3313. PHYS 4321 recommended.

This is a flipped active-learning class in which students can expect to do preparatory work before class and then work together during class.

Instructor Biography

Prof. Dalley is a theoretical physicist who has worked in Oxford, Cambridge, Princeton and CERN. He been teaching physics courses at SMU, from non-science majors to graduate students, since 2006 and has received both an Outstanding Professor Rotunda Award and the Provost's Teaching Recognition Award. At SMU he also directs science outreach programs and professional development courses for high-school physics teachers.

Course Student Learning Outcomes

The student will be able to:

- Calculate the electrostatic potential from a knowledge of the electrostatic electric field,by using the multipole expansion in tandem with a knowledge of the charge distribution, using the method of images, or the separation of variables technique to solve Laplace's equations.
- Describe the electrostatic properties of conductors and dielectrics, calculate static electric fields with the differential and integral forms of Gauss' law and bound charge distributions in dielectrics.
- Calculate the static magnetic field in vacuum and in magnetic materials for a given time-independent current density
- Calculate time-dependent behavior of electric and magnetic fields in vacuum using Maxwell's equations

Class Meeting: Tu/Th 2:00 p.m. – 3:20 p.m. Hyer 0110

Instructor: Dr. S. Dalley, sdalley@smu.edu

Office Hours: Tu/Th 9:00 – 11:00 a.m. Fondren Science 207 or by appointment via Zoom. Zoom meeting ID 477 628 4599 Passcode *dalleyphys*. You will only be able to join Zoom meetings while signed in to your SMU account via SSO.

Required Text: "Introduction to Electrodynamics" 4th edition by David. J. Griffiths, (Pearson) ISBN 978-0-321-85656-2. Other editions are OK, but you are responsible for making any translations in question or section numbers.

Communication

For personal messages, please contact me via your smu email and not Canvas as messaging/comments in Canvas are not forwarded to my email. I will respond to your email within a few hours typically. Responses might be slightly delayed on holidays and weekends. I will communicate with the class via Canvas Announcements. It is your responsibility to check Canvas Announcements and your SMU email.

Attendance

The teaching strategy for this course relies on active group participation of all students, so you are expected to attend every class.

- Students who test positive for COVID-19 and need to isolate, or who are notified of potential exposure, must follow SMU's Contact Tracing Protocol(Links to an external site.). (Links to an external site.) If you contract any other contagious illness (such as the regular flu or a cold for example) you should not come to class until you are better and it is expected that you will take steps when you return to class (social distance and/or mask) that protect others in case you are still contagious.
- The syllabus has already built into it automatic score drops that can be used to cover about one week of absence for any reason. Unavoidable multiple or prolonged absences will be treated on a case-by-case basis. Contact me to discuss whether and how the absence can be made up.

Masks

Masks and social distancing are required in the classroom at all times, preferably an N95-type medical grade mask.

Academic Dishonesty

Students are expected to embrace and uphold the SMU Honor Code (Links to an external site.). Violations of the Honor Code will be acted upon in accordance with the policies and procedures outlined in the Mustang Student Handbook (Links to an external site.). Examples of academic dishonesty are:

- Communication via any method with anyone else during any exam.
- Sharing or copying an assignment intended to be done individually.
- Fabricating lab data or using published information without citation in an essay-style assignment.

- This course operates a policy of zero tolerance toward Academic Dishonesty in any form in any graded assessment. It will usually result in an F grade for the course and a filing with the Dean of Student Life (Honor Code Violation).

Grading

Your course grade will be calculated according to the following assessments

READING (20%)

Before each class you are expected read the relevant sections of the textbook, attempt the Reading Assignment and upload it to Canvas by the deadline before class. The assignment is graded ½ for effort, ½ for correctness. Late Reading Assignments are not accepted but the lowest-scoring two will be dropped to cover for any indisposition (absence, illness, overwork, brain-crash, etc.)

POLLS (5%)

During class you will be asked to respond to poll questions based on the reading for the chapter. It is graded on participation only, at the discretion of the instructor - skipping class will obviously reduce this grade.

HOMEWORKS (25%)

Post-class homework assignments are due in Canvas most weeks. Late homeworks are not counted for credit but the lowest homework score will be dropped to cover for any indisposition (absence illness, overwork, brain-crash, etc.).

IN-CLASS TESTS (7% each)

There will be three 75-min in-class tests on the most recent topics. You will be allowed one letter-sized sheet of paper (both sides) with your notes on it.

CORRECTED TEST (3% each)

You have the opportunity to correct your graded Tests within about one week after receiving it back. Corrections must be submitted separate from but accompanied by your original graded Test. If no corrections are submitted, the original Test score will count for the corrected test credit.

FINAL EXAM (20%)

There will be a 3 hr comprehensive final exam. You will be allowed four letter-sized sheets of paper (both sides) with your notes on it.

