hatcher algebraic topology

Hatcher Algebraic Topology: A Comprehensive Guide for Beginners and Experts

Introduction:

Are you ready to delve into the fascinating world of algebraic topology? If you're a mathematics student, a researcher, or simply a curious individual intrigued by the elegant interplay between algebra and topology, then you've come to the right place. This comprehensive guide will explore Allen Hatcher's renowned textbook, "Algebraic Topology," a cornerstone text for countless mathematicians. We'll unpack its structure, content, and overall value, providing a roadmap for navigating its complexities and maximizing its learning potential. This post is your one-stop shop for everything you need to know about Hatcher's Algebraic Topology, from beginner-friendly overviews to advanced insights for experienced learners. Prepare to unravel the intricate beauty of this fundamental mathematical field.

Understanding the Scope of Hatcher's Algebraic Topology

Hatcher's "Algebraic Topology" isn't just another textbook; it's a widely respected and extensively used resource known for its clarity, comprehensiveness, and accessibility. Unlike many texts that focus solely on theoretical rigour, Hatcher strikes a balance between theoretical depth and practical application. This makes it an ideal companion for both undergraduate and graduate students, as well as for self-learners eager to grapple with this challenging subject. The book systematically builds up the fundamental concepts of algebraic topology, enabling readers to progress steadily from basic topological spaces to sophisticated algebraic structures.

Key Features of Hatcher's Approach

One of the remarkable aspects of Hatcher's work is its intuitive approach. He avoids unnecessary abstractions, focusing instead on providing clear explanations and illuminating examples. This makes the material much more digestible, particularly for readers encountering these concepts for the first time. The book’s structure allows for a flexible learning experience, making it suitable for various learning styles and paces. Hatcher masterfully guides the reader through increasingly complex topics, building a strong foundational understanding along the way.

Main Chapters and Core Concepts Covered in Hatcher's Algebraic Topology

Hatcher’s book is structured logically, moving progressively through essential concepts. Let's examine some of the key chapters and their significance:

1. Fundamental Group and Covering Spaces: This foundational chapter introduces the fundamental group, a powerful invariant that captures the essence of a topological space's "holes." Covering spaces, another crucial concept, are explored, illuminating the connections between the fundamental group and the topology of spaces. This section lays the groundwork for much of the subsequent material.

1. Homology: The concept of homology is introduced, providing a more refined algebraic tool for studying topological spaces. Simplicial homology, a concrete way to compute homology groups, is explained in detail. This chapter is pivotal in understanding the deeper algebraic structures that underlie topological spaces.

1. Singular Homology: Moving beyond simplicial complexes, Hatcher introduces singular homology, a more general and powerful approach to homology theory applicable to a broader class of spaces. This chapter demonstrates the elegance and adaptability of algebraic methods in topology.

1. Homology with Coefficients: This chapter extends homology theory by considering homology groups with coefficients in various algebraic structures, providing richer invariants and deeper insights into the topological spaces under consideration.

1. Cellular Homology: A powerful computational tool, cellular homology is introduced, offering a streamlined method for calculating homology groups for spaces with cell structures, significantly simplifying complex calculations.

1. Cohomology: The dual concept of cohomology is explored, revealing a powerful complementary perspective on the topology of spaces. This chapter provides a deeper understanding of the algebraic invariants used in algebraic topology.

1. Homotopy Theory: This chapter delves into the more advanced concepts of homotopy theory, exploring homotopy groups and their relationships to homology groups. It provides further insight into the relationships between algebraic and topological structures.

1. Spectral Sequences: For more advanced students, this chapter introduces spectral sequences, a powerful tool for computing homology groups in complex situations, opening up possibilities for more complex topological analyses.

A Detailed Outline of Hatcher's Algebraic Topology

Title: Algebraic Topology

Contents:

Introduction: Overview of algebraic topology, its goals, and connection to other mathematical fields. Brief history of the field and motivations for its development.

Chapter 1: Topological Spaces and Continuous Maps: Fundamental definitions and properties of topological spaces. Covers metric spaces, compactness, connectedness, and path connectedness. Introduces the concept of homotopy between continuous maps.

