

HARVARD UNIVERSITY  
**Physics 232: Advanced Electromagnetism**

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*Spring 2020, Mon-Wed-Fri, 3:00-4:15pm, Jefferson 356*

*All class materials can be obtained from [canvas.harvard.edu/courses/66124](https://canvas.harvard.edu/courses/66124)*

The first class will meet on January 27, 2020.

A graduate course in electrodynamics. The text book will be

- *Modern Electrodynamics* by Andrew Zangwill, Cambridge University Press

Occasionally, we will also refer to the classic text: *Classical Electrodynamics*, by J. D. Jackson.

Preliminary outline

1. Review of Electrostatics, Magnetostatics, and Maxwell's Equations
2. Gauge invariance
3. Conservation of Energy and Momentum
4. Simple radiating systems
5. Magnetic dipole and electric quadrupole fields
6. Maxwell's equations in macroscopic media
7. Propagation of light through macroscopic media: metals and dielectrics, Kramers-Kronig relations.
8. Dispersive media; negative index of refraction
9. Geometrical optics; caustics
10. Diffraction
11. Scattering of light
12. Electromagnetic properties of composite media
13. Special relativity
14. Magnetohydrodynamics; Plasmas

There will be regular problem sets, one about every 10 days.

There will be a take-home final exam on Friday May 8. You can pick up the exam at any time on May 8, and have to turn it in within 24 hours of the pick-up time. Please let us know if this time is not possible for you, and we can make alternative arrangements.