IMPORTANT: *In determining the overall course grade, if the score on each initial test and on the final exam is always below 50%, the course grade will be F regardless of performance in other assessments.*

Grading Scale

A	A -	B +	B	B -	C +	C	C -	D +	D	D -	F
100-90%	90-85%	85-80%	80-75%	75-70%	70-65%	65-60%	N/A	N/A	60-50%	N/A	below 50%

Course Outline/Calendar

Date	**TOPIC**	**Pre-Class Prep**	HW due
1/18	**Introduction & Vector Algebra**	1.1	
1/20	**Vector Calculus**	1.2-1.3	
1/22	**Curvilinear Coords, Dirac Delta Function**	1.4-1.6	1.7,1.25,1.33
1/27	**Electrostatic Field & Gauss' Law**	2.1-2.2	
2/1	**Electrostatic Potential & Energy**	2.3-2.4	1.43, 2.6, 2.16
2/3	**Conductors & Capacitors**	2.5	
2/8	*Review of 1.1 – 2.5*		2.27, 2.38, 2.43
2/10	***Test 1***	1.1 – 2.5	
2/15	***Laplace's Equation: Method of Images***	3.1-3.2	
2/17	**Laplace's Equation:**	3.3	

	Separation of Variables		
2/22	**Electrostatic Multipole Expansion**	3.4	3.8, 3.13, 3.19
2/24	**Electric Polarization**	4.1-4.2	
3/1	**Electric Displacement and Linear Dielectrics**	4.3 – 4.4.1	3.28, 3.31, 4.11
3/3	**Boundaries and Energy in Dielectrics**	4.4.2 – 4.4.4	
3/8	*Review of 3.1 - 4.4*		4.18, 4.21, 4.26
3/10	*Test 2*	3.1 - 4.4	
3/22	**Lorentz Force & Current Density**	5.1	
3/24	**Biot-Savart Law & Div/Curl of B**	5.2 - 5.3.2	
3/29	**Ampere's Law & Maxwell's Static Equations**	5.3.3 – 5.3.4	5.5, 5.10, 5.11
3/31	**Magnetic Vector Potential**	5.4	
4/5	**Magnetization**	6.1 – 6.2	5.15, 5.21, 5.35
4/7	**H Field**	6.3-6.4	
4/12	*Review of 5.1 – 6.4*		6.3, 6.8, 6.16
4/14	*Test 3*	5.1 – 6.4	
4/19	**Ohm's Law**	7.1.1	

4/21	**Electromotive Force**	7.1.2 – 7.2.1	
4/26	**Magnetic Induction**	7.2.2-7.2.4	
4/28	**Maxwell's Equations**	7.3.1-7.3.4 & 9.2.1	7.8, 7.16, 7.22
5/11	*Final Exam 11:30am - 2:30 pm*	Chaps 1 – 7	ALL TOPICS

Disclaimer: The instructor reserves the right to make changes to the schedule of the class. Any alterations will be announced in class, in Canvas or via email by the instructor. Students who do not check Canvas or their email assume full responsibility for missing alterations to the course.

Institutional Policies & Procedures

Title IX and Disability Accommodations

Disability Accommodations	Students who needacademic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit http://www.smu.edu/Provost/SASP/DASS (Links to an external site.) to begin the process. Once they areregistered and approved, students thensubmit a DASS Accommodation Letter through the electronic portal, *DASS Link,* and then communicate directly with each of their instructors to make appropriate arrangements. Please note that accommodations are not retroactive, but rather require advance notice in order to implement.
Sexual Harassment	All forms of sexual harassment, including sexual assault, dating violence, domestic violence and stalking, are violations of SMU's Title IX Sexual Harassment Policy and may also violate Texas law.Students who wish to file a complaint or to receive more information about the grievance process may contact Samantha Thomas, SMU's Title IX Coordinator, at accessequity@smu.edu or 214-768-3601.Please note that faculty are mandatory reporters.If students notify faculty of sexual harassment, faculty must report it to the Title IX Coordinator. For more information about sexual harassment, including resources available to assist students,

	pleasevisitwww.smu.edu/sexualmisconduct (Links to an external site.).
Pregnant and Parenting Students	Under Title IX, students who are pregnant or parenting may request academic adjustments by contacting Elsie Johnson (elsiej@smu.edu) in the Office of the Dean of Students, or by calling 214-768-4564.Students seeking assistance must schedule an appointment with their professors as early as possible, present a letter from the Office of the Dean of Students, and make appropriate arrangements.Please note that academic adjustments are not retroactive and, when feasible, require advance notice to implement.

