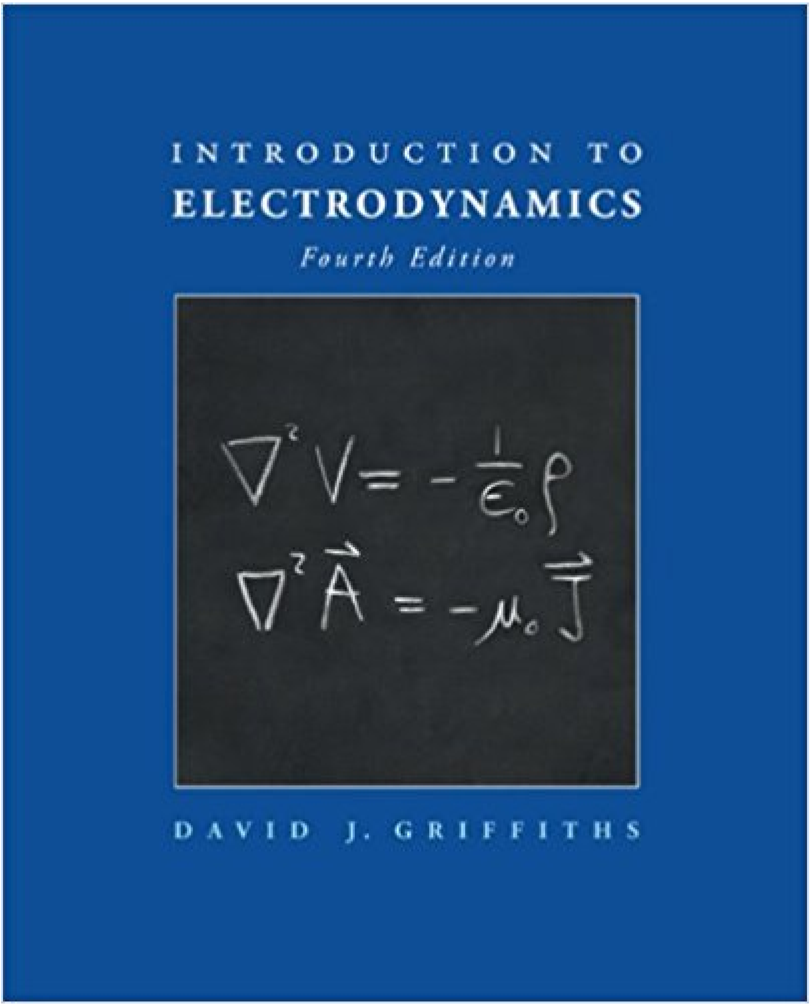
Introduction To Electrodynamics (4th Edition)



Synopsis

For junior/senior-level electricity and magnetism courses. This book is known for its clear, concise, and accessible coverage of standard topics in a logical and pedagogically sound order. The highly polished Fourth Edition features a clear, accessible treatment of the fundamentals of electromagnetic theory, providing a sound platform for the exploration of related applications (ac circuits, antennas, transmission lines, plasmas, optics, etc.). Its lean and focused approach employs numerous new examples and problems.

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Customer Reviews

’Griffiths’s book has come to dominate the American market in junior/senior E&M/electrodynamics textbooks to an extent that I have never seen any other textbook dominate any other undergraduate market - Griffiths’s love of electrodynamics shines from every page ... Not merely clear and effective - it is joyful.’ Dan Styer, Oberlin College, Ohio’... an ideal textbook for an intermediate Electrodynamics course for undergraduate students of Physics.’ David Miller, University of Chicago’... an excellent book, very well organized and readable. The students loved it ... It is a time-tested and highly optimized book.’ Steve Hagen, University of Florida’Griffiths’s classic undergraduate textbook on Electromagnetism has dominated the teaching of the subject at the advanced undergraduate level.’ Shyam Erramilli, Boston University’... an excellent book about this classical topic ... written with Griffiths’s customary clarity and in his very engaging style, so that, students tell me, it is a real pleasure to study from ...’ Eric Laenen, University of Amsterdam

A re-issued and affordable edition of the well-known undergraduate electrodynamics textbook. The Fourth Edition provides a rigorous, yet clear and accessible treatment of the fundamentals of electromagnetic theory and offers a sound platform for explorations of related applications (AC circuits, transmission lines, plasmas, optics and more).

