Classical Field Theory On Electrodynamics Non Abelian Gauge Theories And Gravitation

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ADALYNN BARTLETT

Advanced Classical Electromagnetism Springer
The study of classical electromagnetic fields is an adventure. The theory is complete mathematically and we are able to present it as an example of classical Newtonian experimental and mathematical philosophy. There is a set of foundational experiments, on which most of the theory is constructed. And then there is the bold theoretical proposal of a field-field interaction from James Clerk Maxwell. This textbook presents the theory of classical fields as a mathematical structure based solidly on laboratory experiments. Here the student is introduced to the beauty of classical field theory as a gem of theoretical physics. To keep the discussion fluid, the history is placed in a beginning chapter and some of the mathematical proofs in the appendices. Chapters on Green’s Functions and Laplace’s Equation and a discussion of Faraday’s Experiment further deepen the understanding. The chapter on Einstein’s relativity is an integral necessity to the text. Finally, chapters on particle motion and waves in a dispersive medium complete the picture. High quality diagrams and detailed end-of-chapter questions enhance the learning experience.
Quantum Theory of Near-Field Electrodynamics CRC Press
An Introduction to Quantum Field Theory is a textbook intended for the graduate physics course covering relativistic quantum mechanics, quantum electrodynamics, and Feynman diagrams. The authors make these subjects accessible through carefully worked examples illustrating the technical aspects of the subject, and intuitive explanations of what is going on behind the mathematics. After presenting the basics of quantum electrodynamics, the authors discuss the theory of renormalization and its relation to statistical mechanics, and introduce the renormalization group. This discussion sets the stage for a discussion of the physical principles that underlie the fundamental interactions of elementary particle physics and their description by gauge field theories.
Modern Problems in Classical Electrodynamics Cambridge University Press
Modern introduction to quantum field theory for graduates, providing intuitive, physical explanations supported by real-world applications and homework problems.
Introduction to Electrodynamics John Wiley & Sons
This text on Electrodynamics is intended for upper level undergraduates or postgraduates in Physics. Unlike the competition, the text presents classical theory in an accessible way, while recognizing the role of modern software tools relative to the necessary theoretical mathematics. Some of the strongest features of the text are the integration of current, real world applications and a wide range of exercises.
Foundations of Classical Electrodynamics Classical Field TheoryOn Electrodynamics, Non-Abelian Gauge Theories and Gravitation
In this book we display the fundamental structure underlying classical electro dynamics, i. e. , the phenomenological theory of electric and magnetic effects. The book can be used as a textbook for an advanced course in theoretical electrodynamics for physics and mathematics students and, perhaps, for some highly motivated electrical engineering students. We expect from our readers that they know elementary electrodynamics in the conventional (1 + 3)-dimensional form including Maxwell's equations. More over, they should be familiar with linear algebra and elementary analysis, in cluding vector analysis. Some knowledge of differential geometry would help. Our approach rests on the metric-free integral formulation of the conservation laws of electrodynamics in the tradition of F. Kottler (1922), E. Cartan (1923), and D. van Dantzig (1934), and we stress, in particular, the axiomatic point of view. In this manner we are led to an understanding of why the Maxwell equa tions have their specific form. We hope that our book can be seen in the classical tradition of the book by E. J. Post (1962) on the Formal Structure of Electro magnetics and of the chapter "Charge and Magnetic Flux" of the encyclopedia article on classical field theories by C. Truesdell and R. A. Toupin (1960), in cluding R. A. Toupin's Bressanone lectures (1965); for the exact references see the end of the introduction on page 11. .
Field, Force, Energy and Momentum in Classical Electrodynamics Morgan & Claypool Publishers
Classical field theory, which concerns the generation and interaction of fields, is a logical precursor to quantum field theory, and can be used to describe phenomena such as gravity and electromagnetism. Written for advanced undergraduates, and appropriate for graduate level classes, this book provides a comprehensive introduction to field theories, with a focus on their relativistic structural elements. Such structural notions enable a deeper understanding of Maxwell's equations, which lie at the heart of electromagnetism, and can also be applied to modern variants such as Chern–Simons and Born–Infeld. The structure of field theories and their physical predictions are illustrated with compelling examples, making this book perfect as a text in a dedicated field theory course, for self-study, or as a reference for those interested in classical field theory, advanced electromagnetism, or general relativity. Demonstrating a modern approach to model building, this text is also ideal for students of theoretical physics.