SMU Requirements

Religious Observance	Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. Click here for a list of holidays. (Links to an external site.)
Excused Absences for University Extracurricular Activities	Students participating in an officially sanctioned, scheduled university extracurricular activity should be given the opportunity to make up class assignments or other graded assignments that were missed as a result of their participation. It is the responsibility of the student to make arrangements for make-up work with the instructor prior to any missed scheduled examinations or other missed assignments. (See 2020 (Links to an external site.)- (Links to an external site.)2021 SMU Undergraduate Catalog (Links to an external site.)under “Enrollment and Academic Records/Excused Absences.”)
Final Exams	Final course examinations shall be given in all courses where appropriate, and some form of final assessment is essential. Final exams and assessments must be administered as specified in the official examination schedule. Exams cannot be administeredor due during the last week of classes or during the Reading Period. Syllabi must state clearly the form of the final exam or assessment, and the due dateand time must match the official SMUexam schedule. Final exams are not required to be provided online.

Student Support

Student Academic Success Programs	Students needing assistance with writing assignments for SMU courses may schedule an appointment with the Writing Center through Canvas.Students who would likesupport forsubject-specific tutoring or success strategies should contact SASP, Loyd All Sports Center, Suite 202;214-768-3648; https://www.smu.edu/sasp (Links to an external site.). (Links to an external site.)
Caring Community Connections Program	CCC is a resource for anyone in the SMU community to refer students of concern to the Office of the Dean of Students. The online referral form can be found at smu.edu/deanofstudentsccc (Links to an external site.). (Links to an external site.)After a referral form is submitted, students will be contacted to discuss the concern, strategize options, and be connected to appropriate resources. Anyone who is unclear about what steps to take if they have concerns about students should either consult the CCC Reference (Links to an external site.)Guide (Links to an external site.)or contact the Office of the Dean of Students at 214-768-4564.

Tech Requirements & Help

Please be sure that your device or devices meet the **technical requirements** for Canvas. Technical requirements and browser requirements for Canvas are located in the Canvas Student Guide. If you need Technical Support with Canvas, click the Help link on the left side Global Navigation. From there you can Search Canvas Guides, Chat with Support, or Submit a Request for assistance. You can also contact the SMU IT Help Desk for assistance with Canvas.

TECHNICAL SUPPORT

If you run into any technical problems, there are a number of resources available to you. You can contact the SMU IT Help Desk for assistance with Canvas. Otherwise, here are additional useful resources:

- Canvas(Links to an external site.)
    - Click HelpLinks to an external site.on the Global Navigation (Links to an external site.) to search the Guides, Chat (Links to an external site.) or contact Instructure Support via email or phone
      (Links to an external site.)

PRIVACY POLICIES

- Canvas by Instructure
  (Links to an external site.)
  (Links to an external site.)
- SMU OIT Policies and Legislation
  (Links to an external site.)

ACCESSIBILITY

- Canvas
  - Accessibility within Canvas
  - Voluntary Product Accessibility Template

Student Services

The following services and resources are available to SMU students:

- Altshuler Learning Enhancement Center
  - ALEC offers study-skill workshops and can help you with learning strategies and test preparation. Their phone number is (214) 768-3648.
- Altshuler Writing Center
  - The Altshuler Writing Center is open to all undergraduate students who need technical advice on their assigned papers. The writing center is open most afternoons and a few evenings. To work with someone at the writing center you must make an appointment in advance. To contact please call (214) 768-3648.
- DASS
  - Students needing academic accommodations for a disability must first contact Disability Accommodations & Success Strategies(DASS) at (214) 768-1470 to verify the disability and to establish eligibility for accommodations. They should then schedule an appointment with the professor to make appropriate arrangements. (See an attachment describes the DASS procedures (Links to an external site.) and relocated office.) If you have a disability accommodation you must contact DASS and have a letter of accommodation delivered to the instructor no later than the third day of class. You can email a scanned copy of your letter.
- SMU
  - Online portal for SMU students that allows you to view personal information, emergency contact information, register for AARO (if applicable), view class schedule, enroll in classes, add/drop/swap classes, view grades and view financial aid packages.
- SMU Bookstore
  - Information on textbooks, events, buyback, promotions and more.
- SMU Bursar
  - Information on student finances, bill pay and more.
- SMU Counseling Services

    - College can be a stressful time. There are many transitions and major life events occurring while you are a college student. If you or a friend is going through a difficult time and needs someone to talk to please seek out the resources provided by the counseling center, located in the Health Center and their phone number is (214) 768-2211. For 24 hour help contact (214) 768-2860.
- SMU Dedman Recreation Center
    - Regular exercise is one of the best things you can do for your mental and physical well-being.
- SMU Libraries
    - SMU Libraries has reference librarians happy to help with your research needs. Contact a librarian at http://askalibrarian.smu.edu/or call (214) 768-2326.
- SMU OIT
    - OIT provides computing, information processing, and communications resources to satisfy the needs of faculty, students, and staff, and offers comprehensive support services to help them use technology effectively and creatively.
- SMU Student Affairs
    - SMU Student Affairs is a network of departments, programs and servicesfocused on supporting students' out-of-classroom experiences and co-curricular learning.