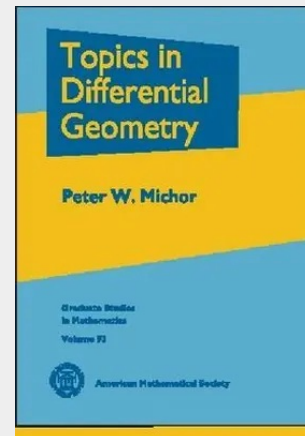


Topics in Differential Geometry

This book treats the fundamentals of differential geometry: manifolds, flows, Lie groups and their actions, invariant theory, differential forms and de Rham cohomology, bundles and connections, Riemann manifolds, isometric actions, and symplectic and Poisson geometry. The layout of the material stresses naturality and functoriality from the beginning and is as coordinate-free as possible. Coordinate formulas are always derived as extra information. Some attractive unusual aspects of this book are as follows: Initial submanifolds and the Frobenius theorem for distributions of nonconstant rank (the Stefan-Sussman theory) are discussed. Lie groups and their actions are treated early on, including the slice theorem and invariant theory. De Rham cohomology includes that of compact Lie groups, leading to the study of (nonabelian) extensions of Lie algebras and Lie groups. The Frolicher-Nijenhuis bracket for tangent bundle valued differential forms is used to express any kind of curvature and second Bianchi identity, even for fiber bundles (without structure groups). Riemann geometry starts with a careful treatment of connections to geodesic structures to sprays to connectors and back to connections, going via the second and third tangent bundles. The Jacobi flow on the second tangent bundle is a new aspect coming from this point of view. Symplectic and Poisson geometry emphasizes group actions, momentum mappings, and reductions. This book gives the careful reader working knowledge in a wide range of topics of modern coordinate-free differential geometry in not too many pages. A prerequisite for using this book is a good knowledge of undergraduate analysis and linear algebra.

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145,50 €

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Nicht mehr lieferbar

Artikelnummer: 9780821820032

Medium: Buch

ISBN: 978-0-8218-2003-2

Verlag: American Mathematical Society

Erscheinungstermin: 30.07.2008

Sprache(n): Englisch

Auflage: Erscheinungsjahr 2008

Serie: Graduate Studies in Mathematics

Produktform: Gebunden

Gewicht: 1068 g

Seiten: 493

Format (B x H): 183 x 261 mm