I am a mathematician and I graduated from Physics Department in a university. These days, I am studying physics again rereading old books that I had or reading new books. When I was an undergraduate student, I learned electrodynamics with the textbook, Foundations of Electromagnetic Theory by Reitz, Milford, and Christy. When I tried to reread it, I found out that I forgot most of the things that I learned and the style of the book is a little formal and boring. So I searched reviews on electromagnetism textbooks at and I decided to read the book, Introduction to Electrodynamics by David J. Griffiths. I was really satisfied with this book. After reading Griffiths, I found that Reitz, Milford, Christy's book has its own merits.As the author says in Preface, the style of the book is less formal than most of other books. While reading the book, I felt like I attended his classes. He emphasizes what is not usually emphasized in other books. For example, on page 42, it says, "... there is nothing subtle or mysterious about transforming to spherical coordinates: you're expressing the same quantity (gradient, divergence, or whatever) in different notation, that's all". For another instance, on page 341, it says, "Some people regard these (the Maxwell's four equations having expression with D and H) as the "true" Maxwell's equations, but please understand that they are in no way more "general" than Eq. 7.40 (the Maxwell's four equations expressed exclusively using E and B); they simply reflect a convenient division of charge and current into free and nonfree parts." These show how meticulous the author is in helping the readers to clearly understand the subject.There are a lot of examples and problems in the book. I've read most of the examples, but I solved only a few problems that seem to be interesting. Maybe some of you don't need any pencil and paper to read the book although I desperately needed them.The author even jokes at some pages. For example, on page 98, it says, "The electric field inside a conductor is zero. Why? Because if there were any field, those free charges would move, and it wouldn't be electrostatics (the title of the chapter) any more. Hmm..."The book is intuitive. There are many results that are induced from long mathematical calculations. But since in many places the author explains their meaning before or after the calculation in an intuitive way, you may find no trouble even if you skip the whole mathematical steps. If you need the part later, you can come back to that part at anytime. Just a glance of them would be enough for many readers, especially, like myself, who just want to know what electrodynamics is about.The book is concrete, lucid and thorough in its explanation as well. For example, on page 281, it says, "As it turns out, H is more useful quantity than D. In the laboratory, you will frequently hear people talking about H (more often even than B), but you will never hear anyone speak of D (only E). The reason is this: To build an electromagnet you run a certain (free) current through a coil. The current is the thing you read on the dial, and this determines H (or at any rate, the line integral of H); B depends on the specific materials you used and even, if iron is present, on the history of your magnet. On the other hand, if you want to set up an electric field, you do not plaster a known free charge on the plates of a parallel plate capacitor; rather, you connect them to a battery of known voltage. It's the potential difference you read on your dial, and that determines E (or rather, the line integral of E); D depends on the details of the dielectric you're using."It is philosophical or fundamental in its tone. It often asks fundamental questions in many places.For example, on page 96, "Equations 2.43 (energy expressed in the form of integration over charge distribution) and 2.45 (energy expressed in the form of integration over the electric field) offer two different ways of calculating the same thing. The first is an integral over the charge distribution: the second is an integral over the field. For instance, in the case of spherical shell the charge is confined to the surface, whereas the electric field is everywhere outside its surface. Where is the energy, then? Is it stored in the field, as Eq. 2.45 seems to suggest, or is it stored in the charge, as Eq. 2.43 implies?"I had three wishes before reading the book. Firstly, I wished that I would really understand the principles of batteries. For instance, how is it possible to sustain a constant voltage difference? I had to be content with the fact that it is not an easy subject. Actually, the author recommends reading an academic paper in case the readers want to know about the principles of batteries.Secondly, I wished to learn about gauge invariance in electrodynamics. The electric and magnetic fields (they are physically real) can be expressed using electric and magnetic potentials (they are only mathematical objects not having any physical reality), respectively. But the choice of electric and magnetic potentials need not be unique. Here we have a freedom to choose like when we choose an antiderivative of a given function. While different choice of gauge gives different formulae, each choice of them is more convenient than others in its proper situation. For this, I am very satisfied with the book.Thirdly, I wished to understand the relationships between relativity and electrodynamics. They are known to have intimate relationships. In fact, the paper on special relativity by Einstein begins with some problems of electrodynamics. For this purpose, it went beyond my expectations. It was extremely helpful.The book introduces relativity in the final chapter. In the first section, it begins with a question on electromagnetic induction; when a moving coil passes above a static magnet, a current by the magnetic force (Lorenz force) flows in the coil. On the other hand, when a moving magnet passes above a static coil, a current by an electric force (Faraday's law) flows in the coil. In his paper on special relativity, Einstein asked. "The observable phenomenon here depends only on the relative motion of the conductor (coil) and the magnet, whereas the customary view draws a sharp distinction between the two cases in which either one or the other of these bodies is in motion." Einstein thought that the apparently distinct two forces, the electric and magnetic forces, are in fact two aspects of an entity whose appearance depends on its relative motion to an observer. And from there, the book introduces the basics of special relativity; time dilation, length contraction, Lorentz transformations, four-vectors, relativistic energy and momentum, relativistic dynamics, tensors.After that, the book sheds new light on classical electrodynamics from the point of view of relativity. There, we learn that "we can calculate the magnetic force between a current-carrying wire and a moving charge without ever invoking the (classical) laws of magnetism (only assuming classical laws of electrostatics and relativity). (page 550)" And we can learn how the electric and magnetic fields appear to two different relatively moving observers. In addition, we can understand how a point charge moving in uniform velocity can generate a magnetic field (note that a moving charge itself is not a current). In the last section, the book formulates the Maxwell's four equations using tensor notations. It is just a simple equation that can be written in one line.Even if you are already familiar with special relativity, I recommend that you read the chapter carefully. I don't think that you might have seen such kind of meticulous explanations about relativistic energy and momentum in other books as follows on page 538."In classical mechanics, there's no such thing as a massless particle--its kinetic energy and its momentum would be zero... However, a closer inspection of Eqs. 12.46 and 12.49 reveals a loophole worthy of a congress man: If u (velocity) = c (the speed of light), then the zero in the numerator is balanced by a zero in the denominator, leaving p (momentum) and E (energy) indeterminate (zero over zero). It is just conceivable, therefore, that a massless particle could carry energy and momentum, provided it always travels at the speed of light. Although Eqs. 12.46 and 12.49 would no longer suffice to determine E and p, Eq. 12.54 suggests that the two should be replaced by E = pc (suggests that E = pc is valid in the massless case). Personally, I would suggest this argument as a joke, were it not for the fact that at least one massless particle is known to exist in nature: the photon. Photons do travel at the speed of light, and they obey Eq. 12.55 (E = pc)."Finally, I'd like to mention the mathematics of the book. The title of the first chapter of the book is Vector Analysis. After the first chapter, readers are bound to begin to study electrostatics, electric potentials, electric fields in matter, and many more. The mathematics of the book is also the author's style, less formal and intuitive. I think if the reader is a very logically rigorous person, he may feel uncomfortable with a few arguments. But I think that they are not urgent points in learning electrodynamics (he may study about it at any later time) and that even if he can't understand 100% of the chapter, he should memorize it (to pass the exams).Among them, I want to comment on the point charge and Dirac delta function. Dirac delta function is a function which has the whole space as its domain, has its value 0 except 0 and infinity at 0, but has the definite value 1 when integrated on its domain. For example. the charge density of a point charge can be considered as the delta function (times some constant). If we admit that in nature, there is nothing like point charge and there are only charges continuously distributed on strings, then we can avoid the problem of infinity and can accept that the delta function is just an approximation for the real picture. Then we see that the charge density of a point charge is a usual function that looks like the delta function only in the large scales (for example, our scale). Likewise, we can accept that the electric field of a point charge does not have infinite value at the position of the point charge. Instead, it has a finite value everywhere. So when we calculate electric fields of a point charge at points in space using Gauss's law, we can apply the divergence theorem which only deals with usual functions. I hope this argument can be helpful to people to understand Chapter 1 of the book without discomfort.

