Spring 2022

Period 6 (1:55 PM - 2:45 PM)

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Office hours:

Wed 2:45 p.m.-3:45 p.m.

Fri 11:00 a.m.-noon

or by appointment

Grader: Kazi Alam

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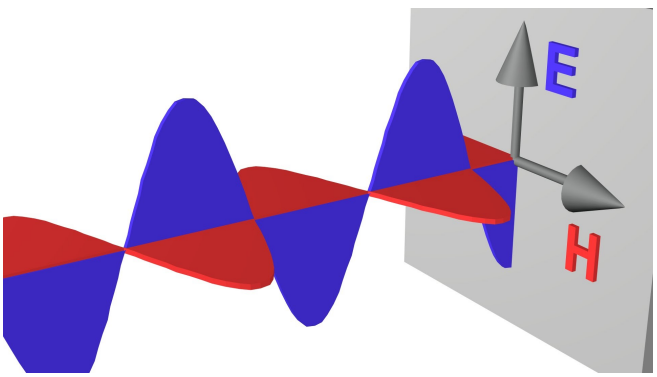
Office: NPB 2157

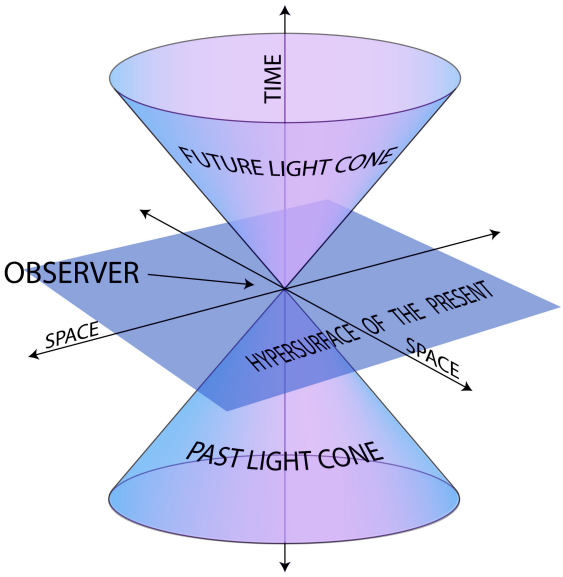
Office hours:

PHY6347

Electromagnetic Theory II

All materials for this class will be posted at UF e-learning . Enter with your Gatorlink login and password.





Overview

PHY 6347 is the second semester of the graduate core sequence in Electromagnetism. The objectives of the course are (*i*) to study electrodynamics at a theoretically sophisticated level; (*ii*) to develop mathematical techniques useful for solving problems in E&M as well as other areas of physics; (*iii*) to develop problem solving skills; (*iv*) to prepare (if necessary) for the preliminary exam. Topics to be covered include

- Time-dependent Maxwell equations: conservation laws, energy density, energy flux (Poynting vector), momentum density, momentum flux (Maxwell stress tensor)
- Plane waves, propagation and dispersion
- Confined geometries: waveguides, cavities, dielectric waveguides/fibers, losses and attenuation
- Radiation from harmonic sources: dipole and higher multipoles, linear antenna, vector spherical harmonic expansion
- Scattering and diffraction
- Special relativity: Lorentz transformations, space-time vectors and tensors, proper time, velocity and acceleration as 4-vectors, energy-momentum, covariant formulation of electromagnetism
- Radiation from accelerated charges; Cherenkov and synchrotron radiation, radiation losses

Coursework

Weekly homework (50% of the grade), due every Friday by 11:59 p.m.

Two exams (25% each)

Both exams are open book. You can use any electronic/printed/handwritten materials but your Internet connection **must be turned off**.

Units Rule

Every algebraic solution of homework and exam problems must be accompanied by a unit check. Without such a check, no more that 75% of the credit will be given even for an otherwise perfectly correct solution. On the other hand, constructing an answer using dimensional analysis and other general arguments (symmetries, analysis of limiting cases, etc.) may earn you up to 50% of the credit, even if a complete solution is not provided.

University Policies

Students are expected to know and comply with the University's policies regarding academic honesty and use of copyrighted materials. Cheating, plagiarism, or other violations of the Academic Honesty Guidelines will not be tolerated and will be pursued through the University's adjudication procedures.

Students requesting classroom accommodations must first register with the Disabilities Resources Program, located in the Dean of Students Office, P202 Peabody Hall. The Disabilities Resources Program will provide

Materials

- **Main text:**
  J. D. Jackson, Classical Electrodynamics, 3rd ed.
- **Supplemental texts:**
- A. Zangwill, Modern Electrodynamics
- L. D. Landau and E. M. Lifshitz, The Classical Theory of Fields (Landau Course of Theoretical Physics, v.2)
- L. D. Landau and E. M. Lifshitz, Electrodynamics of Continuous Media (Landau Course of Theoretical Physics, v.8)

Important dates

No classes:

January 17 (Martin Luther King Jr. Day)

March 7-11 (UF Spring break)

Exams

TBA

Last day of classes: April 20

No final exam

documentation to the student, who must then deliver this documentation to the instructor when requesting accommodations.

Diversity statement

Physics is practiced and advanced by a scientific community of individuals with diverse backgrounds and identities and is open and welcoming to everyone. The instructional team recognizes the value in diversity, equity and inclusion in all aspects of this course. This includes, but is not limited to differences in race, ethnicity, gender identity, gender expression, sexual orientation, age, socioeconomic status, religion and disability. Students may have opportunities to work together in this course. We expect respectful student collaborations such as attentive listening and responding to the contributions of all teammates.

Physics, like all human endeavors, is something that is learned. Our aim is to foster an atmosphere of learning that is based on inclusion, transparency and respect for all participants. We acknowledge the different needs and perspectives we bring to our common learning space and strive to provide everyone with equal access. All students meeting the course prerequisites belong here and are well positioned for success.