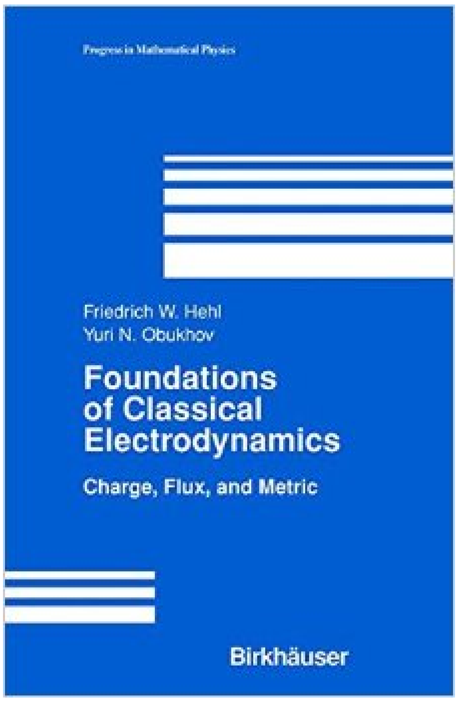
# Foundations Of Classical Electrodynamics (Progress In Mathematical Physics)



## Synopsis

In this book we display the fundamental structure underlying classical electroÂ- 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. MoreÂ- over, they should be familiar with linear algebra and elementary analysis, inÂ- 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 equaÂ- 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 ElectroÂ- 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), inÂ- cluding R. A. Toupin's Bressanone lectures (1965); for the exact references see the end of the introduction on page 11. .

## Book Information

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## Customer Reviews

The differential geometric method has been one of the mostfundamental tools for theoretical physicists since its firstintroduction into special relativity (general relativity) by AlbertEinstein in 1905

(1915). Later it has been applied to many researchareas, such as fluid mechanics, elastomechanics, thermodynamics, solidstate physics, optics, electromagnetism, quantum field theory, etc. As a distinctive feature of traditional classical electrodynamics,this book rests on the metric-free integral formulation of theconservation laws of electrodynamics as represented by exteriordifferential forms. Therefore the book will be of great interest tograduate students and researchers in mathematics and theoreticalphysics who work in field theory and general relativity. The book consists of five parts; a short list of references and anauthor and a subject index are included. Every part ends with a listof references. The authors begin in Part A, as an introductorysection, with an elementary presentation of exterior differentialforms. The necessary geometric concepts, needed to formulateclassical electrodynamics and gravitational theory in the language ofdifferential forms, are explained in Part A and in Part C, too. Theaxioms of classical electrodynamics, the integral formulations ofelectric charge and magnetic flux conservation, are presented in PartB. Subsequently, the linear connection and the metric are introducedin Part C.

Mathematical Library, V. 25) Fractal Geometry: Mathematical Foundations and Applications Set Theory (Studies in Logic: Mathematical Logic and Foundations)