Chapter 2: The Fundamental Group: A detailed explanation of the fundamental group, its properties, and its calculation for various spaces. Covers covering spaces and their applications. Includes examples and exercises to build understanding.

Chapter 3: Homology: Introduces homology groups, both simplicial and singular. Covers the crucial concept of chain complexes and boundary maps. Details different types of homology groups and their properties.

Chapter 4: Applications of Homology: Uses homology to classify surfaces, solve topological problems, and demonstrates the power of this algebraic tool in tackling geometric questions. Includes advanced topics like Mayer-Vietoris sequences.

Chapter 5: Cohomology: Introduces cohomology theory and its relationship to homology. Explores cup products and their geometric significance.

Chapter 6: Homotopy Theory: Discusses higher homotopy groups and their applications. Connects homotopy theory to homology theory.

Chapter 7: Spectral Sequences: (For advanced readers): Introduces the

abstract machinery of spectral sequences, a powerful tool for computing homology groups.

Conclusion: Summarizes the core concepts and applications of algebraic topology, offering directions for further study and highlighting the continuing relevance and development of the field.

Explaining Each Point in the Outline:

Each chapter in the outline builds upon the previous one, forming a rigorous and coherent presentation of algebraic topology. The initial chapters focus on establishing fundamental concepts – topological spaces, continuous maps, and the fundamental group – before moving to more advanced topics like homology, cohomology, and homotopy theory. The inclusion of exercises at each stage is critical for solidifying understanding. The later chapters address increasingly sophisticated techniques and applications. The final chapter on spectral sequences provides advanced material suitable for graduate-level study, rounding out the comprehensive nature of the textbook.

9 Unique FAQs about Hatcher Algebraic Topology:

1. Q: Is Hatcher's book suitable for self-study? A: Yes, while challenging, Hatcher's book is well-structured and explains concepts clearly, making it suitable for self-study with dedication and supplementary resources.

1. Q: What prerequisites are needed to understand Hatcher's book? A: A solid understanding of point-set topology and some familiarity with abstract algebra (group theory, especially) are highly recommended.

1. Q: Is there a solutions manual for Hatcher's exercises? A: No official solutions manual exists, but solutions to many exercises can be found online through various forums and student-created resources.

1. Q: How does Hatcher's book compare to other algebraic topology textbooks? A: Hatcher's book is praised for its clarity, intuitive explanations, and comprehensive coverage. Compared to other texts, it balances theory and applications effectively.

1. Q: What are the best supplementary resources to use alongside Hatcher's book? A: Online lecture notes, supplementary texts like Munkres' "Topology," and engaging in discussions with other students or instructors can be beneficial.

1. Q: Is Hatcher's book suitable for undergraduates? A: Yes, but some parts may be challenging for undergraduates without a strong mathematical background. It's often used in advanced undergraduate or graduate courses.

1. Q: What are the most challenging concepts in Hatcher's book? A: Spectral sequences, homotopy theory, and some of the more abstract proofs can be particularly challenging.

1. Q: Is Hatcher's book solely theoretical, or does it include applications? A: Hatcher’s book provides both theory and relevant applications, showcasing the power of algebraic topology in various mathematical fields.

1. Q: Where can I find Hatcher's book online? A: While a physical copy is ideal, a free PDF version is readily available online, though access may vary depending on your location.

9 Related Articles:

1. Introduction to Topological Spaces: A beginner's guide to understanding the basic concepts of topological spaces, including open sets, closed sets, and continuity.

1. Understanding the Fundamental Group: An in-depth explanation of the fundamental group and its role in classifying topological spaces.

1. Homology Theory: A Beginner's Guide: An accessible introduction to homology theory, focusing on its intuitive meaning and applications.

1. Cohomology: The Dual Perspective: An exploration of cohomology and its relationship to homology, highlighting its utility in topology.

1. Homotopy Theory: Beyond Continuous Maps: An overview of homotopy theory and its connections to the fundamental group and higher homotopy groups.

1. Covering Spaces and Their Applications: An in-depth exploration of covering spaces and their crucial role in understanding fundamental groups.

1. Simplicial Complexes and Simplicial Homology: A detailed explanation of simplicial complexes and how to calculate their homology groups.