I always bought Griffiths books for my physics classes. They're easy to follow and he throws in humor that catches you off guard, but makes your studying more enjoyable. Clearly explained and plenty of examples and practice problems.

Griffiths' text provides a strong foundation to any aspiring physicists understanding of electrodynamics. The proofs within this text are extremely well done and Griffiths does a phenomenal job of breaking down the concepts into easily understood steps. If your school does not use this text, you should recommend it to your professor or use it as a supplemental text.

UPDATE I am continuing to use the book in winter term for the second term of E&M. Lots of pages have now fallen out and you can see the notches on each page in most parts of the book. Terrible, terrible, terrible. Awful quality. Buy the paperback version at least--though I have seen pages coming out on that one too. Better yet, buy the e book. unfortunately I like having a physical book...-original review-The content is good, and fairly well organized. I didn't ever struggle to learn from the text and use lecture as supplement.But as others have said, the physicality of the book is terrible. I have the standard hardcover version and have only been using it since late September (it's December now). The spine crackles incessantly and loudly when the book is moved about, and the glue seems to weakly hold the pages--a huge section in chapter 4 of my text is falling out and one page is fully detached already. It wasn't like this at the start of the term, so I think carrying the book in my backpack caused damage.If you buy the hardcover, don't carry the book around. Just download a copy from the internet and keep that on your phone or tablet or whatever. If you need to buy this book for a class (let's face it, who doesn't?), buy the paperback version if you can.

This is a fantastic treatment of electrodynamics. It's great as a reference, too. I enjoyed how the author balanced the mathematics with the physics. Electrical engineering follows naturally if you understand mathematics, this book allows you to see that and prepares the reader with great knowledge in math that can be applied to electrical engineering concepts.

I heard of this book from a free online radar course professor hosted by the University of New Hampshire and taught by Dr. Robert O'Donnell. I skimmed a couple of chapters and found the mathematics to be very clear as well as the humor demonstrated by Dr. Griffiths. Later on, I took a upper classmen undergraduate course in EM and used this book as a supplement; I basically, read this book instead of the one chosen by my professor. I am very happy to have purchased this book and thank Dr. Griffiths for writing such a majestic piece of literature.I highly recommend this book to all EM enthusiasts.

Great!

Great book, excellent for upperlevel students studying classical electrodynamics. This version uses MKS instead of Gauss units which also made things easier for me. I also found Griffiths to throw some humor in here and there which made it a pleasant surprise.

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