

PHY 3513 001

# Electrodynamics

## Course Syllabus - Fall 2024



### Course Information

**Course Description:** Prerequisite: PHY 2823 and PHY 3423, or consent of instructor. Continuation of the material started in PHY 3423. Topics include Maxwell's equations, electromagnetic waves, wave guides, and radiation from accelerated charges.

**Credit Hours:** 3

**Course Modality:** Traditional in-person

### Meeting Times

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**Duration:** 08/26/2024-12/13/2024

**Campus:** Main Campus

**Location:** [FLN 3.02.01](#)

**Time(s):** TR 1:00 PM - 2:15 PM

### Learning Goals

At the end of the course, you will be able to:

- Remember Key Electrodynamics Formulas  
**Outcome**  
Vector Notation, Lorentz Force Law, Maxwell's Equations
- Understanding Comparisons Among Electrodynamics and Other Theories  
**Outcome**  
Distinguishing Electrostatics, Magnetostatics and Electrodynamics; Relating Electrodynamics to Relativity and Quantum Mechanics/Field Theory
- Analyze Evaluate Methods  
**Outcome**  
Recognizing Symmetry for Shell Theorems, Gauss' Law; Solving Laplace's Equation vs. Method of Images

- Create Computational Programs

**Outcome**

Utilizing Mathematica and UNIX/High Performance Clusters

## Skills Goals

At the end of the course, you will be able to:

- Name: Build off of electrostatics and magnetostatics
- Name: Solve problems in a variety of electrodynamics topics, i.e., Maxwell's equations, electromagnetic waves, wave guides, and radiation from accelerated charges.

## Communicate with Me

**Instructor Name:** Richard Jude Anantua

**Department**

Physics and Astronomy

**Office Location**

AET 3.386

**Student Hours**

Tues 2:30p

**Email Address:** richard.anantua@utsa.edu

**CV Link**

<https://richardanantua.com/cv/>

**Preferred Method of Communication**

Email

## About Me & My Teaching Philosophy

Richard Anantua: I am a UTSA Assistant Professor excited to be part of your academic journey this semester. Electrodynamics is a fundamental pillar of classical physics which you will likely utilize frequently after this course. I intend to provide a thorough grounding in theoretical electrodynamics and computational applications thereof in this key gateway course.



My current research focuses on reverse engineering near-horizon supermassive black hole observations from intercontinental baselines of radio telescopes –primarily the Event Horizon Telescope (EHT)– using a methodology I call "Observing" Jet/Accretion flow/Black hole (JAB) Simulations. I lead the first EHT research group in Texas, primarily conducting research within the EHT Theory and Simulations Working Group. I also lead the EHT Outreach Group for the Americas, and have established nexuses between EHT and networks supporting diversity in the sciences such the NSBP/SAO EHT Scholars program.

My broad research interests have included: theoretical cosmology, high-energy theoretical astrophysics (e.g., Blandford-Znajek jets from supermassive black holes), high-energy theoretical particle physics (e.g., string theory [especially AdS/CFT correspondence]), condensed matter theory (e.g., strongly correlated fermionic systems with holographic dual).

My degrees are as follows:

Ph.D. in Physics; Stanford University 2016 Ed.M. in Education Policy and Management; Harvard University 2014 M.S. in Physics; Stanford University 2013 B.S. in Physics and Philosophy and B.S. in Economics and Mathematics; Yale University 2010

My teaching philosophy can be found in this statement: [https://docs.google.com/document/d/1z4xQDOPAtLsT0aTwlXhVyV\\_QpHiLf\\_jDWgRPMVxyhbE/edit](https://docs.google.com/document/d/1z4xQDOPAtLsT0aTwlXhVyV_QpHiLf_jDWgRPMVxyhbE/edit)

## Course Materials

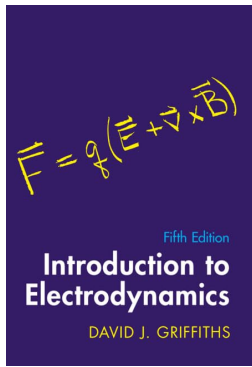
**Introduction to Electrodynamics**

**ISBN:** ISBN 978-1009397759

**Authors:** David J. Griffiths

**Publication Date:** November 2, 2023

**Edition:** 5th



## Additional Course Information

This course is divided into 6 units roughly corresponding to the following collections of chapters in Griffiths Electrodynamics:

Unit 1 Math Methods (Ch. 1)

Unit 2 Electrostatics and Potential Theory (Chs. 2-3)

Unit 3 Electric and Magnetic Fields in Matter (Chs. 4-6)

Unit 4 Electrodynamics and Conservation Laws (Chs. 7,8)

Unit 5 Electromagnetic Waves and Waveguides (Ch. 9)

Unit 6 Potentials, Fields and Radiation – Relativistic Formalism (Chs. 10,11,12)

## Assessments and Assignments

The Assessment/Assignment dates are as follows:

- Quizzes (30%)

Quiz 1 Tu 9/24

Quiz 2 Tu 11/12

- Homeworks (30%)

HW1 Th 9/5

HW2 Tu 9/17

HW3 Tu 10/8

HW4 Tu 10/22

HW 5 Tu 11/19

HW 6 Tu 12/3

- Final Presentation (30%)

Tu 12/10

Th 12/12

- Participation (10%)

All day, every day (hopefully)

## Activities and Grading

Activity	Quantity	%
Homework	6	30
Quizzes	2	30
Final Presentation	1	30
Class Participation	Infinite	10
<b>Total</b>		<b>100%</b>

Distribution of Course Assignments, Their Quantity, and Contribution to Final Grade.