1. Singular Homology and its Advantages: An analysis of singular homology and its advantages over simplicial homology.

1. Applications of Algebraic Topology in Computer Graphics: Exploring the unexpected connections between algebraic topology and computer graphics and its use in 3D modeling and animation.

hatcher algebraic topology: Algebraic Topology Allen Hatcher, 2002 An introductory textbook suitable for use in a course or for self-study, featuring broad coverage of the subject and a readable exposition, with many examples and exercises.

hatcher algebraic topology: Introduction to Topological Manifolds John M. Lee, 2006-04-06 Manifolds play an important role in topology, geometry, complex analysis, algebra, and classical mechanics. Learning manifolds differs from most other introductory mathematics in that the subject matter is often completely unfamiliar. This introduction guides readers by explaining the roles manifolds play in diverse branches of mathematics and physics. The book begins with the basics of general topology and gently moves to manifolds, the fundamental group, and covering

spaces.

hatcher algebraic topology: *Elementary Topology* O. Ya. Viro, O. A. Ivanov, N. Yu. Netsvetaev, V. M. Kharlamov, This text contains a detailed introduction to general topology and an introduction to algebraic topology via its most classical and elementary segment. Proofs of theorems are separated from their formulations and are gathered at the end of each chapter, making this book appear like a problem book and also giving it appeal to the expert as a handbook. The book includes about 1,000 exercises.

hatcher algebraic topology: Algebraic Topology Edwin H. Spanier, 2012-12-06 This book surveys the fundamental ideas of algebraic topology. The first part covers the fundamental group, its definition and application in the study of covering spaces. The second part turns to homology theory including cohomology, cup products, cohomology operations and topological manifolds. The final part is devoted to Homotropy theory, including basic facts about homotropy groups and applications to obstruction theory.

hatcher algebraic topology: A Basic Course in Algebraic Topology William S. Massey, 2019-06-28 This textbook is intended for a course in algebraic topology at the beginning graduate level. The main topics covered are the classification of compact 2-manifolds, the fundamental group, covering spaces, singular homology theory, and singular cohomology theory. These topics are developed systematically, avoiding all unnecessary definitions, terminology, and technical machinery. The text consists of material from the first five chapters of the author's earlier book, Algebraic Topology; an Introduction (GTM 56) together with almost all of his book, Singular Homology Theory (GTM 70). The material from the two earlier books has been substantially revised, corrected, and brought up to date.

hatcher algebraic topology: A Concise Course in Algebraic Topology J. P. May, 1999-09 Algebraic topology is a basic part of modern mathematics, and some knowledge of this area is indispensable for any advanced work relating to geometry, including topology itself, differential geometry, algebraic geometry, and Lie groups. This book provides a detailed treatment of algebraic topology both for teachers of the subject and for advanced graduate students in mathematics either specializing in this area or continuing on to other fields. J. Peter May's approach reflects the enormous internal developments within algebraic topology over the past several decades, most of which are largely unknown to mathematicians in other fields. But he also retains the classical presentations of various topics where appropriate. Most chapters end with problems that further explore and refine the concepts presented. The final four chapters provide sketches of substantial areas of algebraic topology that are normally omitted from introductory texts, and the book concludes with a list of suggested readings for those interested in delving further into the field.

hatcher algebraic topology: Topology and Geometry Glen E. Bredon, 1993-06-24 This book offers an introductory course in algebraic topology. Starting with general topology, it discusses differentiable manifolds, cohomology, products and duality, the fundamental group, homology theory, and homotopy theory. From the reviews: An interesting and original graduate text in topology and geometry...a good lecturer can use this text to create a fine course....A beginning graduate student can use this text to learn a great deal of mathematics.—-MATHEMATICAL REVIEWS

hatcher algebraic topology: Algebraic Topology Tammo tom Dieck, 2008 This book is written as a textbook on algebraic topology. The first part covers the material for two introductory courses about homotopy and homology. The second part presents more advanced applications and concepts (duality, characteristic classes, homotopy groups of spheres, bordism). The author recommends starting an introductory course with homotopy theory. For this purpose, classical results are presented with new elementary proofs. Alternatively, one could start more traditionally with singular and axiomatic homology. Additional chapters are devoted to the geometry of manifolds, cell complexes and fibre bundles. A special feature is the rich supply of nearly 500 exercises and problems. Several sections include topics which have not appeared before in textbooks as well as simplified proofs for some important results. Prerequisites are standard point set topology

