

Effective Field Theories

By Alexey A Petrov, Andrew E Blechman

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This book is a broad-based text intended to help the growing student body interested in constructing and applying methods of effective field theory to solve problems in their research. It begins with a review of using symmetries to identify the relevant degrees of freedom in a problem, and then presents a variety of methods that can be used to construct various effective theories. A detailed discussion of canonical applications of effective field theory techniques with increasing complexity is given, including Fermi's weak interaction, heavy-quark effective theory, and soft-collinear effective theory. Applications of these techniques to study physics beyond the standard model, dark matter, and quantum and classical gravity are explored. Although most examples come from questions in high-energy physics, many of the methods can also be applied in condensed-matter settings. Appendices include various factoids from group theory and other topics that are used throughout the text, in an attempt to make the book self-contained.

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Editorial Review

Review
"The volume is very well written, it is continuous, and includes a rich introduction on the main topics necessary to understand and use EFTs, such as symmetries, renormalization-group methods and anomalies. The tone of the book makes it suitable not only for practitioners in the field, but also for students looking for a broad perspective on different QFT topics — the common EFT language providing the thread — and for teachers searching for analogies and similarities between advanced and classical topics." -- CERN Courier

From the Inside Flap
This book is a broad-based text intended to help the growing student body interested in topics such as gravitational effective theories, supersymmetric effective theories, applications of effective theory techniques to problems in condensed matter physics (superconductivity) and quantum chromodynamics (such as soft-collinear effective theory). It begins with a review of the use of symmetries to identify the relevant degrees of freedom in a problem, and then presents a variety of methods that can be used to solve physical problems. A detailed discussion of canonical examples of effective field theories with increasing complexity is then conducted. Special cases such as supersymmetry and lattice EFT are discussed, as well as recently-found applications to problems in gravitation and cosmology. An appendix includes various factoids from group theory and other topics that are used throughout the text, in an attempt to make the book self-contained.

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