Perturbative Quantum Electrodynamics and Axiomatic Field Theory Princeton University Press
This text concerns continuum mechanics, electrodynamics and the mechanics of electrically polarized media, and gravity. Geared toward advanced undergraduates and graduate students, it offers an accessible approach that formulates theories according to the principle of least action. The chief advantage of this formulation is its simplicity and ease, making the physical content of classical subjects available to students of physics in a concise form. Author Davison E. Soper, a Professor of Physics at the University of Oregon, intended this treatment as a primary text for courses in classical field theory as well as a supplement for courses in classical mechanics or classical electrodynamics. Topics include fields and transformation laws, the principle of stationary action, general features of classical field theory, the mechanics of fluids and elastic solids, special types of solids, nonrelativistic approximations, and the electromagnetic field. Additional subjects include electromagnetically polarized materials, gravity, momentum conservation in general relativity, and dissipative processes.
The Theoretical Minimum Elsevier
This book describes the subject of electrodynamics at classical as well as quantum level, developed as an interaction at a distance. Thus it has electric charges interacting with one another directly and not through the medium of a field. In general such an interaction travels forward and backward in time symmetrically, thus apparently violating the principle of causality. It turns out, however, that in such a description the cosmological boundary conditions become very important. The theory therefore works only in a cosmology with the right boundary conditions; but when it does work it is free from the divergences that plague a quantum field theory. Contents:Classical Electrodynamics:Historical BackgroundThe Problems of Classical Field Theorynman Absorber Theory of RadiationAction at a Distance in Curved SpacetimeCosmological ModelsResponse of the Expanding UniverseQuantum Electrodynamics Non-Relativistic Processes:The Path-Integral Approach to Quantum MechanicsPerturbation Theory and the Influence FunctionalAbsorption and Stimulated EmissionSpontaneous EmissionThe Complete Influence Functional and the Level Shift FormulaRelativistic Quantum Electrodynamics:Path Integrals for Relativisitc ParticlesMany Particle Interactions and the Quantum Response of the UniverseSelf ActionCosmological Cut-Offs to Radiative CorrectionsConcluding Remarks Readership: Undergraduates and research students in physics and cosmology. keywords:Action at a Distance;Electrodynamics;Wheeler-Feynman Theory;Response of the Universe;Direct Particle Fields;Arrow of Time;Cosmology and Quantum;Electrodynamics;QED without Fields
Classical Field Theory LAP Lambert Academic Publishing
This book is a concise introduction to the key concepts of classical field theory for beginning graduate students and advanced undergraduate students who wish to study the unifying structures and physical insights provided by classical field theory without dealing with the additional complication of quantization. In that regard, there are many important aspects of field theory that can be understood without quantizing the fields. These include the action formulation, Galilean and relativistic invariance, traveling and standing waves, spin angular momentum, gauge invariance, subsidiary conditions, fluctuations, spinor and vector fields, conservation laws and symmetries, and the Higgs mechanism, all of which are often treated briefly in a course on quantum field theory.
Special Relativity and Classical Field Theory Springer Science & Business Media
This book addresses the theoretical foundations and the main physical consequences of electromagnetic interaction, generally considered to be one of the four fundamental interactions in nature, in a mathematically rigorous yet straightforward way. The major focus is on the unifying features shared by classical electrodynamics and all other fundamental relativistic classical field theories. The book presents a balanced blend of derivations of phenomenological predictions from first principles on the one hand, and concrete applications on the other. Further, it highlights the internal inconsistencies of classical electrodynamics, and addresses and resolves often-ignored critical issues, such as the dynamics of massless charged particles, the infinite energy of the electromagnetic field, and the limits of the Green’s function method. Presenting a rich, multilayered, and critical exposition on the electromagnetic paradigm underlying the whole Universe, the book offers a valuable resource for researchers and graduate students in theoretical physics alike.
Principles of Quantum Electrodynamics John Wiley & Sons
A revision of the defining book covering the physics and classical mathematics necessary to understand electromagnetic fields in materials and at surfaces and interfaces. The third edition has been revised to address the changes in emphasis and applications that have occurred in the past twenty years.
Classical Field Theory Courier Corporation
Based on a highly regarded lecture course at Moscow State University, this is a clear and systematic introduction to gauge field theory. It is unique in providing the means to master gauge field theory prior to the advanced study of quantum mechanics. Though gauge field theory is typically included in courses on quantum field theory, many of its ideas and results can be understood at the classical or semi-classical level. Accordingly, this book is organized so that its early chapters require no special knowledge of quantum mechanics. Aspects of gauge field theory relying on quantum mechanics are introduced only later and in a graduated fashion--making the text ideal for students studying gauge field theory and quantum mechanics simultaneously. The book begins with the basic concepts on which gauge field theory is built. It introduces gauge-invariant Lagrangians and describes the spectra of linear perturbations, including perturbations above nontrivial ground states. The second part focuses on the construction and interpretation of classical solutions that exist entirely due to the nonlinearity of field equations: solitons, bounces, instantons, and sphalerons. The third section considers some of the interesting effects that appear due to interactions of fermions with topological scalar and gauge fields. Mathematical digressions and numerous problems are included throughout. An appendix sketches the role of instantons as saddle points of Euclidean functional integral and related topics. Perfectly suited as an advanced undergraduate or beginning graduate text, this book is an excellent starting point for anyone seeking to understand gauge fields.
Electromagnetism CRC Press
Viewing physical theories as symbolic constructions came to the fore in the middle of the nineteenth century with the emancipation of the classical theory of the electromagnetic field from mechanics; most notably this happened through the work of Helmholtz, Hertz, Poincaré, and later Weyl. The epistemological problems that nourished this development are today highlighted within quantum field theory.

