

# Classical Electrodynamics Third Edition John David Jackson

Classical Electrodynamics Third Edition by John David Jackson is an acclaimed textbook that provides a comprehensive and in-depth exploration of the fundamental principles of electromagnetism. This revised edition offers a refined and expanded treatment of the subject matter, making it an indispensable resource for students, researchers, and practitioners in the field of electrodynamics.

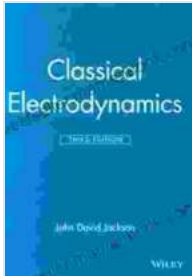
## Key Features and Content

The book is organized into 20 chapters, each covering a specific aspect of electromagnetism. The key features and content of the book include:

- **Rigorous Mathematical Formulation:** Jackson employs a rigorous and precise mathematical approach to present the fundamental concepts of electromagnetism, ensuring a deep understanding of the underlying principles.
- **Extensive Problem Sets:** Each chapter concludes with a comprehensive set of exercises and problems, designed to reinforce understanding and encourage critical thinking.
- **Historical Perspective:** The book includes historical insights and references to original scientific papers, providing a context for the development of electromagnetism.
- **Updated and Expanded Content:** The third edition features updated content and expanded coverage of modern topics, including plasma physics, non-linear optics, and special relativity.

## Chapter Overview

### Chapter 1: Introductory Concepts



#### Classical Electrodynamics Third Edition by John David Jackson

★★★★☆ 4.4 out of 5

Language : English

File size : 148743 KB

Text-to-Speech : Enabled

Screen Reader : Supported

Enhanced typesetting : Enabled

Print length : 1597 pages



- Electrostatic fields and forces
- Gauss's law and electric potential
- Coulomb's law and the energy of the electric field

### Chapter 2: Electrostatic Boundary-Value Problems

- Poisson's and Laplace's equations
- Method of images
- Green's functions

### Chapter 3: Magnetostatics

- Magnetic fields and forces
- Ampère's law and the magnetic vector potential

- Biot-Savart law and the energy of the magnetic field

## **Chapter 4: Magnetostatic Boundary-Value Problems**

- Poisson's and Laplace's equations for the magnetic vector potential
- Method of images
- Green's functions

## **Chapter 5: Time-Varying Fields**

- Maxwell's equations
- Faraday's law and the displacement current
- Poynting's theorem

## **Chapter 6: Propagation of Electromagnetic Waves**

- Plane waves in lossless media
- Reflection and transmission at boundaries
- Waveguides

## **Chapter 7: Dielectric Materials**

- Polarization and electric displacement
- Linear and nonlinear dielectrics
- Dielectric boundary-value problems

## **Chapter 8: Magnetic Materials**

- Magnetization and magnetic permeability
- Magnetic boundary-value problems

## **Chapter 9: Waves in Material Media**

- Propagation of electromagnetic waves in dielectrics and magnetic materials
- Reflection and transmission at boundaries

## **Chapter 10: Circuit Theory**

- Basic circuit elements
- Kirchhoff's laws
- Transient analysis

## **Chapter 11: Transmission Lines**

- Transmission line equations
- Reflection and transmission coefficients
- Smith chart

## **Chapter 12: Waveguides**

- Rectangular and circular waveguides
- Mode structure and dispersion relations

## **Chapter 13: Antennas**

- Hertzian dipole
- Antenna characteristics
- Antenna arrays

## **Chapter 14: Special Relativity**

- Lorentz transformations
- Electromagnetism in relativistic frames
- Radiation by moving charges

## **Chapter 15: Radiation by Oscillating Charges**

- Electric dipole radiation
- Magnetic dipole radiation
- Antenna radiation

## **Chapter 16: Scattering of Electromagnetic Waves**

- Scattering by particles
- Scattering by random media
- The Mie scattering formula

## **Chapter 17: Plasma Physics**

- Plasma properties
- Waves in plasmas

- Plasma applications

## **Chapter 18: Nonlinear Optics**

- Nonlinear polarization
- Second harmonic generation
- Optical parametric amplifiers

## **Chapter 19: Magnetohydrodynamics**

- The magnetohydrodynamic equations
- Applications to astrophysics and fusion research

## **Chapter 20: Quantum Electrodynamics**

- The quantization of the electromagnetic field
- The interaction of light with matter
- Laser theory

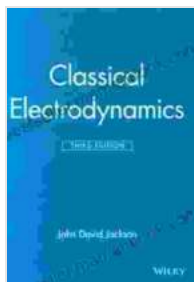
## **Target Audience and Applications**

Classical Electrodynamics Third Edition is primarily intended for advanced undergraduate and graduate students majoring in physics or electrical engineering. It is also a valuable resource for researchers, scientists, and engineers working in the fields of electromagnetism, optics, and plasma physics.

## **Author's Credentials**

John David Jackson (1925-2016) was an American theoretical physicist and professor at the University of California, Berkeley. He was known for his contributions to electromagnetism, particle physics, and general relativity. Jackson's textbooks, including Classical Electrodynamics, are widely regarded as authoritative and accessible resources for students and researchers alike.

Classical Electrodynamics Third Edition by John David Jackson is an exceptional textbook that provides a comprehensive and rigorous treatment of the fundamental principles of electromagnetism. Its clear and precise mathematical formulation, extensive problem sets, and historical insights make it an invaluable resource for anyone seeking to gain a deep understanding of this field. The book's updated and expanded content ensures its relevance to modern research and applications, making it an indispensable companion for students, researchers, and practitioners alike.

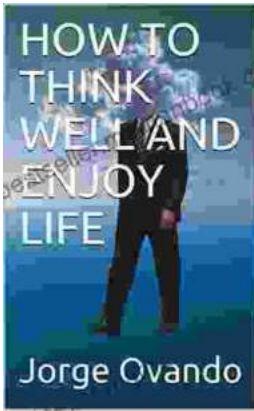


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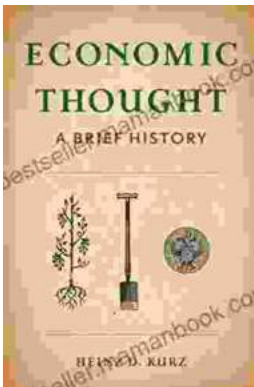
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