(as recalled in the first chapter), elementary algebraic notions (modules, tensor product), and some terminology from category theory. The aim of the book is to introduce advanced undergraduate and graduate (master's) students to basic tools, concepts and results of algebraic topology. Sufficient background material from geometry and algebra is included.

hatcher algebraic topology: Applications of Algebraic Topology S. Lefschetz, 2012-12-06 This monograph is based, in part, upon lectures given in the Princeton School of Engineering and Applied Science. It presupposes mainly an elementary knowledge of linear algebra and of topology. In topology the limit is dimension two mainly in the latter chapters and questions of topological invariance are carefully avoided. From the technical viewpoint graphs is our only requirement. However, later, questions notably related to Kuratowski's classical theorem have demanded an easily provided treatment of 2-complexes and surfaces. January 1972 Solomon Lefschetz 4 INTRODUCTION The study of electrical networks rests upon preliminary theory of graphs. In the literature this theory has always been dealt with by special ad hoc methods. My purpose here is to show that actually this theory is nothing else than the first chapter of classical algebraic topology and may be very advantageously treated as such by the well known methods of that science. Part I of this volume covers the following ground: The first two chapters present, mainly in outline, the needed basic elements of linear algebra. In this part duality is dealt with somewhat more extensively. In Chapter III the merest elements of general topology are discussed. Graph theory proper is covered in Chapters IV and v, first structurally and then as algebra. Chapter VI discusses the applications to networks. In Chapters VII and VIII the elements of the theory of 2-dimensional complexes and surfaces are presented.

hatcher algebraic topology: *Algebra: Chapter 0* Paolo Aluffi, 2021-11-09 Algebra: Chapter 0 is a self-contained introduction to the main topics of algebra, suitable for a first sequence on the subject at the beginning graduate or upper undergraduate level. The primary distinguishing feature of the book, compared to standard textbooks in algebra, is the early introduction of categories, used as a unifying theme in the presentation of the main topics. A second feature consists of an emphasis on homological algebra: basic notions on complexes are presented as soon as modules have been introduced, and an extensive last chapter on homological algebra can form the basis for a follow-up introductory course on the subject. Approximately 1,000 exercises both provide adequate practice to consolidate the understanding of the main body of the text and offer the opportunity to explore many other topics, including applications to number theory and algebraic geometry. This will allow instructors to adapt the textbook to their specific choice of topics and provide the independent reader with a richer exposure to algebra. Many exercises include substantial hints, and navigation of the topics is facilitated by an extensive index and by hundreds of cross-references.

hatcher algebraic topology: Topology Tai-Danae Bradley, Tyler Bryson, John Terilla, 2020-08-18 A graduate-level textbook that presents basic topology from the perspective of category theory. This graduate-level textbook on topology takes a unique approach: it reintroduces basic, point-set topology from a more modern, categorical perspective. Many graduate students are familiar with the ideas of point-set topology and they are ready to learn something new about them. Teaching the subject using category theory--a contemporary branch of mathematics that provides a way to represent abstract concepts--both deepens students' understanding of elementary topology and lays a solid foundation for future work in advanced topics.

hatcher algebraic topology: Homotopical Topology Anatoly Fomenko, Dmitry Fuchs, 2016-06-24 This textbook on algebraic topology updates a popular textbook from the golden era of the Moscow school of I. M. Gelfand. The first English translation, done many decades ago, remains very much in demand, although it has been long out-of-print and is difficult to obtain. Therefore, this updated English edition will be much welcomed by the mathematical community. Distinctive features of this book include: a concise but fully rigorous presentation, supplemented by a plethora of illustrations of a high technical and artistic caliber; a huge number of nontrivial examples and computations done in detail; a deeper and broader treatment of topics in comparison to most beginning books on algebraic topology; an extensive, and very concrete, treatment of the machinery

of spectral sequences. The second edition contains an entirely new chapter on K-theory and the Riemann-Roch theorem (after Hirzebruch and Grothendieck).