The present essay starts off with a concise and non-technical outline of the firmly based aspects of relativistic quantum field theory, i.e. the very successful description of subnuclear phenomena. The particular methods, by which these different aspects have to be accessed, then get described as distinct facets of quantum field theory. The authors show how these different facets vary with respect to the relation between quantum fields and associated particles. Thus, by emphasising the respective role of various basic concepts involved, the authors claim that only a very general epistemic approach can properly account for this diversity - an account they trace back to the philosophical writings of the aforementioned physicists and mathematicians. Finally, what they call their semiotic perspective on quantum field theory gets related to recent discussions within the philosophy of science and turns out to act as a counterbalance to, for instance, structural realism.

Inconsistency, Asymmetry, and Non-Locality Morgan & Claypool Publishers

This graduate-level physics textbook provides a comprehensive treatment of the basic principles and phenomena of classical electromagnetism. While many electromagnetism texts use the subject to teach mathematical methods of physics, here the emphasis is on the physical ideas themselves. Anupam Garg distinguishes between electromagnetism in vacuum and that in material media, stressing that the core physical questions are different for each. In vacuum, the focus is on the fundamental content of electromagnetic laws, symmetries, conservation laws, and the implications for phenomena such as radiation and light. In material media, the focus is on understanding the response of the media to imposed fields, the attendant constitutive relations, and the phenomena encountered in different types of media such as dielectrics, ferromagnets, and conductors. The text includes applications to many topical subjects, such as magnetic levitation, plasmas, laser beams, and synchrotrons. Classical Electromagnetism in a Nutshell is ideal for a yearlong graduate course and features more than 300 problems, with solutions to many of the advanced ones. Key formulas are given in both SI and Gaussian units; the book includes a discussion of how to convert between them, making it accessible to adherents of both systems. Offers a complete treatment of classical electromagnetism Emphasizes physical ideas Separates the treatment of electromagnetism in vacuum and material media Presents key formulas in both SI and Gaussian units Covers applications to other areas of physics Includes more than 300 problems

Quantum Field Theory and the Standard Model Springer Science & Business Media

This excellent text covers a year's course. Topics include vectors D and H inside matter, conservation laws for energy, momentum, invariance, form invariance, covariance in special relativity, and more.

The Classical Electromagnetic Field Springer

Comprehensive graduate-level text by a distinguished theoretical physicist reveals the classical underpinnings of modern quantum field theory. Topics include space-time, Lorentz transformations, conservation laws, equations of motion, Green’s functions, and more. 1964 edition.

Charge, Flux, and Metric World Scientific

Translated from the 6th Russian edition, this latest edition contains seven new sections with chapters on General Relativity, Gravitational Waves and Relativistic Cosmology, where Professor Lifshitz's interests lay. The text of the 3rd English edition has been thoroughly revised and additional problems inserted

What You Need to Know to Start Doing Physics Princeton University Press

Scheck’s successful textbook presents a comprehensive treatment, ideally suited for a one-semester course. The textbook describes Maxwell's equations first in their integral, directly testable form, then moves on to their local formulation. The first two chapters cover all essential properties of Maxwell's equations, including their symmetries and their covariance in a modern notation. Chapter 3 is devoted to Maxwell's theory as a classical field theory and to solutions of the wave equation. Chapter 4 deals with important applications of Maxwell's theory. It includes topical subjects such as metamaterials with negative refraction index and solutions of Helmholtz' equation in paraxial approximation relevant for the description of laser beams. Chapter 5 describes non-Abelian gauge theories from a classical, geometric point of view, in analogy to Maxwell's theory as a prototype, and culminates in an application to the U(2) theory relevant for electroweak interactions. The last chapter 6 gives a concise summary of semi-Riemannian geometry as the framework for the classical field theory of gravitation. The chapter concludes with a discussion of the Schwarzschild solution of Einstein's equations and the classical tests of general relativity. The new concept of this edition presents the content divided into two tracks: the fast track for master's students, providing the essentials, and the intensive track for all wanting to get in depth knowledge of the field. Cleary labeled material and sections guide students through the preferred level of treatment. Numerous problems and worked examples will provide successful access to Classical Field Theory.

Introduction to Classical Field Theory Princeton University Press

"The classical theory of electrodynamics is based on Maxwell's equations and the Lorentz law of force. This book begins with a detailed analysis of these equations, and proceeds to examine their far-reaching consequences. The traditional approach to electr"

Classical and Quantum Electrodynamics and the B(3) Field Courier Corporation

Volume 1 of this three-part series introduces the fundamental concepts of quantum field theory using the formalism of canonical quantization. This volume is intended for use as a text for an introductory quantum field theory course that can include both particle and condensed matter physics students. Dr. Strickland starts with a brief review of classical field theory and uses this as a jumping off point for the quantization of classical field, thereby promoting them to proper quantum fields. He then presents the formalism for real and complex scalar field theories, fermion field quantization, gauge field quantization, toy models of the nuclear interaction, and finally the full Lagrangian for QED and its renormalization. Part of IOP Series in Nuclear Medicine.