An Introduction To Manifolds Universitext

Introduction to Smooth Manifolds
An Introduction to Semiclassical and Microlocal Analysis
Lectures on Hyperbolic Geometry
Differential Geometry
Analysis and Algebra on Differentiable Manifolds: A Workbook for Students and Teachers
Differential Geometry and Statistics
Riemannian Geometry
An Introduction
Lectures at a Summer School in Nordfjordeid, Norway, June 2001
Connections, Curvature, and Characteristic Classes
Stochastic Calculus in Manifolds
From Calculus to Cohomology
De Rham Cohomology and Characteristic Classes
Knots and Primes

An Introduction to Riemannian Geometry
An Introduction to Contemporary Mathematics
with an appendix on the geometry of characteristic classes
Classical Tessellations and Three-Manifolds
Manifolds and Differential Geometry
Complex Geometry
Geometric Group Theory
Differential Forms in Algebraic Topology
Riemannian Manifolds
Analysis On Manifolds
An Introduction
Complex Manifolds without Potential Theory
Local Bifurcations, Center Manifolds, and Normal Forms in Infinite-Dimensional
Dynamical Systems
Differential Forms and Connections
An Introduction to Curvature
An Introduction
With Applications to Mechanics and Relativity
Topology Through Inquiry
Topological, Differential and Conformal Geometry of Surfaces

Calabi-Yau Manifolds and Related Geometries
An Introduction
Riemannian Geometry and Geometric Analysis
Introduction to Topological Manifolds
An Invitation to Algebraic Geometry
An Introduction to Arithmetic Topology

WELLS JOVANI

Introduction to Smooth Manifolds Springer Science & Business Media This book provides a working knowledge of those parts of exterior differential forms, differential geometry, algebraic and differential topology, Lie groups, vector bundles and Chern forms that are essential for a deeper understanding of both classical and modern physics and engineering. Included are discussions of analytical and fluid dynamics, electromagnetism (in flat and curved space), thermodynamics, the Dirac operator and spinors, and gauge fields, including Yang–Mills, the Aharonov–Bohm effect, Berry phase and instanton winding numbers, quarks and quark model for mesons. Before discussing abstract notions of differential geometry, geometric intuition is developed through a rather extensive introduction to the study of surfaces in ordinary space. The book is ideal for graduate and advanced undergraduate students of physics, engineering or mathematics as a course text or for self study. This third edition includes an overview of Cartan's exterior differential forms, which previews many of the geometric concepts developed in the text.

An Introduction to Semiclassical and Microlocal Analysis
Springer Science & Business Media
This is a foundation for arithmetic topology - a new branch of mathematics which is focused upon the analogy between knot theory and number theory. Starting with an informative introduction to its origins, namely Gauss, this text provides a background on knots, three manifolds and number fields. Common aspects of both knot theory and number theory, for instance knots in three manifolds versus primes in a number field, are compared throughout the book. These comparisons begin at an elementary level, slowly building up to advanced theories in later chapters. Definitions are carefully formulated and proofs are largely self-contained. When necessary, background information is provided and theory is accompanied with a number of useful examples and illustrations, making this a useful text for both undergraduates and graduates in the field of knot theory, number theory and geometry.

Springer Science & Business Media
Based on a series of graduate lectures, this book provides an introduction to algebraic geometric methods in the theory of complex linear differential equations. Starting from basic notions in complex algebraic geometry, it develops some of the classical problems of linear differential equations. It ends with applications to recent research questions related to mirror symmetry. The fundamental tool used is that of a vector bundle with connection. The book includes complete proofs, and applications to recent research questions. Aimed at graduate students and researchers, the book assumes some familiarity with basic complex algebraic geometry.
Lectures on Hyperbolic Geometry Springer Science & Business Media
Focussing on the geometry of hyperbolic manifolds, the aim here is to provide an exposition of some fundamental results, while being as self-contained, complete, detailed and unified as possible. Following some classical material on the hyperbolic space and the Teichmüller space, the book centers on the two fundamental results: Mostow's rigidity theorem (including a complete proof, following Gromov and Thurston) and Margulis' lemma. These then form the basis for studying Chabauty and geometric topology; a unified exposition is given of Wang's theorem and the Jorgensen-Thurston theory; and much space is

devoted to the 3D case: a complete and elementary proof of the hyperbolic surgery theorem, based on the representation of three manifolds as glued ideal tetrahedra.

Differential Geometry

Springer

This is a description of the underlying principles of algebraic geometry, some of its important developments in the twentieth century, and some of the problems that occupy its practitioners today. It is intended for the working or the aspiring mathematician who is unfamiliar with algebraic geometry but wishes to gain an appreciation of its foundations and its goals with a minimum of prerequisites. Few algebraic prerequisites are presumed beyond a basic course in linear algebra.