hatcher algebraic topology: Counterexamples in Topology Lynn Arthur Steen, J. Arthur Seebach, 2013-04-22 Over 140 examples, preceded by a succinct exposition of general topology and basic terminology. Each example treated as a whole. Numerous problems and exercises correlated with examples. 1978 edition. Bibliography.

hatcher algebraic topology: Homology Theory James W. Vick, 2012-12-06 This introduction to some basic ideas in algebraic topology is devoted to the foundations and applications of homology theory. After the essentials of singular homology and some important applications are given, successive topics covered include attaching spaces, finite CW complexes, cohomology products, manifolds, Poincare duality, and fixed point theory. This second edition includes a chapter on covering spaces and many new exercises.

hatcher algebraic topology: More Concise Algebraic Topology J. P. May, K. Ponto, 2012-02 With firm foundations dating only from the 1950s, algebraic topology is a relatively young area of mathematics. There are very few textbooks that treat fundamental topics beyond a first course, and many topics now essential to the field are not treated in any textbook. J. Peter May's A Concise Course in Algebraic Topology addresses the standard first course material, such as fundamental groups, covering spaces, the basics of homotopy theory, and homology and cohomology. In this sequel, May and his coauthor, Kathleen Ponto, cover topics that are essential for algebraic topologists and others interested in algebraic topology, but that are not treated in standard texts. They focus on the localization and completion of topological spaces, model categories, and Hopf algebras. The first half of the book sets out the basic theory of localization and completion of nilpotent spaces, using the most elementary treatment the authors know of. It makes no use of simplicial techniques or model categories, and it provides full details of other necessary preliminaries. With these topics as motivation, most of the second half of the book sets out the theory of model categories, which is the central organizing framework for homotopical algebra in general. Examples from topology and homological algebra are treated in parallel. A short last part develops the basic theory of bialgebras and Hopf algebras.

hatcher algebraic topology: Basic Concepts of Algebraic Topology F.H. Croom, 2012-12-06 This text is intended as a one semester introduction to algebraic topology at the undergraduate and beginning graduate levels. Basically, it covers simplicial homology theory, the fundamental group, covering spaces, the higher homotopy groups and introductory singular homology theory. The text follows a broad historical outline and uses the proofs of the discoverers of the important theorems when this is consistent with the elementary level of the course. This method of presentation is intended to reduce the abstract nature of algebraic topology to a level that is palatable for the beginning student and to provide motivation and cohesion that are often lacking in abstact treatments. The text emphasizes the geometric approach to algebraic topology and attempts to show the importance of topological concepts by applying them to problems of geometry and analysis. The prerequisites for this course are calculus at the sophomore level, a one semester introduction to the theory of groups, a one semester introduc tion to point-set topology and some familiarity with vector spaces. Outlines of the prerequisite material can be found in the appendices at the end of the text. It is suggested that the reader not spend time initially working on the appendices, but rather that he read from the beginning of the text, referring to the appendices as his memory needs refreshing. The text is designed for use by college juniors of normal intelligence and does not require mathematical maturity beyond the junior level.

hatcher algebraic topology: Modern Classical Homotopy Theory Jeffrey Strom, 2011-10-19 The core of classical homotopy theory is a body of ideas and theorems that emerged in the 1950s and was later largely codified in the notion of a model category. This core includes the notions of fibration and cofibration; CW complexes; long fiber and cofiber sequences; loop spaces and suspensions; and so on. Brown's representability theorems show that homology and cohomology are also contained in classical homotopy theory. This text develops classical homotopy theory from a

modern point of view, meaning that the exposition is informed by the theory of model categories and that homotopy limits and colimits play central roles. The exposition is guided by the principle that it is generally preferable to prove topological results using topology (rather than algebra). The language and basic theory of homotopy limits and colimits make it possible to penetrate deep into the subject with just the rudiments of algebra. The text does reach advanced territory, including the Steenrod algebra, Bott periodicity, localization, the Exponent Theorem of Cohen, Moore, and Neisendorfer, and Miller's Theorem on the Sullivan Conjecture. Thus the reader is given the tools needed to understand and participate in research at (part of) the current frontier of homotopy theory. Proofs are not provided outright. Rather, they are presented in the form of directed problem sets. To the expert, these read as terse proofs; to novices they are challenges that draw them in and help them to thoroughly understand the arguments.

