

Applied Mathematical Sciences

Gregory L. Naber

# Topology, Geometry and Gauge fields

Interactions

*Second Edition*

 Springer

# Topology Geometry And Gauge Fields Interactions Applied Mathematical Sciences

**Waldyr A. Rodrigues, Jr,Edmundo  
Capelas de Oliveira**



## **Topology Geometry And Gauge Fields Interactions Applied Mathematical Sciences:**

**Topology, Geometry and Gauge fields** Gregory L. Naber, 2011-03-22 A study of topology and geometry beginning with a comprehensible account of the extraordinary and rather mysterious impact of mathematical physics and especially gauge theory on the study of the geometry and topology of manifolds The focus of the book is the Yang Mills Higgs field and some considerable effort is expended to make clear its origin and significance in physics Much of the mathematics developed here to study these fields is standard but the treatment always keeps one eye on the physics and sacrifices generality in favor of clarity This second edition has replaced a brief appendix in the first on the Seiberg Witten equations with a much more detailed survey of Donaldson Witten Theory and the Witten Conjecture regarding the relationship between Donaldson and Seiberg Witten invariants A large number of exercises are included to encourage active participation on the part of the reader Review from first edition It is unusual to find a book so carefully tailored to the needs of this interdisciplinary area of mathematical physics Naber combines a knowledge of his subject with an excellent informal writing style SIAM REVIEW

**Topology, Geometry, and Gauge Fields** Gregory Naber, 1997-04-24 Like any books on a subject as vast as this this book has to have a point of view to guide the selection of topics Naber takes the view that the rekindled interest that mathematics and physics have shown in each other of late should be fostered and that this is best accomplished by allowing them to cohabit The book weaves together rudimentary notions from the classical gauge theory of physics with the topological and geometrical concepts that became the mathematical models of these notions The reader is asked to join the author on some vague notion of what an electromagnetic field might be to be willing to accept a few of the more elementary pronouncements of quantum mechanics and to have a solid background in real analysis and linear algebra and some of the vocabulary of modern algebra In return the book offers an excursion that begins with the definition of a topological space and finds its way eventually to the moduli space of anti self dual SU 2 connections on  $S^4$  with instanton number 1

**The Geometry of Heisenberg Groups** Ernst Binz, Sonja Pons, 2008 The three dimensional Heisenberg group being a quite simple non commutative Lie group appears prominently in various applications of mathematics The goal of this book is to present basic geometric and algebraic properties of the Heisenberg group and its relation to other important mathematical structures the skew field of quaternions symplectic structures and representations and to describe some of its applications In particular the authors address such subjects as signal analysis and processing geometric optics and quantization In each case the authors present necessary details of the applied topic being considered This book manages to encompass a large variety of topics being easily accessible in its fundamentals It can be useful to students and researchers working in mathematics and in applied mathematics BOOK JACKET Geometric Phases in Classical and Quantum Mechanics Dariusz

Chruscinski, Andrzej Jamiolkowski, 2012-12-06 Several well established geometric and topological methods are used in this work in an application to a beautiful physical phenomenon known as the geometric phase This book examines the geometric

phase bringing together different physical phenomena under a unified mathematical scheme The material is presented so that graduate students and researchers in applied mathematics and physics with an understanding of classical and quantum mechanics can handle the text

The Many Faces of Maxwell, Dirac and Einstein Equations Waldyr A. Rodrigues, Jr, Edmundo Capelas de Oliveira, 2016-04-26 This book is an exposition of the algebra and calculus of differential forms of the Clifford and Spin Clifford bundle formalisms and of vistas to a formulation of important concepts of differential geometry indispensable for an in depth understanding of space time physics The formalism discloses the hidden geometrical nature of spinor fields Maxwell Dirac and Einstein fields are shown to have representatives by objects of the same mathematical nature namely sections of an appropriate Clifford bundle This approach reveals unity in diversity and suggests relationships that are hidden in the standard formalisms and opens new paths for research This thoroughly revised second edition also adds three new chapters on the Clifford bundle approach to the Riemannian or semi Riemannian differential geometry of branes on Komar currents in the context of the General Relativity theory and an analysis of the similarities and main differences between Dirac Majorana and ELKO spinor fields The exercises with solutions the comprehensive list of mathematical symbols and the list of acronyms and abbreviations are provided for self study for students as well as for classes From the reviews of the first edition The text is written in a very readable manner and is complemented with plenty of worked out exercises which are in the style of extended examples their book could also serve as a textbook for graduate students in physics or mathematics Alberto Molgado Mathematical Reviews 2008 k

Probabilistic Models of Cosmic Backgrounds Anatoliy Malyarenko, 2024-06-30 Combining research methods from various areas of mathematics and physics Probabilistic Models of Cosmic Backgrounds describes the isotropic random sections of certain fiber bundles and their applications to creating rigorous mathematical models of both discovered and hypothetical cosmic backgrounds Previously scattered and hard to find mathematical and physical theories have been assembled from numerous textbooks monographs and research papers and explained from different or even unexpected points of view This consists of both classical and newly discovered results necessary for understanding a sophisticated problem of modelling cosmic backgrounds The book contains a comprehensive description of mathematical and physical aspects of cosmic backgrounds with a clear focus on examples and explicit calculations Its reader will bridge the gap of misunderstanding between the specialists in various theoretical and applied areas who speak different scientific languages The audience of the book consists of scholars students and professional researchers A scholar will find basic material for starting their own research A student will use the book as supplementary material for various courses and modules A professional mathematician will find a description of several physical phenomena at the rigorous mathematical level A professional physicist will discover mathematical foundations for well known physical theories

**Topology, Geometry, and Gauge Fields** Gregory Naber, 2014-01-15 **American Book Publishing Record**, 2000 **Newsletter** New Zealand Mathematical Society, 2000 Topology, Geometry, and Gauge Fields Gregory

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