Analysis and Algebra on Differentiable Manifolds: A Workbook for Students and Teachers Springer

Introducing the tools of modern differential geometry--exterior calculus, manifolds, vector bundles, connections--this textbook covers both classical surface theory, the modern theory of connections, and curvature. With no knowledge of topology assumed, the only prerequisites are multivariate calculus and linear algebra.

Differential Geometry and Statistics Springer Science & Business Media

An introductory textbook on cohomology and curvature with emphasis on applications.

Riemannian Geometry

Hassell Street Press

An application of differential forms for the study of some local and global aspects of the differential geometry of surfaces. Differential forms are introduced in a simple way that will make them attractive to "users" of mathematics. A brief and elementary introduction to differentiable manifolds is given so that the main theorem, namely Stokes' theorem, can be presented in its natural setting. The applications consist in developing the method of moving frames expounded by E. Cartan to study the local differential geometry of immersed surfaces in R3 as well as the intrinsic geometry of surfaces. This is then collated in the last chapter to present Chern's proof of the Gauss-Bonnet theorem for compact surfaces.
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Lectures at a Summer School in Nordfjordeid, Norway, June 2001
Springer Science & Business Media
"This textbook is intended for a year-long graduate course on complex analysis, a branch of mathematical analysis that has broad applications, particularly in physics, engineering, and applied mathematics. Based on nearly twenty years of classroom lectures, the book is accessible enough for independent study, while the rigorous approach will appeal to more experienced readers and scholars, propelling further research in this field. While other graduate-level complex analysis textbooks do exist, Zakeri takes a distinctive approach by highlighting the geometric properties and topological underpinnings of this area. Zakeri includes more than three hundred and fifty problems, with problem sets at the end of each chapter, along with additional solved examples. Background knowledge of undergraduate analysis and topology is needed, but the thoughtful examples are accessible to beginning graduate students and advanced undergraduates. At the same time, the book has sufficient depth for advanced readers to

enhance their own research. The textbook is well-written, clearly illustrated, and peppered with historical information, making it approachable without sacrificing rigor. It is poised to be a valuable textbook for graduate students, filling a needed gap by way of its level and unique approach"--
Connections, Curvature, and Characteristic Classes Springer Science & Business Media
This is an introduction to a very active field of research, on the boundary between mathematics and physics. It is aimed at graduate students and researchers in geometry and string theory. Proofs or sketches are given for many important results. From the reviews: "An excellent introduction to current research in the geometry of Calabi-Yau manifolds, hyper-Kähler manifolds, exceptional holonomy and mirror symmetry....This is an excellent and useful book." --MATHEMATICAL REVIEWS
Stochastic Calculus in Manifolds Springer Science & Business Media
Manifolds, the higher-dimensional analogs of smooth curves and surfaces, are fundamental objects in modern mathematics. Combining aspects of algebra, topology, and analysis, manifolds have also been applied to classical mechanics, general relativity, and quantum field theory. In this streamlined introduction to the subject, the theory of manifolds is presented with the aim of helping the reader achieve a rapid mastery of the essential

topics. By the end of the book the reader should be able to compute, at least for simple spaces, one of the most basic topological invariants of a manifold, its de Rham cohomology. Along the way, the reader acquires the knowledge and skills necessary for further study of geometry and topology. The requisite point-set topology is included in an appendix of twenty pages; other appendices review facts from real analysis and linear algebra. Hints and solutions are provided to many of the exercises and problems. This work may be used as the text for a one-semester graduate or advanced undergraduate course, as well as by students engaged in self-study. Requiring only minimal undergraduate prerequisites, 'Introduction to Manifolds' is also an excellent foundation for Springer's GTM 82, 'Differential Forms in Algebraic Topology'.

From Calculus to Cohomology Springer

This text focuses on developing an intimate acquaintance with the geometric meaning of curvature and thereby introduces and demonstrates all the main technical tools needed for a more advanced course on Riemannian manifolds. It covers proving the four most fundamental theorems relating curvature and topology: the Gauss-Bonnet Theorem, the Cartan-Hadamard Theorem, Bonnet’s Theorem, and a special case of the Cartan-Ambrose-Hicks Theorem.

