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Autor: Mukhi, Sunil

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Sinopsis

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This book presents a survey of Topology and Differential Geometry and also, Lie Groups and Algebras, and their Representations. The first topic is indispensable to students of gravitation and related areas of modern physics (including string theory), while the second has applications in gauge theory and particle physics, integrable systems and nuclear physics.

Part I provides a simple introduction to basic topology, followed by a survey of homotopy. Calculus of differentiable manifolds is then developed, and a Riemannian metric is introduced along with the key concepts of connections and curvature. The final chapters lay out the basic notions of simplicial homology and de Rham cohomology as well as fibre bundles, particularly tangent and cotangent bundles.

Part II starts with a review of group theory, followed by the basics of representation theory. A thorough description of Lie groups and algebras is presented with their structure constants and linear representations. Root systems and their classifications are detailed, and this section of the book concludes with the description of representations of simple Lie algebras, emphasizing spinor representations of orthogonal and pseudo-orthogonal groups.

The style of presentation is succinct and precise. Involved mathematical proofs that are not of primary importance to physics student are omitted. The book aims to provide the reader access to a wide variety of sources in the current literature, in addition to being a textbook of advanced mathematical methods for physicists.