hatcher algebraic topology: *Basic Algebraic Topology* Anant R. Shastri, 2016-02-03 Building on rudimentary knowledge of real analysis, point-set topology, and basic algebra, Basic Algebraic Topology provides plenty of material for a two-semester course in algebraic topology. The book first introduces the necessary fundamental concepts, such as relative homotopy, fibrations and cofibrations, category theory, cell complexes, and si

hatcher algebraic topology: Elementary Applied Topology Robert W. Ghrist, 2014 This book gives an introduction to the mathematics and applications comprising the new field of applied topology. The elements of this subject are surveyed in the context of applications drawn from the biological, economic, engineering, physical, and statistical sciences.

hatcher algebraic topology: Algebraic Topology - Homotopy and Homology Robert M. Switzer, 2017-12-01 From the reviews: The author has attempted an ambitious and most commendable project. [...] The book contains much material that has not previously appeared in this format. The writing is clean and clear and the exposition is well motivated. [...] This book is, all in all, a very admirable work and a valuable addition to the literature. Mathematical Reviews

hatcher algebraic topology: Algebraic Topology: An Intuitive Approach Hajime Satō, 1999 The single most difficult thing one faces when one begins to learn a new branch of mathematics is to get a feel for the mathematical sense of the subject. The purpose of this book is to help the aspiring reader acquire this essential common sense about algebraic topology in a short period of time. To this end, Sato leads the reader through simple but meaningful examples in concrete terms. Moreover, results are not discussed in their greatest possible generality, but in terms of the simplest and most essential cases. In response to suggestions from readers of the original edition of this book, Sato has added an appendix of useful definitions and results on sets, general topology, groups and such. He has also provided references. Topics covered include fundamental notions such as homeomorphisms, homotopy equivalence, fundamental groups and higher homotopy groups, homology and cohomology, fiber bundles, spectral sequences and characteristic classes. Objects and examples considered in the text include the torus, the Möbius strip, the Klein bottle, closed surfaces, cell complexes and vector bundles.

hatcher algebraic topology: An Introduction to Differentiable Manifolds and Riemannian Geometry , 1975-08-22 An Introduction to Differentiable Manifolds and Riemannian Geometry

hatcher algebraic topology: Combinatorial Algebraic Topology Dimitry Kozlov, 2008-01-08 This volume is the first comprehensive treatment of combinatorial algebraic topology in book form. The first part of the book constitutes a swift walk through the main tools of algebraic topology. Readers - graduate students and working mathematicians alike - will probably find particularly useful the second part, which contains an in-depth discussion of the major research techniques of combinatorial algebraic topology. Although applications are sprinkled throughout the second part, they are principal focus of the third part, which is entirely devoted to developing the topological structure theory for graph homomorphisms.

hatcher algebraic topology: Algebraic Topology of Finite Topological Spaces and Applications Jonathan A. Barmak, 2011-08-24 This volume deals with the theory of finite topological spaces and

its relationship with the homotopy and simple homotopy theory of polyhedra. The interaction between their intrinsic combinatorial and topological structures makes finite spaces a useful tool for studying problems in Topology, Algebra and Geometry from a new perspective. In particular, the methods developed in this manuscript are used to study Quillen's conjecture on the poset of p-subgroups of a finite group and the Andrews-Curtis conjecture on the 3-deformability of contractible two-dimensional complexes. This self-contained work constitutes the first detailed exposition on the algebraic topology of finite spaces. It is intended for topologists and combinatorialists, but it is also recommended for advanced undergraduate students and graduate students with a modest knowledge of Algebraic Topology.

hatcher algebraic topology: Lectures on Algebraic Topology Sergeĭ Vladimirovich Matveev, 2006 Algebraic topology is the study of the global properties of spaces by means of algebra. It is an important branch of modern mathematics with a wide degree of applicability to other fields, including geometric topology, differential geometry, functional analysis, differential equations, algebraic geometry, number theory, and theoretical physics. This book provides an introduction to the basic concepts and methods of algebraic topology for the beginner. It presents elements of both homology theory and homotopy theory, and includes various applications. The author's intention is to rely on the geometric approach by appealing to the reader's own intuition to help understanding. The numerous illustrations in the text also serve this purpose. Two features make the text different from the standard literature: first, special attention is given to providing explicit algorithms for calculating the homology groups and for manipulating the fundamental groups. Second, the book contains many exercises, all of which are supplied with hints or solutions. This makes the book suitable for both classroom use and for independent study.