## Grade Distribution and Letter Grade

Letter Grade	Grade Range
A+	97-100 (Reported as A on final transcript)
A	93-96
A-	90-92
B+	86-89
B	83-85
B-	80-82
C+	76-79
C	73-75
C-	70-72
D+	66-69
D	63-65
D-	60-62
F	<60

## Course Expectations & Policies

### Instructor-Initiated Drops

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This course uses instructor-initiated drops for students who exceed the absence and/or missed assignment limit. Therefore, up to the last day for students to withdraw from an individual course, **[M 10/28]**, you will be dropped for exceeding **[5 absences/3 assignments]**. Students will receive at least one courtesy warning when approaching the absence/missed assignment limit. Notification will be sent using ASAP to the student's email address. A subsequent absence or missed assignment will result in being dropped from the course. Notification of being dropped will also be sent through ASAP to the student's email address. *This drop does not affect enrollment in other courses.* **Please consult the [Dropping Courses webpage](#)** for further details on the process and appeals.

### Video and Audio Recording

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As the instructor of this course, I may record meetings and lessons. You are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Recordings may not be published, reproduced, or shared with those not in the class. If the instructor or a UTSA office plans any other uses for the recordings, consent of the students identifiable in the recordings is required before such use unless an exception is allowed by law. For more information on your privacy and class recordings, review [Student Privacy \(FERPA\) in Virtual Classrooms and Other Educational Recordings](#) and the [Guide to Secure Video Conferencing Tools](#).

### Academic Freedom

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Academic freedom<sup>1</sup> is a cornerstone of the University. Academic freedom in its teaching aspect is fundamental for the protection of the rights of the teacher in teaching and of the student to freedom in learning.<sup>2</sup> Each faculty member is entitled to full freedom in the classroom discussing the subject that the faculty member teaches.<sup>3</sup> The University of Texas at San Antonio will not penalize or discipline members of the faculty because of their exercise of academic freedom.

Along with this freedom comes responsibility. It is the responsibility of faculty members to ensure that topics taught are related to the classroom subject. Students should be free to take reasoned exception to the data or views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.<sup>4</sup> It is not the proper role of the university or any outside agency to attempt to shield individuals from ideas and opinions they find unwelcome, disagreeable, or even deeply offensive.<sup>5</sup> Engaging with new ideas and perspectives helps students grow intellectually and is beneficial to the educational process.

1. Statement adapted from Texas A&M University's [Syllabus Statement Regarding Academic Freedom](#)

2. 1940 Statement of Principles on Academic Freedom and Tenure

3. Board of Regents Rule 31004; HOP Policy 4.02
4. American Association of University Professors Joint Statement on Rights and Freedoms of Students
5. The Chicago Statement

## Our Commitment to Inclusivity

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The University of Texas at San Antonio, a Hispanic Serving Institution situated in a global city that has been a crossroads of peoples and cultures for centuries, values diversity and inclusion in all aspects of university life. As an institution expressly founded to advance the education of Mexican Americans and other underserved communities, our university is committed to promoting access for all. UTSA, a premier public research university, fosters academic excellence through a community of dialogue, discovery and innovation that embraces the uniqueness of each voice.

## Syllabus Changes

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The syllabus is subject to change at the instructor's discretion. Any changes/corrections to the course materials, assignment dates, or other updates will be communicated to the students ahead of time. You are responsible for checking Canvas for corrections or updates to the syllabus.

## Course Schedule

For a list of important university-wide dates, review [One Stop's academic calendar](#).

## Essential Student Information

- **Important:** Bookmark and visit the [Common Syllabus Information webpage](#) to find important and valuable resources about counseling services, transitory/minor medical issues, supplemental instruction, tutoring services, academic success coaching, sexual harassment and sexual misconduct, campus safety and emergency preparedness, and the Roadrunner Creed.
- For technical requirements, support, and resources, visit [Academic Innovation's Student Technical Support](#) page.
- UTSA provides reasonable accommodations to students via [Student Disability Services](#). For more details on eligibility, policies, and requirements, please visit [www.utsa.edu/disability](http://www.utsa.edu/disability) or call (210) 458-4157.
- Students at UTSA are responsible for ensuring their work is consistent with UTSA's standards for academic integrity. Students should review [Section 203 of the UTSA Student Code of Conduct](#) for appropriate standards of academic integrity.
- UTSA provides numerous services for students from counseling to tutoring to a food pantry. Visit [Student Affairs Programs and Services](#) and [Student Success](#) for more information.

- Visit the [UTSA Libraries and Museums](#) site for access to journals, research tutorials, and tech gear you can borrow and to find your department's librarian.
- Enroll in the [Roadrunner Success Playbook](#), an open enrollment, self-paced, online hub in Canvas tailored to ensure you have the resources you need to excel at UTSA.
- Follow [Digital Learning Netiquette](#) standards for your online communication activities.