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	Nota di contenuto	Part I Mathematical foundations -- 1 Lie groups and Lie algebras: Basic concepts -- 2 Lie groups and Lie algebras: Representations and structure theory -- 3 Group actions -- 4 Fibre bundles -- 5 Connections and curvature -- 6 Spinors -- Part II The Standard Model of elementary particle physics -- 7 The classical Lagrangians of gauge theories -- 8 The Higgs mechanism and the Standard Model -- 9 Modern developments and topics beyond the Standard Model -- Part III Appendix -- A Background on differentiable manifolds -- B Background on special relativity and quantum field theory -- References -- Index.

Sommario/riassunto

The Standard Model is the foundation of modern particle and high energy physics. This book explains the mathematical background behind the Standard Model, translating ideas from physics into a mathematical language and vice versa. The first part of the book covers the mathematical theory of Lie groups and Lie algebras, fibre bundles, connections, curvature and spinors. The second part then gives a detailed exposition of how these concepts are applied in physics, concerning topics such as the Lagrangians of gauge and matter fields, spontaneous symmetry breaking, the Higgs boson and mass generation of gauge bosons and fermions. The book also contains a chapter on advanced and modern topics in particle physics, such as neutrino masses, CP violation and Grand Unification. This carefully written textbook is aimed at graduate students of mathematics and physics. It contains numerous examples and more than 150 exercises, making it suitable for self-study and use alongside lecture courses. Only a basic knowledge of differentiable manifolds and special relativity is required, summarized in the appendix.