hatcher algebraic topology: *Algebraic Topology* Satya Deo, 2003-12-01

hatcher algebraic topology: Algebraic Topology William Fulton, 2013-12-01 To the Teacher. This book is designed to introduce a student to some of the important ideas of algebraic topology by emphasizing the re lations of these ideas with other areas of mathematics. Rather than choosing one point of view of modem topology (homotopy theory, simplicial complexes, singular theory, axiomatic homology, differ ential topology, etc.), we concentrate our attention on concrete prob lems in low dimensions, introducing only as much algebraic machin ery as necessary for the problems we meet. This makes it possible to see a wider variety of important features of the subject than is usual in a beginning text. The book is designed for students of mathematics or science who are not aiming to become practicing algebraic topol ogists-without, we hope, discouraging budding topologists. We also feel that this approach is in better harmony with the historical devel opment of the subject. What would we like a student to know after a first course in to pology (assuming we reject the answer: half of what one would like the student to know after a second course in topology)? Our answers to this have guided the choice of material, which includes: under standing the relation between homology and integration, first on plane domains, later on Riemann surfaces and in higher dimensions; wind ing numbers and degrees of mappings, fixed-point theorems; appli cations such as the Jordan curve theorem, invariance of domain; in dices of vector fields and Euler characteristics; fundamental groups

hatcher algebraic topology: Foundations of Algebraic Topology Samuel Eilenberg, Norman Steenrod, 2015-12-08 The need for an axiomatic treatment of homology and cohomology theory has long been felt by topologists. Professors Eilenberg and Steenrod present here for the first time an axiomatization of the complete transition from topology to algebra. Originally published in 1952. The Princeton Legacy Library uses the latest print-on-demand technology to again make available previously out-of-print books from the distinguished backlist of Princeton University Press. These editions preserve the original texts of these important books while presenting them in durable paperback and hardcover editions. The goal of the Princeton Legacy Library is to vastly increase access to the rich scholarly heritage found in the thousands of books published by Princeton University Press since its founding in 1905.

hatcher algebraic topology: Categories and Functors Bodo Pareigis, 1970

hatcher algebraic topology: *Basic Topology* M.A. Armstrong, 2013-04-09 In this broad introduction to topology, the author searches for topological invariants of spaces, together with techniques for their calculating. Students with knowledge of real analysis, elementary group theory, and linear algebra will quickly become familiar with a wide variety of techniques and applications involving point-set, geometric, and algebraic topology. Over 139 illustrations and more than 350 problems of various difficulties help students gain a thorough understanding of the subject.

hatcher algebraic topology: Differential Topology Morris W. Hirsch, 2012-12-06 A very valuable book. In little over 200 pages, it presents a well-organized and surprisingly comprehensive treatment of most of the basic material in differential topology, as far as is accessible without the methods of algebraic topology....There is an abundance of exercises, which supply many beautiful examples and much interesting additional information, and help the reader to become thoroughly familiar with the material of the main text. —MATHEMATICAL REVIEWS

hatcher algebraic topology: Classical Topology and Combinatorial Group Theory John Stillwell, 2012-12-06 In recent years, many students have been introduced to topology in high school mathematics. Having met the Mobius band, the seven bridges of Konigsberg, Euler's polyhedron formula, and knots, the student is led to expect that these picturesque ideas will come to full flower in university topology courses. What a disappointment undergraduate topology proves to be! In most institutions it is either a service course for analysts, on abstract spaces, or else an introduction to homological algebra in which the only geometric activity is the completion of commutative diagrams. Pictures are kept to a minimum, and at the end the student still does nr~ understand the simplest topological facts, such as the rcason why knots exist. In my opinion, a well-balanced introduction to topology should stress its intuitive geometric aspect, while admitting the legitimate interest that analysts and algebraists have in the subject. At any rate, this is the aim of the present book. In support of this view, I have followed the historical development where practicable, since it clearly shows the influence of geometric thought at all stages. This is not to claim that topology received its main impetus from geometric recreations like the seven bridges; rather, it resulted from the l'isualization of problems from other parts of mathematics-complex analysis (Riemann), mechanics (Poincare), and group theory (Dehn). It is these connec tions to other parts of mathematics which make topology an important as well as a beautiful subject.