De Rham Cohomology

and Characteristic Classes Routledge
This text presents a graduate-level introduction to differential geometry for mathematics and physics students. The exposition follows the historical development of the concepts of connection and curvature with the goal of explaining the Chern–Weil theory of characteristic classes on a principal bundle. Along the way we encounter some of the high points in the history of differential geometry, for example, Gauss' Theorema Egregium and the Gauss–Bonnet theorem. Exercises throughout the book test the reader’s understanding of the material and sometimes illustrate extensions of the theory. Initially, the prerequisites for the reader include a passing familiarity with manifolds. After the first chapter, it becomes necessary to understand and manipulate differential forms. A knowledge of de Rham cohomology is required for the last third of the text. Prerequisite material is contained in author's text An Introduction to Manifolds, and can be learned in one semester. For the benefit of the reader and to establish common notations, Appendix A recalls the basics of manifold theory. Additionally, in an attempt to make the exposition more self-contained, sections on algebraic constructions such as the tensor product and the exterior power are included. Differential geometry, as its name implies, is the study of

geometry using differential calculus. It dates back to Newton and Leibniz in the seventeenth century, but it was not until the nineteenth century, with the work of Gauss on surfaces and Riemann on the curvature tensor, that differential geometry flourished and its modern foundation was laid. Over the past one hundred years, differential geometry has proven indispensable to an understanding of the physical world, in Einstein's general theory of relativity, in the theory of gravitation, in gauge theory, and now in string theory. Differential geometry is also useful in topology, several complex variables, algebraic geometry, complex manifolds, and dynamical systems, among other fields. The field has even found applications to group theory as in Gromov's work and to probability theory as in Diaconis's work. It is not too far-fetched to argue that differential geometry should be in every mathematician's arsenal.
Knots and Primes Springer Science & Business Media
Author is well-known and established book author (all Serge Lang books are now published by Springer); Presents a brief introduction to the subject; All manifolds are assumed finite dimensional in order not to frighten some readers; Complete proofs are given; Use of manifolds cuts across disciplines and includes physics, engineering and economics
An Introduction to Riemannian Geometry Cambridge University

Press
This book presents the techniques used in the microlocal treatment of semiclassical problems coming from quantum physics in a pedagogical, way and is mainly addressed to non-specialists in the subject. It is based on lectures taught by the author over several years, and includes many exercises providing outlines of useful applications of the semi-classical theory.
An Introduction to Contemporary Mathematics CRC Press
Unlike many other texts on differential geometry, this textbook also offers interesting applications to geometric mechanics and general relativity. The first part is a concise and self-contained introduction to the basics of manifolds, differential forms, metrics and curvature. The second part studies applications to mechanics and relativity including the proofs of the Hawking and Penrose singularity theorems. It can be independently used for one-semester courses in either of these subjects. The main ideas are illustrated and further developed by numerous examples and over 300 exercises. Detailed solutions are provided for many of these exercises, making An Introduction to Riemannian Geometry ideal for self-study.
with an appendix on the geometry of characteristic classes Springer Science & Business Media
Differential geometry began as the study of curves and surfaces using the methods of calculus. In time, the notions of curve and surface were

generalized along with associated notions such as length, volume, and curvature. At the same time the topic has become closely allied with developments in topology. The basic object is a smooth manifold, to which some extra structure has been attached, such as a Riemannian metric, a symplectic form, a distinguished group of symmetries, or a connection on the tangent bundle. This book is a graduate-level introduction to the tools and structures of modern differential geometry. Included are the topics usually found in a course on differentiable manifolds, such as vector bundles, tensors, differential forms, de Rham cohomology, the Frobenius theorem and basic Lie group theory. The book also contains material on the general theory of connections on vector bundles and an in-depth chapter on semi-Riemannian geometry that covers basic material about Riemannian manifolds and Lorentz manifolds. An unusual feature of the book is the inclusion of an early chapter on the differential geometry of hyper-surfaces in Euclidean space. There is also a section that derives the exterior calculus version of Maxwell's equations. The first chapters of the book are suitable for a one-semester course on manifolds. There is more than enough material for a year-long course on manifolds and geometry.

Classical Tessellations and Three-Manifolds

Springer Science & Business Media

Aimed primarily at graduate students and researchers, this text is a comprehensive course in modern probability theory and its measure-theoretical foundations. It covers a wide variety of topics, many of which are not usually found in introductory textbooks. The theory is developed rigorously and in a self-contained way, with the chapters on measure theory interlaced with the probabilistic chapters in order to display the power of the abstract concepts in the world of probability theory. In addition, plenty of figures, computer simulations, biographic details of key mathematicians, and a wealth of examples support and enliven the presentation.

Manifolds and Differential Geometry Springer Science & Business Media This book is novel in its broad perspective on Riemann surfaces: the text systematically explores the connection with other fields of mathematics. The book can serve as an introduction to contemporary mathematics as a whole, as it develops background material from algebraic topology, differential geometry, the calculus of variations, elliptic PDE, and algebraic geometry. The book is unique among textbooks on Riemann surfaces in its inclusion of an introduction to Teichmüller theory. For this new edition, the author has expanded and rewritten several sections to include additional material and to improve the presentation.

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