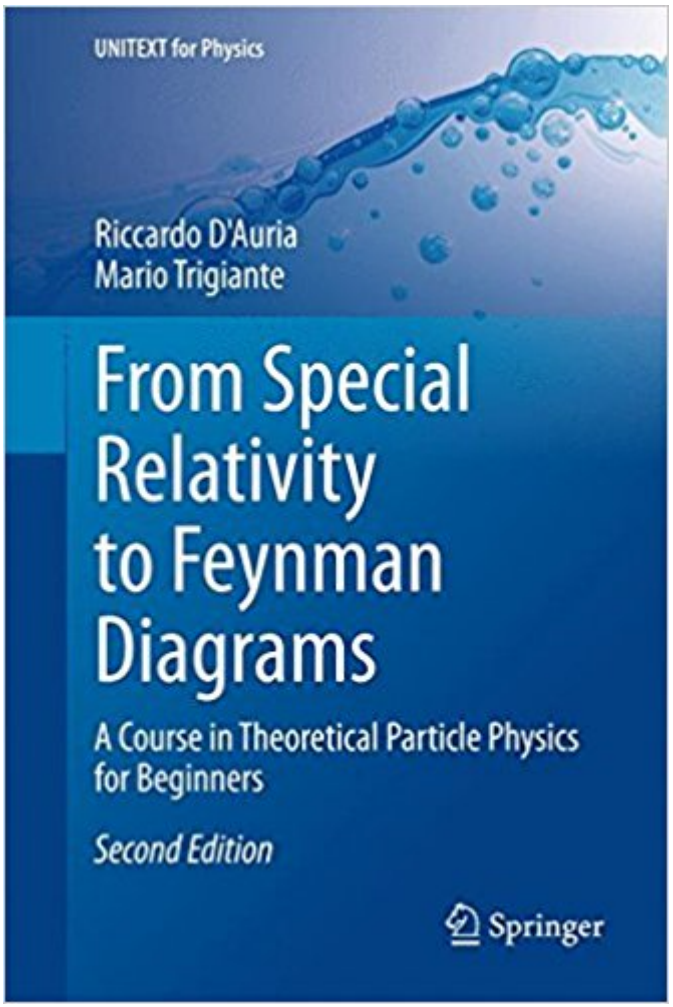
From Special Relativity To Feynman Diagrams: A Course In Theoretical Particle Physics For Beginners (UNITEXT For Physics)



Synopsis

This book, now in its second edition, provides an introductory course on theoretical particle physics with the aim of filling the gap that exists between basic courses of classical and quantum mechanics and advanced courses of (relativistic) quantum mechanics and field theory. After a concise but comprehensive introduction to special relativity, key aspects of relativistic dynamics are covered and some elementary concepts of general relativity introduced. Basics of the theory of groups and Lie algebras are explained, with discussion of the group of rotations and the Lorentz and PoincarÃƒÂ© groups. In addition, a concise account of representation theory and of tensor calculus is provided. Quantization of the electromagnetic field in the radiation range is fully discussed. The essentials of the Lagrangian and Hamiltonian formalisms are reviewed, proceeding from systems with a finite number of degrees of freedom and extending the discussion to fields. The final four chapters are devoted to development of the quantum field theory, ultimately introducing the graphical description of interaction processes by means of Feynman diagrams. The book will be of value for students seeking to understand the main concepts that form the basis of contemporary theoretical particle physics and also for engineers and lecturers. An Appendix on some special relativity effects is added.

Book Information

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From the reviews: This textbook covers, step-by-step, important topics in special relativity, relativistic dynamics, the equivalence principle and the Einstein equation interaction and the

S-matrix, divergent diagrams and renormalization. They are all explained in a simple but mathematically rigorous way, and so this textbook provides a thorough grounding for students planning to enter research in theoretical physics. The goal here is to formulate the main contemporary concepts for a one-year course. (Gert Roepstorff, Zentralblatt MATH, Vol. 1238, 2012) The aim of this textbook is to provide a path from classical, relativistic mechanics to QED. the book provides an insightful discussion of classical physics . It is very useful for lecturers who look for a bit of extra insight and material for a course on classical mechanics, and especially special relativity. It is also a great addition for curious students who feel somewhat unsatisfied with standard texts on these topics. (Axel Maas, Mathematical Reviews, January, 2013)From the reviews: This textbook covers, step-by-step, important topics in special relativity, relativistic dynamics, the equivalence principle and the Einstein equation interaction and the S-matrix, divergent diagrams and renormalization. They are all explained in a simple but mathematically rigorous way, and so this textbook provides a thorough grounding for students planning to enter research in theoretical physics. The goal here is to formulate the main contemporary concepts for a one-year course. (Gert Roepstorff, Zentralblatt MATH, Vol. 1238, 2012) The aim of this textbook is to provide a path from classical, relativistic mechanics to QED. the book provides an insightful discussion of classical physics . It is very useful for lecturers who look for a bit of extra insight and material for a course on classical mechanics, and especially special relativity. It is also a great addition for curious students who feel somewhat unsatisfied with standard texts on these topics. (Axel Maas, Mathematical Reviews, January, 2013)"

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value for students seeking to understand the main concepts that form the basis of contemporary theoretical particle physics and also for engineers and lecturers. An Appendix on some special relativity effects is added.

This is definitely an exceptional book covering most of the basic divisions of modern physics concisely yet in a stunningly deep and insightful fashion. I would never expect, and have never seen that so much of advanced topics could be gathered in a single moderate volume with such a depth. Chapters 1&2, covering the special relativity, is almost a masterpiece in itself. The conciseness does never prevent the authors from conveying to you their deep insight. Almost the same continues in their presentation of; Symmetry and Lie Groups, Lagrangian and Hamiltonian formalism, Electromagnetic field and its quantization, which is an early and basic introduction to quantum field theory, Non-relativistic and relativistic quantum mechanics and finally Quantum field theory. General Relativity is given a relatively short and passing touch, yet here also the presentation of the basic equivalence principle is unique. On my part, I have experienced the delight and satisfaction of finding answers to some questions bothered me for long times. Finally, arriving to a basic understanding, albeit at an introductory level, of what quantum field theory is, and why it is needed in the first place, is an exceptional joy in itself. Not a physicist by profession, this is sufficient for me. Others may built on and continue as far as they wish after persevering in the study of this book from start to the end. Having covered almost all of foundations of modern physics with full definitions given from the scratch, the authors have created a body of text, which is very coherent in its flow and logic. Thus, in my idea, any one having some maturity in philosophy of science, classical mechanics and electromagnetism, with an introduction to special relativity and quantum mechanics (at an undergraduate level) can, theoretically, tackle this beautiful book; of course with hard work, zeal and perseverance. It is a monograph without any problems and exercises. But this is more than compensated if one fills in the slipped steps in derivations and conclusions reached. Similarly one should think hard on some hints and allusions as well as convince himself about the insightful remarks and judgments, generously presented. I attribute the shortness of references list to the self sufficiency of the book. I have all of the books in this list, but would compare none of them with this one.The well-known Jacoby identity for the Poison Brackets, given on page 225 is obviously a typo the correct form of which is already given in Annex D.

It is my honor to take the course of one of the authors, as can be expected from the experience of the course, the authors truely have very deep physical insight into this subject, and this book would

serve as a very nice bridge to QFT after you have basic knowledge of quantum mechanics, classical mechanics, electrodynamics.

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