hatcher algebraic topology: Bordism, Stable Homotopy and Adams Spectral Sequences Stanley O. Kochman, 1996 This book is a compilation of lecture notes that were prepared for the graduate course ``Adams Spectral Sequences and Stable Homotopy Theory'' given at The Fields Institute during the fall of 1995. The aim of this volume is to prepare students with a knowledge of elementary algebraic topology to study recent developments in stable homotopy theory, such as the nilpotence and periodicity theorems. Suitable as a text for an intermediate course in algebraic topology, this book provides a direct exposition of the basic concepts of bordism, characteristic classes, Adams spectral sequences, Brown-Peterson spectra and the computation of stable stems. The key ideas are presented in complete detail without becoming encyclopedic. The approach to characteristic classes and some of the methods for computing stable stems have not been published previously. All results are proved in complete detail. Only elementary facts from algebraic topology and homological algebra are assumed. Each chapter concludes with a guide for further study.

hatcher algebraic topology: *Introduction to Topology* Theodore W. Gamelin, Robert Everist Greene, 2013-04-22 This text explains nontrivial applications of metric space topology to analysis. Covers metric space, point-set topology, and algebraic topology. Includes exercises, selected answers, and 51 illustrations. 1983 edition.

hatcher algebraic topology: Topology and Groupoids Ronald Brown, 2006 Annotation. The book is intended as a text for a two-semester course in topology and algebraic topology at the advanced undergraduate orbeginning graduate level. There are over 500 exercises, 114 figures, numerous diagrams. The general direction of the book is towardhomotopy theory with a geometric point of view. This book would providea more than adequate background for a standard algebraic topology coursethat begins with homology theory. For more information

seewww.bangor.ac.uk/r.brown/topgpds.htmlThis version dated April 19, 2006, has a number of corrections made.

hatcher algebraic topology: Lectures On Algebraic Topology Haynes R Miller, 2021-09-20 Algebraic Topology and basic homotopy theory form a fundamental building block for much of modern mathematics. These lecture notes represent a culmination of many years of leading a two-semester course in this subject at MIT. The style is engaging and student-friendly, but precise. Every lecture is accompanied by exercises. It begins slowly in order to gather up students with a variety of backgrounds, but gains pace as the course progresses, and by the end the student has a command of all the basic techniques of classical homotopy theory.

hatcher algebraic topology: On Thom Spectra, Orientability, and Cobordism Yu. B. Rudyak, 2007-12-12 Rudyak’s groundbreaking monograph is the first guide on the subject of cobordism since Stong's influential notes of a generation ago. It concentrates on Thom spaces (spectra), orientability theory and (co)bordism theory (including (co)bordism with singularities and, in particular, Morava K-theories). These are all framed by (co)homology theories and spectra. The author has also performed a service to the history of science in this book, giving detailed attributions.

hatcher algebraic topology: Algebraic Topology Marvin J. Greenberg, 2018-03-05 Great first book on algebraic topology. Introduces (co)homology through singular theory.

hatcher algebraic topology: A First Course in Algebraic Topology Czes Kosniowski, 1980-09-25 This self-contained introduction to algebraic topology is suitable for a number of topology courses. It consists of about one quarter 'general topology' (without its usual pathologies) and three quarters 'algebraic topology' (centred around the fundamental group, a readily grasped topic which gives a good idea of what algebraic topology is). The book has emerged from courses given at the University of Newcastle-upon-Tyne to senior undergraduates and beginning postgraduates. It has been written at a level which will enable the reader to use it for self-study as well as a course book. The approach is leisurely and a geometric flavour is evident throughout. The many illustrations and over 350 exercises will prove invaluable as a teaching aid. This account will be welcomed by advanced students of pure mathematics at colleges and universities.

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